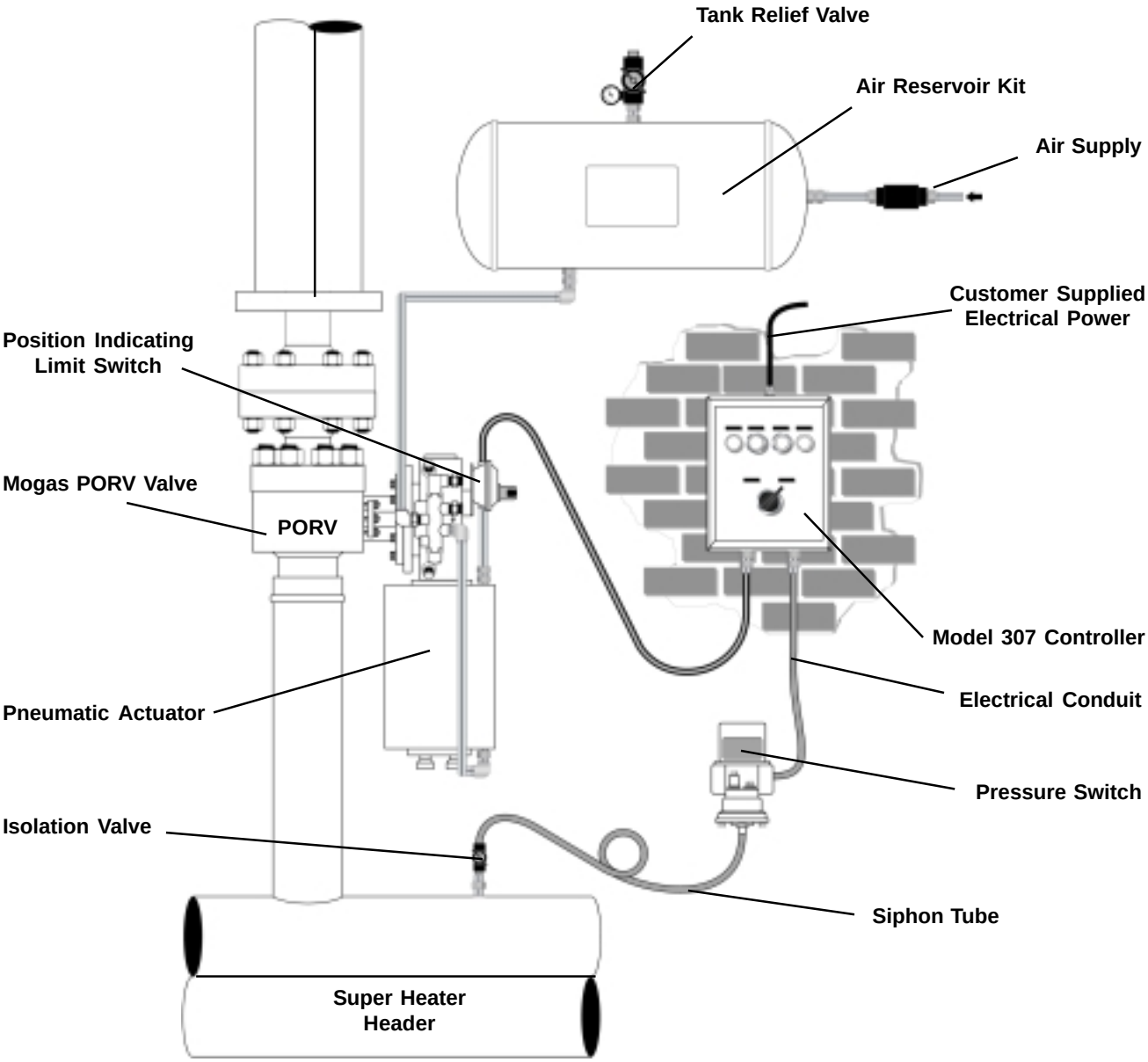
PORV
Maintenance Manual

PORV System Schematic



PORV Specification Sheet

Cornpany Contact _____

Mogas Sales Order No. _____

Customer P.O. No. _____

Ship Date _____

Mogas Ball Valve

ASME Class _____ Assembly Stamped Yes No

Body Material _____

Bore Size _____

Inlet Size _____ Sch. / I.D. _____ End Conn. _____

Outlet Size _____ Sch. / I.D. _____ End Conn. _____

Customer Operation Temp. _____

Customer Design Conditions _____

Opening Set Pressure _____

Reset Pressure _____

Relieving Capacity _____

PORV Standard Features

Control Box Controller Model 307

Actuator Model _____ Air Pressure _____ psi

Solenoid Valve _____

Limitswitch _____

Optional Features

Pressure Switch Yes No

Manufacturer _____ Part No. _____

Siphon Tube Yes No

Manufacturer _____ Part No. _____

Air Reservoir Kit Yes No

Manufacturer _____ Part No. _____

If you have questions regarding your Mogas **PORV**, please call 281.449.0291, and ask for the Service Department.

PORV Maintenance Manual

Table of Contents

PORV General Description

The set pressure of the PORV is selected to be lower than that of the spring loaded safety valve in order to prevent or reduce the number of lifts of the safety valve, thus extending the life of the safety valve. The set pressure selected for the PORV is recorded on the Mogas PORV Specification Sheet, located on page 2. Mogas provides both "V" stamped and non-stamped PORV valves. All valves are designed in accordance with ANSI B16.34. All "V" stamped PORVs have been flow certified by the National Board of Boiler and Pressure Vessel Inspectors.

The PORV operates as a system. The Mogas ball valve is normally closed. It opens when the solenoid valve is electrically energized. The pressure switch senses steam pressure and closes an electrical switch when steam pressure exceeds a predetermined set point. This, in turn, energizes the solenoid valve, which pressurizes the "to open" cylinder port of the pneumatic actuator, thereby opening the ball valve. The Mogas ball valve remains open until the steam pressure has returned to normal limits. When the pressure switch senses that the steam pressure has returned to normal, the electrical switch within the pressure switch opens, thereby de-energizing the solenoid valve and closing the Mogas ball valve.

PORV Standard Features

- **Mogas Ball Valve**
  Mogas Industries, Inc manufactures the severe service ball. Consult the PORV Specification on page 2 of this manual for specifics on the Inlet Size, Outlet Size, Sch. / I.D. and End Connections.

- **Pneumatic Actuator**
  The actuator is a Bettis Double Acting actuator, sized on a minimum of 80 psi air pressure. Details on the actuator are included in a separate manual prepared by the actuator manufacturer.

- **Control Box**
  The control box is a Model 307 Controller. It is an electrical control package, all housed in a single, weatherproof fiberglass control box. The Model 307 Controller includes: an "auto/manual" selector switch, separate red/green push buttons for local, manual opening and/or closing, separate red/green pilot lights which indicate open or closed, two ½" electrical conduit hubs, a 20-point terminal strip and pre-piped flexible conduit and wiring connections.

- **Limit switch**
  Westlock manufactures the limit switch, it is Part No. 2007XBY-25. It is mounted on the top of the actuator and has been adjusted at the Mogas factory.

- **Solenoid Valve**
  Versa manufactures the solenoid valve. It has been selected specifically for this service with ,high temperature electrical coils and trim. It is standard for the solenoid to be mounted on the actuator. In this case, air piping from the solenoid to the actuator is assembled at the Mogas factory. If the solenoid is shipped loose, the user assembles piping. The user assembles electrical wiring and air piping to the air supply during installation.

PORV Optional Features

- **Pressure Switch**
  The pressure switch is required to sense system pressure to signal automatic and closing of thePORV. If purchased from Mogas, the set point for the pressure switch has been calibrated to the customer specified value shown on the PORV Specification Sheet, located on page 2 of this manual. However, the set point is affected by temperature; thus it is recommended the set pressure calibration be confirmed by testing once the switch is installed in place. If purchased from Mogas, details on the pressure switch are included in a separate manual prepared by the pressure switch manufacturer.

PORV Optional Features

- **Siphon Tube**
  The siphon tube, if supplied by Mogas, is .125" O.D. x .35" thick wall, 316SS tube, with .25" NPT male (TIG welded on) ends. Standard length is 15 feet.

- **Air Reservoir Kit**
  Mogas recommends utilizing an air reservoir kit in the PORV System. The air reservoir kit is ntended to provide a sufficient mass of compressed air located close to the PORV System to assure rapid operation. Standard components include a 30-gallon air tank, a relief valve and a pressure gauge. If purchased from Mogas, details on the air reservoir kit are included in a separate manual prepared by the manufacturer. If purchased by the user, it is imperative that amply sized piping is used to allow operation in 1½" seconds or less.

The user is responsible for providing adequate instrument air and electrical power to the system, as well as locating and installing the components and sub-assemblies. Mogas personnel are available to assist during installation either on-site or by telephone.

PORV Installation

The following procedures are typical for installing a Mogas PORV. The standard PORV System consists of a Mogas ball valve, solenoid valve, limit switch and pneumatic actuator; all assembled, tested and adjusted as an integral unit. Additional accessories that are required to complete a PORV System include a control box, pressure switch and siphon tube. An optional air reservoir kit is also recommended to insure the specified maximum operating time of 1½ second. All of these items may be provided by the user, or furnished by Mogas. When furnished by Mogas, the user ships them loose for installation. Installation instructions assume that the user as part of the Mogas PORV System will install all items, both standard and optional. The user is ultimately responsible for the assurance of proper welding procedures and wiring.

Step 1 Verify that the valve is in the open position to prevent damage to internal parts from weld splatter. The PORV must remain in the open position during welding. Use the welding ground strap on the same end that is being welded to prevent electricity from traveling through the valve, which could ruin the ball and seat assembly.
Please see Weld Requirements below.

Weld Requirements

CAUTION: Current flow through the valve during installation can damage the ball or seat coating and cause valve leakage. Install the valve in-line and support the valve and actuator as necessary with nylon straps. If allowed by the weld procedure, weld the circumference evenly to minimize distortion and allow for cooling between passes. Preheat and postweld stress relief should be carried out per ASME VIII, ANSI B31.1 and ANSI B31.3, see table below. Note that F22 materials over ½" thick require 350ºF to 400ºF preheat and 1250ºF to 1350ºF postweld heat treat. Heat input to the valve during stress relief is to be minimized and monitored to keep the body below 1100ºF and the actuator below 200ºF. Place the heating coils as close to the weld as possible and keep the valve surfaces clear to allow maximum heat dissipation from the valve. Inspect the condition of the valve and actuator for proper orientation and alignment. Operate the valve several times to ensure smooth operation, noting any difference between before and after installation. Retorque packing gland nuts to 40 in. lbs.

Weld Requirements per ASME 31.1 & 31.3

Material	P No.	Group No.	Preheat {°F}	Postweld Heat Treatment {°F}
A105	1	2	50 - Nom. Thickness < 1" 175 - Nom. Thickness 1"	1100 – 1200 Nom. Thickness > ¾"[1]
F22	5	1	350 - 400	1300 - 1400 Nom. Thickness > ½"[2]

Notes: The term nominal thickness (Nom.) is the lesser thickness of the weld, or the materials being joined.
[1] Not required if nominal thickness is under ¾"and 200ºF minimum preheat is applied if the base material exceeds 1".
[2] Not required for nominal thickness under ½", 300ºF minimum preheat is applied and a maximum chrome content of 3%.

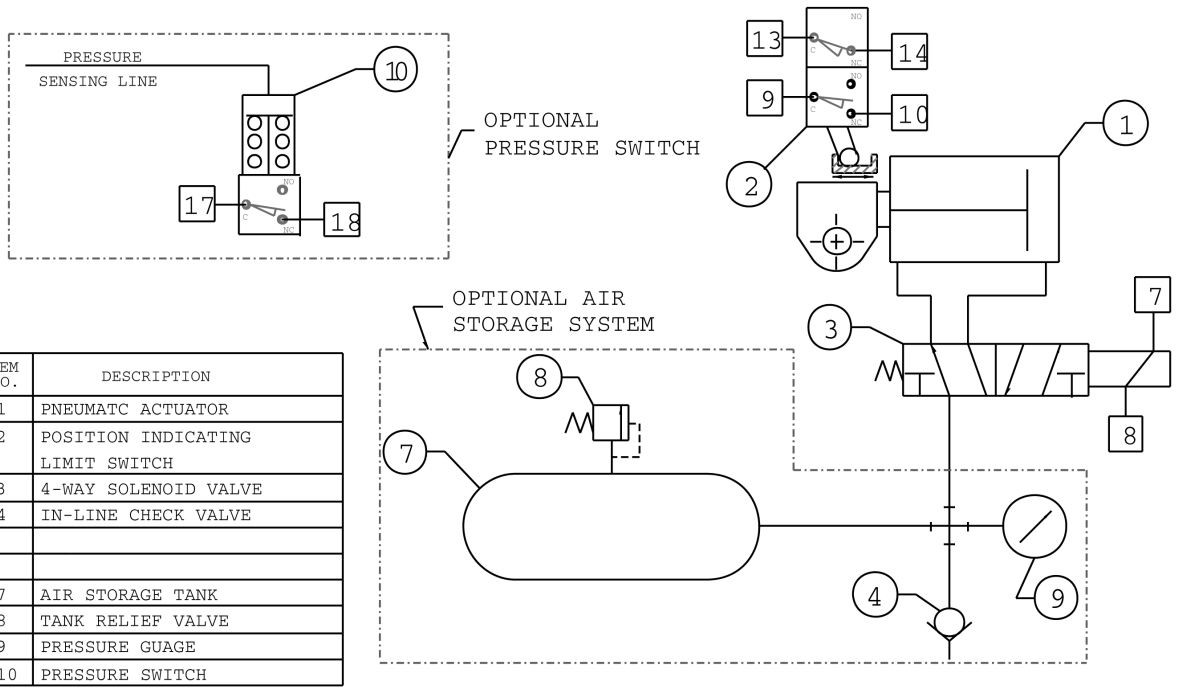
PORV Installation

Step 2 Install the Model 307 Controller to the PORV for remote operation.

Step 3 Locate and mechanically connect the pressure switch and siphon tube to the pressure-sensing tap in the steam piping system. An isolation valve is recommended between the siphon tube and the pressure-sensing tap.

Step 4 If used, the optional air reservoir kit should be installed and connected to the solenoid valve as shown in Figure 1, below. It is imperative for proper operation, that the supply tubing size from the air storage kit to the solenoid valve be large enough to insure 1½-second operation, or less. The tubing or piping size from the air storage kit should be at least equal to the solenoid valve inlet connection size.

Figure 1 Installation of the Optional Air Reservoir Kit



ITEM NO.	DESCRIPTION
1	PNEUMATC ACTUATOR
2	POSITION INDICATING LIMIT SWITCH
3	4-WAY SOLENOID VALVE
4	IN-LINE CHECK VALVE
7	AIR STORAGE TANK
8	TANK RELIEF VALVE
9	PRESSURE GUAGE
10	PRESSURE SWITCH

Shown in Closed Position
(Solenoid De-energized)

NOTE: Air Supply Line - It is important that the user provide sufficiently sized piping between the air reservoir and the solenoid valve to prevent air starvation of the actuator. If an air reservoir kit is not utilized, it is imperative that the user provides ample piping to allow operation in 1½ second or less. Recommended air supply line is ½". This assumes 100 equivalent feet of pipe from the source, 15rP @ supply pressure 100 psi.

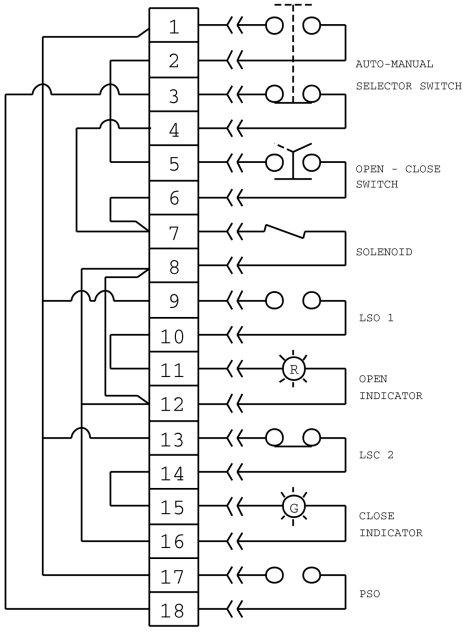
PORV Installation

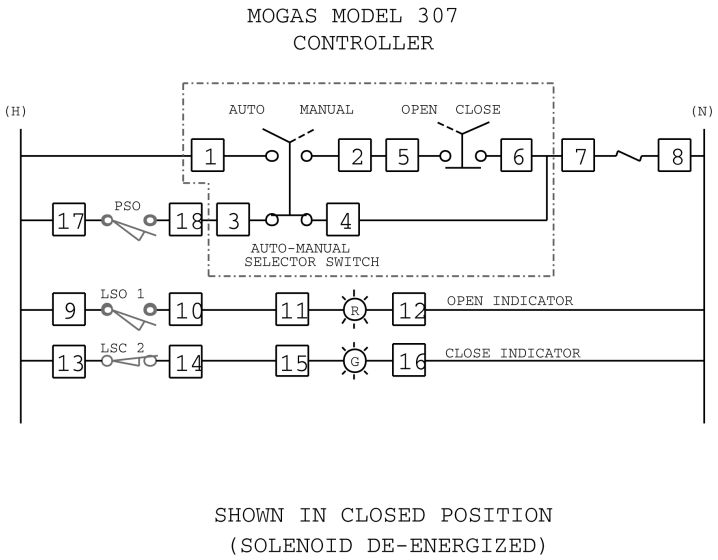
Step 5 The pressure switch, Model 307 Controller, solenoid valve and limit switch, should all be electrically wired as shown in Figure 2, located below. The installation of the PORV System is now complete. Opening and closing the valve with the Model 307 Controller can verify proper hook-up and operation.

Figure 2 Installation of the Controller and Solenoid Valve

Note: Cycle Time Should be 1½ Seconds or Less
If not, please confirm the following:
- ***Adequate instrument air pressure (80 psi)***
- ***Supply line size (½")***
- ***Correct stem packing torque (40 in. lbs.)***

Customer Power Connections at Terminals 1 & 8





PORV Operation

Manual Operation

To manually operate the PORV System, on the Model 307 Controller, turn the selector switch to "hand". Press the green "open" button. The PORV will cycle from closed to open. During cycling, both indicator lights will be illuminated. At the end of the opening stroke, only the red light will be illuminated. To return the PORV to the closed position, press the red "close" button. Both indicator lights will illuminate during the closing stroke. At the end of the stroke, the green indicator light will remain illuminated.

PORV Operation

Automatic Operation

Turn the selector switch to the “auto” position. The PORV will cycle open at the set pressure specified by the customer, noted on the PORV Specification Sheet, page 2 of this PORV Owner’s Manual.

Verification of Automatic Operation

Verification of “opening” set point of the pressure switch and “closing” set point of the pressure switch is achieved by connecting the switch to a calibrated pressure source. If the pressure switch is provided by Mogas it is preset according to the customer specified set pressure. Temperature changes affect this set pressure; thus it is recommended that the pressure switch be recalibrated under working conditions. Details on the pressure switch are included in a separate manual prepared by the pressure switch manufacturer.

PORV Maintenance

- Lubricate pneumatic actuator according to manufacturer instructions
- After the first excursion to elevated temperature, retorque the gland nuts tt 40 in. lbs. Check the packing gland nuts periodically, retorque if necessary.
- No lubrication is required for the operation of Mogas Ball Valves.

PORV Disassembly, Rework, Assembly

Disassembly

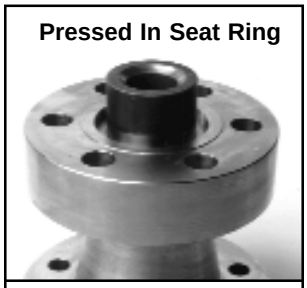
If the valve is still under Mogas warranty, the disassembly, rework and assembly of ASME “V” stamped and non stamped Mogas PORV valves is to be performed only by certified Mogas service technicians or by Mogas Industries, Inc.

Step 1 Remove bolts holding the actuator to the mounting flange or mounting flange adapter; remove adapter.

Step 2 Disassemble any piping from the valve, which prevents removal of the valve. If welded in, make sure the valve is open during cutting to allow slag to be cleaned out of the bore and to prevent damage to the ball.

Step 3 Grind or chisel off ground bead welded across the body to end connection joint. Remove body-to-end connect bolting and remove the end connect. Be careful not to damage sealing surface inside the body gasket counter-bore. If the gasket sticks in the body or end connection, please remove the gasket at this time. If the ball and seat appear in good condition, skip to Step 2 of the Rework section, located on page 9 of this manual.

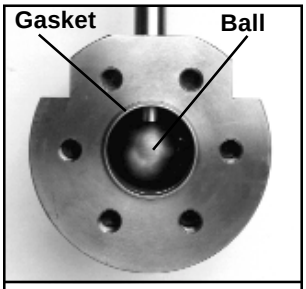
Step 4 If the pressed in seat ring is scratched or damaged, remove it from the end connect by inserting the removal tool into the seat ring. (The special seat removal tool can be purchased directly from Mogas). Then, pump in grease with a high-pressure gun. Small scratches in the ball or seat can be lapped out per the Rework section, located on page 9 of this manual.



Disassembly, Step 4

PORV Disassembly, Rework, Assembly

Disassembly

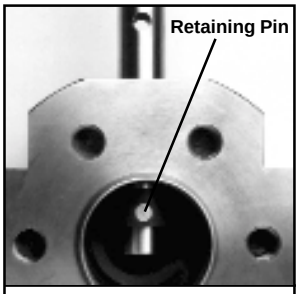


Disassembly, Step 5

Step 5 Rotate the ball clockwise to the fully closed position; remove by lifting at the end opposite the stem and gently "rolling out" until the ball is clear of the body.

Step 6 Note: If the stem packing is in good condition, skip to the Rework section, located on page 9. For replacement of the stem packing only, proceed to Disassembly, Step 7, located below, and remove the packing with a corkscrew removal tool and install the packing per Assembly Step 4, located on page 10.

Step 7 To disassemble the stem, remove the mounting flange adapter if used, and then remove the shear pin from the stem adapter or lever. Remove the mounting flange bolts from the mounting flange and mounting flange leg. Remove the pin from the outer thrust bearing and then remove the bearing itself. Then remove the gland nuts and gland flange. Note: To prevent the pin or inner thrust bearing from dropping down the bore, a rag should be stuffed in the bore prior to removal.

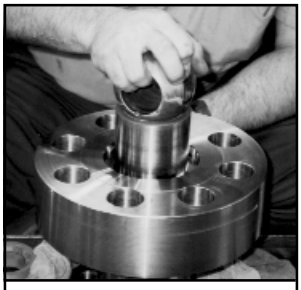


Disassembly, Step 8

Step 8 With a brass hammer or wood block, tap the stem into the body cavity, remove the retainer pin from the inner thrust bearing and pull the stem out through the body. The thrust bearings can be removed from the body. Note: The stem does not need to be removed if the packing is the only thing that needs to be replaced.

Rework

If the valve is still under warranty, any and all rework not performed by Mogas will void warranty. Lapping compound and gaskets may be purchased from Mogas.


Rework, Step 2

Step 1 Visually inspect all parts for damage taking note of all sealing surfaces. If the seat landing surfaces are damaged, return the valve to Mogas Industries, Inc. for repair or replacement.

Step 2 The ball may be "kiss lapped" to the downstream seat ring while still in the end connection using a small amount of fine diamond lapping compound. If the surfaces do not show full contact with machinist blue, contact Mogas and see Assembly, Step 6, located on page 10, because special tooling is required for seat ring removal. If the pressed in seat ring is removed, a new seat ring should be installed with the seat press in tool. Relap and check for full seat contact after seat installation. The body side seat may be lightly lapped to the upstream side of the ball and to the seat pocket, using diamond lapping compound and a circular motion. Lap for ten to fifteen minutes maximum. If the surfaces do not lap correctly, return the valve to Mogas, or call the Mogas Service Department for assistance at 281.449.0291.

Step 3 Clean all parts thoroughly and carefully inspect them, especially the sealing surfaces. Replace the body gasket and the stem packing to ensure proper valve operation.

Assembly

Step 1 Clean all parts before assembly. Install the thrust bearing into the stem bore from the inside body. Make sure the pinhole in the thrust washer is pointed toward the body bore, and not toward the gland flange side. Note: Alter the edge of the pinhole so the pin cannot fall out.

PORV Disassembly, Rework, Assembly

Assembly

Step 2 Install the anti-extrusion rings and stem packing by sliding the first anti-extrusion ring in the stem packing pocket of the valve body (with the stem in place), using the gland flange as a packing tool. Repeat for each of the three packing rings, pressing firmly in place with the gland flange. Then do the same with the remaining anti-extrusion ring. Note: Make sure the "T" on the end of the stem is facing up toward the top.

Step 3 Make sure the gland studs are in place, then install gland flange over the stem.

Step 4 Tighten the nuts alternately to uniformly compress the packing set per the Stem Packing Torques Table, located below. Slide the upper thrust bearing onto the stem and attach it with the retainer pin. Make sure that the thrust washer's drilled hole is facing toward the valve body and not the mounting flange. With a center punch and hammer, peen around the hole on the thrust bearing (both sides) so that the shear pin is trapped in the thrust bearing. Note: Be sure the stem is extended as far as it will go.

Stem Packing Torques

Orifice	Bore	Class	Packing Studs	In-House Assembly Torque (in./lbs.) [2]	Service Torque (in./lbs.) [3]
UF	1.0"	2500# 4500#	5/16″-18 3/8″-16	55.4 150.3	33.776.8
UL	1.3"	2500# 4500#	5/16″-187 16″-14	63.3230.0	38.6118.0
UH	1.4"	2500# 4500#	5/16″-181 2″-13	79.2 265.0	48.2136.0
UD	1.6"	2500# 4500#	5/16″-185 8″-11	79.2558.0	48.2286.0
UK	1.81"	2500# 4500#	5/8″-115 8″-11	310.0640.0	190.0328.0
UM	2.0"	2500# 4500#	5/8″-113 4″-10	310.0814.0	190.0418.0
UN	2.125"	2500# 4500#	1/2″-133 4″-10	286.01183.0	175.0608.0

[2]Torque used by Mogas factory for initial assembly

[3]Recommended torque for use after installation in order to maximize packing life

Step 5 Hold the body vertically and install the spring and push ring in the body cavity.

Step 6 Roll the ball to a fixed, closed position making sure the mate-lapped ball and seat surfaces match. Note: Both the ball and the seats are inscribed with corresponding numbers to show which side of the ball matches the correct seat. Place the ball into the body cavity over a properly aligned stem. The "T" or single scribe line should be facing up towards the end connect.

Step 7 Install the body gasket into the groove located at the body face where the end connect meets the body.

Step 8 Make sure all studs are in place.

PORV Disassembly, Rework, Assembly

Assembly

Step 9 Install the end connection onto the body by positioning it with the seat facing down over the body bore. Align the boltholes with the studs. Lower the end connection to the body face and screw on the nuts. Torque to the recommended tightness, per the Stem Packing Torques Table on page 10. If the valve does not stroke, please contact the Mogas Service Department at 281.449.0291.

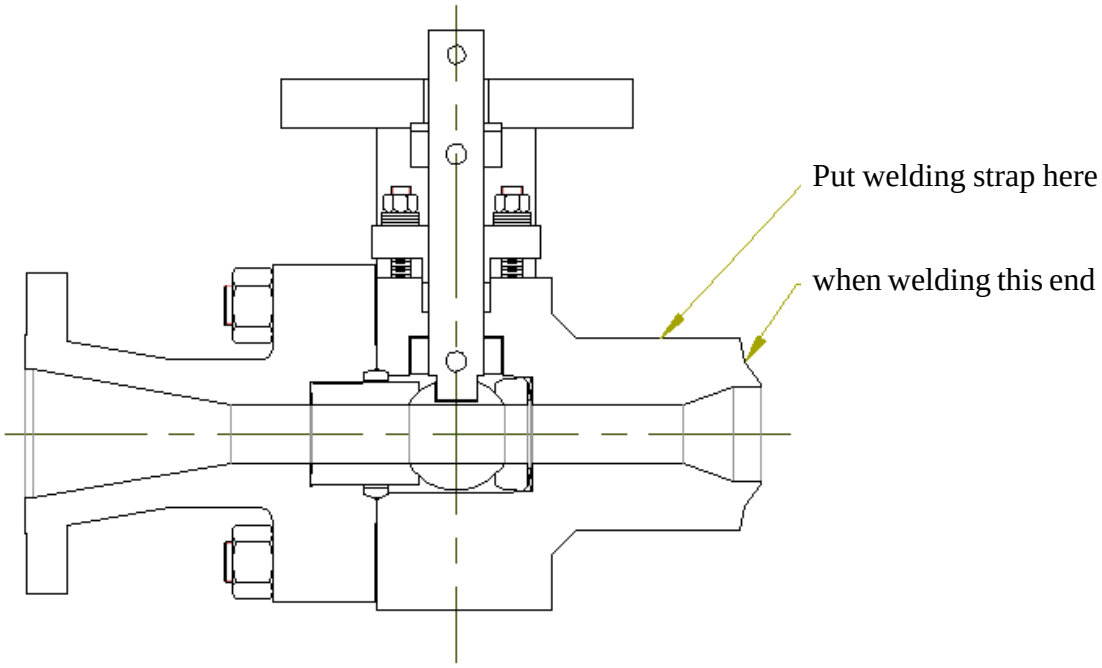
Step 10 Position the mounting flange legs in the proper holes in the body. Place the mounting flange over the stem and position on the legs. Install the bolts and lock washers through the mounting flange and tighten. The upper thrust bearing should be connected to the gland-packing flange. If not, pull up on the stem. The stem must not be pushed into the ball, as this could cause misalignment and leakage. Recheck that the upper thrust bearing is connected to the gland-packing flange after installing the stem adapter and actuator.

Step 11 Place the stem adapter, if one is used, on the stem and install the shear pin.

Step 12 If the mounting flange adapter is used, bolt to the mounting flange.

Step 13 Install the actuator on the mounting flange (or adapter) as originally supplied by Mogas. When installing the actuator, verify either by measurement or observation, that the valve stem is not pushed into the valve body. Make sure the stem has not rotated 180º, causing unmatched ball and seat surfaces.

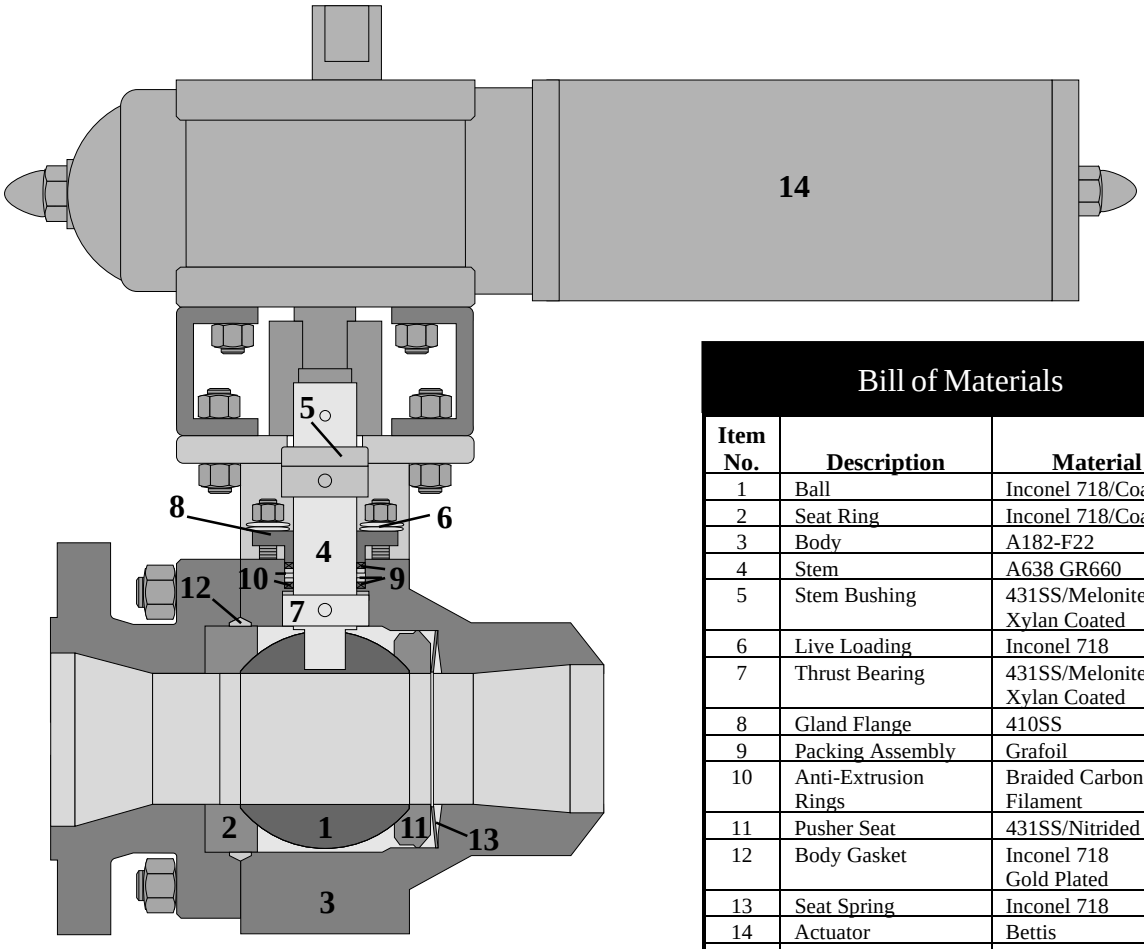
Figure 4, Welding Information



PORV Warranty Information

Products manufactured by Mogas Industries, Inc. are warranted against defects of material and/or workmanship for a period of one year from the date the product is shipped. The warranty is only valid when a product is used within the service and pressure range for which it is intended/manufactured. Under no circumstances will Mogas assume responsibility for equipment defects not manufactured by Mogas. The warranty is limited to no charge replacement of parts, defective in material or workmanship, and does not extend to claims for labor, expense, or other loss or damage occasioned by such defect of material or workmanship. No unauthorized back charges will be accepted. The warranty does not cover deterioration by corrosion, erosion, or any cause of failure other than defect of material or workmanship. The purchaser is expected to determine the suitability of a Mogas product for a particular application/purpose. The warranty is in place and in lieu of all warranties of merchantability and fitness. No other warranty, expressed or implied, will be allowed without the written agreement of Mogas Industries, Inc. Mogas Industries, Inc must first approve any adjustments to the warranty in writing. Mogas Industries, Inc performs all warranty work.

PORV Drawing and Bill of Materials Information



Bill of Materials

Item No.	Description	Material
1	Ball	Inconel 718/Coated
2	Seat Ring	Inconel 718/Coated
3	Body	A182-F22
4	Stem	A638 GR660
5	Stem Bushing	431SS/Melonite and Xylan Coated
6	Live Loading	Inconel 718
7	Thrust Bearing	431SS/Melonite and Xylan Coated
8	Gland Flange	410SS
9	Packing Assembly	Grafoil
10	Anti-Extrusion Rings	Braided Carbon Filament
11	Pusher Seat	431SS/Nitrided
12	Body Gasket	Inconel 718 Gold Plated
13	Seat Spring	Inconel 718
14	Actuator	Bettis
*	Solenoid Valve	Versa
*	Limitswitch	Westlock
*	Control Box	Model 307

***Included as a standard PORV component.**