



# WR60/WR80 Series

OVER-PRESSURE RELIEF VALVES



**> Waukesha Cherry-Burrell®**

Protect your pump with an external over-pressure relief valve. If pump discharge pressure exceeds the set cracking-pressure, the valve will open to a relief path.

The adjustable-spring actuator allows users to set the desired relief cracking pressure right at the valve by simply turning the adjustment screw. The relief pressure setting can be bypassed to completely open the valve for CIP cleaning without over-pressuring the valve.

## Over-Pressure Relief Valves

### FEATURES AND BENEFITS

- Utilizes standard W60/W80 single seat components offering machined-from-bar bodies, modular design, and low cost of ownership
- Adjustable-spring, maintenance-free actuator allows easy setting of desired relief cracking pressure
- Actuator piston bypasses relief pressure setting and fully opens valve for CIP cleaning without need to over-pressurize the valve
- Multiple body styles provide minimal dead-leg relief configurations with pump for efficient cleaning and processing
- Various controls options available on valve for feedback and automation
- W80 stem flush adapter available for aseptic applications

### MATERIALS

Product Wetted: ASTM 316L (UNS-S31603); (DIN-1.4404)

Non-Product: ASTM 304 (UNS-S30400); (DIN-1.4301)

Seat Material: Tef Flow™ "P" (Std) and metal (Optional) for strength and durability

Elastomers: FKM or EPDM

Finish:  $\leq 32\text{Ra}$  ( $\leq 0.8\text{ }\mu\text{m}$ ) Other finishes available upon request

Sizes: Available in three actuator diameters, 4" (102mm), 5" (127mm) and 6" (152mm) with heavy springs for these series and sizes:

- W61 air-to-raise valves (AR) 1.5" (38mm) – 4" (102mm)
- W63 air-to-lower (AL) 2" (51mm) -4" (102mm)

### PRESSURE RATINGS

#### Standard

VALVE SIZE WITH PRESSURE AT	1.0"/1.5" (25/38MM)	2.0" (51MM)	2.5" (64MM)	3.0" (76MM)	4.0" (101MM)	6.0"* (152MM)
70°F (20°C)	<b>500 PSI</b> (34.5 bar)	<b>450 PSI</b> (31 bar)	<b>400 PSI</b> (28 bar)	<b>350 PSI</b> (24 bar)	<b>200 PSI</b> (14 bar)	<b>150 PSI</b> (10 bar)
160/180°F (71/82°C)	<b>375 PSI</b> (26 bar)	<b>350 PSI</b> (24 bar)	<b>300 PSI</b> (17 bar)	<b>250 PSI</b> (17 bar)	<b>150 PSI</b> (10 bar)	<b>100 PSI</b> (6 bar)
250°F (121°C)	<b>250 PSI</b> (17 bar)	<b>250 PSI</b> (17 bar)	<b>200 PSI</b> (14 bar)	<b>150 PSI</b> (10 bar)	<b>125 PSI</b> (8 bar)	<b>75 PSI</b> (5 bar)

#### Valve with High Pressure Adapter and Clamps

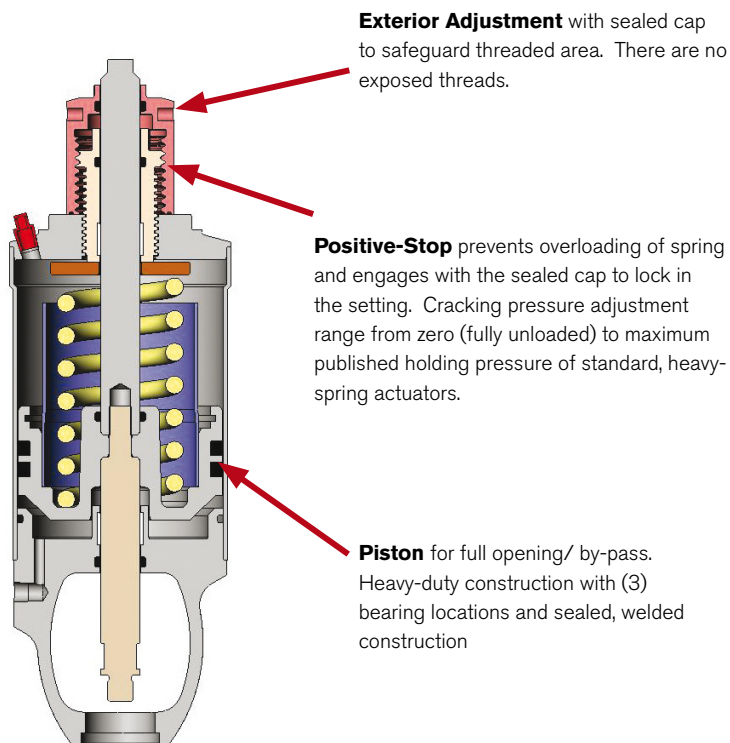
VALVE SIZE WITH PRESSURE AT	1.0"/1.5" (25/38MM)	2.0" (51MM)	2.5" (64MM)	3.0" (76MM)	4.0" (101MM)	6.0"* (152MM)
70°F (20°C)	<b>1220 PSI</b> (84 bar)	<b>900 PSI</b> (62 bar)	<b>720 PSI</b> (49 bar)	--	--	--
160/180°F (71/82°C)	<b>1160 PSI</b> (80 bar)	<b>855 PSI</b> (60 bar)	<b>690 PSI</b> (47 bar)	--	--	--
250°F (121°C)	<b>1100 PSI</b> (75 bar)	<b>830 PSI</b> (57 bar)	<b>660 PSI</b> (45 bar)	--	--	--

3, 4 or 6 inch high pressure clamp not available.

\*6" valves available in W61 Shutoff and W65 Divert only. For other valve types contact factory.

For all valve options see Valve Key Datasheet (DS-1204)

## Typical product applications



### NOTES:

- Pump Over-Pressure valves are designated as WR60 and WR80 Series Valves.
- Not an ASME rated device or SRV. Not suitable for tanks or other pressure-vessels.
- WR60/WR80 valves are not factory-set to a specific cracking pressure. Once installed, the valve should be adjusted and calibrated to desired relief pressure and verified by a line pressure gauge.

### Beverage

Beer  
Cider  
Fruit Drinks  
Liquid Sugar and Glucose  
Soft Drinks  
Wine  
Wort



### Food

Animal Oils  
Flavorings  
Pet Food  
Soups and Sauces  
Vegetable Juices  
Vegetable Oils  
Vinegars



### Dairy

Cream  
Milk  
Milk Concentrate  
Raw Milk  
Skimmed Milk  
Whey  
Whey Concentrate



### Pharmaceutical and Toiletries

Emulsions  
Extracts  
Lotions  
Perfumes  
WFI (Water for Injection)  
High Purity Water  
Pure Water



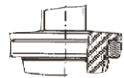
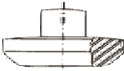
### Chemical

Additives  
Adhesives  
Coatings  
Contaminated Liquids  
Detergents  
Emulsions  
Paint



OPTIONS AND ACCESSORIES

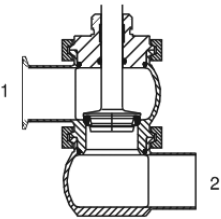
SEAT OPTIONS

SEAT TYPE		MAXIMUM TEMPERATURE	APPLICATION	SERIES
	TEF-FLOW™ "P" (TFP)	280°F (137°C)	High Temp High Pressure Pressure Relief	WR60 WR80
	Metal (M)	375°F (190°C)	High Pressure High Flow Large Particulate	WR60 WR80

PORT OPTIONS

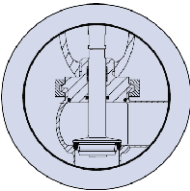
- W = Weld
- S = S-Line
- I = I-Line (female - 15I)
- 14I = I Line (male - 14I)
- B = Bevel Seat (male threaded end)
- F = Flange
- Q = Q-Line
- D = DIN 11851 405 Thread
- A = Aseptic I-Line (15NI)

For mixed connection types, specify in order of port #.

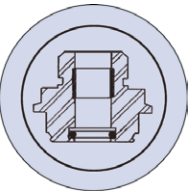


Example:  
W61-TS-SW

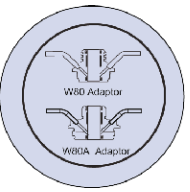
ADAPTER OPTIONS



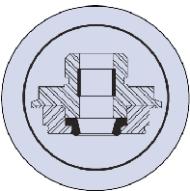
The 'standard' adaptor is used on all models of short and long stroke W60 Series valves. Machined from SS 316L bar with a thick cross-section, the adaptor adds strength to the valve body and provides alignment for the stem. The outer perimeter seals to the valve body with an O-ring that is located forward to the product zone to minimize crevices. The product stem passes through the adaptor and is sealed to the adaptor with an O-ring. A Teflon bearing guides the stem and takes up the mechanical loading imparted by hydraulic forces. This increases the service life of the stem seal. Adaptors are made in 1"-6" (25mm -152mm) sizes.



The pressure limitation of the W60 adaptor is the sealing capability of the dynamic O-ring on the product stem. This variation of the W60 adaptor uses a backing ring added on the atmospheric side to support the stem O-ring. This significantly boosts the pressure rating on the stem O-ring. The product stem passes through the adaptor and is sealed to the adaptor with an O-ring and is guided by a Teflon bearing.



This adaptor is used to convert a 'standard' W60 series valve to a W80. The outer perimeter seals to the valve body with an O-ring that is located forward to the product zone to minimize crevices. The product stem passes through the adaptor and is sealed in the upper part and the lower part of the adaptor with O-rings. The space between the O-rings is flushed with a suitable liquid or steam. The Teflon bearing is located in the flushed chamber. Adaptors are made in 1"-6" (25mm - 152mm) sizes. For vacuum-rated, extended shelf-life (ESL) applications, the W80A adaptor adds steam trace to the adapter-to-valve body connection



For high-risk and hard to clean product applications, the wiping stem seal fills the gap between the product zone and the traditional O-ring stem seal. The adaptor is a two-piece design to allow easy inspection or replacement of the wiping stem seal. The outer perimeter seals to the valve body with an O-ring that is located forward to the product zone to minimize crevices. A Teflon bearing is used to guide and support the valve stem.

## CONTROL TOP OPTIONS

### WCB BRANDED CONTROL TOPS

#### WR63/WR83 ONLY

##### Product Benefits And Features

- Transparent Control Top keeps all electrical components visible.
- Maintainable, designed with the user in mind, making assembly and troubleshooting worry free and easy.
- SPX uses the industry's most widely recognized electrical components, so access to off the shelf replacement parts is easy, ensuring quick delivery and less down time.
- NEMA 4x (IP64)
- Stainless Steel Control Top Option

##### Connector Options

- S/O Cord Grip for hard wire (std)
- Quick Disconnect Pin Connectors

##### Interface Options

- ASi Field Bus Card
- Device Net Field Bus Network Card

##### Position Indication

- Set & Forget Switch
- Inductive Proximity Switches 20-140V AC/DC, 2-Wire (Std)
- Microswitches 24VDC, 110VAC
- Intrinsically safe options 5-24VDC

##### Solenoid Valves

- 24VDC or 110V

#### WR61/WR81 ONLY

- Yoke mount proximity switch
- (1) or (2) inductive proximity switches, 24VDC/110VAC 2-wire
- Intrinsically safe options
- Externally Mounted Solenoids



Set & Forget  
Control Top



### APV BRANDED CONTROL TOPS

#### WR63/WR83 ONLY

##### Product Features And Benefits

- Reliability and long service life - robust clamp connection, reinforced Stainless Steel air coupling threads to avoid air leakages, and water tight seals
- Reduced costs - few parts and simple design
- Ease of Operation - contains manual override solenoids and adjustment screw to throttle air flow to actuator to ensure optimal opening and closing
- Clarity - clear and bright indication of valve position - 5 diodes in LED panel and convenient location
- Standardization - same control top used on various APV valve lines, offers common look and controls interface
- NEMA 6 (IP67)

##### Connector Options

- S/O Cord Grip for hard wire (std)
- Quick Disconnect Pin Connectors

##### Interface Options

- ASi Field® Bus Card
- Profibus and DeviceNet (CU3)

##### Position Indication

- 2 internal or 2 external feedback sensor switches for valve open/valve closed position detection

##### Solenoid Valves

- 24V DC or 110V AC
- Select 1 or 3 Solenoids



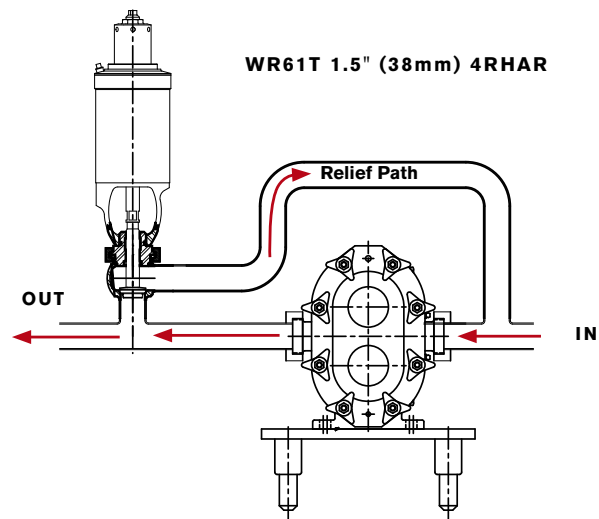
CONFIGURATIONS AND THEORY OF OPERATION

Over-Pressure Protection on a Positive-Displacement Pump using the Adjustable-Spring Actuator

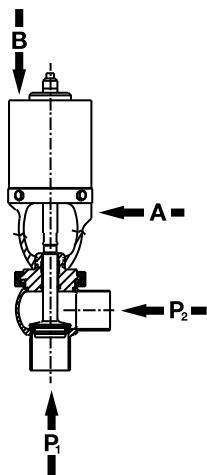
Capacity Example:

- Model 30 Universal PD
- 1.5" (38mm) Ports, 25 gpm (6 M³/hr)
- Cracking Pressure: 100 psi (7 bar)
- Air-to-Raise Configuration

Use the W61 Holding Pressure Charts in the Operation and Maintenance manual or datasheet DS-1201 to select a maximum holding-pressure higher than the desired cracking pressure for a given plug size. Use the heavy-duty actuator listings i.e. 4HAR. WR61 holding pressures also listed on page 10.



W61 AR/HAR (air-to-raise) - Standard Stroke



	VALVE SIZE - INCHES (MM) - PRESSURE IN PSI (BAR)						
	ACTUATOR SIZE IN (MM)	1" (25)	1.5" (38)	2" (51)	2.5" (64)	3" (76)	4" (102)
Bottom Port (P <sub>1</sub> ), Actuator spring holds closed against:	4HAR	213 (15)	177 (12)	99 (7)	64 (4)	44 (3)	25 (2)
	5HAR <sub>i</sub>	---	378 (26)	212 (15)	136 (9)	94 (6)	54 (4)
	6HAR <sub>i</sub>	---	602 (42)	338 (23)	216 (15)	150 (10)	87 (6)

Select:  
4HAR, maximum holding pressure of 177 psi (12 bar)  
The 4RHAR Adjustable-Spring actuator will also hold to 177 psi (12 bar) max when fully loaded.  
Designate the W61 as a WR61.

Selection: WR61T 1.5" 4RHAR

Set Pressure

- Use tables on page 10 or in the W60/W80 Operation and Maintenance manual, 95-03022, to estimate the number of turns off the maximum to achieve the desired relief cracking pressure.
- 177 psi (12 bar) – 100 psi (7 bar) desired cracking point = 77 psi (5 bar)  
1.5" (38mm) Plug, 4RHAR, 24 psi (2 bar) per turn reduction from maximum
- Turn adjustment screw 100% down (fully loaded to maximum), then back off 77/24 or approximately 3.2 turns to achieve 100 psi (7 bar) cracking pressure

Refer to page 9, Pressure Rise Charts for performance under flow.

Air-To-Raise Spring-Adjustable Actuator Spring Setting Pressure change per turn of adjusting screw

PLUG SIZE	ACTUATOR		
	4RHAR	5RHAR	6RHAR
1.5	24	40	82
2.0	13	23	46
2.5	9	15	29
3.0	6	10	20
4.0	3	6	12

Screw may be different due to spring variations.

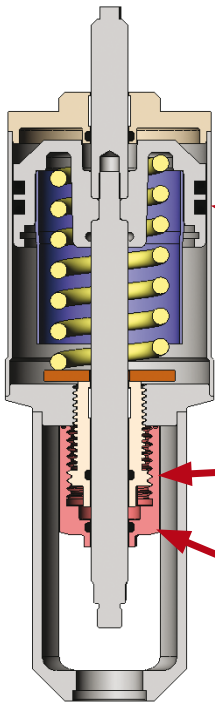
## CONFIGURATIONS AND THEORY OF OPERATION

### Over-Pressure Protection on a Positive-Displacement Pump using the Adjustable-Spring Actuator

For Free-draining, minimal dead-leg relief piping, use the WR63 valve, CD body and an Air-to-Lower, adjustable-spring actuator. If pump discharge pressure exceeds the set cracking-pressure, the valve will open and relieve the over-pressure to pump suction.

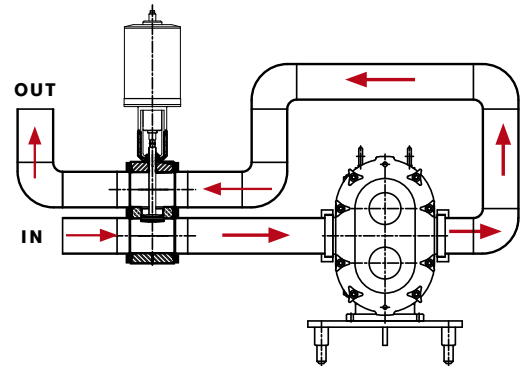
#### Selection: WR63CD Reverse-Acting

**WR63 Reverse-Acting Over-Pressure Relief with CD body for Cross-Flow Operation**



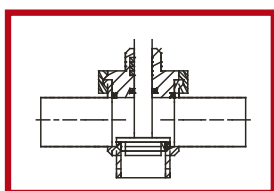
Cracking pressure adjustment range from zero (fully unloaded) to maximum published hold pressure of standard, heavy-spring actuators.

- Piston for full opening/by-pass. Heavy-Duty construction with (3) bearing locations and sealed, welded construction.
- Positive-Stop prevents overloading of spring and engages with the sealed cap to lock in the setting.
- Exterior Adjustment with sealed cap to safeguard threaded area.

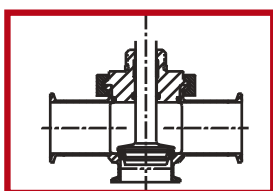


#### Selection: WR61C Air-To-Raise Adjustable-Spring Actuator

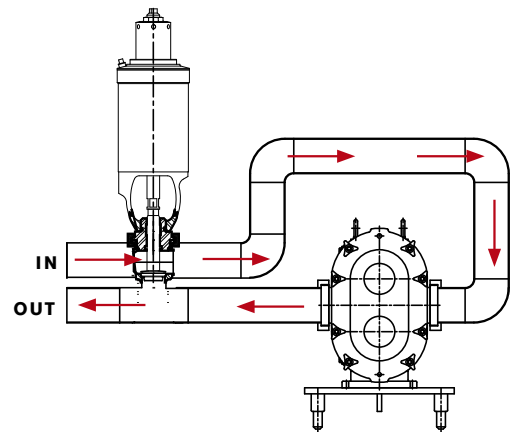
Air-to-Raise (WR61), Cross-Flow Body configurations also available for minimal dead-leg relief lines. Use the C, CM or CPS body with a close-coupled tee as a cost effective solution.



**CM**



**CPS**



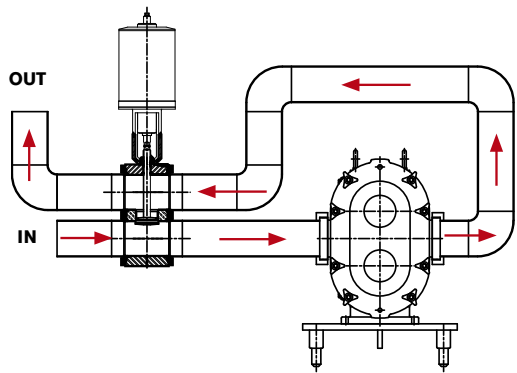
CONFIGURATIONS AND THEORY OF OPERATION

Over-Pressure Protection using a Reduced-Seat Valve and the Adjustable-Spring Actuator

Reduced-Seat Valve Bodies

Capacity Example:

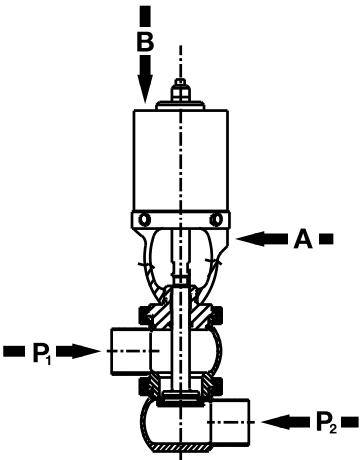
- Model 220 Universal PD
- 4" (102mm) Ports, 115 gpm (26m³/hr)
- Cracking Point: 170 psi (12 bar)
- Cross-flow, minimal dead-leg
- Air-to-lower (AL) configuration



Use the W63 Holding Pressure Charts in the Operation and Maintenance manual or datasheet DS-1201 to select a maximum holding-pressure higher than the desired cracking pressure for a given plug size. Use the heavy-duty actuator listings i.e. 4HAR. WR63 holding pressures also listed on page 10.

W63 AL/AHL (Air-to-Lower) - Standard Stroke

	VALVE SIZE - INCHES (MM) - PRESSURE IN PSI (BAR)						
	ACTUATOR SIZE IN (MM)	1" (25)	1.5" (38)	2" (51)	2.5" (64)	3" (76)	4" (102)
Port (P <sub>1</sub> ), Actuator spring holds closed against:	4AL	231 (16)	164 (11)	81 (6)	49 (3)	33 (2)	17 (1)
	4HAL <sub>1</sub>	301 (21)	233 (16)	114 (8)	69 (5)	46 (3)	24 (2)
	5AL	349 (24)	290 (20)	142 (10)	86 (6)	58 (4)	31 (2)
	5HAL <sub>1</sub>	---	497 (34)	244 (17)	147 (10)	99 (7)	52 (4)
	6AL	442 (30)	385 (27)	189 (13)	114 (8)	77 (5)	41 (3)
	6HAL <sub>1</sub>	---	---	323 (22)	195 (13)	131 (9)	68 (5)



A cracking pressure of 170 psi (12 bar) is achievable - with a 2.5" (64mm) plug

Selection: 6HAL provides 68 psi (5 bar) max. holding pressure on a 4" (102 mm) plug- not enough to achieve desired cracking pressure of 170 psi (12 bar) for the chosen line size.

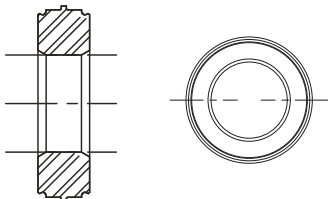
Reduced-Seat Selection: WR63CD 40/25 with the 6RHAL actuator

While the port connections and body remain 4.0" (102 mm), the valve plug is 2.5" (64 mm). The maximum holding pressure of the 2.5" (64 mm) plug can be used = 195 psi (13 bar).

For Reduced-Seat valves, pressure drop, pressure rise and reseating pressure must be estimated using the 2.5" (64 mm) valve plug size. Refer to Pressure Rise Charts on page 9.

When the desired cracking pressure exceeds the maximum holding pressure of the actuator- for the chosen valve size:

1. Consider reducing the valve size and using a reducer in the piping. This is the most cost-effect solution for T-body styles
2. For cross-flow bodies, a reduced-seat option can be selected.



Reduced-Seat Insert 4.0/2.5

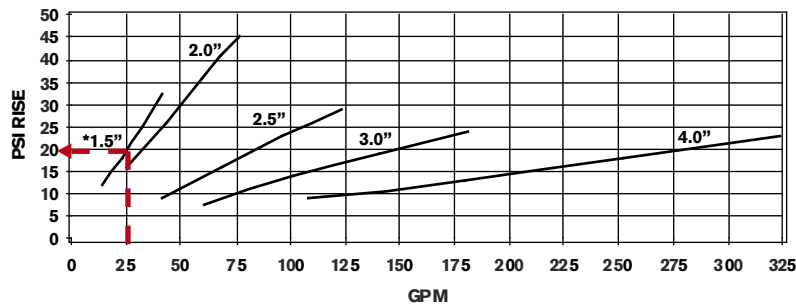


## ADDITIONAL TECHNICAL DATA

### WR61/WR63 Over-Pressure Valve Pressure Rise

Utilizing either Air-to-Rise or Air-to-Lower adjustable-spring actuators respectively

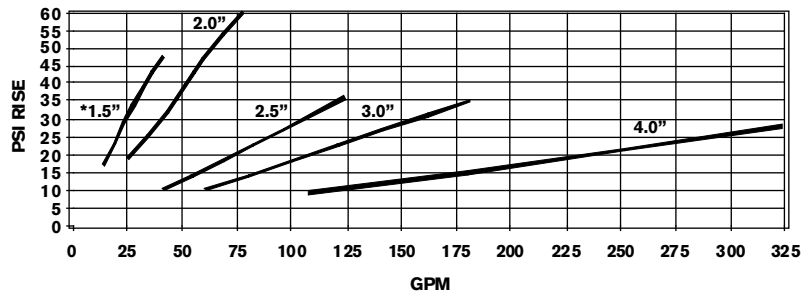
4" (102 mm)  
Diameter  
Actuator



**WR61T 1.5" (38) 4RHAR Actuator**  
Relief @ 25 gpm (6 m<sup>3</sup>/hr) will produce 20 psi (1 bar) added pressure rise.

(See notes below)

5" (127 mm)  
Diameter  
Actuator

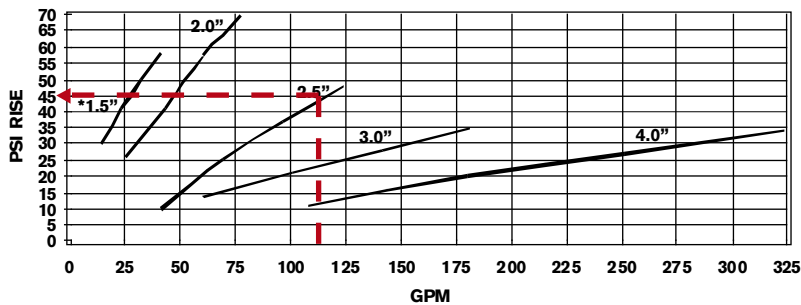


#### Reseating Pressure:

Total relief line pressure must drop by 20 psi (1 bar) for reseating.

(See table below)

6" (152 mm)  
Diameter  
Actuator



**WR63CD 4.0"(102mm)/  
2.5"(64mm) 6RHAL Actuator**  
Relief @ 115 gpm (26 m<sup>3</sup>/hr) adds 45 psi (3 bar) pressure rise with the 2.5" (64 mm) plug.

(See notes below)

#### Reseating Pressure:

Total relief line pressure must drop by 18 psi (1 bar) for reseating.

(See table below)

#### \* Valve Seat Size

Pressure rise and reseating values are estimated based on water at 70°F (21°C).

Results can vary subject to flow conditions and product properties. For pressure rise curves on viscous fluids, please contact factory.

NOTE: Not for use as an ASME-coded relief valve.

#### Chart Guide

1. Locate curve for selected actuator size and valve seat size.
2. Where relief flow rate intersects curve, determine pressure rise.
3. Add pressure-rise to relief-pressure and relief-path line-pressure loss, elevation loss, destination pressure etc. For estimated total pressure during relief.
4. Use reseat pressure to gauge minimum differential between set pressure and normal operating pressure.

RESEATING PRESSURE		
VALVE SEAT SIZE INCHES (MM)	REDUCTION IN PRESSURE FROM SET PRESSURE PSI (BAR)	
	WR61	WR63
1.5" (38)	20 (1 bar)	30 (2 bar)
2" (51)	12 (.8 bar)	22 (2 bar)
2.5" (64)	8 (.5 bar)	18 (1 bar)
3" (76)	5 (.3 bar)	15 (1 bar)
4" (102)	5 (.3 bar)	15 (1 bar)

## ADDITIONAL TECHNICAL DATA

### WR61 DATA

#### Maximum Holding Pressure\* Per Valve Size From W61 Valve Chart

PLUG SIZE INCHES (MM)	ACTUATOR SIZE PSI (BAR)		
	4" HAR	5" HAR	6" HAR
1.5" (38)	177 (12)	378 (26)	602 (42)
2.0" (51)	99 (7)	212 (15)	338 (23)
2.5" (64)	64 (4)	136 (9)	216 (15)
3.0" (76)	44 (3)	94 (6)	150 (10)
4.0" (102)	25 (2)	54 (4)	87 (6)

#### Pressure\* Change Per Turn of Adjusting Screw

PLUG SIZE INCHES (MM)	ACTUATOR SIZE PSI (BAR)		
	4" RHAR	5" RHAR	6" RHAR
1.5" (38)	24 (2)	40 (3)	82 (6)
2.0" (51)	13 (.9)	23 (2)	46 (3)
2.5" (64)	9 (.6)	15 (1)	29 (2)
3.0" (76)	6 (.4)	10 (.7)	20 (1)
4.0" (102)	3 (.2)	6 (.4)	12 (.8)

Actual pressure change per turn of adjusting screw may be different due to variations between springs.

### WR63 DATA

#### Maximum Holding Pressure\* Per Valve Size From W63 Valve Chart

PLUG SIZE INCHES (MM)	ACTUATOR SIZE PSI (BAR)		
	4" HAL	5" HAL	6" HAL
1.5" (38)**	233 (16)	497 (34)	659 (45)
2.0" (51)	114 (8)	244 (17)	323 (22)
2.5" (64)	69 (5)	147 (10)	195 (13)
3.0" (76)	46 (3)	99 (7)	131 (9)
4.0" (102)	24 (2)	52 (4)	68 (5)

#### Pressure\* Change Per Turn of Adjusting Screw

PLUG SIZE INCHES (MM)	ACTUATOR SIZE PSI (BAR)		
	4" RHAL	5" RHAL	6" RHAL
1.5" (38)**	32 (2)	53 (4)	90 (6)
2.0" (51)	16 (1)	26 (2)	44 (3)
2.5" (64)	9 (.6)	16 (1)	27 (2)
3.0" (76)	6 (.4)	11 (.7)	18 (1)
4.0" (102)	3 (.2)	6 (.4)	9 (.6)

Actual pressure change per turn of adjusting screw may be different due to variations between springs.

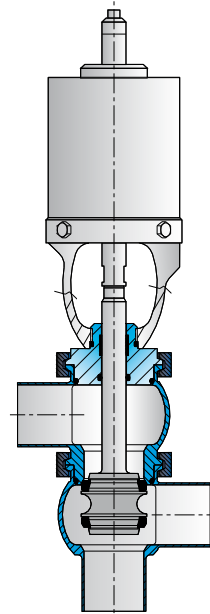
\*Review valve features and port connections to determine pressure limitations.

\*\* WR63 not available with 1.5" (38mm) body size due to limitations on pressure adjustment to 0 psi (0 bar) relief pressure. It is only available with longer body sizes and 1.5" (38mm) reduced seat insert.

## W60 SERIES VALVES: SAFE, STRONG AND SANITARY

### Sanitary Design for CIP

- Long-radius bodies are free-draining without recesses for superior cleaning performance.
- Stationary seals close to the product zone: choice of O-ring, quad or wiping-stem seals.
- Spin-cleaning, Snap-on PTFE seats for reliable sealing: choice of PTFE, PEEK™, Tri-Ring, Metal or bonded rubber.



W62TT

### Long lasting and Easy to Maintain

- Machined-from-Bar construction with thick walls and interlocking bodies to resist distortion and active plant environments.
- Multiple PTFE bearings for stem alignment and strength.
- Long life actuator is field-maintainable with finger-safe, caged springs and cartridge-piston assemblies.

### Simple, Flexible Design of proven dependability

- **Modular bonnets:** Standard, High-Pressure (up to 1200 PSI (83 bar)), W80 Series Flush (for steam or liquid).
- **Rugged, See-Through Control Tops:** Set & Forget Switch Technology, Proximity and Micro-Switches, Bus Cards: ASi and DeviceNet.

Made in Wisconsin



## WR60/WR80 Series

### OVER-PRESSURE RELIEF VALVES



Based in Charlotte, North Carolina, SPX Corporation (NYSE: SPW) is a global Fortune 500 multi-industry manufacturing leader. For more information, please visit [www.spx.com](http://www.spx.com)

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