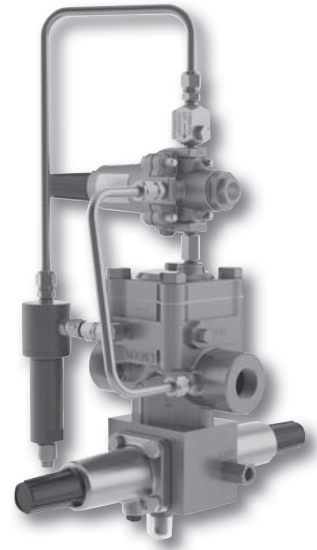


Mooney* Flowgrid* Slam Shut* 1 inch Valve

Installation/Operation/Maintenance Manual

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Scope

This manual provides the installation, operation, and maintenance for the Mooney Slam Shut valve (Slam Shut only) and the Mooney Flowgrid Slam Shut valve (Slam Shut and Flowgrid combined). The Mooney Slam Shut or Mooney Flowgrid Slam Shut can be supplied in three configurations; (1) over pressure protection only, (2) under pressure protection only, and (3) over and under pressure protection.

Instructions for the Flowgrid regulator and Pilot are found in separate IOM manuals.

Product Description

The slam shut valve is an easy to maintain automatic emergency shutoff device. The slam shut is designed for use with a pressure reducing regulator to provide secondary downstream pressure protection.

The device is designed to shut off the flow of gas when the sense or downstream pressure in the system either exceeds or drops below the set point pressures. It can be used as a stand alone device or integrated with the one inch Flowgrid regulator. The one inch Mooney Slam Shut valve consists of a valve body with a bleed plate and cover mounted on top, and a Slam Shut actuator assembly mounted on the bottom of the body. The one inch Mooney Flowgrid Slam Shut also has a throttle plate, diaphragm, and main spring.



The Slam Shut can be provided in one of three different actuator assemblies; (1) Overpressure protection only, (2) Underpressure protection only, or (3) Overpressure and Underpressure protection.

The one inch Mooney Slam Shut has several unique features such as:

- Easy to maintain; only two bolts required to remove entire Slam Shut assembly
- Resistant to sticking due to freezing water or debris in pipeline
- Well contained moving mechanical parts resistant to vibration effects

Materials of Construction	
Valve Body, Bleed Plate & Spring Case	Carbon Steel (WCB)
Throttle Plate	17-4 PH or A515
Slam Shut Seat	SST
Slam Shut Seal	Nitrile
Flowgrid Diaphragm	Nitrile or Viton
Flowgrid Spring	SST
Slam Shut Housing, Slam Shut Spring Cases	Aluminum
Spring Cover	Aluminum
Rotating Shaft	SST
Main Shaft Guide	Delrin
End Cap	Lexan
Plug Seal	Nitrile
O-Rings	Nitrile

Over Pressure Set Point Ranges

Spring Color	Spring Range		Accuracy (% of Set Point) **
	psig	Bar	
Red	5 - 10	0.35 - 0.7	10
Silver	10 - 40	0.7 - 3	5
Blue	40 - 90	3 - 6	2.5
Purple	90 - 175	6 - 12	2.5
Black	175 - 250	12 - 17	2.5
White/Green	250 - 450	17 - 31	2.5

** Preliminary AG Data, Testing per EN 14382

- Excellent performance and accuracy across a large pressure range by changing only the spring
- External visual indicator to show when the unit is tripped
- Easy to reset; only three caps need to be removed for complete reset
- High cycle applications; only one wear component
- No pressure differential requirements for full shutoff
- Spring Case Vent Chamber may be pressurized for remote trip or remote change of setpoint

Specifications	
Sizes	1" NPT & SWE 1.25" NPT & SWE
Types	Stand Alone or Integrated into Flowgrid
Pressure Protection	Standard: Over Optional: Over and/or Under
Temperature*	-20°F to 150°F (-29°C to 65°C)
Maximum Operating Inlet Pressure	740 psig (50 Bar)
Operating Sense Pressure	5 to 450 psig (.35 Bar to 31 Bar)
Response Time	< .25 seconds

* EN14382 restricts the minimum temperature to -4° F (-20° C).

Under Pressure Set Point Ranges

Spring Color	Spring Range		Accuracy (% of Set Point) **
	psig	Bar	
Red	5 - 10	0.35 - 0.7	2.5
Silver	10 - 40	0.7 - 3	2.5
Blue	40 - 90	3 - 6	2.5
Purple	90 - 175	6 - 12	1.0
Black	175 - 250	12 - 17	1.0
White/Green	250 - 450	17 - 31	1.0

Valve Markings

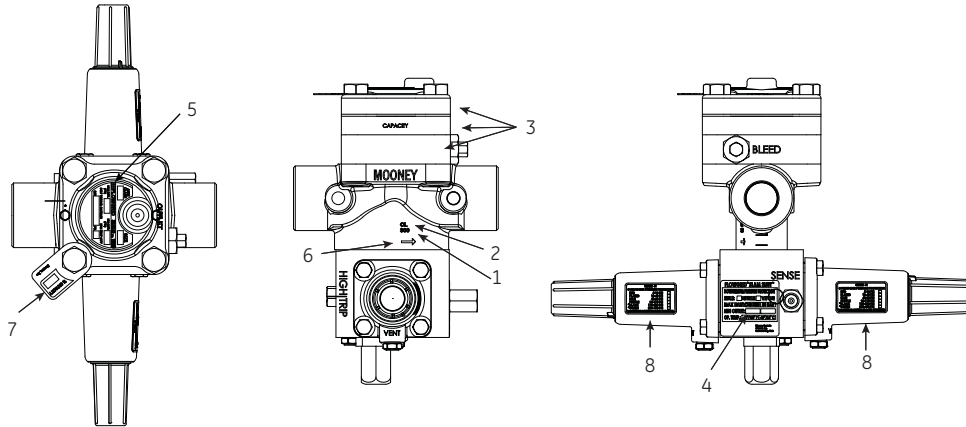


Figure 1 – Valve Markings

1. American National Standards Institute (ANSI) pressure class rating of the valve.
2. Indication that the valve has been hydrostatically tested according to code requirements.
3. The serial number is stamped on the spring case, bleed plate, valve body, & throttle plate on Flowgrid regulators with integral slam shuts. On stand alone slam shuts the serial number is stamped on the cover, bleed plate, and valve body.
4. The Slam Shut Nameplate location.
5. The Flowgrid Nameplate location.
6. The flow direction is marked on the spring case or cover (“INLET” and/or a flow arrow). Proper alignment assures that the diaphragm guide on the Spring Case is aligned toward outlet side of the valve on regulators.
7. The % Capacity tag indicates the capacity of the throttle plate (100%, 75%, 50%, & 35%) in the valve.
8. The springcase nameplate indicating the pressure range for each color spring.

Nameplate Information

Flowgrid Nameplate information, see the Flowgrid IOM.

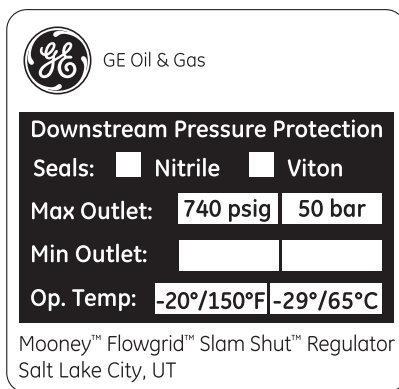


Figure 2 – Slam Shut Nameplate

Item	Definition
NITRILE	The Slam Shut has all nitrile soft goods.
VITON	The Slam Shut has nitrile static seals and viton dynamic seals and diaphragms.
MAX INLET	Maximum inlet pressure PSIG/BAR
MIN OUTLET	Minimum difference in inlet and downstream pressure required for the Slam Shut to operate.
OP. TEMP.	Operation Temperature range

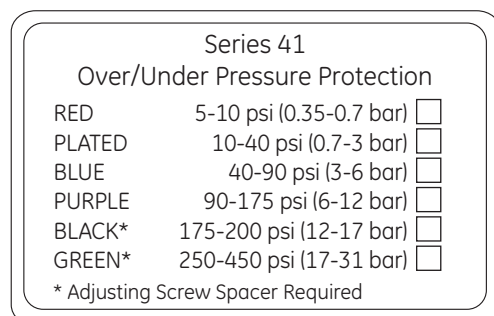


Figure 3 – Valve Markings Nameplate

Principals of Operation

During normal operation in the untripped condition, the plug is retracted into the fully open position. The downstream pressure is monitored by the Overpressure and/or Underpressure sensing diaphragms. If an overpressure or underpressure condition occurs, the sensing diaphragms will move the trip shaft, causing the valve to trip completely closed. After the Slam Shut has tripped, the valve must be reset manually.

Hydrostatic Testing

All slam shut Stand Alone valves and slam shut valves integrated into Flowgrid valves are hydrostatically tested at the factory prior to shipment according to ISA-S75.19-1989 and MSS-SP-61 standards.

If it is necessary to retest the valve, the slam shut valve may be hydrotested without any modifications. If a FlowGrid regulator is integrated into the slam shut, care should be taken to not damage the diaphragm. Refer to the Flowgrid IOM.

Installation

WARNING

Personal injury, equipment damage, or leakage due to explosion of accumulated gas or bursting of pressure containing parts may result if the Slam Shut is over pressured or is installed where service conditions could exceed the limits given in the specification of this manual or on the nameplate, or where conditions exceed any ratings of the adjacent piping or piping connections. Verify the limitations of the Flowgrid regulator, Slam Shut valve and pilot to ensure none of the devices are over pressured. To avoid such injury or damage, provide pressure relieving or pressure limiting devices as required by applicable codes to prevent service conditions from exceeding those limits. Additionally, physical damage to the regulator could result in damage such as breaking the pilot (if supplied) off the main valve, causing personal injury and/or property damage due to explosion of accumulated gas.

To avoid such injury and damage, install the Slam Shut and Regulator in a safe location.

NOTE: The Slam Shut maybe supplied as a stand alone unit or integrated into a Flowgrid regulator with filters, restrictors and pilots. This procedure covers the installation of the slam shut and may refer to components not ordered with the slam shut. Consult the proper IOM for the installation of Flowgrid regulator, filters, restrictors and pilots.

1. **PERSONNEL:** Installation of the slam shut valve and/or Flowgrid regulator should be made by qualified personnel familiar with high pressure piping and pilot operated regulators.

2. **PRIOR INSPECTION:** Inspect the Slam Shut valve, regulator, pilot, and tubing for any damage that might have occurred in shipping. Make sure the body, pilot lines, and inlet piping are clear and free from foreign material.
3. **ORIENTATION:** Stand alone Slam Shuts must be installed up stream of the pressure regulator to provide secondary protection. The Slam Shut valve or Slam Shut integrated into a Flowgrid regulator may be installed in any position, the best position being one that provides easiest access for the Slam Shut, pilot adjustment and maintenance.
4. **SCREWED END VALVES:** Apply pipe compound to the male threads starting one or two threads back from the end prior to assembling the joint.
5. **FLANGED END VALVES:** Use suitable line gaskets and standard bolting practices with flanged bodies. A criss-cross pattern of incrementally tightening the line bolts is recommended.
6. **WELD END BODIES:** Before welding a butt weld and/or a socket weld valve body, disassemble the valve. On stand alone Slam Shuts remove the bonnet, Slam Shut body assembly and all O-rings. On Slam Shuts integrated into Flowgrid valves; remove the Slam Shut body assembly, Spring Case and all trim parts including diaphragm and O-rings. Reassemble the valve (refer to the MAINTENANCE section of this manual for Disassembly and Assembly procedures) and pressurize to check for leaks prior to putting the valve in service.
7. **Slam Shut SENSE LINE:** Install a 3/8 inch OD tube from the sense port to a port on the pipe line located 8 to 10 pipe diameters minimum of straight pipe downstream of the final regulator in the run. The sense port is located on the downstream side of the controller and latch module just above the Slam Shut label.

NOTE: The sense line connection should be away from areas of turbulence (such as valves, reducers, and elbows) and should have a full opening into the pipe free from burrs, drill peels, and weld slag. Shutoff valves are not required in the control line(s), but if installed, they should be of the full opening type.

8. **INLET PRESSURE LINES:** All pilots or other devices requiring a supply of inlet pressure that can result in a flow of gas downstream of the Slam Shut must be connected to the center port (port inlet) on the Slam Shut body assembly. A shut off valve may be installed in the sense line to prevent the Slam Shut valve from closing during setup of regulators and other equipment and to aid in setting up the Slam Shut valve.

WARNING

Connection of any device such as a pilot to the inlet port on the valve body can result in the flow of gas downstream of the Slam Shut canceling the secondary downstream pressure protection of the slam shut. This may result in personal injury, death, equipment damage, and/or bursting of pressure containing parts and/or leakage of gas resulting in explosion of accumulated gas.

- 9. VENT VALVES AND GAUGE CONNECTIONS:** Vent valves and gauge connections are recommended in the inlet and outlet piping to the slam shut and downstream regulator. These are a great convenience during start up, maintenance, and operation.
- 10. TOKEN RELIEF VALVES:** Installation of a token relief valve in the line downstream of the slam shut is recommended. The relief valve should be set to open before the slam shut valve is set to close. Minor over pressure problems such as gas thermal expansion or seat leakage due to dirt moving through the system will be handled by the relief valve, while maintaining a supply of gas to the customers. Major malfunctions of the regulator beyond the flow capacity of the token relief will activate the slam shut valve.

Setup

Changing the Trip Set Point

- Remove the Adjusting Screw Cap
- Turn the Adjusting Screw with a 9/16" wrench to change the set point. Turning clockwise will increase the setpoint pressure, turning counter-clockwise will decrease the setpoint pressure.

Resetting the Slam Shut (See Figure 4)

- Close the Upstream and Downstream Block Valves.
- Remove the bleed cap, reset cap, and clear bottom cap.
- Inside of the cavity labeled 'bleed', push and hold the pin with a screwdriver. This will cause the pressure upstream of the valve to bypass the shutoff device into the downstream piping, causing the pressure across the plug to equalize.
- If an Underpressure feature is being used, the line pressure must be 20% or more above the setpoint before resetting the valve. If an Overpressure feature is being used, the line pressure must be 20% or more below the setpoint before resetting the valve.
- Where the clear cap was previously located, find the shaft with a hole through it. Insert a screwdriver into the hole and, using the screwdriver as a handle, pull the shaft into the reset position.

- With the shaft held in the reset position, push the reset pin. The trip mechanism will then 'snap' into place.
- Replace the bleed cap, reset cap, and clear bottom cap. (Make sure the reset pin remains in the 'reset' hole)
- Open the Upstream and Downstream block valves.

Testing Slam Shut Shutoff

During all Slam Shut shutoff tests, if a Flowgrid pressure regulator is combined with the Slam Shut, the Flowgrid must be in the open position. There are two options to force the regulator open; (1) install a ball valve in the inlet tubing to the restrictor and close the valve to open the Flowgrid, or (2) disconnect and vent the inlet and outlet tubing.

Shutoff Test –

Overpressure Protection Only (See Figure 5)

- Close upstream and downstream block valves and vent line pressure on inlet and outlet sides.
- Disconnect the Slam Shut Sense Line and plug the tubing connection in the piping.
- Connect a pressurized bottle into the Slam Shut Sense Line and introduce pressure above the Overpressure Set Point. The Slam Shut will trip closed.
- Disconnect the bottle and re-install the Sense Line tubing.
- Open the upstream block valve and monitor the downstream piping for any leakage.
- Go through the 'Resetting the Slam Shut' procedure for Slam Shut reset.

Alternate Shutoff Test #1 –

Overpressure Protection Only (See Figure 6)

- Must have a ball valve installed in the Slam Shut Sense Line & a tee between the ball valve and the Slam Shut.
- Close the Slam Shut Sense Line and vent the tubing.
- Connect a pressurized bottle into the tee, and introduce pressure above the Overpressure Set Point. The Slam Shut will trip closed.
- Disconnect the bottle and plug the tee.
- Open the Slam Shut Sense Line ball valve.
- Check the downstream piping for any leakage.
- Go through the 'Resetting the Slam Shut' procedure for Slam Shut reset.

Alternate Shutoff Test #2 –

Overpressure Protection Only

- Inlet and Outlet pipelines must have pressure.
- Remove the adjustment screw cap on the Overpressure Unit.

3. Slightly loosen the nut on the adjusting screw. Do not change the location of the nut on the screw.
4. Turn the adjustment screw counter-clockwise until the Slam Shut trips closed.
5. Close the downstream block valve.
6. Vent the downstream piping and monitor the downstream piping for any leakage.
7. Turn the adjusting screw clockwise until the nut contacts the spring case. Tighten the nut.
8. Go through the 'Resetting the Slam Shut' procedure for Slam Shut reset.

Shutoff Test – Any unit with Underpressure Protection

1. Close upstream and downstream block valves and vent line pressure on inlet and outlet sides. Slam Shut should trip closed when venting.
2. Slightly open the upstream block valve, introducing line pressure, and monitor the downstream piping for any leakage.
3. Go through the 'Resetting the Slam Shut' procedure for Slam Shut reset.

Alternate Shutoff Test #3 – Any unit with Underpressure Protection (See Figure 7)

1. Must have a ball valve installed in the Slam Shut Sense Line.
2. Close the Slam Shut Sense Line ball valve and vent the tubing. Slam Shut will then trip closed.
3. Re-connect the tubing and open the sense line ball valve.
4. Close the downstream block valve and vent the downstream piping, and monitor the downstream piping for any leakage.
5. Go through the 'Resetting the Slam Shut' procedure for Slam Shut reset.

Testing Regulator Shutoff with Integrated Slam Shut

When testing for regulator shutoff (lockup), the Slam Shut must be in the open position during the shutoff test. Follow the procedures below to ensure that the Slam Shut remains in the open position. Refer to the Flowgrid IOM for regulator shutoff procedures.

For the Overpressure Protection Only version of the Slam Shut:

1. Close the upstream and downstream block valves and vent the line pressure
2. If the Slam Shut is not already in the open position, follow the 'Resetting the Slam Shut' procedure to open the Slam Shut.

For any Slam Shut version with Underpressure Protection:

1. Close the upstream and downstream block valves and vent the line pressure.
2. Connect a pressurized bottle into the Slam Shut Sense Port and apply a constant pressure above the Underpressure set point (and below the Overpressure set point if applicable). (See Figure 5).
3. Follow the 'Resetting the Slam Shut' procedure to open the Slam Shut.

Startup and Operation

With Mooney Flowgrid Slam Shut units, it is recommended that the Overpressure Protection adjustment screw be turned fully in (clockwise) & the Underpressure Protection adjustment screw be turned fully out (counter-clockwise), prior to setting the Flowgrid regulator. Follow the steps from the Flowgrid regulator IOM for regulator Startup and Operation. For Slam Shut Startup and Operation, follow the steps below:

Establish Set Point for Overpressure Protection Unit:

1. Close the upstream and downstream block valves and vent the line pressure.
2. Verify that the Overpressure Protection adjustment screw is turned fully in (clockwise) and the Underpressure Protection (if applicable) is turned fully out (counter-clockwise).
3. Connect a pressurized bottle into the Slam Shut Sense Port and apply the desired Set Point pressure. (See Figure 2).
4. Turn the adjustment screw out (counter-clockwise) slowly until the Slam Shut trips closed.
5. Disconnect the pressurized bottle and re-connect the Slam Shut Sense Line.
6. Follow the 'Resetting the Slam Shut' procedure to open the Slam Shut.

Establish Set Point for Underpressure Protection Unit:

1. Close the upstream and downstream block valves and vent the line pressure.
2. Verify that the Underpressure Protection is turned fully out (counter-clockwise).
3. Connect a pressurized bottle into the Slam Shut Sense Port and apply the desired Set Point pressure.
4. Turn the adjustment screw in (clockwise) slowly until the Slam Shut trips closed.
5. Disconnect the pressurized bottle and re-connect the Slam Shut Sense Line.
6. Follow the 'Resetting the Slam Shut' procedure to open the Slam Shut.

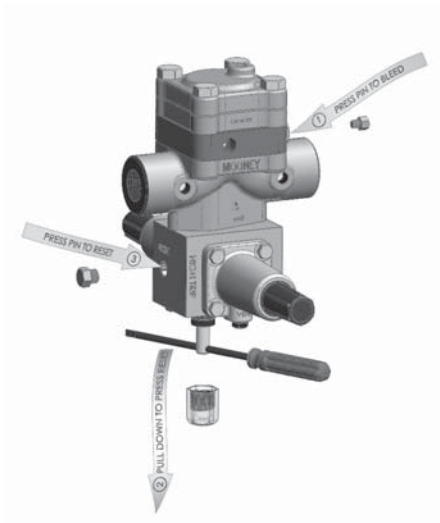


Figure 4

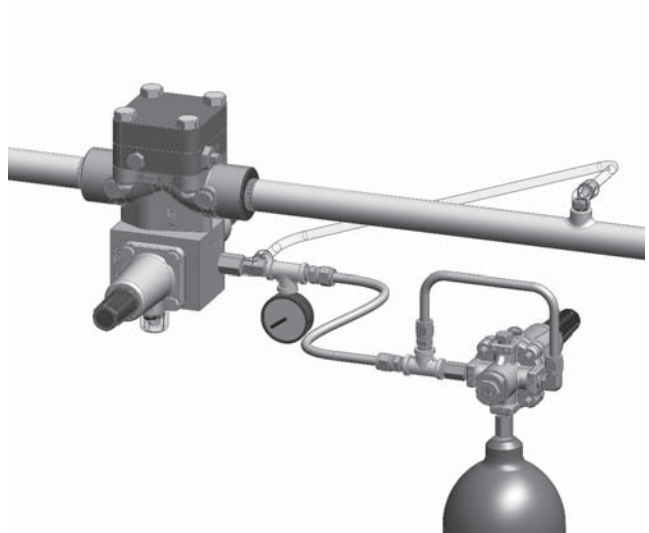


Figure 5

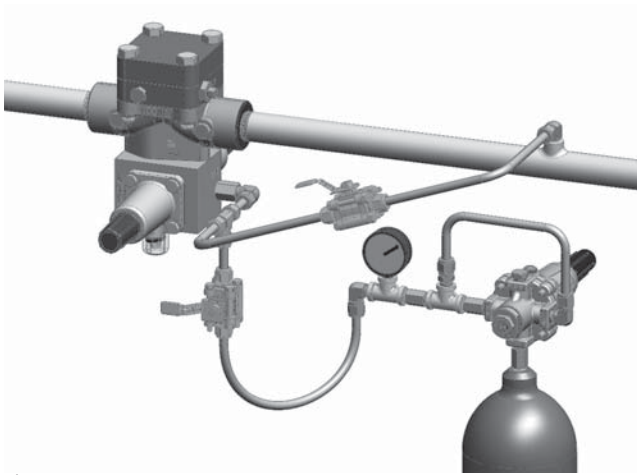


Figure 6

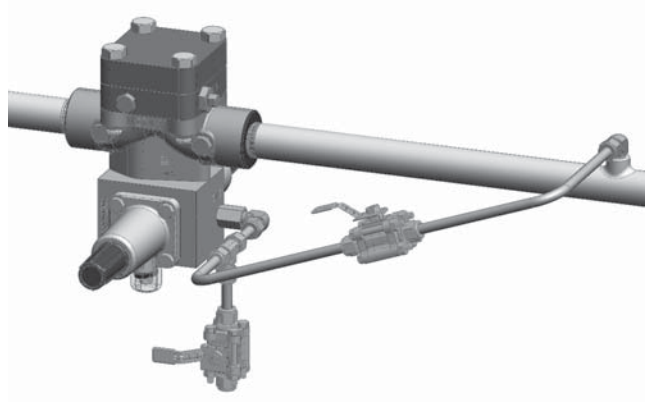


Figure 7

Maintenance

The slam shut parts are subject to normal wear and must be inspected and replaced as they become worn. The frequency of the inspection and replacement of the parts depends on the severity of the service conditions and/or the applicable government requirements.

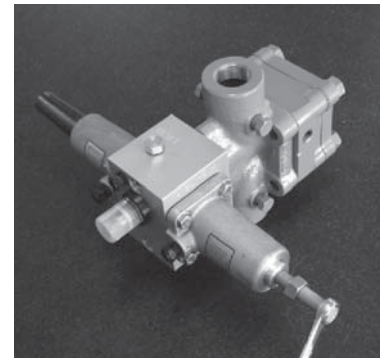
Inspect all parts for wear and damage. Replace all worn and damaged parts as necessary. Replace all seals when tearing down and rebuilding the slam shut valve assembly.

WARNING

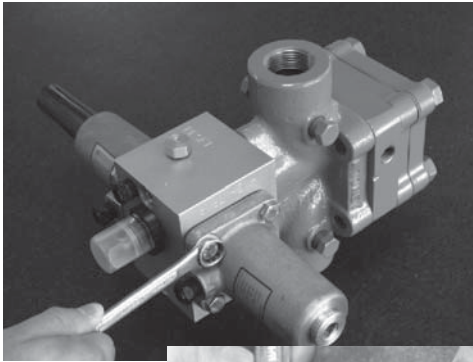
Before disassembly make sure the Slam Shut and optional integrated regulator have been isolated by closing upstream and downstream block valves. Safely release the pressure in the lines. Failure to complete these steps may result in personal injury and property damage.

Replacement of Seals in Overpressure Assembly

1. Turn adjusting screw counter clockwise until fully removed.



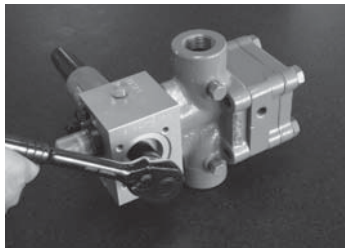
- Use 1/2" wrench to remove four cap screws from spring case with 'High Trip' labeled on the actuator block.



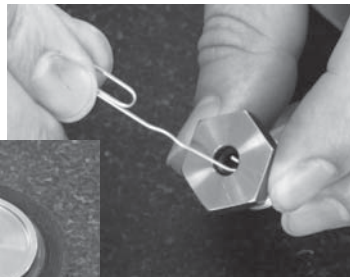
- Use 9/16" wrench to remove nut from diaphragm assembly.



- Use 3/4" socket wrench to remove Insert assembly.



- Pin O-ring (Use a paper clip or similar tool to remove O-ring. Take care not to scratch the part during removal) (Re-install with Parker Super O-Lube)

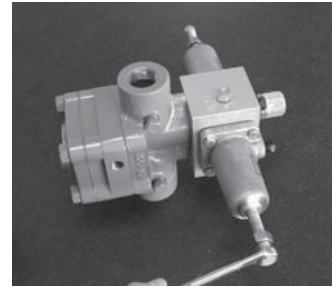


- Insert O-ring (Re-install with Lubriplate 105)

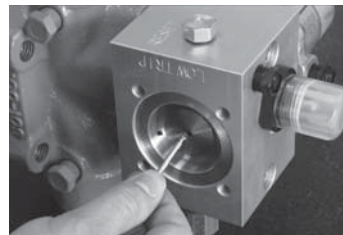
- Use a paper clip to remove insert O-ring.(take care not to scratch).
- Inspect and/or Replace the following seals
 - Sense diaphragm (Re-install dry)

Replacement of Seals in Underpressure Assembly

- Turn adjusting screw



- Use 1/2" wrench to remove four cap screws from spring case with 'Low Trip' labeled on the actuator block.
- Use 9/16" wrench to remove nut from diaphragm assembly.
- Use head of trip pin to remove the seal plate. (Take care not to scratch the trip pin).

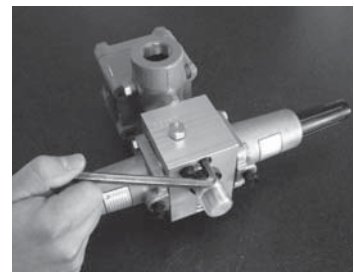


- Inspect and/or Replace the following seals
 - Sense diaphragm (Re-install dry)
 - Pin o-ring (Re-install with Parker Super O-Lube)
 - Lower seal plate o-ring (Re-install with Lubriplate 105)
 - Upper seal plate o-ring (Re-install with Lubriplate 105)
 - Inspect and/or replace the rotator shaft part for excessive wear (Re-install dry)

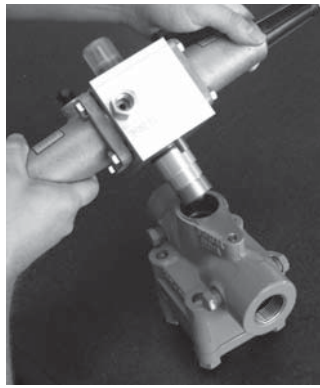


Replacement of Seals in Main Shaft Assembly

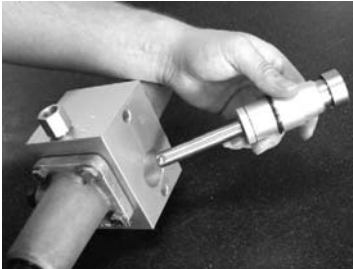
- Disconnect the slam shut sense line from the actuator block.
- Use 5/16" allen wrench to remove two cap screws from the actuator block.



3. Pull the actuator assembly out of the main body.



4. Pull the main shaft assembly out of the actuator block.



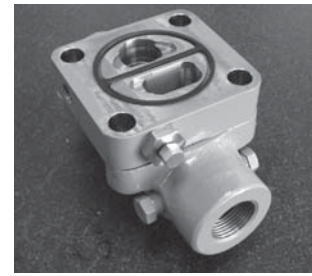
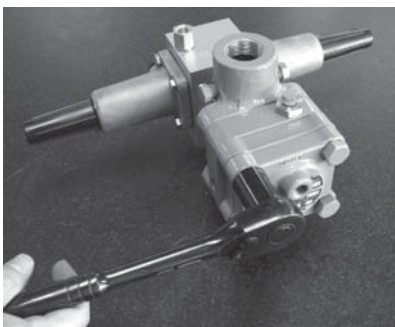
5. Use a 5/32" allen wrench to remove the plug screw.
6. Unscrew the reset shaft, and the assembly will then separate.



7. Inspect and/or Replace the following seals
 - Plug Seal (Re-install dry)
 - Spring Cover O-ring (Re-install with Lubriplate 105)
 - Spring Plate O-ring (Re-install with Lubriplate 105)
 - Shaft O-ring (Re-install with Lubriplate 105)

Replacement of Seals in Slam Shut Seat Assembly (and FlowGrid if applicable)

1. Disconnect the connecting tubing and accessories (if applicable)
2. Use 13/16" wrench to remove the four cap screws on the top plate.



3. Remove the parts from the body.
4. Inspect and/or Replace the following seals
 - Body Seals (Qty 2) (Re-install dry)
 - Slam Shut Seat O-ring (Re-install with Lubriplate 105)
 - Diaphragm (if applicable) (Re-install dry)

Replacement of Seals in Equalizer (bleed) Assembly

1. Use a 7/8" wrench to remove the bleed cap and assembly



2. Inspect and/or Replace the following seals
 - Cap o-ring (Re-install with Lubriplate 105)
 - Stem O-ring (Re-install with Lubriplate 105)
 - Orifice o-ring (Re-install with Lubriplate 105)
 - Plug & Stem (Re-install dry)



NOTE: Replacing the seals in the Overpressure Assembly, Underpressure Assembly, or Main Shaft Assembly may be done with the slam shut actuator block removed from the body. The body does not need to be removed from the pipeline when servicing the Slam Shut or Flowgrid.

Piping Schematic

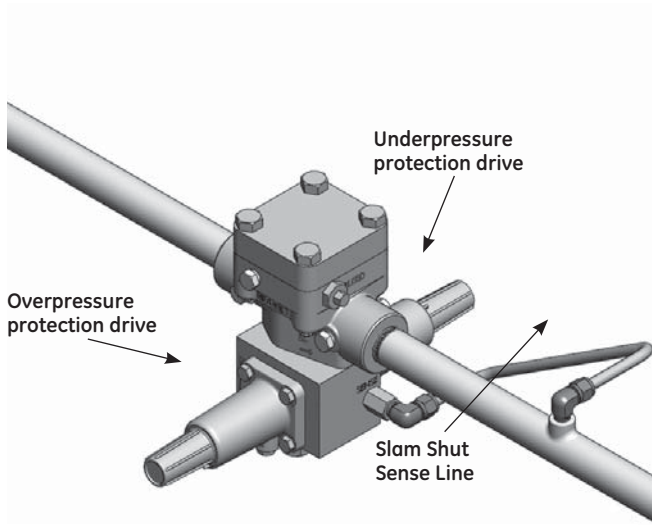


Figure 8 - Stand Alone Slam Shut

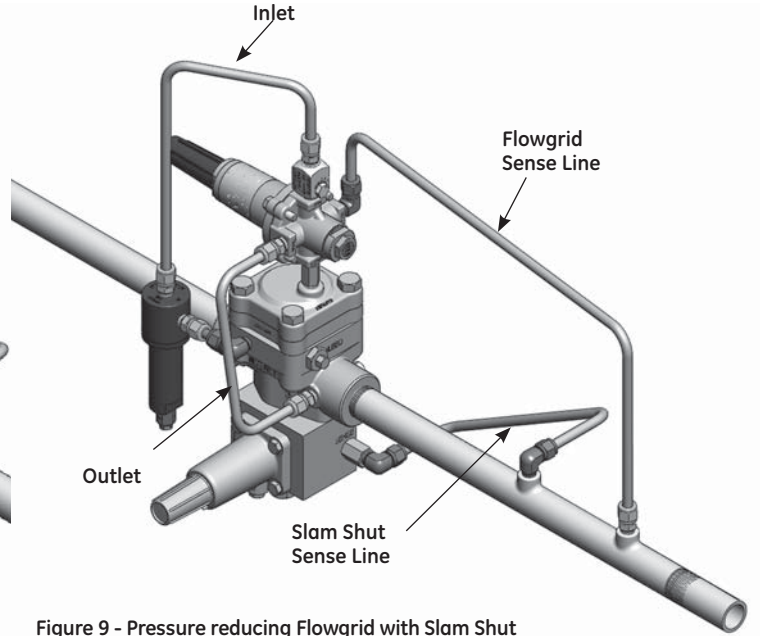


Figure 9 - Pressure reducing Flowgrid with Slam Shut downstream overpressure protection

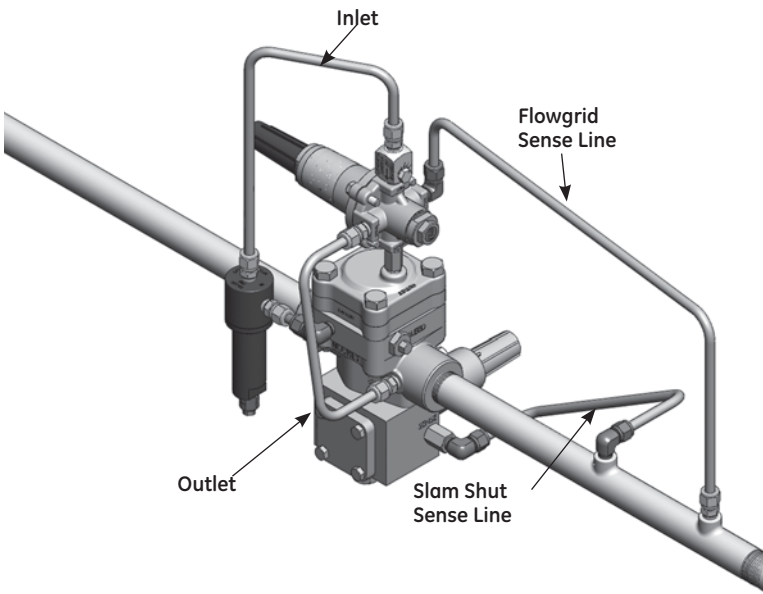


Figure 10 - Pressure reducing Flowgrid with Slam Shut downstream underpressure protection

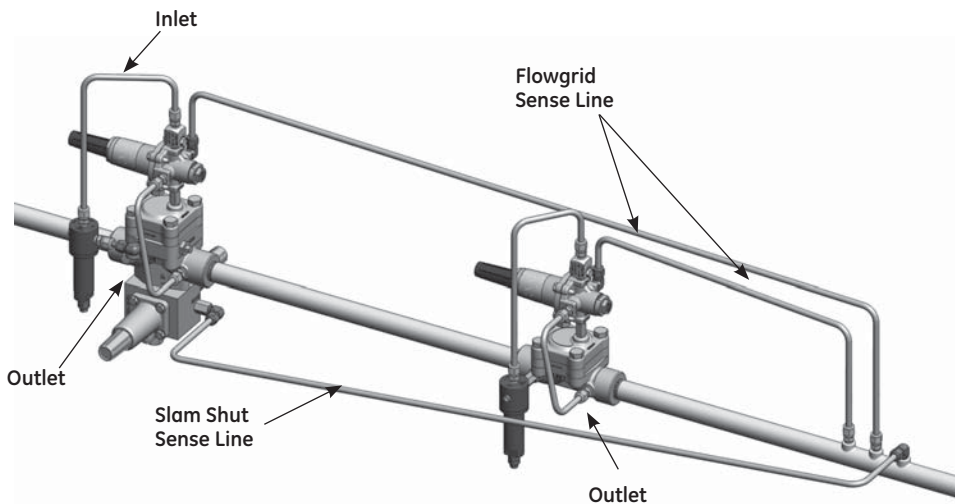


Figure 11 - Standby Monitor with Slam Shut over 60 psid (4 bar)

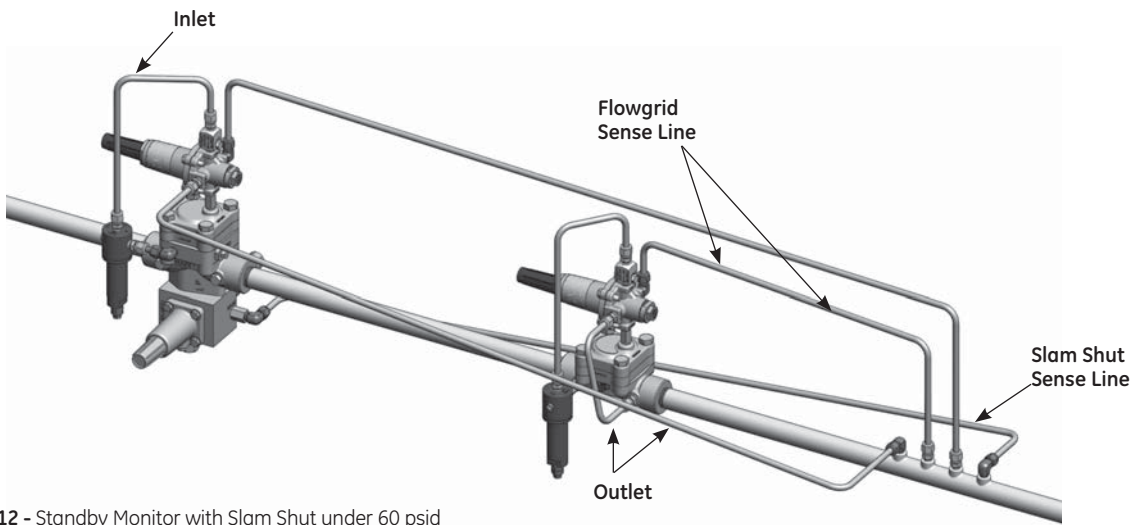


Figure 12 - Standby Monitor with Slam Shut under 60 psid

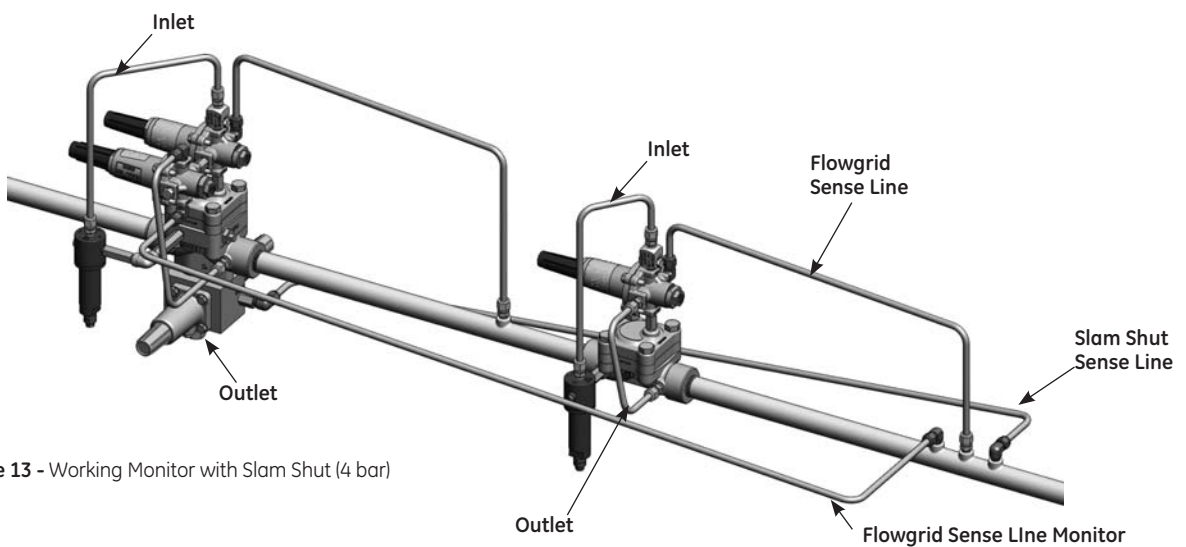


Figure 13 - Working Monitor with Slam Shut (4 bar)

Troubleshooting		
Problem	Likely Cause	
Fails Shutoff Test (leaks from upstream to downstream piping)	Damaged Plug Seal Damaged Seat Damaged Seat O-Ring Damaged Body Seal	Porosity in Body Casting Damaged sealing surface Service conditions too cold for plug seal
Fails External Leakage Test	Damaged Spring Cover O-ring Damaged Body Seal Damaged Sensing Diaphragm Damaged Flowgrid Diaphragm	Damaged Upper Seal Plate O-ring Damaged sealing surface Damaged Sense Port Adapter O-ring
Fails External Leakage Test out of Bleed Assembly	Damaged Bleed Cap O-ring Damaged Bleed Stem O-ring Damaged Sealing Surface	
Vents gas out of Slam Shut Actuator Body Vent Port	Damaged Sensing Diaphragm Rubber damaged on diaphragm assembly nut	Nut on diaphragm assembly not properly tightened Damaged Sealing Surface
Fails to Reset	Damaged Main Shaft external threads Reset Shaft not properly tightened onto Main Shaft	Main Shaft not properly tightened onto Plug Reset Pin missing Rotator Shaft excessively worn or damaged
Fails to Trip Closed	Rotator Shaft damaged Excessive internal icing	

Product Support

Local support is available through our manufacture's representative and distributor network. Contact the factory or refer to our web site for your support representative contact information. Factory support is available from 8:00 AM to 4:30 PM MST Monday through Friday. Limited after hours support is also available. Complete product specifications, parts lists, and flow calculation software is available on our web site. www.ge.com/energy +1 801-487-2225 USA.

Limited Warranty

Seller warrants that Products shall be delivered free from defects in material, workmanship and title and that Services shall be performed in a competent, diligent manner in accordance with any mutually agreed specifications. The warranty for Products shall expire one (1) year from first use or eighteen (18) months from delivery, whichever occurs first, except that software is warranted for ninety (90) days from delivery. The warranty for Services shall expire one (1) year after performance of the Service, except that software-related Services are warranted for ninety (90) days. If Products or Services do not meet the above warranties, Buyer shall promptly notify Seller in writing prior to expiration of the warranty period. Seller shall (i) at its option, repair or replace defective Products and (ii) re-perform defective Services. If despite Seller's reasonable efforts, a non-conforming Product cannot be repaired or replaced, or non-conforming Services cannot be re-performed, Seller shall refund or credit monies paid by Buyer for such non-conforming Products and Services. Warranty repair, replacement or re-performance by Seller shall not extend or renew the applicable warranty period. Buyer shall obtain Seller's agreement on the specifications of any tests it plans to conduct to determine whether a non-conformance exists. Buyer shall bear the costs of access for Seller's remedial warranty efforts (including removal and replacement of systems, structures or other parts of Buyer's facility), de-installation, decontamination, re-installation and transportation of defective Products to Seller and back to Buyer. The warranties and remedies are conditioned upon (a) proper storage, installation, use, operation, and maintenance of Products, (b) Buyer keeping accurate and complete records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of Products or Services only as authorized by Seller in writing. Failure to meet any such conditions renders the warranty null and void. Seller is not responsible for normal wear and tear. The above sets forth the exclusive remedies for all claims based on failure of or defect in Products or Services, regardless of when the failure or defect arises, and whether a claim, however described, is based on contract, warranty, indemnity, tort/extra-contractual liability (including negligence), strict liability or otherwise. The warranties provided above are exclusive and are in lieu of all other warranties, conditions and guarantees whether written, oral, implied or statutory. NO IMPLIED OR STATUTORY WARRANTY, OR WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE APPLIES.

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