Mooney
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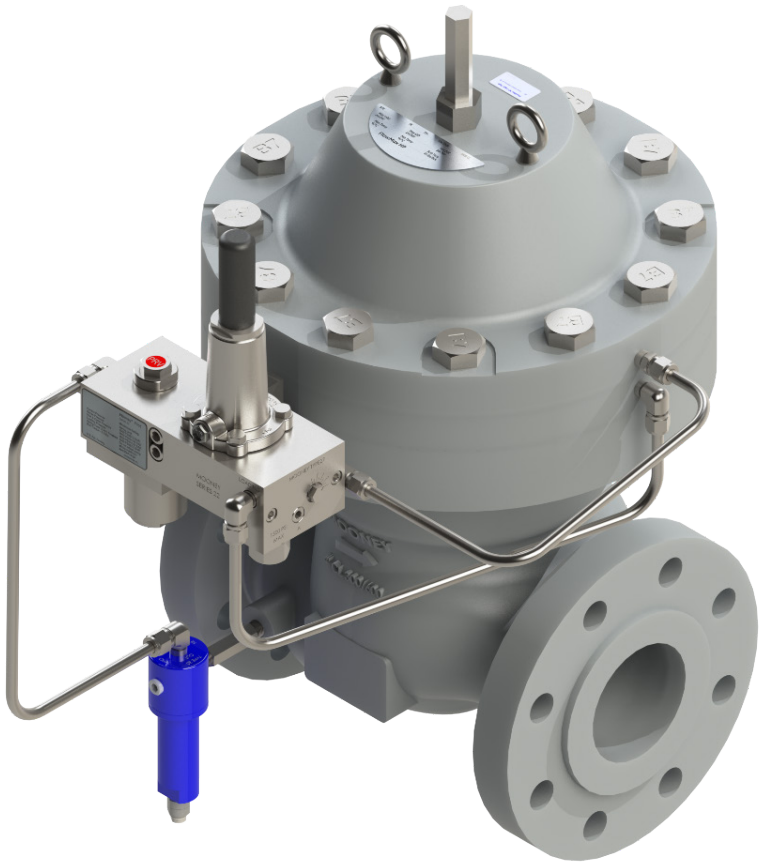
FlowMax™ HP Regulator

Instruction Manual (Rev. B)



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Scope

This manual provides instructions for the Installation, Operation, and Maintenance of the **Mooney**™ FlowMax HP Regulator (instructions for the standard FlowMax and the Series 22 Pilot can be found in separate manuals).

Product Description

The Mooney FlowMax HP is an easy to maintain regulator designed to be used with a self-contained pilot system. The Mooney FlowMax HP regulator has several unique features that add to its versatility, such as:

- In-line maintenance
- A single maximum pressure rating for all components
- One actuator for all pressures and differentials
- A compact, low-volume actuator housing for quick response
- Top-entry design
- Maximum flow at a low differential
- Increased closing force with an increase in inlet pressure

Materials of Construction	
Body	ASTM A 216 WCB Steel
Actuator Housing	ASTM A 516 Gr 70 Steel
Plug Seal	Nitrile
Diaphragm	Nitrile/Nylon
O-Ring & Seals	Nitrile
Bolting	ASTM B7
Spring	Music Wire
Trim	Stainless Steel
Seal Pack Housing	**Stainless Steel**

Table 1 - Materials of Construction

Specifications	Imperial	Metric
Sizes	2,3,4, and 6 inch	DN 50, DN 80, DN 100, DN 150
Body Style	Single Port	Single Port
End Connections	300 CL RF, 600 CL RF	Flanged
Temperature Working Emergency	-20°F to 150°F -40°F to 175°F	-29°C to 66°C -40°C to 80°C
Maximum Operating Differential	1300 psi	90 bar
Maximum Casing Pressure	1480 psig	102 barg
Minimum Differential (Fully Open)	12 psi	0.83 bar
Outlet Pressure Range	Series 22: 3 - 900 psig	0.21 - 62 barg
Maximum Inlet Pressure	1480 psig (may be limited by flange or pilot rating)	102 barg (may be limited by flange or pilot rating)
Pilot Supply Body Tap	Two 1/4" - 18 NPTF	Two 1/4" - 18 NPTF
Sense Line Tap	Three 1/4" - 18 NPTF	Three 1/4" - 18 NPTF

Table 2 - Specifications

Principle of Operation (Refer to Figure 1)

When the downstream pressure is greater than the set point of the pilot, the pilot is closed, resulting in equal pressure above and below the main diaphragm. With a balancing plug area slightly larger than the seat area, the resulting closing force, along with the force of the main spring, forces the plug against the seat.

With an increase in demand, the outlet pressure will begin to drop and decrease the pressure above the main diaphragm. A drop of outlet pressure below the pilot set point will cause the pilot to open.

As the pilot opens, pressure increases underneath the main diaphragm faster than pressure can bleed through the restrictor. The imbalance in pressure on the main diaphragm overcomes the spring force and the additional closing force from the balanced plug, causing the plug to rise off the seat and satisfy the flow demand.

Once the flow demand is satisfied and the downstream pressure begins to increase, the pressure above the main diaphragm and in the pilot sense cavity rises. This causes the pilot to close. The pressure below the main diaphragm bleeds through the restrictor until pressure equalizes above and below the main diaphragm. The forces of the main spring and the balanced plug then close the plug on the seat.

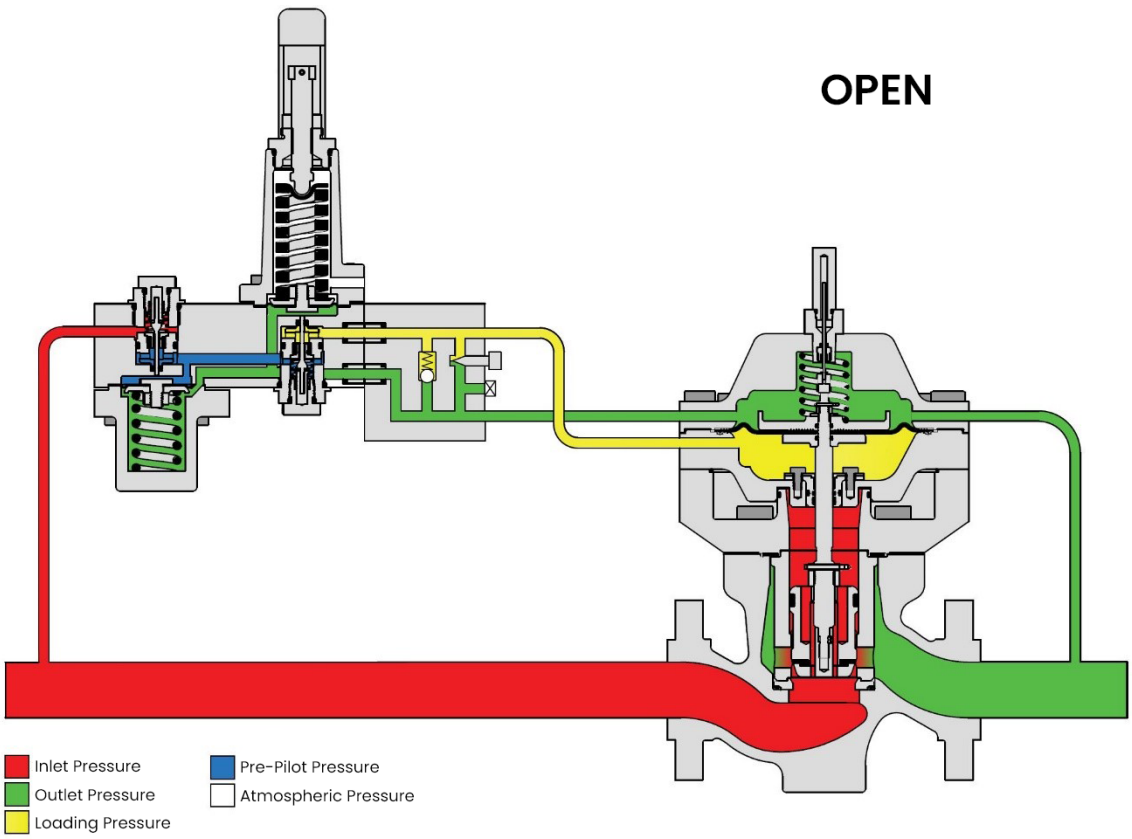


Figure 1 - Typical Pressure Reducing Regulator Flow Schematic

Nameplate Information

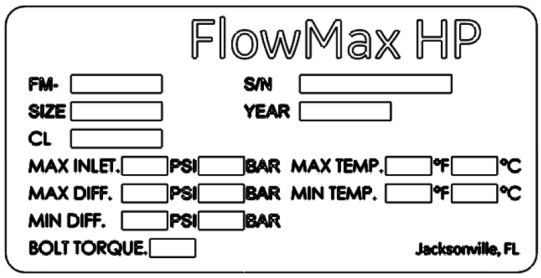


Figure 2 - Nameplate

Item	Definition
FlowMax HP	Trademarked name
FM	FlowMax product identification
S/N	Serial number assigned to regulator
Size	Line size of body
Year	Date of manufacture
CL	Pressure rating class
Max Inlet	Maximum inlet pressure psi/bar
Max. Differential	Maximum allowable differential pressure
Min. Differential	Minimum differential required to fully open regulator
Max. Temperature	Maximum operating temperature in degrees Fahrenheit/Celsius
Min. Temperature	Minimum operating temperature in degrees Fahrenheit/Celsius
Bolt Torque	Torque requirement of actuator bolts

Regulator Markings

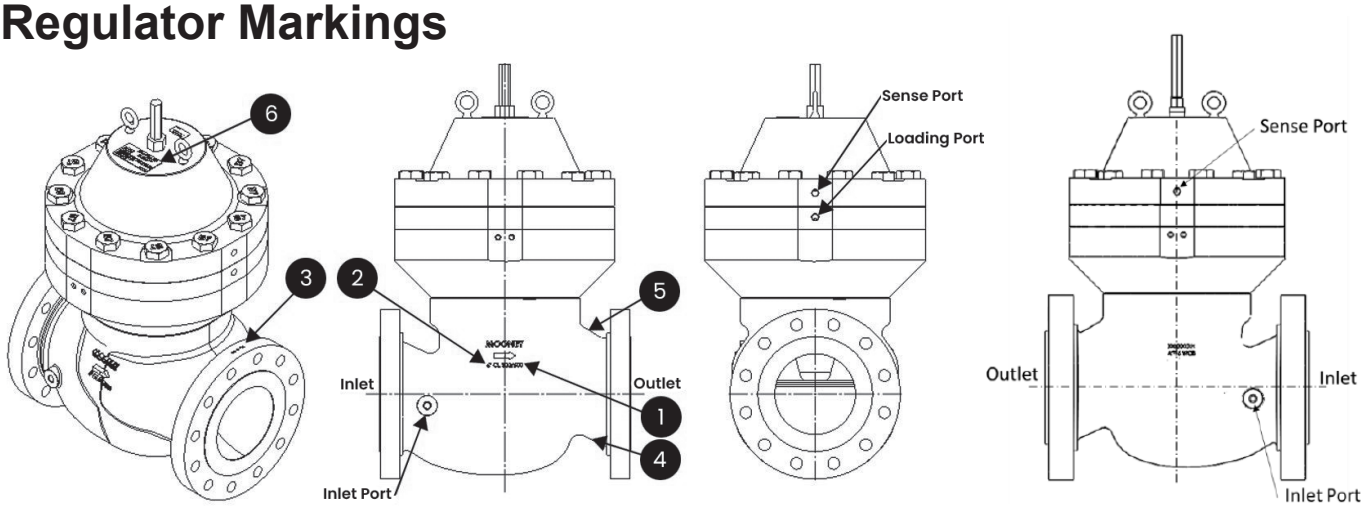


Figure 3 - Regulator Markings

1. American National Standards Institute (ANSI) pressure class rating of the regulator.
2. Line size of body.
3. ANSI pressure class rating of the flange.
4. Indication that the regulator has been hydrostatically tested according to code requirements.
5. The Serial Number is stamped on the Body.
6. The Nameplate location.
7. Cage Identifier (not shown - generally attached as a bolt tag)

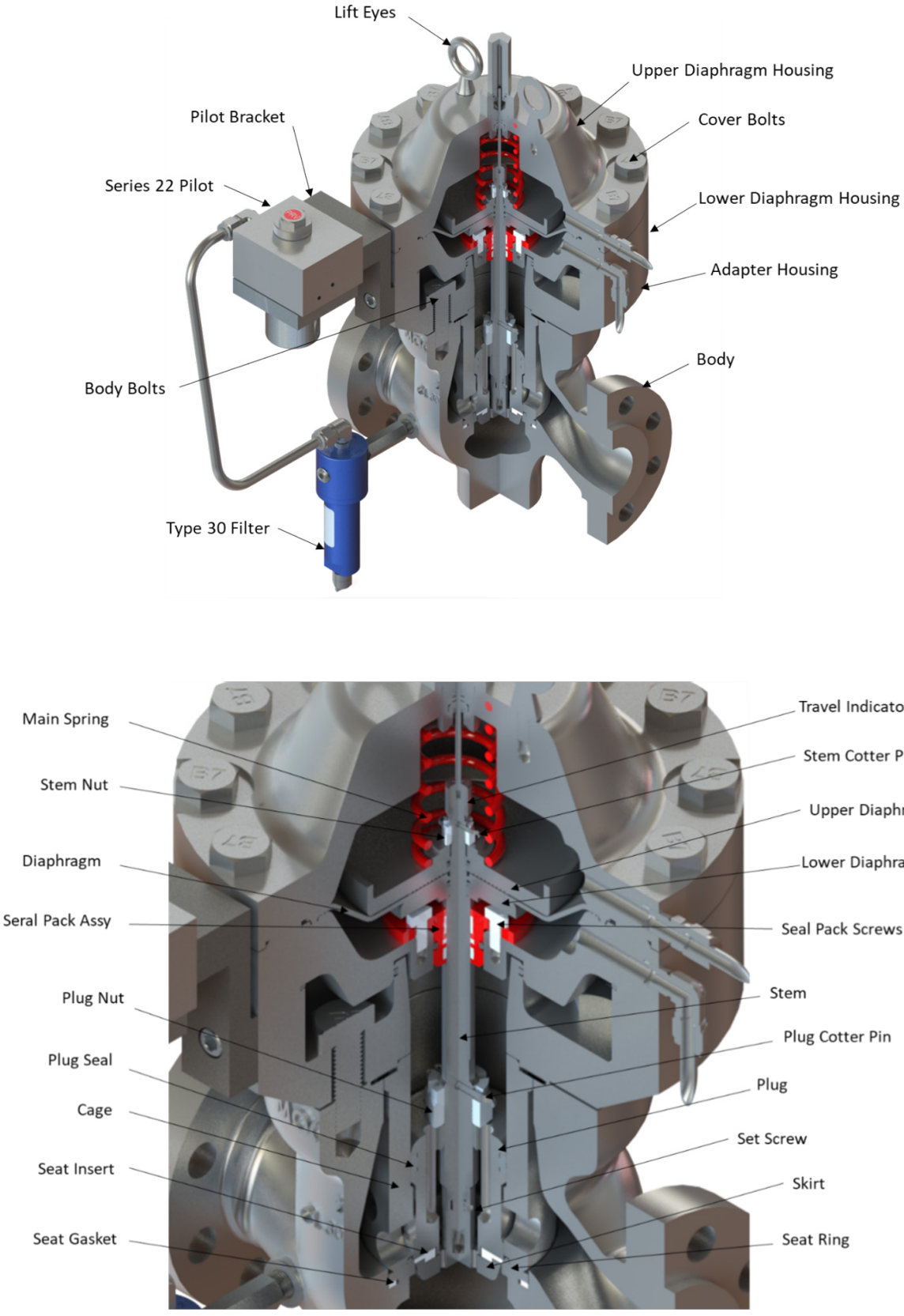


Figure 4 - Component Identification

Hydrostatic Testing

⚠WARNING

Installation and testing of the FlowMax HP Regulator should be made by trained, qualified personnel familiar with high pressure piping and pilot operated regulators.

All FlowMax HP regulators are hydrostatically tested at the factory prior to shipment according to ISA-S75.19 and EN 334 standards. If it is necessary to retest the Regulator body, follow the procedures listed below.

Note: This Procedure applies to the regulator body only. If actuator retesting is required, contact the factory for proper procedures.

1. Disconnect and remove the pilot inlet, actuator sense control line(s) and loading lines.
2. Remove the body-to-actuator bolts and remove the actuator and pilot.
3. Plug the pilot supply line in the regulator body or, if applicable, the pilot filter.
4. Plug the flange/actuator mounting surface on the body.

Note: A plug for hydrostatically testing the Body is available from the factory.

6. Pressurize the system to the required maximum hydrostatic pressure.
7. After the hydrostatic test is completed and the body is dry and clean, follow the assembly procedures in the maintenance section of this manual.

Installation

⚠WARNING

Personal injury, equipment damage, or leakage due to explosion of accumulated gas or bursting of pressure containing parts may result if this regulator 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 both regulator and pilot to ensure neither device is over pressured. To reduce the chances of such injury or damage, provide pressure relieving or pressure limiting devices (as required by the U.S. code of Federal Regulations, by the National Fire Codes of the National Fire Protection Association, or by other applicable codes) to prevent service conditions from exceeding those limits. Additionally, physical damage to the regulator, pilot, or tubing can cause personal injury and/or property damage due to explosion of accumulated gas. To reduce the chances of such injury and damage, install the regulator in a safe location.

1. **Personnel:** Installation of the FlowMax HP regulator should be performed by trained, qualified personnel familiar with high-pressure piping and pilot- operated regulators.
2. **Prior Inspection:** Inspect the main regulator, pilot, and tubing for any damage that might have occurred in shipping. Make sure the body, pilot sense lines, and piping are clear and free of foreign material.
3. **Flanged End Regulators:** Use suitable line gaskets and good bolting practices with flanged bodies. Incremental tightening of the line bolts in a crisscross pattern is recommended.

⚠WARNING

Gas regulators installed in confined or enclosed spaces should be provided with adequate ventilation to prevent the possibility of gas buildup or accumulation from leaks and venting. Leaks or vented gas may accumulate causing personal injury, death, or property damage. Pilot spring cases and the regulator enclosure should be vented to a safe area away from air intakes, or any hazardous location. The vent lines and stacks must be protected against condensation and clogging.

4. **Orientation:** The FlowMax HP regulator may be installed in any position – the best position being the one that provides easiest access for pilot adjustment and general maintenance.
5. **Control Lines:** Control (sense) lines should be run from the FlowMax HP actuator to a point at least 8 to 10 pipe diameters downstream from the regulator (refer to piping schematics). Use Table 4 as a guide for the ideal tubing size to use. Reduce as necessary to connect the actuator.

Outlet Pressure		
Pilot Regulator with:	**3 to 5 psig (0.14 - 0.35 barg)**	**Greater than 5 psig (0.35 barg)**
Static Sense Line	1/2” Tubing	3/8” Tubing
Sense Line with Flow	1/2” Tubing	1/2” Tubing

Table 3 - Outlet Pressure

Note: The control 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. Shut-off valves may be required in the control line(s), if installed, they should be of the full opening type. Gas velocity at the sense line connection should not exceed 100 ft/sec (30m/sec).

7. **Pilot Supply Lines:** Run a 3/8-inch or 1/2-inch pilot supply line from the upstream piping or from the Inlet port body connection on the side of the FlowMax HP regulator to the pilot Inlet port.
8. **A Filter** in the pilot supply line is recommended to remove particulates from the pilot supply that could affect the variable orifice in the pilot.

   Note: A shut-off valve is not required in the pilot supply line, but if one is installed, it must be a full-opening type.
9. **Vent Valves and Gauge Connections:** Vent valves and gauge connections are recommended in the Inlet and actuator sense piping of the FlowMax HP regulator.
10. **Interstage Piping:** The recommended length of the interstage piping between monitor regulators is 6 pipe diameters or 36 inches (915 mm), whichever is greater. It is also recommended that the interstage piping be swaged up 1 pipe diameter over the nominal port size of the regulator for working monitor applications.

    For example: A station with two 2” FlowMax HP regulators in a working monitor configuration should have interstage piping at least 36 inches (915 mm) in length and swaged up to a 3-inch pipe.

Piping Schematics

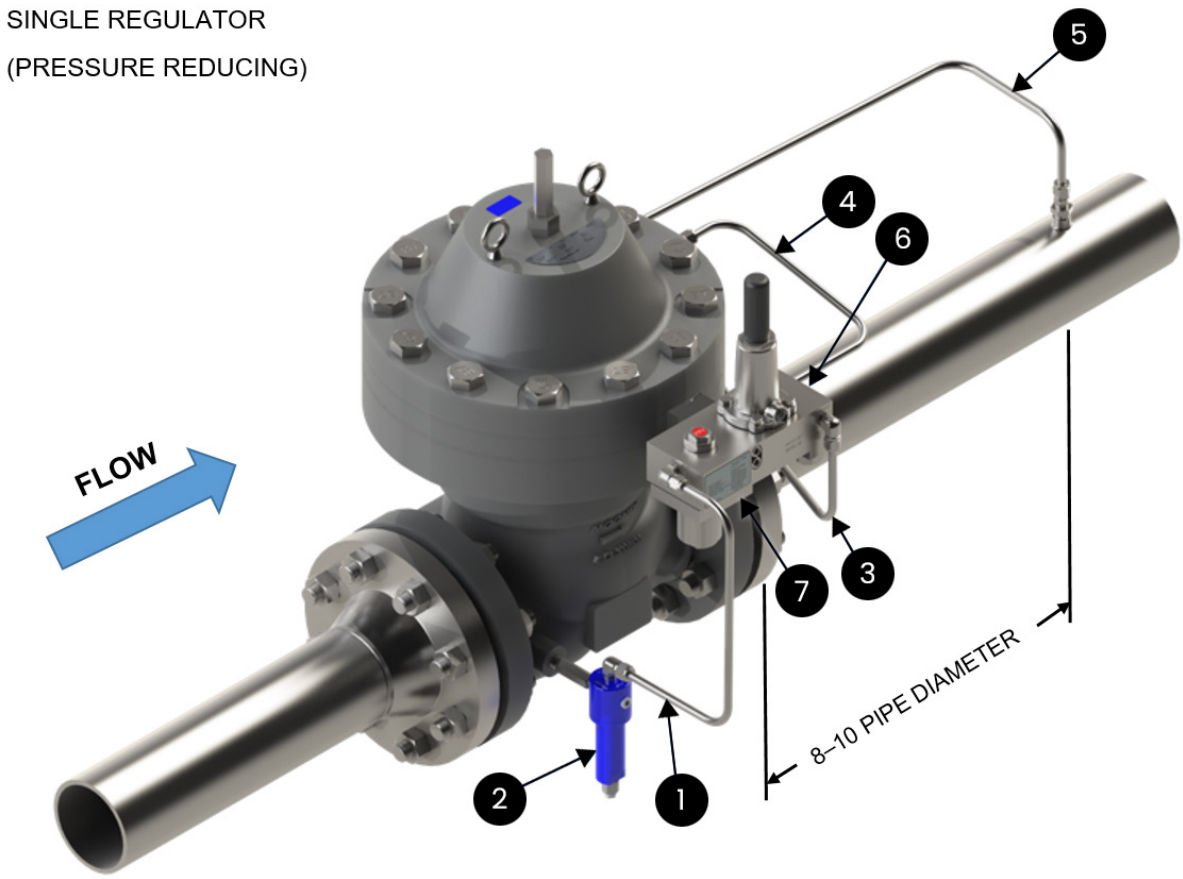
The following piping schematics are provided:

1. Single Regulator with Single Pilot.....Page 6
2. Stand-by Monitor (Monitor located downstream).....Page 7
3. Stand-by Monitor (Monitor located upstream) .....Page 8
4. Working Monitor set.....Page 9

All drawings show installations with the Series 22 Pilot. Consult factory for installation schematics of other manufacturers pilot on the FlowMax HP regulator.

Piping Schematics (cont'd)

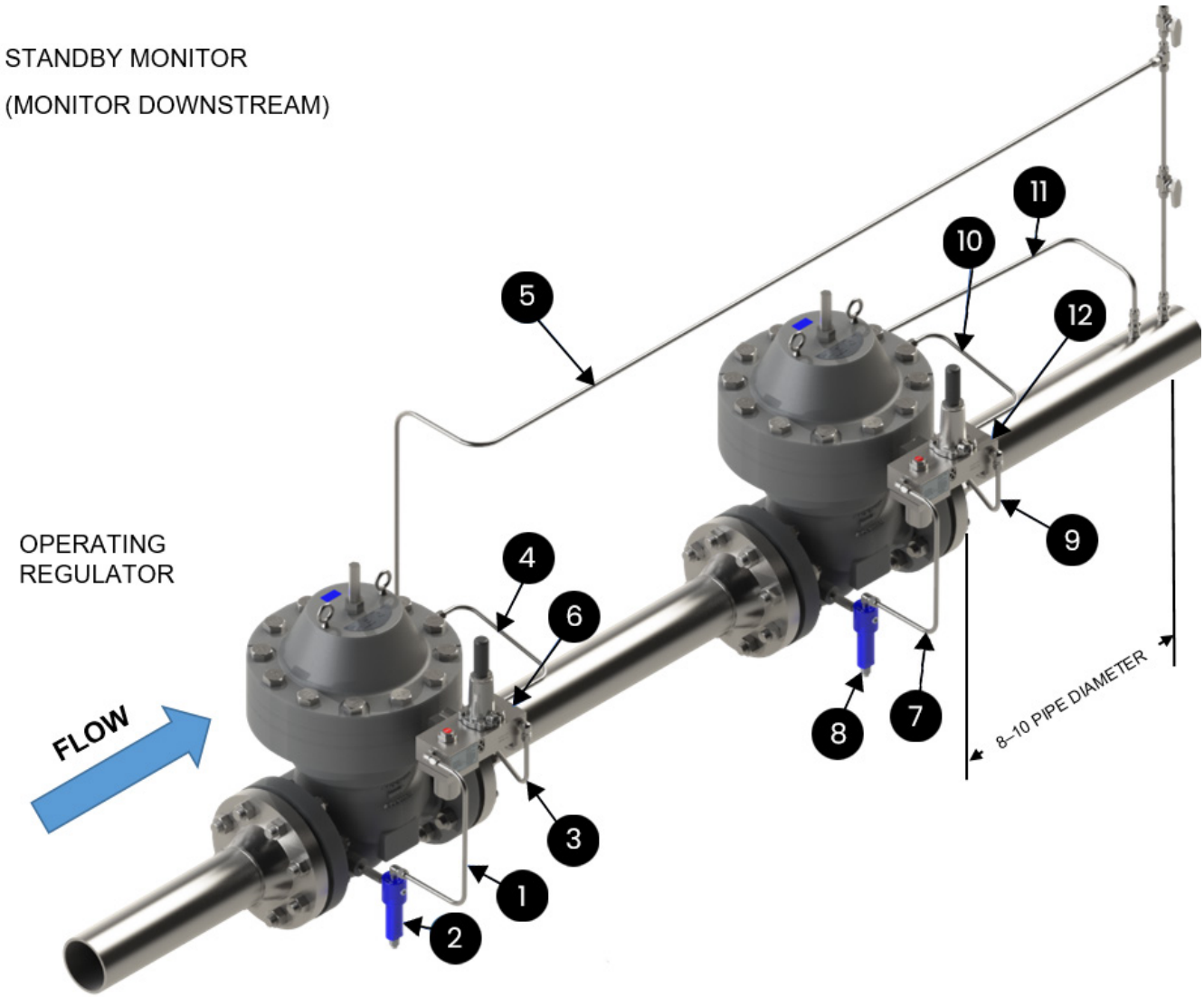
1. Single Regulator/Single Pilot (Pressure Reducing Regulator)



1. Pilot supply tubing from filter OUTLET connection to the Series 22 pilot INLET port.
2. Type 30 filter mounted in inlet piping.
3. LOADING port of Series 22 pilot connected to Loading connection on the actuator housing of the FlowMax HP regulator
4. Sense line connecting the SENSE Port on the Series 22 pilot to the sense port on the FlowMax HP actuator.
5. Sense line connecting the FlowMax HP regulator to the downstream piping. (Refer to Table 4 on Page 5 for sense piping recommendations)
6. Series 22 pilot with pilot cartridge in PRV mode.
7. Pre-Pilot portion of Series 22 Pilot.

Piping Schematics (cont'd)

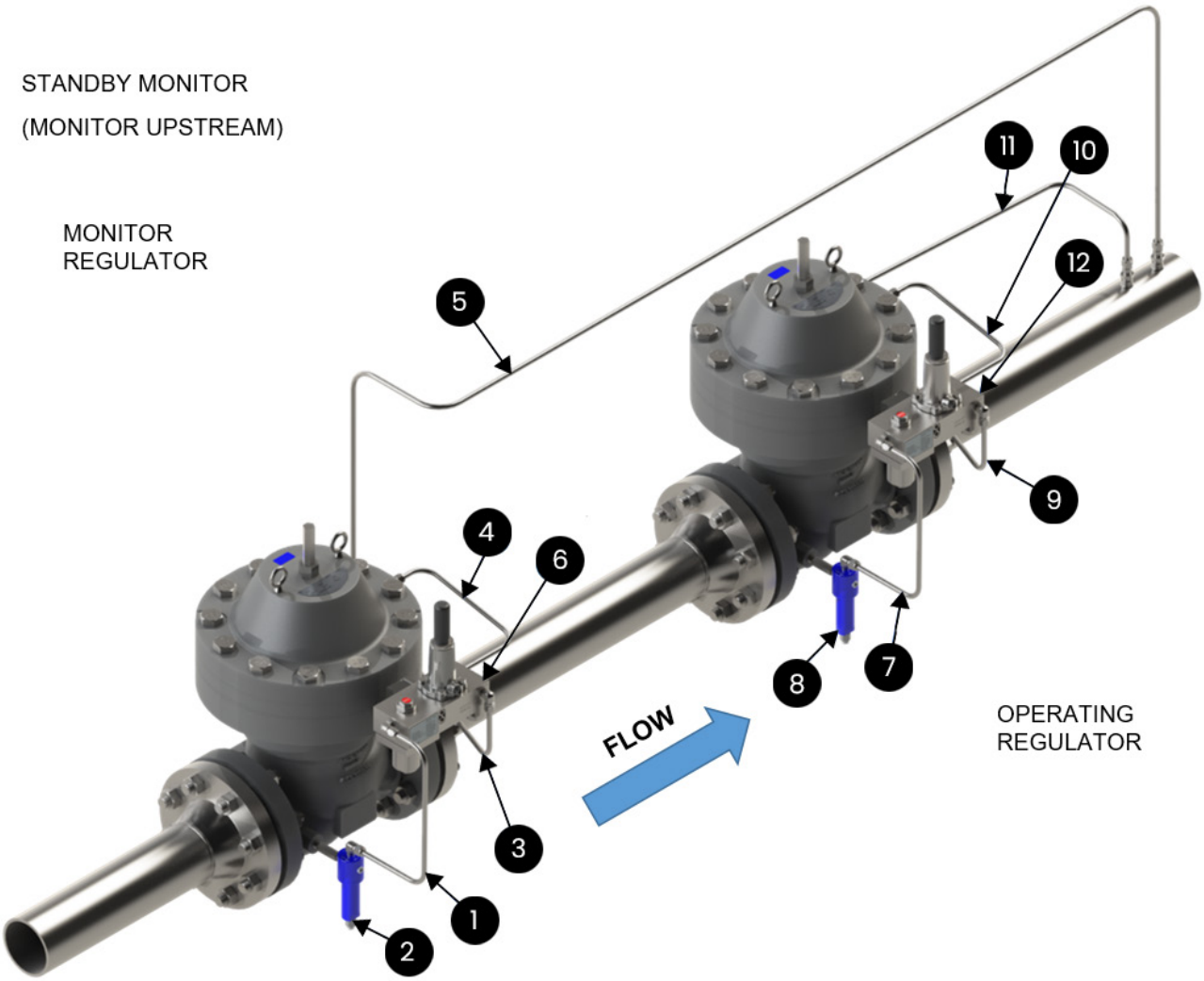
2. Stand-by Monitor (Monitor located downstream)



1. Pilot supply tubing from filter OUTLET to Series 22 pilot INLET port.
2. Type 30 Filter mounted in inlet piping.
3. LOADING Port of Series 22 pilot connected to the loading connection on the actuator housing of the FlowMax HP regulator.
4. Sense line connecting the SENSE port on the Series 22 pilot to the sense port on the FlowMax HP actuator.
5. Sense line connecting the FlowMax HP regulator to the downstream piping. (Refer to Table 4 on Page 5 for sense piping recommendations)
6. Series 22 pilot with pilot cartridge in PRV mode.
7. Pilot supply tubing from filter OUTLET to Series 22 pilot INLET port.
8. Type 30 filter mounted in inlet piping.
9. LOADING port of Series 22 pilot connected to the Loading connection on the actuator housing of the FlowMax HP regulator.
10. Sense line connecting the SENSE port on the Series 22 pilot to the sense port on the FlowMax HP actuator.
11. Sense line connecting the FlowMax HP actuator to the downstream piping.
12. Series 22 pilot with pilot cartridge in PRV mode.

Piping Schematics (cont'd)

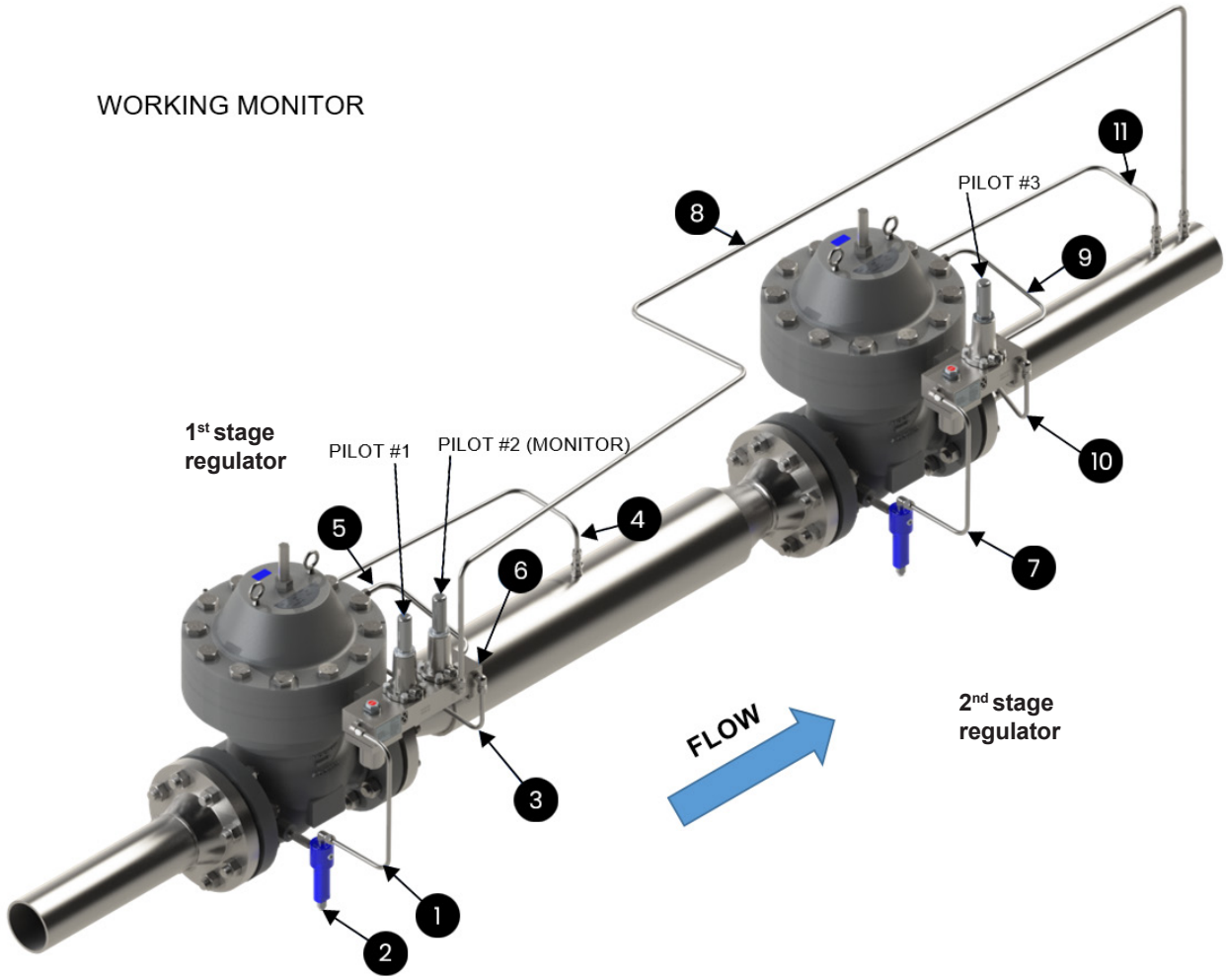
3. Stand-by Monitor (Monitor located upstream)



1. Pilot supply tubing from filter OUTLET connection to Series 22 pilot INLET port.
2. Type 30 filter mounted in inlet piping.
3. LOADING port of Series 22 pilot connected to the Loading connection on the actuator housing of the FlowMax HP regulator.
4. Sense line connecting the SENSE port on the Series 22 pilot to the sense port on the FlowMax HP actuator.
5. Sense line connecting the FlowMax HP actuator to the downstream piping. (Refer to Table 4 on Page 5 for sense piping recommendations)
6. Series 22 pilot with pilot cartridge in PRV mode.
7. Pilot supply tubing from filter OUTLET connection to Series 22 Pilot INLET port.
8. Type 30 filter mounted in inlet piping.
9. LOADING port of Series 22 pilot connected to Loading connection on the actuator housing of the FlowMax HP regulator.
10. Sense line connecting SENSE port on Series 22 pilot to the sense port on the FlowMax HP actuator.
11. Sense line connecting the FlowMax HP actuator to the downstream piping.
12. Series 22 pilot with pilot cartridge in PRV mode.

Piping Schematics (cont'd)

4. Working Monitor Set



1. Pilot supply tubing from filter OUTLET connection to Series 22 pilot (#1) INLET port.
2. Type 30 filter mounted in the inlet piping.
3. Pilot #2 LOADING port connected to the loading connection on the actuator housing of the FlowMax HP regulator.
4. Sense line connecting the 1st stage FlowMax HP regulator to the interstage piping. (Refer to Table 4 on Page 5 for sense piping recommendations)
5. Sense line connecting SENSE port on Series 22 pilot (#2) to the sense port on the FlowMax HP actuator.
6. Series 22 pilot with pilot cartridge in PRV mode.
7. Pilot supply tubing from filter OUTLET connection to Series 22 pilot (#3) INLET port.
8. Sense line connecting the SENSE port on the monitor pilot (#2) to the downstream piping.
9. Sense line connecting SENSE port on Series 22 pilot (#3) to the sense port on the FlowMax HP actuator.
10. LOADING port of Series 22 pilot (#3) connected to the loading connection on the actuator housing of the FlowMax HP regulator.
11. Sense line connecting the 2nd stage FlowMax HP regulator to the downstream piping.

Start-up and Operation

The following procedures are suggested for start-up of the FlowMax HP regulator equipped with Series 22 pilots. Start-up of the FlowMax HP regulator should be made by trained, qualified personnel familiar with high pressure systems and pilot-operated regulators.

⚠WARNING

The instruction manual for the PILOT(S) being used should be consulted to insure that the installation and start-up instructions for the pilot are followed. Some equipment can be damaged if not installed and put into operation correctly.

Single Pressure Reducing Regulator

1. Back off the pilot adjusting screw to fully remove the spring compression.
2. Slowly open the upstream block valve to pressurize the FlowMax HP regulator and pilot system. The regulator should lock up (shut off) with zero pressure downstream.
3. Fully open any hand valve(s) in the control line(s) and the pilot supply line.
4. Slightly open a downstream block valve or open a vent in piping downstream of the FlowMax HP regulator.
5. Slowly increase the pilot spring setting until the desired downstream pressure is achieved.
6. Slowly close the downstream block valve or vent to check the FlowMax HP regulator for lockup (shut off).
7. Slowly open the downstream block valve to allow full flow.

Stand-by Monitor

(Upstream Operating Regulator Configuration)

This procedure is based on the first regulator being the Operating regulator and the second regulator being the Monitor regulator.

Note: In this configuration, installation of a shut-off valve and a vent valve are required in the sense line of the operating regulator to facilitate testing of the monitor regulator performance. See Page 7.

1. If necessary, purge any pressure in the station.
2. Set operating regulator pilot (#1) spring at the MAXIMUM setting. The sense line shut-off valve should be closed and the sense line vent valve should be open.
3. Set monitor pilot (#2) spring to the MINIMUM (zero) setting.
4. Slowly open the inlet block valve. Full inlet pressure should be present at the monitor regulator and the Monitor regulator should be closed.
5. Open any hand valve(s) in the pilot supply lines on both regulators. The sense line shut-off valve should remain closed and the sense line vent valve should remain open (Refer to page 7).
6. Open a vent or downstream block valve.
7. Increase the pilot spring setting of the monitor regulator until the desired monitor override setting is reached. Lock in the pilot setting.
8. With some flow going through the station, close the vent valve on the operating regulator sense line and open the shut-off valve on the same line. Start to lower the Pilot setting of the operating regulator until the desired outlet pressure is achieved.

Note: When the set point of the operating regulator becomes less than the set point of the monitor regulator, the interstage pressure will drop from approximately full inlet pressure to 5-10 psi (0.34-0.68 bar) above the outlet pressure at low flow rates.

Checking Stand-by Monitor Operation

1. With flow going through the station, slowly open the vent valve installed in the operating regulator sense line while closing the shut-off valve in the same line. The outlet pressure should begin to rise as the operating regulator goes wide open. When the pressure reaches the setpoint of the monitor regulator, the monitor should take control and the interstage pressure should increase to approximately full inlet pressure.
2. Return the system to normal operation by reversing the process with the vent valve being closed while the shut-off valve is returned to the open position. The interstage pressure should drop to 5-10 psi (0.34-0.68 bar) above the outlet pressure as the operating regulator regains control (at low flows).

Stand-by Monitor

(Upstream Monitor Regulator Configuration)

This procedure is based on the first stage regulator being the Monitor regulator and the second stage regulator being the Operating regulator.

1. If necessary, purge any pressure in the station.
2. Set first stage monitor regulator pilot spring at the MAXIMUM setting.
3. Set second stage operating regulator pilot spring to the MINIMUM (zero) setting.
4. Slowly open the inlet block valve. Full inlet pressure should be present at the second stage operating regulator and it should be closed.
5. Fully open any hand valve(s) in the control line(s) and the pilot supply line.
6. Open a vent or downstream block valve.
7. Increase the set point of the second stage operating regulator to the desired monitor over-ride set pressure.
8. Decrease the pilot spring setting of the first stage monitor regulator until it takes control at a set point just below the final desired monitor over-ride set pressure.
9. Increase the second stage operating regulator to the maximum pilot setting.
10. Increase the first stage monitor regulator set pressure to the final desired monitor over-ride set point.
11. Decrease the pilot spring setting of second stage operating regulator until the final set point is achieved.

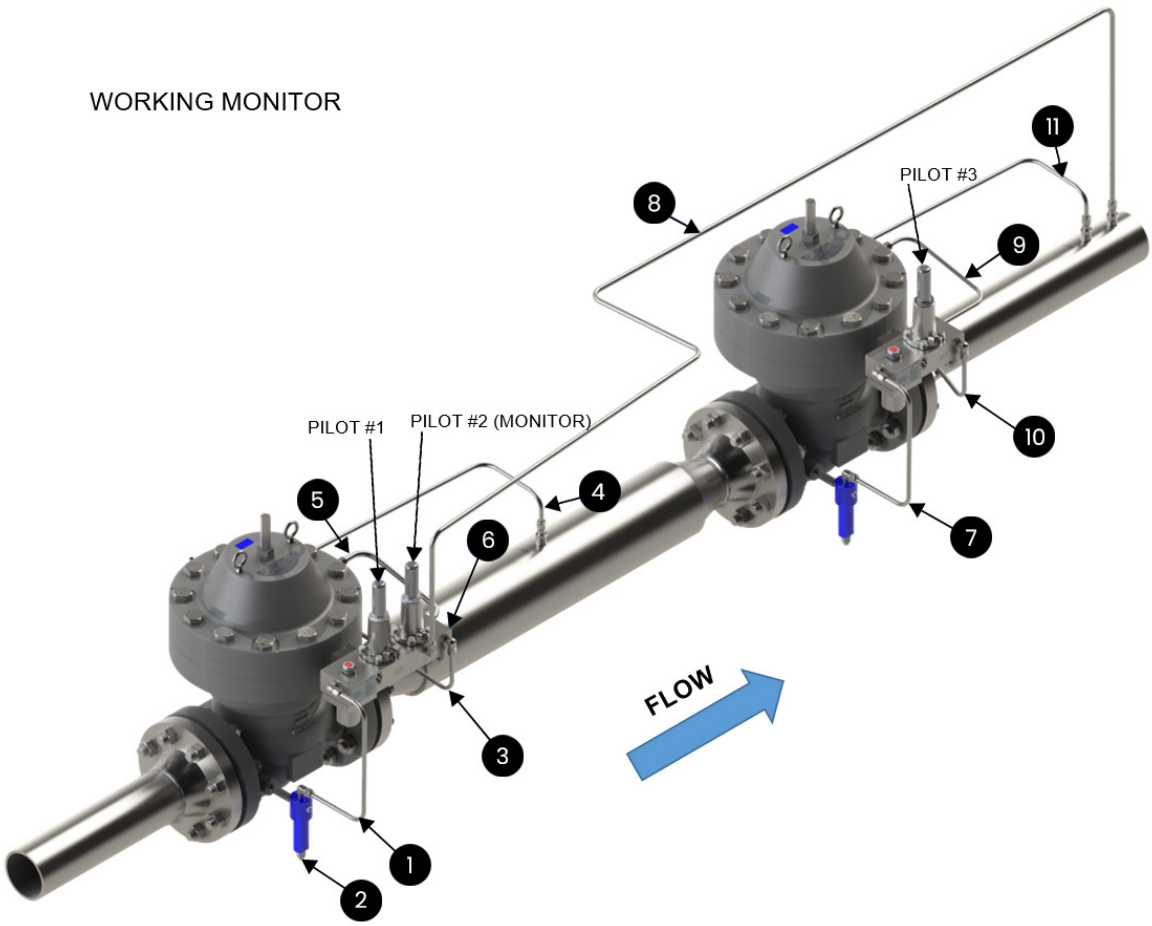
    Note: When the set point of the operating regulator becomes less than the set point of the monitor regulator, the interstage pressure will rise to 5-10 psi (0.34-0.68 bar) below the full inlet pressure (at low flows).

Checking Stand-by Monitor Operation

1. With flow going through the station, slowly increase the setting of the operating regulator. When the pressure reaches the setpoint of the monitor regulator, the monitor should take control and the interstage pressure should decrease to approximately 5-10 psi (0.34-0.68 bar) above the outlet pressure.
2. Reduce the setting of the operating regulator back to the required outlet pressure. The interstage pressure should increase to 5-10 psi (0.34-0.68 bar) below the inlet pressure as the operating regulator regains control (at low flows).

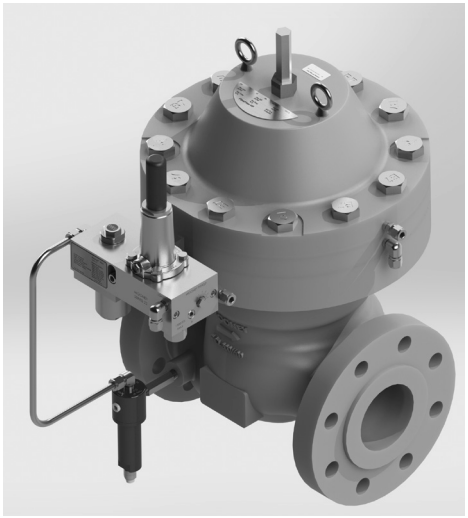
Working Monitor Start-up Procedure

1. Purge any pressure in the station.
2. Set pilots #1 and #2 to a setting above the desired set points.
3. Set the pilot (#3) at a zero setting.
4. Slowly open the inlet block valve to station. The second stage regulator should remain closed as a result of the pilot #3 being set to zero.
5. Fully open any hand valve(s) in the control line(s) and the pilot supply line.
6. Open an outlet block valve or vent to allow flow through the station.
7. Increase the setting of the second stage regulator, pilot (#3) to the desired monitor over-ride pressure set point of the station.
8. Lower the setpoint of the first stage regulator pilot (#1) to the desired interstage pressure setting. The first stage regulator should begin to control the interstage pressure at the setpoint of Pilot #1.
9. Lower the setpoint of pilot #2 to take control of the system (a pressure that will be slightly lower than the final monitor over-ride pressure).
10. Raise the setpoint of pilot #3 to a maximum setting.
11. Raise the setpoint of pilot #2 to maintain the exact monitor over-ride pressure set point.
12. Lower pilot #3 to the desired station outlet pressure.



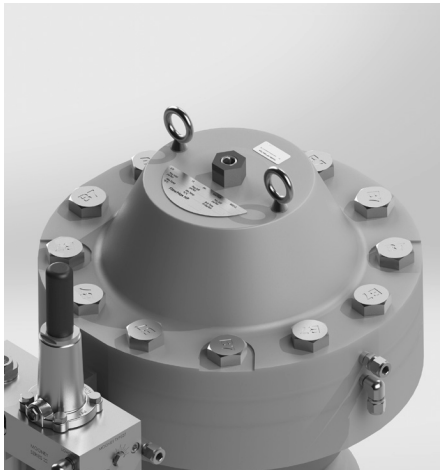
Maintenance

1. Disconnect the Sense and Loading tubing to the Actuator. The Series 22 Pilot block can remain attached to the Adapter housing and does not need to be removed for this procedure.



2. Disconnect Travel Indicator shaft from Stem by pressing down on shaft and rotating in a clockwise direction. Travel Indicator Stem should be free to move up and down.

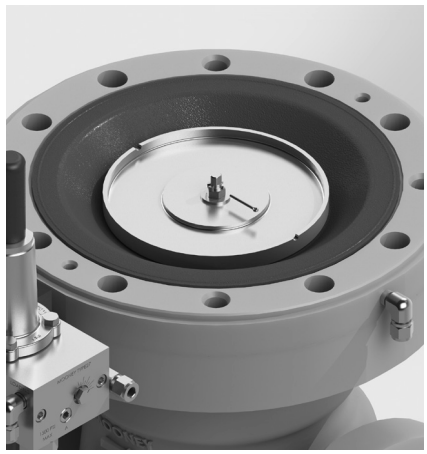
3. Remove all the Cap Screws holding the Upper Actuator Housing to the Lower Actuator Housing.



4. Using proper lifting points, lift the Upper Actuator Housing off the unit.

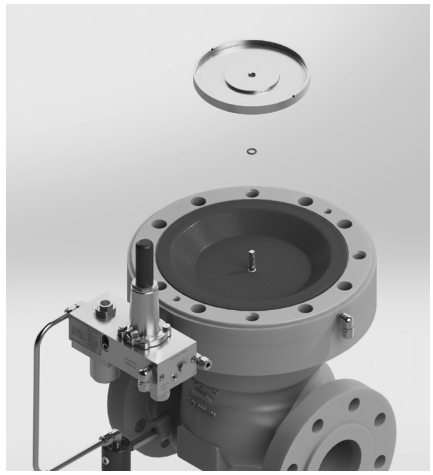
5. Remove the Spring and Travel Indicator shoe. The Travel Indicator shoe is threaded onto the Stem.

6. Remove the upper Cotter Pin.



7. While using the wrench flats on the top of the Stem to hold it in place, unscrew the upper Castle Nut from the Stem.

8. Remove the Upper Diaphragm Support plate.
Note: The Upper Diaphragm Support plate has an internal O-ring that should be inspected and replaced if necessary.



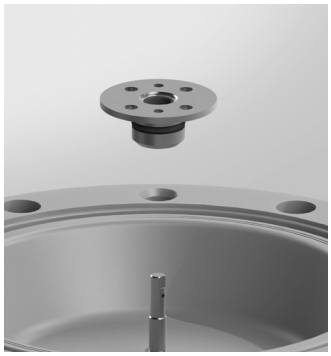
9. Remove the Diaphragm and inspect for any bubbles, cracking or other damage that may be present. Replace if necessary.

10. Remove the Lower Diaphragm Support plate.
Note: The Lower Diaphragm Support plate also has an internal O-ring that should be inspected and replaced if necessary.

11. The Seal Pack is held in place by four Cap Screws. Remove the four Cap Screws and remove the Cover Plate. Two threaded holes are used for jacking or lifting the Seal Pack out as a complete unit.

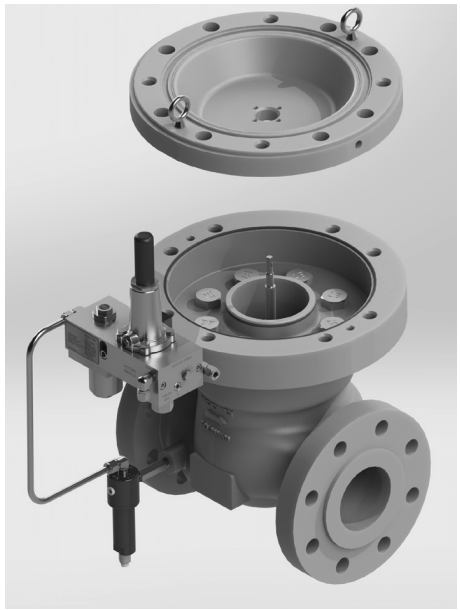
12. Thread two of the Seal Pack cap screws into the extra holes and tighten to lift the Seal Pack out of the Lower Actuator Housing.

13. Due to the difficulty in replacing the Seal Pack's internal Stem Seal, it is recommended that the Seal Pack be replaced as a complete unit.



14. Remove the Lower Diaphragm Housing. If Lower Diaphragm Housing is difficult to remove, two cover bolts may be inserted into opposite threaded holes on the Housing and used as jacking screws.

15. Attach Lift Eyes to two threaded holes in the housing and lift vertically. Lift Eyes from the Upper Actuator cover may be used.

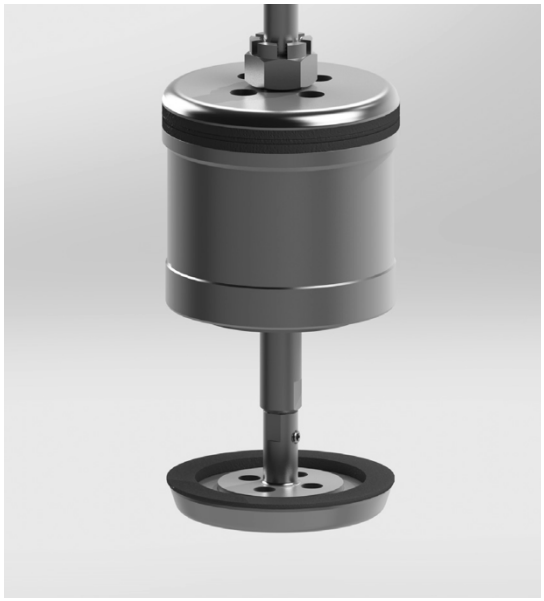


16. Inspect and replace O-ring in Adapter Housing if necessary. Also inspect and replace the environmental O-ring if necessary.

17. Plug assembly may be removed by lifting Stem. Plug will experience a click when the Plug Seal transitions from the cage to the Adapter Housing. The Plug should be pulled upward rapidly. To assist in removal, the upper nut and washer can be threaded onto the top of the shaft to serve as a gripping point.

18. To rebuild Plug assembly, remove Cotter Pin and loosen the Castle Nut.

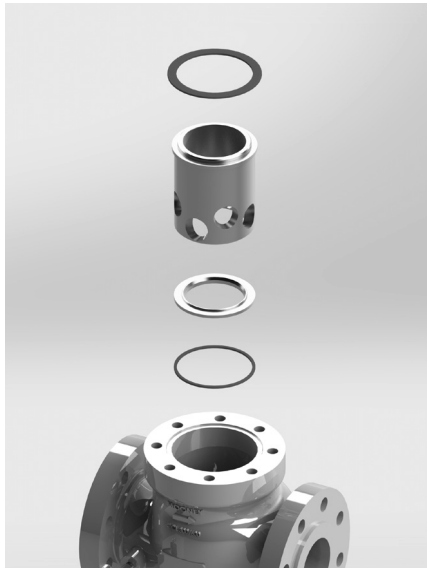
19. Once the Castle Nut is loosened, the Plug and Castle Nut can be moved up the Stem and the Set screw on the Plug skirt will be exposed.



20. After loosening the Plug skirt Set screw, the Plug skirt can be unscrewed from the Stem and the Seat Insert can be replaced. Be sure to use wrench flats on Plug skirt and Stem to avoid twisting the Stem assembly.

21. Replace Seat Insert.
22. Reinstall Plug Skirt and Set screw..
23. Install Castle Nut and tighten as per Table 5. Tighten to the minimum required torque and then continue to tighten until the castellated nut aligns with the shaft hole. Use wrench flats to hold part and prevent the assembly from turning.
24. Install Cotter Pin and deform at least 90 degrees for proper locking. Set aside for installation after lower valve rebuild.
25. **New Crush Gaskets are required if the Adapter Housing is removed.** Remove the Inlet supply line and remove the Adapter Housing Cap Screws. Lift the Adapter Housing using the provided lifting holes. ***Note: The removal of the Adapter will only be necessary if the cage and seat ring need to be inspected and replaced.***

26. Remove the Upper Crush Gasket and lift the Cage from the Body. Clean and inspect the Cage for any sign of abrasive wear or damage.
27. Remove the Seat Ring and Lower Crush Gasket. Inspect the Seat Ring for any sign of abrasive wear or damage. Replace if necessary. Due to the close fit between the Seat and Cage, the Seat may require prying to remove it from the cage.



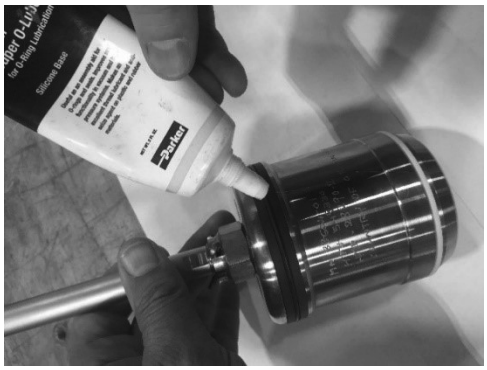
28. **Re-Assembly**
Insert Lower Crush Gasket.
Note: The two Crush Gaskets are not re-usable and must be replaced if the Adapter Housing is removed during teardown and reassembly.

29. Insert the Seat Ring, Cage and Upper Crush Gasket. Apply a light coat of Never-Seez to the top of the Cage that intersects with the Adapter Housing.

30. Position the Adapter Housing in place on top of the Upper Crush Gasket and install Cap Screws.
Note: The torquing of the Adapter Housing Cap Screws is critical to setting the Upper and Lower Crush Gaskets and must be done in an even crisscross manner to provide even force for setting the gaskets. Torque should be applied in intervals of 1/3 the final torque, 2/3 final torque and final torque.

31. Torque Adapter Housing Cap Screws to specified levels (see Table 5).

32. Install rebuilt Plug Assembly. Apply Parker o-lube and install Plug assembly into Cage. Plug will stick slightly at transition, keep pushing with a slight circular motion to help the plug pass over the Adapter to Cage transition.



33. Install Lower Diaphragm Housing.

34. Install Seal Pack Housing by sliding Seal Pack assembly onto Stem and then sliding into the Lower Diaphragm Housing. Install Seal Pack Cover.
Note: The Stem has a taper which allows for easy installation of the Stem Seals.

35. Torque the Seal Pack Cap Screws to specified levels (see Table 5) and manually move the Stem through a few cycles to assure proper alignment prior to attaching the Diaphragm and Diaphragm Support Plates.

36. Install Lower Diaphragm Support plate, Diaphragm, and Upper Support plate.

37. Slide the Castle Nut and Washer onto the Stem shaft and engage threads. The Castle Nut can be tightened by hand but, prior to wrench tightening, place a separate wrench on the Stem wrench flats to prevent rotation while tightening the Castle Nut.

38. Tighten the Upper Castle Nut to the torque listed in Table 5. Tighten to the minimum required torque and then continue to tighten until the castellated nut aligns with the shaft hole for proper insertion of the Cotter Pin.

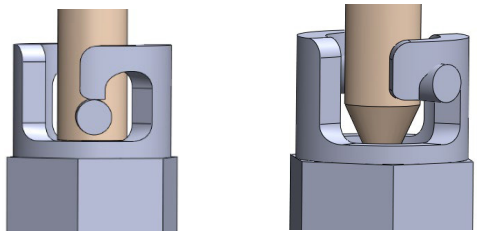
39. Insert Cotter Pin and bend the ends more than 90 degrees to maintain proper locking action and assure that the Cotter Pin does not interfere with the Main Spring.

40. Thread the Travel Indicator shoe onto the Stem and tighten while holding the stem from turning using a wrench across the provided flats.

41. Set and center the Spring on the Upper Diaphragm Support plate prior to lowering the Upper Actuator Housing onto the assembly.

42. Ensure that the Diaphragm bead is sitting in the groove of the Lower Actuator Housing.

43. Lower and bolt the Upper Actuator Housing to the recommended torque specification.



44. Reattach the Travel Indicator by pressing down on the Indicator stem and turning in counter-clockwise direction. Travel Indicator should be locked to the Stem and should not be loose to move up and down.

45. Reconnect the Sense, Loading and Inlet tubing.

46. Pressure test for leaks prior to returning to service.

FlowMax HP Bolting Torques lb-ft (N-m)				
	2”	3”	4”	6”
Actuator Cap Screws	96 (130)	165 (224)	250 (340)	380 (515)
Stem Nut	8 (11)	8 (11)	8 (11)	11 (15)
Adapter Housing Cap Screws	165 (224)	165 (224)	250 (340)	380 (515)
Plug Nut	18 (25)	18 (25)	18 (25)	22 (30)
Seal Pack Bolts	8 (11)	8 (11)	8 (11)	14 (19)

Table 5

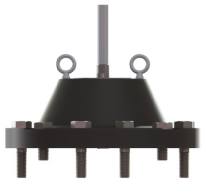
FlowMax HP Actuator Component Weights											
Size	**Class**	**Flowmax HP (w/o pilot)**		**Actuator Assembly**		**Upper Diaphragm Housing**		**Lower Diaphragm Housing**		**Adapter Housing**	
		lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
2	600	163	74	67	31	30	14	30	14	38	18
3	600	308	140	128	58	65	30	48	22	76	35
4	600	469	213	191	87	102	47	67	31	104	48
6	600	705	320	263	120	140	64	96	44	139	64
											

Table 6

Troubleshooting

Problem	Solution
The regulator will not shut-off	1. Verify the gap between the actuator and body is equal around its diameter 2. Check actuator to body bolts - tighten if necessary 3. Check the pilot for excess friction (“sticking open”) 4. Check main spring 5. Check the plug seal for damage 6. Check the seat for any nicks or damage to the sealing surface 7. Check for damage to the seat O-ring 8. Check for obstructions in the internal plug holes
Regulator will not open	1. Check if any valves in the sense line are not fully open 2. Check the pilot set point 3. Check that existing piping matches the piping schematics 4. Check for binding 5. Check the main diaphragm for damage
Erratic Behavior	1. Check the location of the sense line (away from pipes, fittings, and other turbulent locations) 2. Check that the size of the sense line is adequate 3. Check if any valves in the sense line are not fully open 4. Check the pilot for excess friction (“sticking”) 5. Check for excess friction in the actuator

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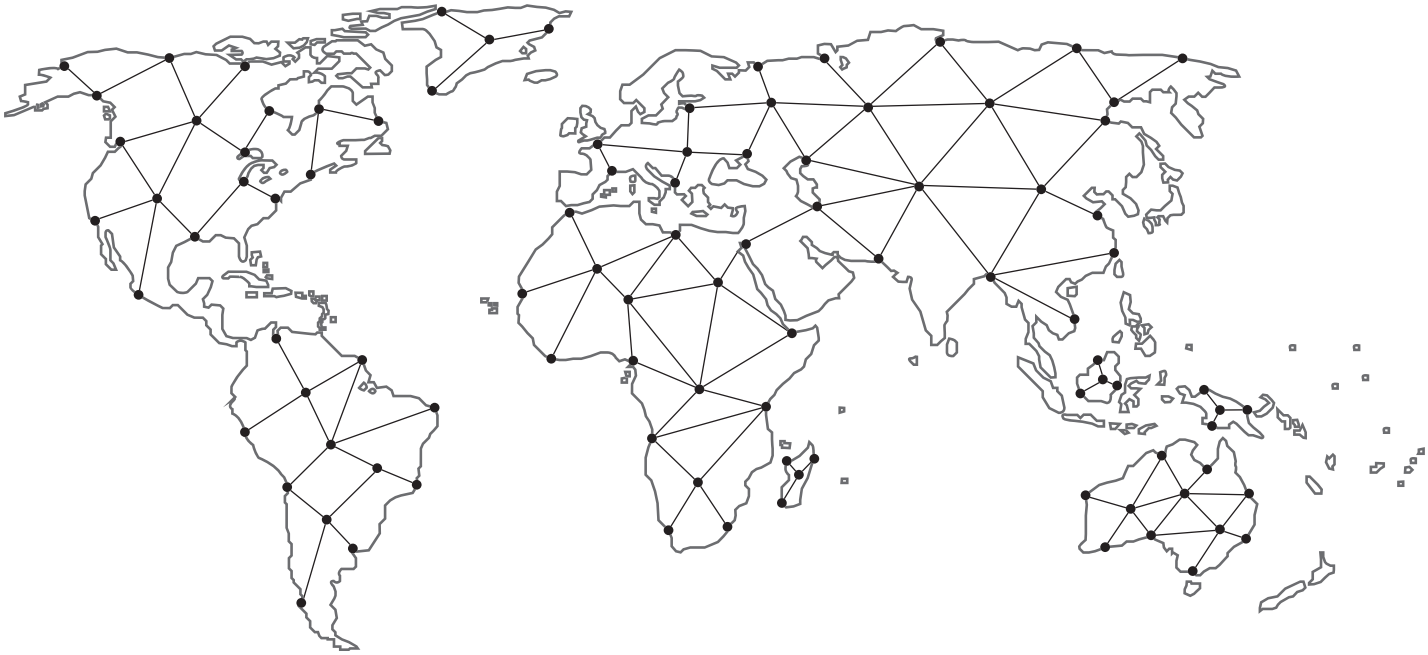

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