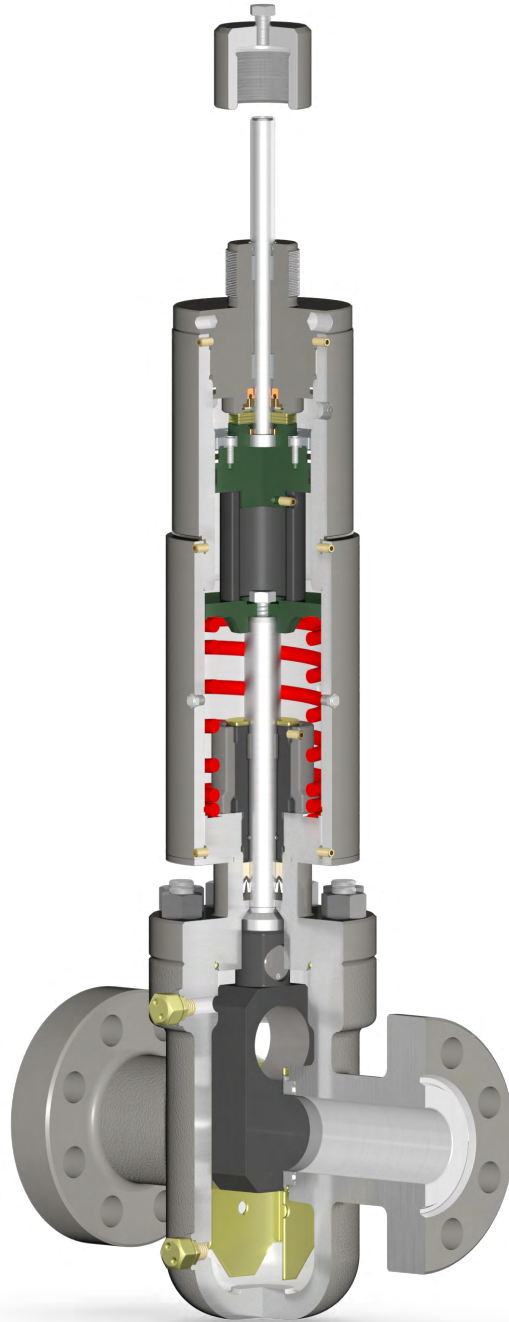




***SINGLE ACTING HYDRAULIC ACTUATOR (SAH)
GATE VALVE SERVICE AND OPERATION MANUAL***



INTRODUCTION

In appreciation to our customer for purchasing our product, we have prepared this Operation Manual to assist you in the Operation, Maintenance, Assembly and Installation of the Valveworks USA API 6A Single Acting Hydraulic Actuator (SAH) Gate Valve. We encourage following the recommendations in this booklet to attain the best possible service from our product, which is designed and proven to offer the service one can expect of a quality product.

To contact a representative for more specific information pertaining to a special problem:



**1650 SWAN LAKE ROAD
BOSSIER CITY, LA USA 71111**

PHONE	318-425-0266
FAX	318-425-0934
TOLL FREE	888-425-0266
EMAIL	SALES@VWUSA.US
WEBSITE	WWW.VALVEWORKSUSA.COM

QUALITY

Valveworks USA management and employees are committed to continually improve the effectiveness of our quality management system to produce a quality assured product which meets or exceeds our customer's expectations and requirements.

SAFETY

Caution must be taken as to the surrounding area and its potential dangers of projectiles.

Pressure kills! Even a loose, stand alone valve may contain trapped pressure which will turn any component into a projectile missile when disassembled, causing injury or death. Never stand over a component or in its path of release during assembly. Always operate the valves from the open to close position slowly releasing trapped pressure. Always remove fittings first, taking extreme caution to their potential danger as a projectile. If the valve is frozen and can not be operated, take extreme caution to the disassembly of the components.

Weighted blankets or protective screens and shields should be utilized. Caution should be taken when handling components during disassembly and assembly, as most components are heavy, greasy, hard to handle and have edges which can cause injury. Always be cautious of how the valve is positioned and standing. Be sure the valve is secured in position so there is no possible chance of tipping over. Never apply test pressure above the manufacturers rated working pressure. The shell test pressure above the working pressure has already been tested by the manufacturer and is not required after the initial assembly test of the valve. The manufacturer has already verified the quality of the valve shell body components and will void the warranty from the manufacturer if the valve is pressure tested above the rated working pressure indicated for the valve. Always wear steel toes shoes, hard hat, eye and ear protection while performing repairs.

**TABLE OF CONTENTS**

APPLICATIONS	4
TEMPERATURE RATING	4
TRIM CHART	4
ORDERING INFORMATION	5-7
ACTUATOR ASSEMBLY INSTRUCTIONS	7-8
ACTUATOR ASSEMBLY-BOM	9-11
BONNET ASSEMBLY INSTRUCTIONS	12
BONNET ASSEMBLY-BOM	13
BONNET TO VALVE ASSEMBLY INSTRUCTIONS	14
BONNET TO VALVE ASSEMBLY-BOM	14-15
OPERATION	15
OPENING AND CLOSING THE VALVE	16
TROUBLESHOOTING	17



APPLICATIONS

Valveworks USA Single Acting Hydraulic Actuator (SAH) gate valves can be applied to the following sizes and working pressures.

APPLICATION	OPTIONS AVAILABLE
GATE VALVE SIZE	1-13/16 through 7-1/16
MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP)	0 to 20M
ACTUATOR MAXIMUM OPERATING PRESSURE	2500 PSI
TEMPERATURE RANGE	-60°C TO 121°C (-75°F TO 250°F)

The Single Acting Hydraulic Actuator (SAH) Gate Valves covered in this manual are suitable for performance requirement levels 1 and 2, PR1 and PR2 respectively.

TEMPERATURE RATING

TEMPERATURE CLASSIFICATION	OPERATING RANGE			
	°C		(°F)	
K	-60	82	-75	180
L	-46	82	-50	180
N	-46	60	-50	140
P	-29	82	-20	180
S	-18	60	0	140
T	-18	82	0	180
U	-18	121	0	250
V	2	121	35	250

TRIM CHART

MATERIAL CLASS	MINIMUM MATERIAL REQUIREMENTS	
	BODY, BONNET, END AND OUTLET CONNECTIONS	PRESSURE-CONTROLLING PARTS, STEMS, AND MANDREL HANGERS
AA - General Service	Carbon or low-alloy steel	Carbon or low-alloy steel
BB - General Service	Carbon or low-alloy steel	Stainless steel
CC - General Service	Stainless steel	Stainless steel
DD - Sour Service ^a	Carbon or low-alloy steel ^b	Carbon or low-alloy steel ^b
EE - Sour Service ^a	Carbon or low-alloy steel ^b	Stainless steel ^b
FF - Sour Service ^a	Stainless steel ^b	Stainless steel ^b
HH - Sour Service ^a	CRAs ^b	CRAs ^b
^a As defined by NACE MR0175.		
^b In compliance with NACE MR0175.		

As shown by API-6A. For specific details consult Valveworks USA.



ORDERING INFORMATION

The following information should be provided with any request for quote or order placement of ValveWorks USA Single Acting Hydraulic Actuator (SAH) Gate Valves:

ACTUATOR

- Model, Series and Size of Actuator
- API 6A Requirements (PR – PSL)
- ISO Certification Requirements
- Control Fluid Power
- Well Fluid Power
- Temperature
- Location (Onshore/Offshore)
- Material (API 6A)
- Actuator Control Pressure Availability
- Special Test Requirements
- Special Material Requirements

BONNET (to be supplied by VALVEWORKS USA)

- Model of Bonnet
- Size of Bonnet
- Pressure Rating (max.)
- Manufacturer (other than VALVEWORKS USA)
- API 6A Requirements (PR – PSL)
- Temperature (API 6A)
- Material (API 6A)
- Special Test Requirements
- Special Material Requirements
- Special Coating or Protection Requirements

VALVE

- Model of Valve
- Size of Valve
- Pressure Rating (maximum)
- API 6A Requirements (PR-PSL)
- API 14D Requirements (Class of Service)
- Temperature Rating (API 6A)
- Material (API 6A)
- Any Special Test Requirements
- Any Special Material Requirements
- Any Special Coating or Protection Requirements
- Other Specifications and/or Certifications



ACTUATOR ACCESSORIES (MECHANICAL)

Safety Lock Open Device:

This device is used to mechanically stroke the actuator. It is used on small or low-pressure valves while valve body is pressurized. It is typically used during installation and testing phases of well completions.

Hydraulic Opener:

Typically used for stroking large or high-pressure valves under well pressure and sometimes work over operations. These openers also replace the hand wheel opener which cannot be employed in high torque requirement applications.

Fusible Lock Open Cap:

Mechanically holds open the actuator and valve during work over or when the safety systems are inoperative. This device locks the actuator in the down position, allowing it to rise only in the event of a fire.

ACTUATOR ACCESSORIES (ELECTRICAL)

Electrical Limit Switch:

An electrical contact permits a remote indication of gate valve position (full open or full closed). Typically used on large production platforms where there is remote monitoring and control of valves.

Continuous Position Indicators:

Linear displacement transducers operate at low currents. The frequency of their output can be used to provide exact position throughout the range between the open and closed positions.

Proximity Switches:

This magnetically operated switch senses the linear motion of the valve by Magnetic action either with or without the need for physical contact.

Hydraulic Switches:

Hydraulic limit switches are available for use when electrical supply is not present.

Magnetic Reed Switches:

This magnetic reed switches device is activated by a magnetic field. It monitors linear travel of the gate valve. The switches are completely sealed against harsh environments.



ACTUATOR SELECTION

To simplify the process of selecting an actuator for a specific job, contact a Valveworks USA sales representative. Note that higher control supply pressure makes possible the use of smaller size actuators. If the maximum flow line pressure is much less than the pressure rating of the valve, then selection of the size of the actuator for this lower pressure rating will be less expensive.

PROCEDURE

It is important to determine valve specifications such as size, maximum working pressure, and expected shut-in pressure or maximum sales line delivery pressure. If maximum flow line pressure is less than half of the maximum working pressure of the valve consult Valveworks USA for optimum sizing of actuator. Also, determine the available control pressure (Hydraulic Pressure) supply at the well site. This supply can be rated up to 2500 psi.

For further assistance in ordering the right actuator series, contact Valveworks USA sales agent. To interpret the graphs for normal valve sizes, find the maximum Flowline Pressure on the lower horizontal axis. Next, find the Actuator Control Pressure on the left hand vertical axis. After locating the Flowline Pressure and the Actuator Control Pressure, locate their intersection point by drawing a vertical line from the selected Flowline Pressure and a horizontal line from the selected Actuator Control Pressure.

PERIODIC MAINTENANCE

Valveworks USA recommends the following maintenance schedule.

<i>Interval</i>	<i>Maintenance Operation</i>
<i>Once a Month</i>	<i>Cycle open and close one time.</i>
<i>As Required</i>	<i>Clean debris from vent and breather holes. Replace as needed.</i>
<i>Every 5 years</i>	<i>Replace Safety Valve</i>
<i>Every 5 years</i>	<i>Replace piston seals and wear rings.</i>
<i>When seals are replaced</i>	<i>Inspect top shaft and interior of piston housing.</i>

These are just recommended intervals of maintenance. Depending on the level of usage, your valve(s) may require more or less maintenance than this manual suggests. For more information, contact Valveworks USA.

ASSEMBLY INSTRUCTIONS

The following steps have to be followed before assembly of any component of the SAH series equipped valves.

- Assembly work area must be clean and free of dirt, metallic shavings and wood particles.
- Surface preparation of work area should be metallic or covered with a layer of corrugated cardboard.
- All lubricants and utensils used in assembly must be clean.
- All tools used in assembly must be clean and in good working order.
- Clean all components (metallic) prior to assembly.
- Keep all elastomers and plastic base materials in bags or boxes until needed for assembly.
- Inspect all components for burrs, dings, marks, scrapes, nicks, and etc. prior to assembly.



SINGLE ACTING HYDRAULIC ACTUATOR

- Inspect internal surface finish of upper/piston housing (8).
- Check all non-metallic components for flash, nicks, cuts, abrasions and etc.
- Inspect seal bore of threaded boss on top plug (2) for surface imperfections. Make sure coating is smooth. No ripples or fish eyes or covered particles are present.
- Grease entire bore of the top plug with light application of white silicone grease.
- Install polypaks (21), wear bearings (16) and rod wiper (20) inside the top plug.

Caution: Make sure lip of rod wiper is pointing toward grooved end of top plug.

- Install O-ring (23) and back up ring (24) on nose of top plug. Grease lightly. (The top plug is now assembled.)
- Grease outside diameter of piston (6) lightly.
- Install polypaks (14) and wear bearings (15) outside the piston.
- Place top shaft (1) in top of piston and install seal retainer (2).

Caution: Make sure retainer ring snaps into groove completely.

- Screw downstop (12) on the bottom side of the piston.

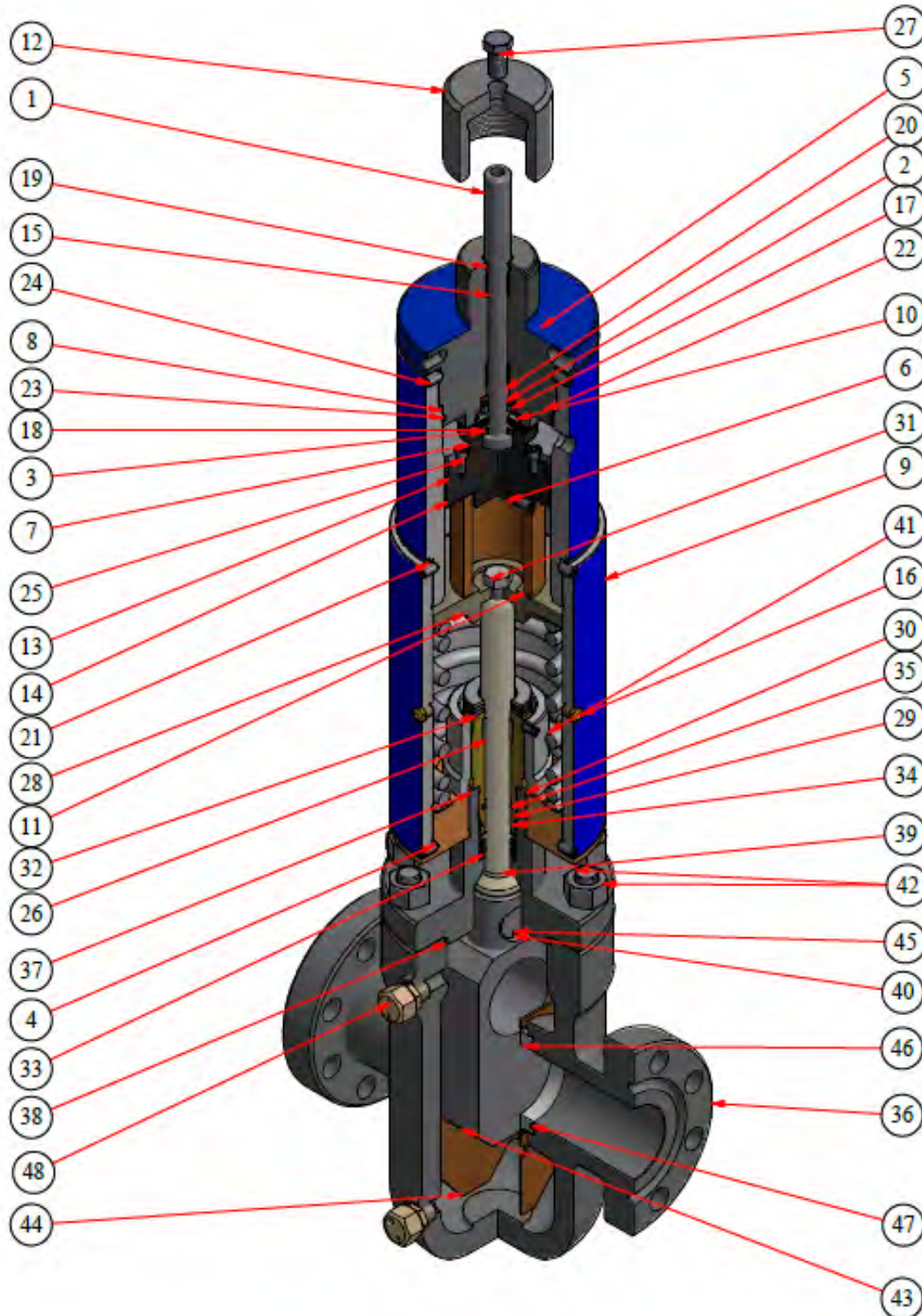
The piston assembly is now complete.

- Apply never-seize or equivalent to inside diameter threads of lower ring (4) and outside threads of bonnet assembly.
- Install shim stack, anti-rotate slip (38) and spring (33) on the top of lower ring accordingly.
- Place the spring plate on top of the spring and tighten it with 11 UNC bolt into the top of the stem.
- Place the lower housing on the lower ring with breather holes aligned with valve body flanges.
- Apply never-seize or equivalent to inside diameter threads of the lower housing (9) and outside diameter threads of the lower ring. Insert the screw through lower housing and screw it into lower ring.
- Place piston assembly along with downstop on top of spring plate.
- Apply never-seize or equivalent to inside diameter threads of the lower housing (9) and outside diameter threads of the piston/upper housing.
- Screw upper housing into lower housing and back off half a turn. Place an o-ring in the groove
- Lightly grease piston bore and slide the top shaft through the top plug.
- Apply never-seize or equivalent to inside diameter threads of upper housing and outside diameter threads of top plug.
- Screw top plug into the upper housing until the top plug bottoms. Install set screws into the housing.
- Insert one .625 – 11 UNC – 2A X 1.75 long bolt (25) through hole in lock open cap (13).
- With one hand holding top shaft from moving, place the lock open cap over and onto the crown of the top shaft with the other hand and rotate the bolt into the threaded hole of the top shaft.
- With one hand holding top shaft from moving, place the lock open cap over and onto the crown of the top shaft with the other hand and rotate the bolt into the threaded hole of the top shaft.

Rotate the lock open cap in a clockwise direction until lock open cap stops on shoulder of top plug case. (This action suspends the internal components from moving in any direction.)

- The ValveWorks USA Single-Acting Hydraulic Actuator is now assembled and ready for testing.
- After the actuator has been pressure tested, install Burst Disc Fitting in the pressure nipple located on the upper housing.

Before the completed SAH actuator can be tested, it must be thoroughly inspected. If this is a new actuator assembly, it must be adapted to a bonnet assembly and stroked several times, making sure that operating is smooth and complete by using an adequate hydraulic pressure. Once this new actuator assembly is mounted to the bonnet assembly, make sure that the lower housing to base plate and bolts are in place, tightened and secure. If this is a new actuator assembly, or if the bonnet, actuator, or valve have been repaired, testing must be performed by procedures outlined in API 14D or API 6A whichever is applicable for the valve and service. (This testing excludes Hydrostatic testing of the actuator). A certified individual should perform all assembly and testing.)



Single Acting Hydraulic Actuator (SAH)



Double Acting Hydraulic Actuator (DAHA) - BOM		
ITEM	DESCRIPTION	QTY
1	TOP SHAFT	1
2	SEAL RETAINER	1
3	RETAINER PLATE	1
4	LOWER RING	1
5	TOP CAP	1
6	PISTON	1
7	SEAL FACE PLATE	1
8	HYDRAULIC HOUSING	1
9	LOWER HOUSING	1
10	SHIM - COARSE	5
11	DOWNSTOP	1
12	LOCK OPEN CAP	1
13	PISTON SEAL	1
14	WEAR BEARING	1
15	WEAR BEARING	2
16	BREATHER	4
17	RETAINER RING	1
18	RETAINER RING	1
19	ROD WIPER	1
20	POLYPAK SEAL	1
21	O-RING	1
22	O-RING	1
23	BACKUP RING	1
24	SET SCREW	27
25	CAP SCREW	4
26	WEAR BEARING	1
27	BOLT, HEX HD	1
28	SPRING PLATE	1
29	PACKING RETAINER	1
30	ANTI-ROTATE SLIP	1
31	BOLT, HEX HD	1
32	SHIM	3
33	PACKING, OPTI-SEAL	1
34	O-RING	1
35	O-RING	1
36	BODY	1
37	BONNET	1
38	BONNET SEAL RING	1
39	STEM, BONNET	1
40	LIFT NUT	1
41	SPRING	1
42	STUD W/ NUT	8
43	GATE	1
44	GATE GUIDE	2
45	ROLL PIN	1
46	SEAT	2
47	O-RING	2
48	BODY GREASE FITTING	2



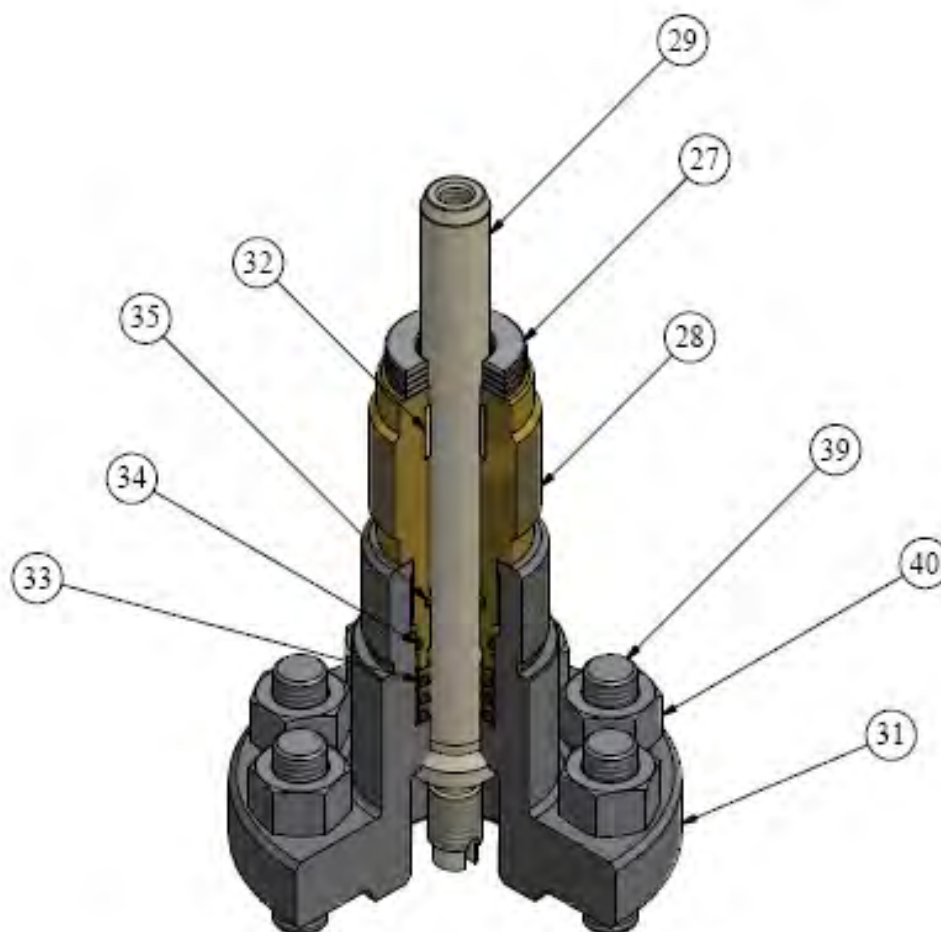
BONNET ASSEMBLY

The Bonnet is the part of the actuator that connects the actuator to the valve. Valveworks USA can manufacture the bonnet to adapt to each manufacturer or use the Adapter Bonnet Kit, when bonnet is to be supplied by the valve manufacturer. This adaptation component is designed for each manufacturer and each model of valve.

- The following are the assembly instructions for the bonnet:
- Inspect the bonnet in the following critical areas:
- Bonnet gasket seal face
- Fire seal area
- Proper identification after testing with proper marking technique on flange outer diameter or nameplate identification. This includes all additional porting such as bleeder holes, etc. Porting will differ with each valve manufacturer.
- Insert the Operating Stem into the bottom of the bonnet and lower the bonnet onto the Valve Body Assembly. Install bonnet nuts and tighten using star pattern.
- Screw the Lower Ring onto the bonnet and tighten.
- Screw the Anti-Rotate Slip onto the packing retainer and tighten.
- Screw Set Screw into the threaded hole at the top of the anti-rotate slip. The set screw should be tightened firmly against the upper (non-threaded) portion of the packing retainer.
- Move the gate into the open position and verify with the drift rod. Hold the Spring Plate in position on top of the operating stem and slide a stack of shims into the space between the top of the packing retainer and the bottom of the spring plate to determine the correct number of shims to use for setting the drift. Remove spring plate and slide shims onto operating stem so that they rest on the packing retainer. Replace the spring plate to ensure that no space exist between the shims and the bottom of the spring plate.
- Place the spring on the lower ring. Place the spring plate on the top of the spring and insert the spring plate bolt through the spring plate. Screw the spring plate bolt into the top of the operating stem as far as possible by hand. Using a wrench, compress the spring by screwing the spring plate bolt into the operating stem until it is tight.
- The bonnet is now complete and ready to be assembled and tested.

The valve and bonnet assembly must be tested in accordance with API 6A as applicable to the valve usage and service.

All assembly and testing must be performed by a certified assembler and tester.



BONNET ASSEMBLY - BILL OF MATERIALS

ITEM	DESCRIPTION	QTY
27	SHIMS	4
28	PACKING RETAINER	1
29	STEM, BONNET	1
31	BONNET	1
32	WEAR BEARING	1
33	OPTISEAL	1
34	O- RING	1
35	O- RING	1
39	STUD	8
40	HEX NUT	8

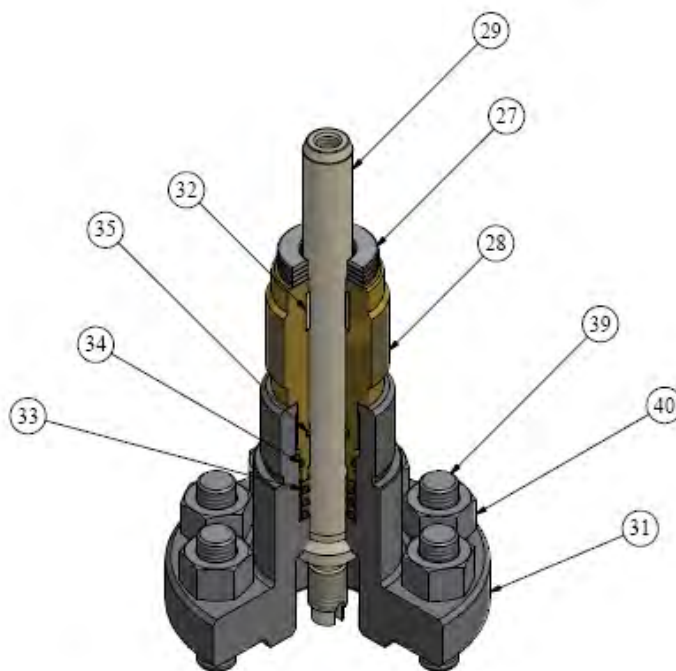


BONNET TO VALVE ASSEMBLY

- Insert the Operating Stem into the bottom of the bonnet and lower the bonnet onto the Valve Body Assembly. Install bonnet nuts and tighten using star pattern.
- Screw the Lower Ring onto the bonnet and tighten.
- Screw the Anti-Rotate Slip onto the packing retainer and tighten.
- Screw Set Screw into the threaded hole at the top of the anti-rotate slip. The set screw should be tightened firmly against the upper (non-threaded) portion of the packing retainer.
- Move the gate into the open position and verify with the drift rod. Hold the Spring Plate in position on top of the operating stem and slide a stack of shims into the space between the top of the packing retainer and the bottom of the spring plate to determine the correct number of shims to use for setting the drift. Remove spring plate and slide shims onto operating stem so that they rest on the packing retainer. Replace the spring plate to ensure that no space exist between the shims and the bottom of the spring plate.
- Place the spring on the lower ring. Place the spring plate on the top of the spring and insert the spring plate bolt through the spring plate. Screw the spring plate bolt into the top of the operating stem as far as possible by hand. Using a wrench, compress the spring by screwing the spring plate bolt into the operating stem until it is tight. The Valveworks USA bonnet assembly is now complete and ready to be assembled to the actuator.

Once the bonnet has been installed on a valve, it may be hydrostatically tested along with the valve and the actuator. The testing and assembling must be performed by a qualified assembler and tester.

The valve, bonnet and actuator assembly must be tested in accordance with API 6A and 14D as applicable to the valve usage and service.





BONNET TO VALVE ASSEMBLY - BOM		
27	SHIM	4
28	PACKING RETAINER	1
29	STEM, BONNET	1
31	WEAR BEARING	1
32	OPTISEAL	1
33	O-RING	1
34	O- RING	1
38	BODY GREASE FITTING	2
39	BODY, FLANGED	1
40	GATE	1
41	LIFT NUT	1
42	SEAT	2
43	GATE GUIDE	2
44	HEX NUT	8
45	STUD	8
46	BONNET SEAL RING	1
47	BONNET	1

OPERATION

Valveworks USA's single-acting hydraulic actuator is operated by application of adequate hydraulic pressure to the upper and lower side ports of the actuator. Hydraulic pressure on the internal piston will in turn force the bonnet stem to either open or close the valve, depending on whether the valve is direct acting or reverse acting. Proper amount of hydraulic supply needed per operation is found in the appendix.

Single-acting hydraulic actuators are very similar to double-acting hydraulic actuators; the noticeable difference between them is absence of a spring in a DAH actuator. Also, Valveworks USA SAH actuators have a port on its upper housing which can be used either as a supply port or an exhaust port. These actuators are made-up of the following basic components in their construction: top shafts, top plugs, pistons, downstops, springs, spring plates, stems, wear bearings, seals and base plates with bolts for holding the actuators together. Furthermore, the Valveworks USA SAH actuators contain seals such as O-rings, Optiseals and Polypak seals. The seals provide strength; low friction; wear resistance; temperature changes; and the ability to form a tight seal; all of which make the seals capable of withstanding hydraulic industrial application requirements.

The SSV valve with a Valveworks USA actuator is normally supplied in the fail-closed operating configuration. Hydraulic actuator supply drives the valve's reverse ported gate down and holds it in open position under normal operating conditions. In the event of an abnormal condition, the actuator supply pressure is released or bled off by quick exhaust mechanisms, allowing the valve to close by body pressure acting on the bonnet stem diameter and spring force. Restoration of hydraulic actuator supply pressure automatically reopens the valve.

When required, the valve can be configured with a fail open gate design for a blow-down system.



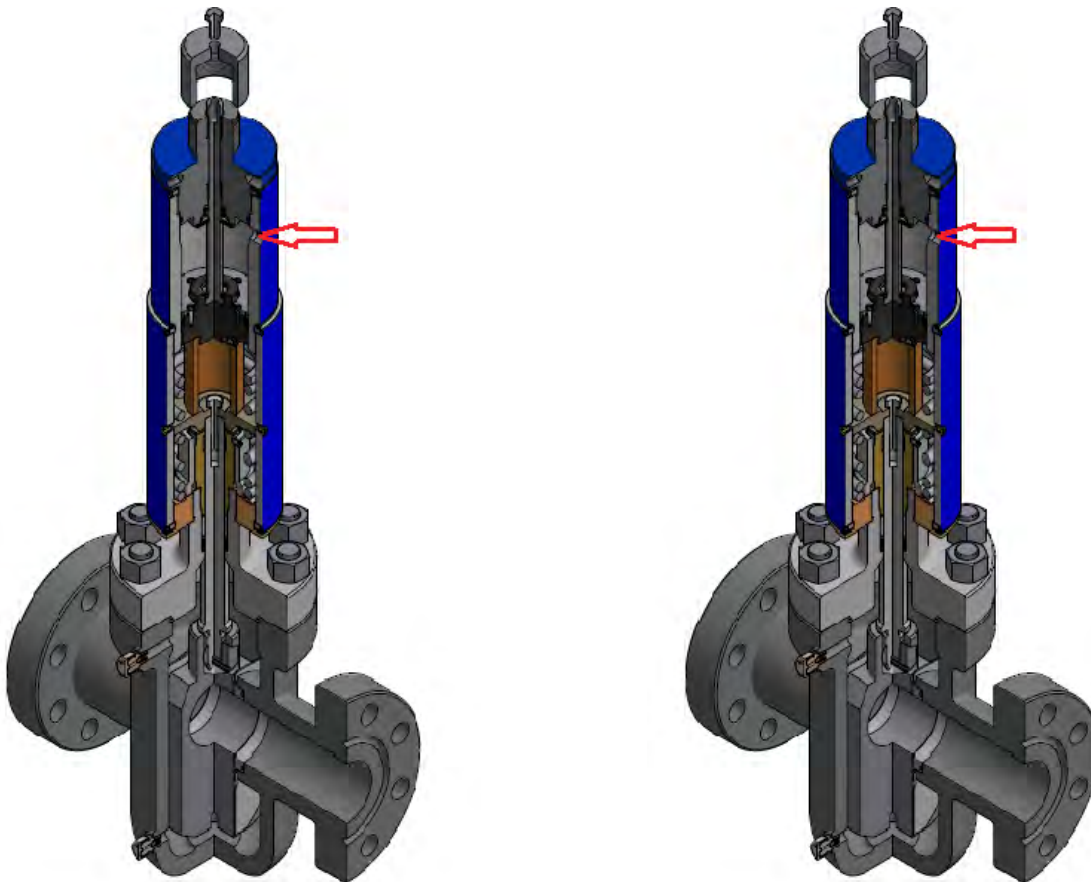
OPENING AND CLOSING THE VALVE

The actuator input pressure drives the reverse ported gate downwards into open position as shown in the figure. The arrow shows the pressure input location.

As the actuator pressure exits from the upper housing, valve body pressure and actuator spring force close the valve as shown in the figure. The arrow shows the pressure exit location.

Depending on the size of the valve, the actuator stroke can be calculated using the distance between spring plate and top of the lower ring with the gate closed for a reverse acting valve. Valveworks USA actuators contain stem spacers that assist in adjusting the stroke by adding/removing these spacers.

When required, the valve can be configured with a fail open gate design for a blow-down system.



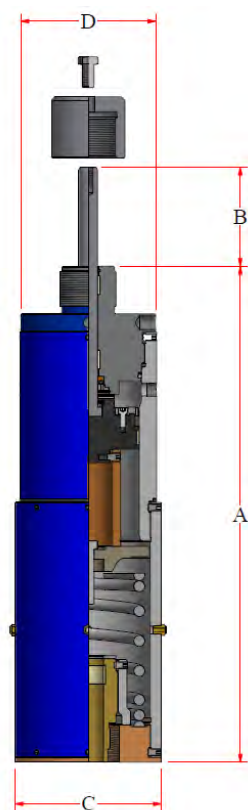


TROUBLESHOOTING

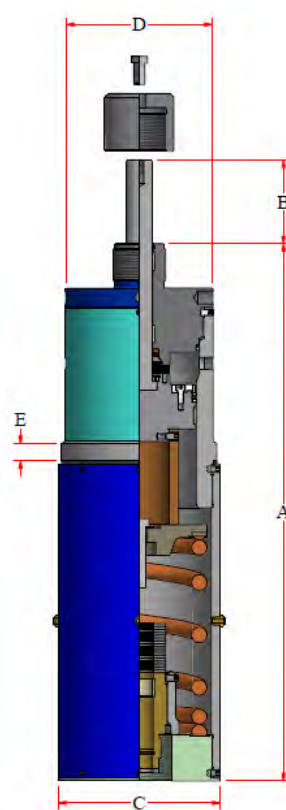
PROBLEM	CAUSE	SOLUTION
CONTROL PRESSURE WILL NOT BUILD IN ACTUATOR	Damaged control line	Inspect control line for damage and/or leak fittings.
	Insufficient pressure in control line	Install gauge at pressure source to verify desired pressure available.
	Faulty pressure gauge.	Verify if pressure gauge is correctly calibrated.
	Leaking around bolted flange and/or bottom of actuator.	Replace and/or inspect seals on piston retainer nut in as per assembly instructions. Check piston retainer nut thread engagement to piston retainer plate for face seal contact. Check bolts on flange for proper torque. If leakage persists, replace piston seals.
ACTUATOR WILL NOT STROKE ON A VALVE WHETHER OR NOT VALVE IS PRESSURIZED	Insufficient pressure in control line	Check pressure from source. Consult control pressure information from the information chart per size valve application (appendix).
	Bonnet to bonnet stem binding	Consult appropriate maintenance and operating instructions for bonnet.
	Valve and/or seals improperly installed	Remove actuator per instructions in this manual. Remove bonnet per instructions from bonnet manufacturer's maintenance and operating manual. Repair and/or replace valve components in accordance with valve manufacturer's instruction manual.
	Debris in valve and actuator vents	Remove actuator per instructions in this manual. Remove bonnet per instructions from bonnet manufacturer's maintenance and operating manual. Clean debris from valve body.
ACTUATOR WILL NOT STROKE TO "FULL CLOSED" OR FAIL SAFE" POSITION.	Gate and seats are improperly installed causing excessive friction	Remove actuator per instructions in this manual. Manually push and/or pull bonnet stem to determine severity of binding. If severe, clean and inspect gate and seats for wear/abrasion. Replace if signs of galling are observed.
	Excessive seal friction due to loss of lubrication in bonnet/valve.	Remove actuator per instructions in this manual. Manually push and/or pull bonnet stem to determine severity of binding. Remove bonnet per instructions from bonnet manufacturer's maintenance and operating manual. Clean, inspect, and lubricate.
ACTUATOR WILL NOT DRIFT AFTER ASSEMBLY OF BONNET TO VALVE	Wrong number of shims installed.	Remove actuator per instructions. Check number of shims.
	Wrong spacer ring per valve size.	Repeat actuator removal and check for proper spacer ring per bill of material.
	Improper gate to stem engagement.	Remove actuator and bonnet as per instruction manual. Adjust engagement per valve in manufacturer's instructions and/or drawings.
ACTUATOR LOWER RING TRIES TO UNSCREW	Anti-Rotate Slip is not torqued	Remove Lower and Upper Housing, Spring, Spring plate and re-torque with pipe wrench as per torque specifications.



PHYSICAL DIMENSIONS



550 SERIES



650 SERIES

SERIES	A	C	D	E
550	26.710	7.875	7.280	N/A
650	30.810	9.250	8.450	1.00

The dimensions B vary for different series of SAH actuators and different valve sizes chosen to accompany them.



**1650 SWAN LAKE ROAD
BOSSIER CITY, LA USA 71111**

PHONE	318-425-0266
FAX	318-425-0934
TOLL FREE	888-425-0266
EMAIL	SALES@VWUSA.US
WEBSITE	WWW.VALVEWORKSUSA.COM