Anderson Greenwood™ Type 81P Spring Operated Pressure Relief Valves

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Figure 1. *Anderson Greenwood Type 81P Spring-Operated Pressure Relief Valves*

Product Safety Sign and Label System

The following signal words and meanings are intended to explain the levels of risk associated with this product.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation or unsafe practice which could result in death or serious injury.

⚠ CAUTION

CAUTION used with the safety alert symbol, indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

NOTICE - Hazards or unsafe practices which COULD result in product or property damage.

Safety First

⚠ WARNING

Read and understand all instructions. Failure to follow all instructions listed below, may result in system overpressure and/or serious personal injury or death.

To reduce the risk during installation:

- Comply with all information on the product, in this manual and in any local and national codes that apply to this product.
- Do not allow untrained personnel to work with this product.
- Use Emerson parts and work procedures specified in this manual.

Safety Precautions

Proper handling, storage, installation, maintenance and operation are essential to the safe and reliable functioning of any pressure relief product.

- Never subject valves to sharp impact loads. Rough handling (striking, bumping, dropping, etc.) may alter the pressure setting, deform valve parts and affect seat tightness and valve performance adversely. Striking a valve which is under pressure can cause premature actuation.
- When moving a valve, never use the lifting lever to lift the valve.
- Always lower the system pressure to the pressure level specified in the instruction before making any adjustment to the valve.
- Ear and eye protection should be used when working on a valve which has pressure.
- Never stand in front of the discharge outlet of a pressure relief valve which is under pressure.
- Always stand to the side of and at a safe distance from the valve discharge and use extreme care when observing a valve for leakage.

The above precautions and suggestions are by no means exhaustive and the user should always approach and use any pressure relief valve with great care. Emerson cannot be expected to know, evaluate and advise customers of all the possible applications and operating conditions for its products or of the possible hazardous consequences which may result from the misapplication or misuse of such products. Consequently, the improper handling, storage, installation, use or maintenance of any Emerson product by a non-Emerson employee may void any Emerson guarantees or warranties with respect to such product. All personnel working with Emerson products should be trained adequately and thoroughly familiar with the contents of the appropriate instruction manual(s).

Operation, Installation and Safety Instructions are available at Emerson.com/Final Control or from your local Emerson regional sales office or representative. Any installation, maintenance, adjustment, repair and testing performed on pressure relief valves should be done in accordance with the requirements of all applicable codes and standards under which those performing such work should maintain proper authorization through appropriate governing authorities. No repair, assembly and test work done by other than Emerson shall be covered by the warranty extended by Emerson to its customers. The user assumes full responsibility of work. In maintaining and repairing Anderson Greenwood products the user should use only parts manufactured by Emerson. Call your nearest Emerson regional sales office or representative for a service engineer should you wish assistance with your field needs.

Suitability of the material and product for the use contemplated by the buyer is the sole responsibility of the buyer. Also, storage, installation and proper use and application are the sole responsibility of the purchaser. Emerson disclaims any and all liability arising out of the same.

Specifications

Specifications are given for the Type 81P valve on below. Specifications for a given valve as it originally comes from the factory are stamped on the nameplate.

Sizes
1/2 x 1 to 2 x 3 in. / DN 15 x 25 to 50 x 80

Connections
NPT, Flanged, Cone and Thread

Orifices
-2, -3, -4/-8, -4/-8 (81P-T), G and J

Set Pressures
50 to 12,500 psig / 3.34 to 862 barg

Temperature Range[1]
-423 to 400°F / -253 to 205°C

Code
ASME Section VIII and XIII (UV Designator)

1. The pressure/temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.

Introduction

The Anderson Greenwood™ Type 81P pressure relief valve is a direct acting spring-loaded balanced pressure relief valve for liquid and gas service especially for a wide range of pressures and temperatures. Type 81P valves have been selected for installation because of their performance features, reliability and ease of maintenance.

Adherence to the installation and maintenance procedures specified herein will provide the utmost in safety, a minimum of maintenance and a long service life. Anderson Greenwood Type 81P valves are manufactured in accordance with the requirements of Section VIII ASME Boiler and Pressure Vessel Code and Section XIII Rules for Overpressure Protection.

NOTE

Gas service is only available with -4 and -8 orifice.

Storage and Handling

⚠ CAUTION

Valves weighing more than 25 lb / 11 kg must not be lifted manually.

Use appropriate lifting equipment or team lifting techniques to prevent personal injury.

- Valves are often on hand at the job site months before they are installed. Unless stored properly and protected, valve performance may be affected adversely.
- Rough handling and dirt may damage or cause misalignment of the valve parts. It is recommended that the valves be left in their original shipping containers and that they be stored in a warehouse or at a minimum on a dry surface with a protective covering until they are used.
- Care should be exercised to ensure the plastic and elastomer parts like Seat and O-rings etc., are not damaged during shipping and handling.
- Unless otherwise specified, plastic and elastomer parts can be only used until their Maximum Shelf Life (Request Shelf Life certificate when placing the order to the factory). The parts shall be scrapped past their Maximum Shelf Life.

⚠ CAUTION

If the valve has a special cleaning and are packed in a plastic bag, this bag shall not be opened until just before installing the valve, otherwise the cleanliness of the valve will be compromised which can cause hazardous situation.

Installation

Care in Handling

NOTICE

Pressure relief valves must be handled carefully and never subjected to sharp impact loads. They should not be struck, bumped or dropped. Rough handling may alter the pressure setting, deform valve parts and affect seat tightness and valve performance adversely. Inlet and outlet protectors should remain in place until the valve is ready to be installed on the system.

Inspection

NOTICE

Pressure relief valves should be inspected visually before they are installed to ensure that no damage has occurred during shipment or while in storage. All protective material, sealing plugs and any extraneous material inside the valve body or nozzle must be removed.

The valve nameplate and other identifying tags should be checked to ensure that the particular valve is being installed at the location for which it was intended.

The valve seals protecting the spring setting should be intact. If seals are not intact, the valve should be inspected, tested and seals installed properly before use to avoid valve leakage and poor performance.

Inlet Piping

⚠ WARNING

Improper installation of a pressure relief valve can cause system overpressure, potentially resulting in fatal injury.

Pressure relief valves should be mounted vertically in an upright position on a connecting fitting that provides direct and unobstructed flow between the vessel and the valve. Installing a pressure relief valve in other than this recommended position might affect its operation adversely. A pressure relief valve that does not open due to obstruction, can cause system overpressure resulting in situation causing potential for fatality. A valve should never be installed on a fitting having a smaller inside diameter than the inlet diameter of the valve.

For high pressure applications above 10,000 psig / 689.5 barg, medium pressure Cone and Thread Fitting shall be used. For Type 81P, the internal diameter of inlet tubing connection size should be greater than orifice diameter or this may result in poor valve performance and piping damage which can cause severe injury or death. The valve should be installed as close as possible to the protected equipment. Piping to the inlet of the valve should meet the general requirements outlined in Section 5 of American Petroleum Institute Recommended Practice 520 Part II. This document discusses several inlet piping design considerations and recommends that inlet piping pressure losses not exceed 3% of the set pressure when the valve is relieving at its maximum rated capacity.

Inlet piping (nozzles) must be designed to withstand the total resultant forces due to the valve discharging at the maximum accumulated pressure and the expected piping loads. The magnitudes of the bending moment exerted on the inlet piping will depend on the configuration and method of supporting the outlet piping. Need to add support/ bracket onto valve body to balance reaction force during relief to protect inlet pipe connected to valve for high pressure applications, one on the other side of the outlet and the other on top of the body, refer to Figure 2.

When initially put into operation, failure to adequately clean the connections during installation can result in potential harm to the piping system which may cause leakage and piping system not holding the pressure to operate safely, potentially leading to severe injuries or even fatalities, as it may cause damage to the valve. Both the valve inlet and the vessel and/or line on which the valve is mounted must be cleaned thoroughly of all foreign material.

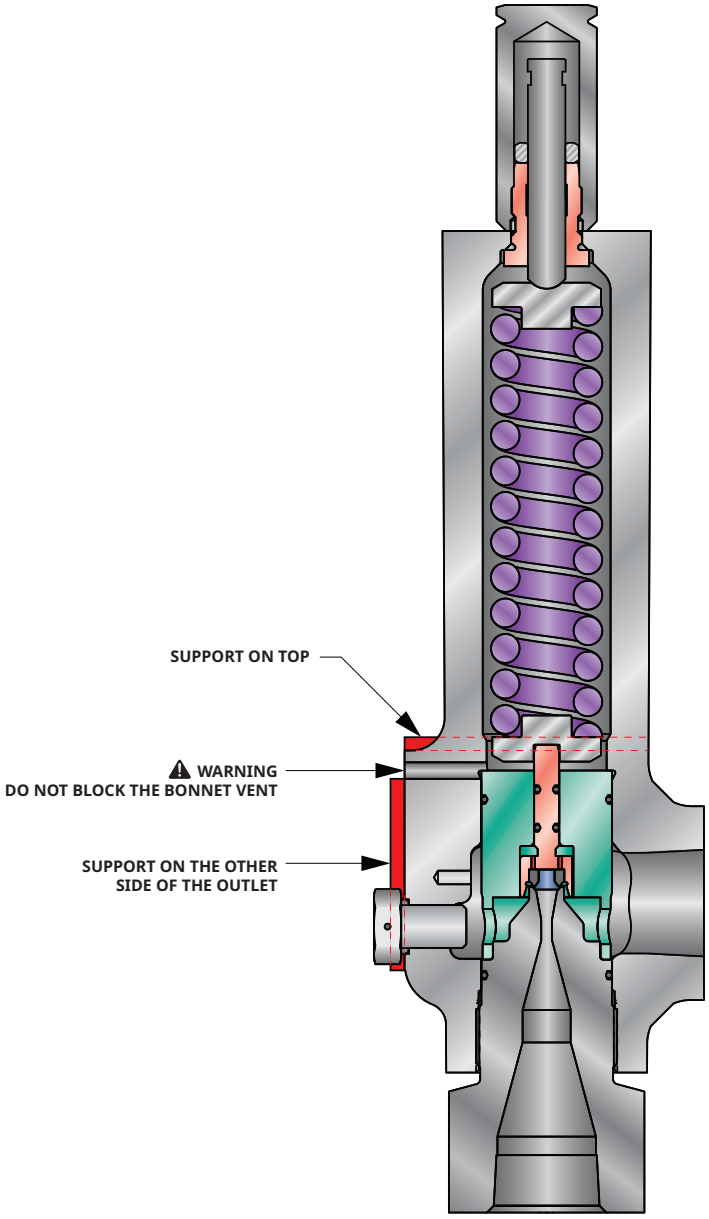


Figure 2. *Type 81P Support Location*

⚠ WARNING

Failure to clean the connections during installation can damage the piping system, potentially resulting in severe injury or fatality.

Outlet Piping

⚠ WARNING

Improper discharge of a pressure relief valve can increase backpressure, potentially resulting in fatal injury.

Outlet piping should be simple and direct. Where possible, for non-hazardous fluids, a short discharge pipe or vertical riser connected through a long radius elbow venting directly to atmosphere is recommended. Such discharge piping shall be at least the same size as the valve outlet. If not, then this can adversely affect the valve performance and may increase the backpressure which can lead to severe injuries or even fatalities.

All discharge piping should be run as direct as is practicable to the point of final release for disposal. Valve effluent must discharge to a safe disposal area. Where discharge piping is long, due consideration shall be given to the use of long radius elbows and the reduction of excessive line strains through the use of expansion joints and proper means of support to minimize line sway and vibration under operating conditions.

⚠ WARNING

Blocking the bonnet vent can result in the valve not functioning properly leading to serious injury or death.

In installations where the pressure relief valve discharges into a closed system, care must be taken to ensure that built up and superimposed back pressure has been calculated properly, specified and accounted for when sizing and selecting the valve. The valve discharge piping should be sufficiently large so that the built-up backpressure does not exceed 5% of the set pressure when relieving.

The Type 81P valve is balanced against back pressure. Discharge piping that redirects the flow 90° is recommended to minimize reactive thrust loads during relief. All discharge piping should be properly braced to withstand the reactive thrust forces of the pressure relief valve during the relieving condition, otherwise could result in death or serious injury.

Personal injury or property damage can result from the discharge of static electricity when flammable or hazardous gases are present. Static electricity must be drained to ensure valve installed without static electricity when flammable or hazardous gases are present.

⚠ WARNING

Reactive thrust forces without proper bracing can result in serious injury or death.

⚠ CAUTION

Discharge of static electricity can result in personal injury or property damage.

Hydrostatic Pressure Tests

Hydrostatic Test of Vessel or System

⚠ CAUTION

Bent spindles and damaged valve seats are problems caused by improper hydrostatic test procedures which may result in minor or moderate injury.

When a pressure vessel or system is to be hydrostatically tested, the Type 81P valve must be removed and suitable blind flange must be installed in its place. This practice precludes the possibility of any damage to the pressure relief valve. Bent spindles and damaged valve seats are problems that can be caused by improper hydrostatic test procedures which may result in minor or moderate injury.

Be sure to drain the vessel and blow out the system to ensure adequate drying before reinstalling the pressure relief valve.

Hydrostatic Test of Outlet System

⚠ CAUTION

Valve seat damage may result in minor or moderate injury.

When a hydrostatic test must be conducted on the outlet piping system, the Type 81P valve must be removed and suitable blind flange must be installed in its place. This practice precludes the possibility of any damage to the pressure relief valve. If secondary hydrotest pressure exceeds the recommended design pressure, it can damage the valve seats and may result in minor or moderate injury.

Setting and Adjustments

NOTICE

Type 81P provides soft seated design from 50 to 12,500 psig (dependent on the orifice) to provide premium leak tightness. With its rapid opening and closing action the life of the seat decreases as we get higher in pressure.

New Valves

Every new Type 81P pressure relief valve is tested and sealed prior to shipment by following applicable codes and standards. The external adjustment points of each valve are sealed to ensure that no changes have been made to the valve after shipment and that the valve has not been disassembled or tampered with. The seals and nameplates are your assurance that the valve has been built and tested to the applicable Codes and Standards and are the physical evidence of our product warranty.

NOTICE

Type 81P is to be used for liquid service. Any foreign material upstream to the valve may cause damage to the sealing surface or guiding surface which can severely impact the performance of the valve.

All new Type 81P valves are tested fully using the appropriate testing medium (air or water) prior to shipment, so there is no need to pre-test the valve prior to installation. All Type 81P testing should be conducted at Emerson test facilities or Emerson authorized test facilities.

Type 81P valves are tested for seat tightness after the final set point test and prior to shipment from the factory.

Testing should be conducted on adequately designed test system to ensure proper valve actuation, accurate test results and to avoid damage to the sealing surfaces of the valve.

It is good practice to inspect the valve prior to installation. This inspection determines any damage which may have occurred due to rough handling in transit or storage and initiates appropriate service records. Do not install the valve if the seal is broken or tampered with as this may result in minor or moderate injury. In this instance, consult factory.

Reconditioned Valves

Valves which have not been in service for extended periods due to plant shutdown or long-term storage or valves which have been repaired or reconditioned, should be tested before being put into operation. All Type 81P testing should be conducted at Emerson test facilities or Emerson authorized test facilities.

To prevent valve damage, seat leakage and inaccurate set pressure, the testing procedure listed in this manual should be followed.

⚠ CAUTION

If above procedures are not followed, this could result in minor or moderate injury.

Table 1. *Tolerance*

SET PRESSURE	TOLERANCE
Above 70 psig / 483 kPag	± 3% of the specified set pressure
70 psig / 483 kPag and below	± 2 psi / 13.8 kPa

Valves Removed from Service

Valves being removed from service should be tested before being disassembled to determine the set pressure and seat tightness. This is an important phase of the maintenance routine. The test results should be recorded for review and determination of necessary corrective action. The 'as received from service' condition of a pressure relief valve is a useful tool in establishing the proper time interval between inspections, used with the safety alert symbol and proper PPE protection (Eye, Ear, Hands and Toes) to avoid minor or moderate injury. All Type 81P testing should be conducted at Emerson test facilities or Emerson authorized test facilities.

Valve Inspection and Pre-testing

Valves in hazardous fluid service and any other materials classified as dangerous must be neutralized immediately after removal from service.

⚠ CAUTION

If above procedures are not followed, this could result in minor or moderate injury.

Visual Inspection and Neutralizing

A visual inspection shall be made when valves are first removed from service. The presence of deposits or corrosive products in the valve and in the piping should be recorded and valves should be cleaned to the extent possible prior to disassembly. Check the condition of external surfaces for any indication of corrosive atmospheric attack or evidence of mechanical damage. Document the manufacturer nameplate information and any repair nameplate information, if applicable. Document if external adjustment seal wires are intact or broken.

⚠ CAUTION

If above procedures are not followed, this could result in minor or moderate injury.

Test Fluid - Set Pressure Test

NOTICE

The test fluid should be water or shop air for Type 81P valves based on the application its installed. Please refer to the nameplate.

Note

Gas service is only available with -4 and -8 orifice.

Standard Performance Requirements

⚠ CAUTION

Do not install a valve exceeding the nameplate or specification section.

Outlet Leakage Test with Air

Apply 30 psig / 207 kPag to the valve outlet. Do not apply pressure to the valve inlet. All pressurized areas shall be checked for leaks. There shall be no visible leakage from the spring bonnet or valve inlet. Some spring tension is required for the test. Repeat the test at 100 psig / 689 kPag. Remove the outlet pressure.

Table 2. *Cracking Pressure*

SET PRESSURE	MINIMUM CRACKING PRESSURE	MAXIMUM CRACKING PRESSURE
100 psig / 689 kPag and above	92.5% of the specified set pressure	+3% of the specified set pressure[1]
Above 70 psig / 483 kPag and below 100 psig / 689 kPag	80% of the specified set pressure	+3% of the specified set pressure
70 psig / 483 kPag and below	80% of the specified set pressure	+2 psig / 15 kPag of the specified set pressure

1. +4% for the -2/-3 orifice.

Set Pressure

The set pressure is defined as 93% of that pressure where the valve “pops” or “gushes”. Adjust the spring to obtain “pop” or “gush” at 107% ± 2% of nameplate set.

Example

1. Nameplate Set Pressure: 75 psig

Pop 107% ± 2% (75) = 78.75 to 81.75

Actual Pop 80 psig

Actual Set 80 (.93) = 74.4 psig

2. Nameplate Set Pressure: 517 kPag

Pop 107% ± 2% (517) = 542.85 to 563.53

Actual Pop 553 kPag

Actual Set 553 (.93) = 514.3 kPag

Note

If the Type 81P liquid valve is not marked with the UV code stamp and if a water source is not available valves with set pressures greater than 750 psi / 51.7 barg may be set on air by adjusting the spring to obtain first crack at 95% of set pressure. The valve should not be popped on air as this may damage the seat. For set pressures below 750 psi / 51.7 barg, the Type 81P should only be set pressure adjusted using the water method above.

Valves with relief capacity in GPM must be set using water if the valve will bear the ‘VR’ repair symbol stamp.

Type 81P air valves shall be set using an accumulator large enough to accurately measure set pressure. Turn the spring adjustment screw on bonnet in most of the way. Increase pressure to desired level and back out screw until valve pops. Lock screw with jam nut and retest. Readjust as required.

Cracking Pressure

See Table 2.

Reseat Pressure

Blowdown is not adjustable on Type 81P valves. Blowdown on water may vary from 0 to 25%. The range increases to 0 to 30% for -2 and -3 orifices.

Reseat Leakage

No visible leakage shall occur at reseat for one minute with the supply pressure at 75% ± 2% of set.

Inlet Leakage Test Pressure

Apply pressure to the valve inlet. No leakage shall occur for one minute at 95% of the specified Minimum Cracking Pressure on increasing pressure.

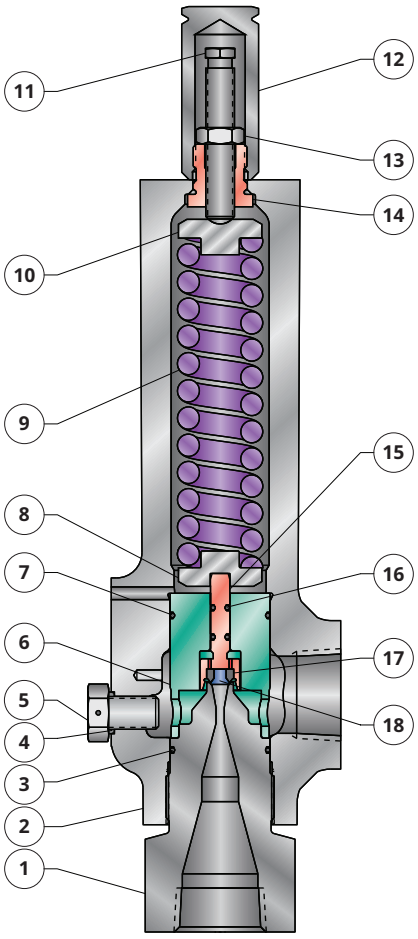


Figure 3. *Type 81P (-2 and -3 Orifices)*

Table 3. *Type 81P-2/-3 Parts List*

KEY	PART NAME	KEY	PART NAME
1	Nozzle	11	Pressure Adjustment Screw
2	Body	12	Cap
3	Nozzle Seal	13	Lock Nut, Pressure Adjustment Screw
4	Blowdown Adjustment Screw Seal	14	Insert
5	Blowdown Adjustment Screw	15	Spindle
6	Guide	16	Spindle Seal
7	Guide Seal	17	Retainer Ring
8	Bottom Spring Washer	18	Seat
9	Spring	19	Nameplate (Not Shown)
10	Top Spring Washer	20	Drivescrew (Not Shown)

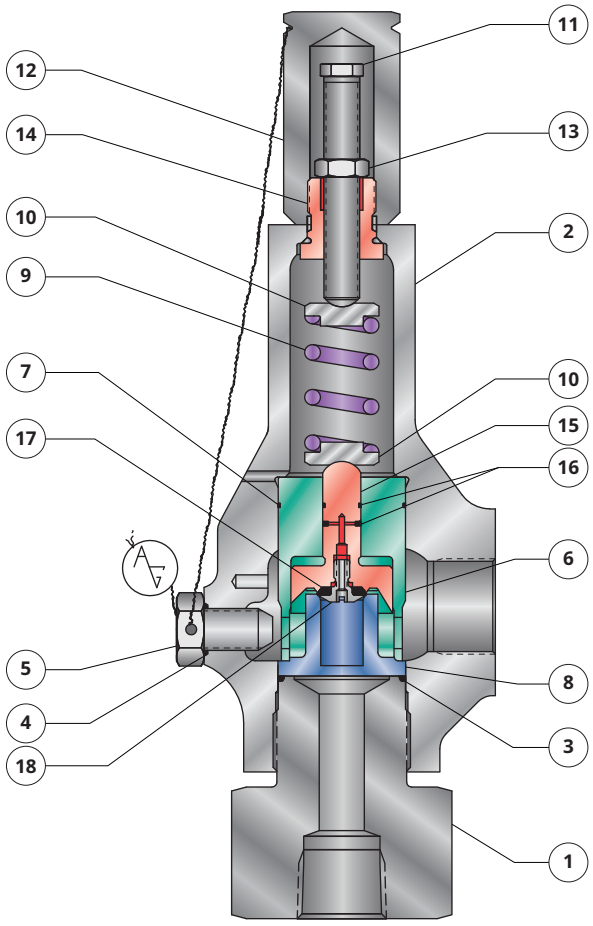


Figure 4. *Type 81P (-4 and -8 Orifices)*

Table 4. *Type 81P (-4 and -8 Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Inlet Bushing	11	Pressure Adjustment Screw
2	Body	12	Cap
3	Bushing Seal	13	Lock Nut, Pressure Adjustment Screw
4	Blowdown Adjustment Screw Seal	14	Insert
5	Blowdown Adjustment Screw/Plug	15	Spindle
6	Guide	16	Spindle Seal
7	Guide Seal	17	Seat
8	Nozzle	18	Seat Retainer Screw
9	Spring	19	Nameplate (Not Shown)
10	Spring Washer	20	Drivescrew (Not Shown)

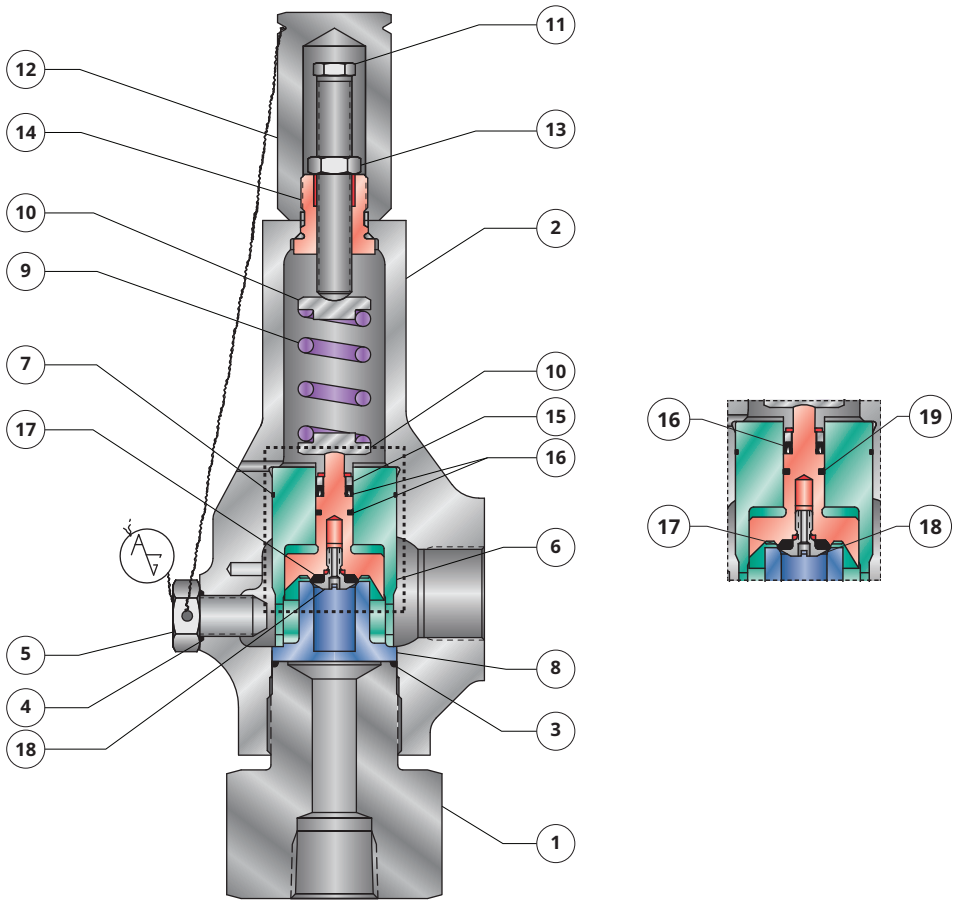


Figure 5. *Type 81P-T (-4 and -8 Orifices)*

Table 5. *Type 81P-T (-4 and -8 Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Inlet Bushing	12	Cap
2	Body	13	Lock Nut, Pressure Adjustment Screw
3	Bushing Seal	14	Insert
4	Blowdown Adjustment Screw Seal	15	Spindle
5	Blowdown Adjustment Screw	16	Spindle Seal
6	Guide	17	Seat
7	Guide Seal	18	Seat Retainer Screw
8	Nozzle	19	Drag Seal
9	Spring	20	Nameplate (Not Shown)
10	Spring Washer	21	Drivescrew (Not Shown)
11	Pressure Adjustment Screw	- - - -	- - - -

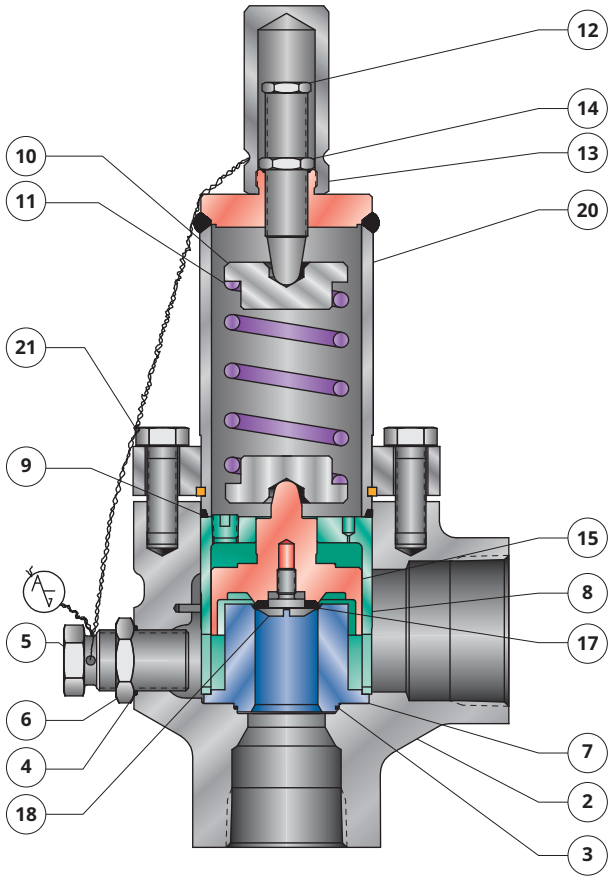


Figure 6. *Type 81P (G and J Orifices)*

Table 6. *Type 81P (G and J Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Flange - Inlet (Slip-on as shown)	13	Cap
2	Body	14	Lock Nut, Pressure Adjustment Screw
3	Nozzle Seal	15	Spindle
4	Blowdown Adjustment Screw Seal	16	Spindle Seal (Not Shown)
5	Blowdown Adjustment Screw	17	Seat
6	Blowdown Adjustment Lock Nut	18	Seat Retainer Screw
7	Nozzle	19	Drag Ring (Not Shown)
8	Guide	20	Bonnet
9	Guide Seal	21	Flange Bolt
10	Spring Washer	22	Nameplate (Not Shown)
11	Spring	23	Drivescrew (Not Shown)
12	Pressure Adjustment Screw	- - - -	- - - -

Valve Disassembly

⚠ CAUTION

Valves in hazardous fluid service and any other materials classified as dangerous must be neutralized immediately after removal from service. If not followed, this may result in minor or moderate injury.

Each orifice may be installed slightly differently. The following sections outline the specific disassembly steps for each configuration.

Type 81P (-2, -3 Orifice)

Valves should be disassembled as described below. Parts identification may be found on Figure 3. The parts from each valve should be marked properly and segregated to keep them separate from parts used in other valves. Place disassembled parts into a plastic bin to keep separated.

1. Hold body (key 2) in the vice. Use brass/ aluminum jaws to protect valve and nameplate. Cut and remove the external wire seal and remove the cap (key 12).
2. Before releasing the spring load, make note of the depth of the pressure adjustment screw (key 11) in the body by measuring the height of the pressure adjustment screw with a pair of dial calipers or depth micrometer. This measurement will help when reassembling the valve to its approximate original setting. Loosen the locknut (key 13) on the pressure adjustment screw.
3. Release all of the spring load by rotating the pressure adjustment screw (key 11) in a counterclockwise direction. Remove the pressure adjustment screw.
4. Remove the plug or blowdown adjustment screw (key 5).
5. Take the body out of the vice and rotate it where the nozzle (key 1) is facing up.
6. Unscrew the nozzle (1) from the body.
7. Take out nozzle seal (key 3) with a pick.
8. Remove the valve from the vice and hit it hard on a solid rubber surface to facilitate the removal of the guide assembly (keys 6,15,17,18). The retainer ring and seat will fall out.
9. Remove guide assembly from valve body. Remove the spring (key 9) and washers (keys 8 and 10) from the body (key 2).
10. Separate the guide assembly by removing the spindle (key 15) from the guide (key 6).
11. Remove the spindle seals (key 16) with a pick. Remove the guide seal (key 7) with a pick.

Type 81P (-4, -8 Orifice)

Valves should be disassembled as described below. Parts identification may be found on Figure 4. The parts from each valve should be marked properly and segregated to keep them separate from parts used in other valves. Place disassembled parts into a plastic bin to keep separated.

1. Hold body (key 2) in the vice. Use brass/ aluminum jaws to protect valve and nameplate. Cut and remove the external wire seal and remove the cap (key 12).
2. Before releasing the spring load, make note of the depth of the pressure adjustment screw (key 11) in the body by measuring the height of the pressure adjustment screw with a pair of dial calipers or depth micrometer. This measurement will help when reassembling the valve to its approximate original setting. Loosen the locknut (key 13) on the pressure adjustment screw.
3. Release all of the spring load by rotating the pressure adjustment screw (key 11) in a counterclockwise direction. Remove the pressure adjustment screw.
4. Remove the plug or blowdown adjustment screw (key 5).
5. Take the body out of the vice and rotate it where the inlet bushing (key 1) is facing up.
6. Unscrew the inlet bushing (key 1) or inlet flange assembly.
7. Take out bushing seal (key 3) with a pick.
8. Remove the valve from the vice and hit it hard on a solid rubber surface to facilitate the removal of the guide assembly (keys 6, 7, 8, 15, 16, 17, 18). The guide assembly will come partially out.

9. Remove guide assembly from valve body. Remove the spring and washers (key 9 and 10) from the body (key 2).
10. Separate the guide assembly. If the nozzle (key 8) did not come out during the removal of the guide assembly, hit the top of the spindle (key 15) with a rubber mallet to separate the nozzle, then remove the spindle from the guide.
11. Grab the skirt of the spindle (key 15) in the vice and remove the seat retainer screw (key 18) and seat (key 17) from the spindle.
12. Remove the spindle seals (key 16) with a pick. Remove the guide seal (key 7) with a pick.

Type 81P-T (-4, -8 Orifice)

Valves should be disassembled as described below. Parts identification may be found on Figure 5. The parts from each valve should be marked properly and segregated to keep them separate from parts used in other valves. Place disassembled parts into a plastic bin to keep separated.

1. Hold body (key 2) in the vice. Use brass/ aluminum jaws to protect valve and nameplate. Cut and remove the external wire seal and remove the cap (key 12).
2. Before releasing the spring load, make note of the depth of the pressure adjustment screw (key 11) in the body by measuring the height of the adjustment screw with a pair of dial calipers or depth micrometer. This measurement will help when reassembling the valve to its approximate original setting. Loosen the locknut (key 13) on the pressure adjustment screw.
3. Release all the spring load by rotating the pressure adjustment screw (key 11) in a counterclockwise direction. Remove the adjustment screw.
4. Remove the plug or blowdown adjustment screw (key 5).
5. Take the body out of the vice and rotate it where the inlet bushing (key 1) is facing up.
6. Unscrew the inlet bushing (key 1) or inlet flange assembly.
7. Take out bushing seal (key 3) with a pick.
8. Remove the valve from the vice and hit it hard on a solid rubber surface to facilitate the removal of the guide assembly (keys 6, 8, 15, 16, 17, 18, 19). The guide assembly will come partially out.
9. Remove guide assembly from valve body. Remove the spring and washers (keys 9, 10) from the body (key 2).
10. Separate the guide assembly. If the nozzle (key 8) did not come out during the removal of the guide assembly, hit the top of the spindle (key 15) with a rubber mallet to separate the nozzle, then remove the spindle from the guide (key 6).
11. Grab the skirt of the spindle (key 15) in the vice and remove the seat retainer screw (key 18) and seat (key 17) from the spindle.
12. Remove the spring energized spindle seal (key 16) and O-ring seal (Drag seal) (key 19) with a pick. Remove the guide seal (key 7) from the guide with a pick.

Type 81P (G and J Orifices)

Valves should be disassembled as described below. Parts identification may be found on Figure 6. Current design shown in Figure 6 is the 1 piece bonnet design, old style was a 3 piece bonnet design. The parts from each valve should be marked properly and segregated to keep them separate from parts used in other valves. Place disassembled parts into a plastic bin to keep separated.

1. Hold body (key 2) in the vice. Use brass/ aluminum jaws to protect valve and nameplate. Cut and remove the external wire seal and remove the cap (key 13).
2. Before releasing the spring load, make note of the depth of the pressure adjustment screw (key 12) in the body by measuring the height of the pressure adjustment screw with a pair of dial calipers or depth micrometer. This measurement will help when reassembling the valve to its approximate original setting. Loosen the locknut (key 14) on the pressure adjustment screw.
3. Release all of the spring load by rotating the pressure adjustment screw (key 12) in a counterclockwise direction. Remove the pressure adjustment screw.

4. Remove the plug or blowdown adjustment screw (key 5) and remove the blowdown adjustment screw seal (key 4).
5. Remove the spring bonnet (key 20) by unbolting the flange bolts (key 21) and pulling the bonnet off the body.
6. Remove the spring (key 11) and washers (key 10) from the bonnet.
7. Remove the valve from the vice and hit it hard on a solid rubber surface to facilitate the removal of the guide assembly (keys 9, 8, 16, 19, 15, 17, 18, 7, 3). The guide assembly will come partially out.
8. Remove guide assembly from valve body.
9. Separate the guide assembly. If the nozzle (key 7) did not come out during the removal of the guide assembly, hit the top of the spindle (key 5) with a rubber mallet to separate the nozzle, then remove the spindle from the guide.
10. Grab the skirt of the spindle (key 15) in the vice and remove the seat retainer screw (key 18) and seat (key 17) from the spindle.
11. Remove the spindle seal (key 16) and drag seal (key 19) with a pick. Remove the guide seal (key 9) with a pick. Remove nozzle seal (key 3) with a pick.

Inspection and Maintenance

Cleaning

External parts such as the valve body, bonnet and cap should be cleaned by immersion in a non-corrosive cleaning solution bath. These external parts may be cleaned by brushing, provided the brushes used do not damage nor contaminate the base metals. Only clean stainless-steel brushes should be used on stainless steel components. Only soft wire brushing is allowed on the body bore, taking special care to not damage where the guide seal sits in the body. The internal parts such as the nozzle, spindle and guide should be cleaned using acetone or alcohol, then rinsed with clean tap water and dried.

⚠ CAUTION

Internal parts should not be mechanically blasted.

Type 81P (-2, -3 Orifice)

Check all valve parts for wear and corrosion.

Nozzle (key 1)

1. Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface.
2. Replace the nozzle if there is severe scoring, scratches or nicks.

Spindle (key 15)

Check spindle sealing surface for nicks, scratches or marks. If the damage is light, polish it out. If the damage is severe, replace the spindle.

Spring (key 9)

Inspect for evidence of cracking, pitting or deformation. Replace if severe pitting, corrosion or deformation is found.

Body (key 2)

Inspect the body for any scratches, nicks, corrosion or pitting on sealing surfaces or in bore. Replace the body if the damage is too severe.

Retaining Ring (key 17)

Check contact area for nicks, dings, corrosion and pitting. Replace if any damage found.

Guide (key 6)

1. Inspect the guide sealing surfaces (where it contacts the nozzle and the bottom spring washer) for any nicks, scratches, or scoring.
2. Replace the guide if damage is too severe.
3. Look at guide bore where spindle goes through and inspect for scoring.

Cap (key 12)

Inspect the cap for any nicks, scratches or scoring especially where the cap contacts the body. Replace if the damage is too severe.

Type 81P (-4, -8 Orifice)

Check all valve parts for wear and corrosion.

Nozzle (key 8)

1. Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface.
2. Replace the nozzle if there is severe scoring, scratches or nicks.

Spindle (key 15)

Check spindle sealing surface for nicks, scratches or marks. If the damage is light, polish it out. If the damage is severe, replace the spindle.

Spring (key 9)

Inspect for evidence of cracking, pitting or deformation. Replace if severe pitting, corrosion or deformation is found.

Body (key 2)

Inspect the body for any scratches, nicks, corrosion or pitting on sealing surfaces or in bore. Replace the body if the damage is too severe.

Seat Retainer Screw (key 18)

Check contact area for nicks, dings, corrosion and pitting. Replace if any damage found.

Guide (key 6)

1. Inspect the guide sealing surfaces (where it contacts the nozzle and the bottom spring washer) for any nicks, scratches, or scoring.
2. Replace the guide if damage is too severe.

Cap (key 12)

Inspect the cap for any nicks, scratches or scoring especially where the cap contacts the body. Replace if the damage is too severe.

Bushing (key 1)

Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface. Replace if the damage is too severe.

Type 81P-T (-4, -8 Orifice)

Check all valve parts for wear and corrosion.

Nozzle (key 8)

1. Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface.
2. Replace the nozzle if there is severe scoring, scratches or nicks.

Spindle (key 15)

Check spindle sealing surface for nicks, scratches or marks. If the damage is light, polish it out. If the damage is severe, replace the spindle.

Spring (key 9)

Inspect for evidence of cracking, pitting or deformation. Replace if severe pitting, corrosion or deformation is found.

Body (key 2)

Inspect the body for any scratches, nicks, corrosion or pitting on sealing surfaces or in bore. Replace the body if the damage is too severe.

Seat Retainer Screw (key 18)

Check contact area for nicks, dings, corrosion and pitting. Replace if any damage found.

Guide (key 6)

1. Inspect the guide sealing surfaces (where it contacts the nozzle and the bottom spring washer) for any nicks, scratches, or scoring.
2. Replace the guide if damage is too severe.

Cap (key 12)

Inspect the cap for any nicks, scratches or scoring especially where the cap contacts the body. Replace if the damage is too severe.

Bushing (key 1)

Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface. Replace if the damage is too severe.

Type 81P (G and J Orifices)

Check all valve parts for wear and corrosion.

Nozzle (key 7)

1. Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface.
2. Replace the nozzle if there is severe scoring, scratches or nicks.

Spindle (key 15)

Check spindle sealing surface for nicks, scratches or marks. If the damage is light, polish it out. If the damage is severe, replace the spindle.

Spring (key 11)

Inspect for evidence of cracking, pitting or deformation. Replace if severe pitting, corrosion or deformation is found.

Body (key 2)

Inspect the body for any scratches, nicks, corrosion or pitting on sealing surfaces or in bore. Replace the body if the damage is too severe.

Seat Retainer Screw (key 18)

Check contact area for nicks, dings, corrosion and pitting. Replace if any damage found.

Guide (key 8)

1. Inspect the guide sealing surfaces (where it contacts the nozzle and the bottom spring washer) for any nicks, scratches, or scoring.
2. Replace the guide if damage is too severe.

Cap (key 13)

Inspect the cap for any nicks, scratches or scoring especially where the cap contacts the body. Replace if the damage is too severe.

Bonnet (key 1)

Examine the sealing surface for damage. If slight scoring is visible, polish the sealing surface. Replace if the damage is too severe.

Table 7. *Applicable Soft Goods*

ORIFICE	PARTS
81P (-2/-3)	Seat (key 18), Nozzle Seal (key 3), Spindle Seal (key 16), Guide Seal (key 7), Blowdown Adjustment Screw Seal (key 4)
81P (-4/-8)	Seat (key 17), Bushing Seal (key 3), Guide Seal (key 7), Spindle Seals (key 16), Blowdown Adjustment Screw Seal (key 4)
81P-T	Seat (key 17), Bushing Seal (key 3), Guide Seal (key 7), Spindle Seal (key 16), Drag Seal (key 19), Blowdown Adjustment Screw Seal (key 4)
81P (G and J)	Seat (key 17), Nozzle Seal (key 3), Guide Seal (key 9), Spindle Seal (key 16), Drag Ring (key 19), Blowdown Adjustment Screw Seal (key 4)

Table 8. *Lubricants*[1]

PART	SET PRESSURE	TEMPERATURE RATING	LUBRICANT
Spindle Seals	50 to 1000 psig / 3.4 to 69.0 barg	Below 400°F / 204°C	Dow Corning® 33
	Above 1000 psig / 69.0 barg	Below 400°F / 204°C	Desco® 600
	Above 50 psig / 3.45 barg	400°F / 204°C and above	Fluorolube® LG-160[2]
All threaded connections	All	All	Dow Corning® 33

1. This lubricants is for -2/-3 orifice. –4, –8 and lettered orifices use Molykote® 33.
2. Rated for temperatures above 400 °F and is not included in the standard kit.

Soft Goods (Applicable to All Type 81P Valves)

1. Please replace all soft goods with a new soft goods kit each time you disassemble and repair a valve.

Dow Corning® is a mark owned by Dow Corning Corporation
Desco® is a mark owned by South Coast Product, L.P.
Fluorolube® is a mark owned by Gabriel Performance Products, LLC
Molykote® is a mark owned by DuPont Polymers, Inc.

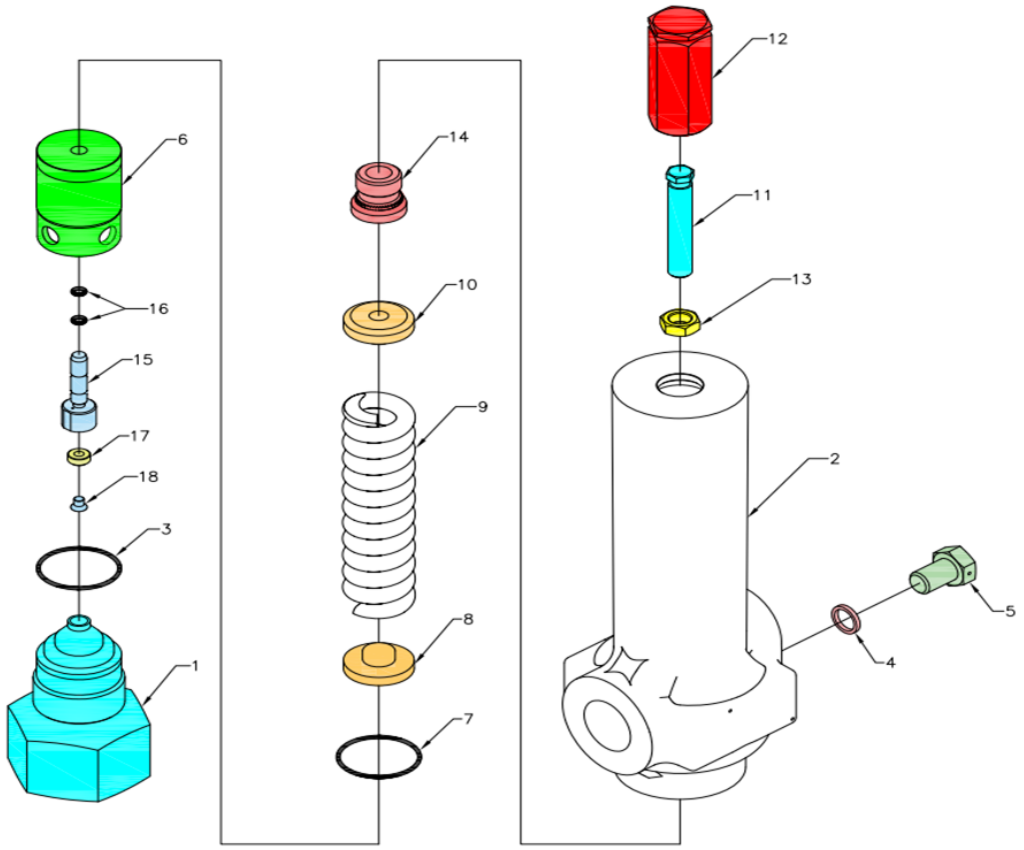


Figure 7. *Type 81P (-2 and -3 Orifices) Exploded Views*

Table 9. *Type 81P (-2 and -3 Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Nozzle	11	Pressure Adjustment Screw
2	Body	12	Cap
3	Nozzle Seal	13	Lock Nut, Pressure Adjustment Screw
4	Blowdown Adjustment Screw Seal	14	Insert
5	Blowdown Adjustment Screw	15	Spindle
6	Guide	16	Spindle Seal
7	Guide Seal	17	Retainer Ring
8	Bottom Spring Washer	18	Seat
9	Spring	19	Nameplate (Not Shown)
10	Top Spring Washer	20	Drivescrew (Not Shown)

Valve Assembly

Note

The insert does not get removed from the valve body, the exploded view is just to show where each component fits in.

Lubrication

All O-Ring seals shall receive a light coat of Dow Corning® FS 3451 or equivalent otherwise specified. See Table 8. The seat shall not be lubricated.

For proper performance, O-ring soft seals and seat per Table 8 should be replaced during each repair.

Special attention should be given to all machined surfaces to ensure that they are clean, undamaged and ready for assembly.

Type 81P (-2, -3 Orifice)

1. Pre-assemble guide assembly, which consists of guide (key 6), guide seal (key 7), spindle (key 15), nozzle (key 1), nozzle seal (key 3), seat (key 18), retainer ring (key 17), spindle seals (key 16) per Figure 7.
   a. Put the seat (key 18) on the retainer ring (key 17).
   b. Put the spindle (key 15) in a vice by the flat on the spindle skirt.
   c. Insert the retainer ring (key 17) with seat into the spindle (key 15) by hand as far as possible.

NOTICE

Do not overtighten the retainer ring as it will deform the seat.

   d. Lubricate spindle seals (key 16) and proceed to install them on the spindle. Add an additional light coat of lubricant to the outside of seals after they have been installed.

⚠ CAUTION

Excessive lubrication can cause sticking and increased friction, adversely affecting valve performance.

   e. Insert spindle (key 15) into guide.
   f. Install the O-ring onto the nozzle.
   g. Lubricate guide seal (key 7) and install guide seal on the OD of the guide. This step completes the guide assembly.
2. Hold body (key 2) in your hand and turn upside down and insert the top spring washer (key 10). Make sure the washer counterbore faces the adjustment screw hole.
3. Insert the body into a vice making sure not to damage nameplate.
4. Insert the spring (key 9) and bottom spring washer (key 8) making sure the counterbore is facing the spindle.
5. Take the guide assembly and insert into the body with the O-ring on outside of guide assembly facing down towards the spring.
6. Press set by hand the guide assembly into the body and take an appropriate tool to pop the guide assembly into locking place.
7. Thread in the nozzle (key 1) into the body (key 2) using a torque wrench (torque value = 127 to 134 ft-lbf) except for 1/2 NPT-4.
8. Remove the body from the vice.
9. Turn the body upright and screw the pressure adjustment screw (key 11) to the pre-measurement noted in the disassembly procedure.
10. Lubricate insert (key 14) threads and loosely install the cap.

Type 81P (-4, -8 Orifice)

1. Pre-assemble guide assembly, which consists of guide (key 6), guide seal (key 7), nozzle (key 8), spindle (key 15), seat (key 17), seat retaining screw (key 18), spindle seals (key 16) per Figure 8.
   a. Put the seat (key 17) on the retaining screw (key 18). Add a small amount of lubricant to the retaining screw threads.
   b. Put the spindle (key 15) in a vice by the flat on the spindle skirt.

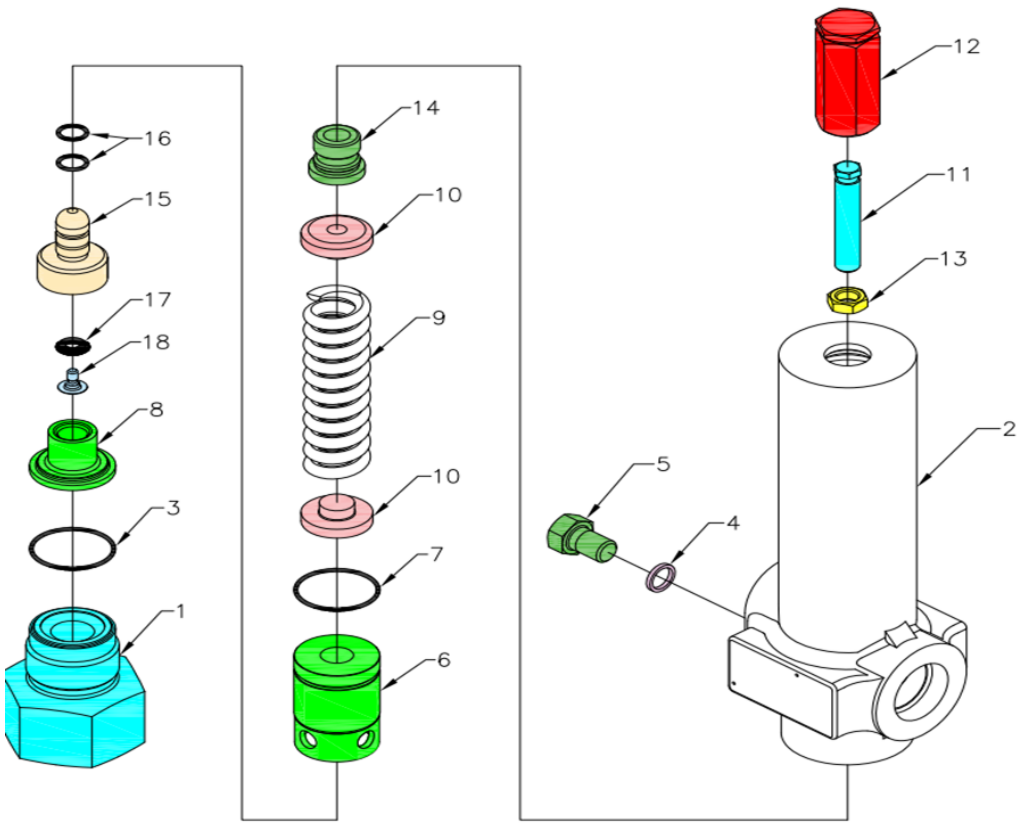


Figure 8. *Type 81P (-4 and -8 Orifices) Exploded View*

Table 10. *Type 81P (-4 and -8 Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Inlet Bushing	11	Pressure Adjustment Screw
2	Body	12	Cap
3	Bushing Seal	13	Lock Nut, Pressure Adjustment Screw
4	Blowdown Adjustment Screw Seal	14	Insert
5	Blowdown Adjustment Screw/Plug	15	Spindle
6	Guide	16	Spindle Seal
7	Guide Seal	17	Seat
8	Nozzle	18	Seat Retainer Screw
9	Spring	19	Nameplate (Not Shown)
10	Spring Washer	20	Drivescrew (Not Shown)

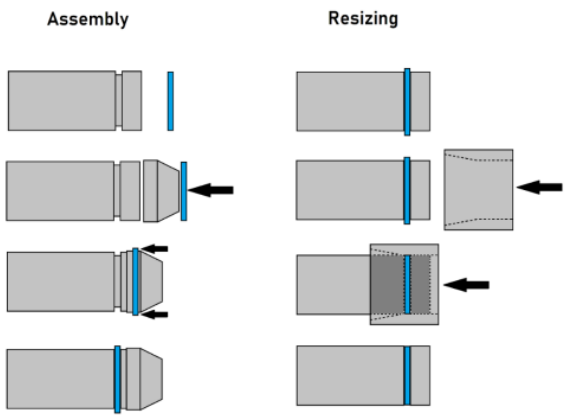


Figure 9. *Assembly and Resizing of Polytetrafluoroethylene (PTFE) Seals*

c. Thread the retaining screw (key 18) with seat into the spindle (key 15) by hand as far as possible. If the screw threads in fully without resistance, the locking Heli-coil is damaged and the spindle must be replaced. Tighten the retaining screw until the seat contacts the spindle, then apply an additional 1/4 turn.

NOTICE

Do not overtighten the retainer screw as it will deform the seat.

d. Lubricate spindle seals and proceed to install them on the spindle. Add an additional light coat of lubricant to the outside of seals after they have been installed.

⚠ CAUTION

Excessive lubrication may affect valve performance and should be avoided.

e. Insert spindle (key 15) into guide.

f. Press fit the nozzle (key 8) into the guide making sure the spindle (key 15) tip is not being compressed at the same time.

NOTICE

Damage to the valve seat will occur if the spindle is compressed when press fitting the nozzle.

g. Lubricate guide seal (key 7) and install guide seal on the OD of the guide. This step completes the guide assembly.

2. Hold body (key 2) in your hand and insert one spring washer (key 10). Make sure the washer counterbore faces the adjustment screw hole.
3. Insert the body into a vice making sure not to damage nameplate.
4. Insert the spring (key 9) and lower spring washer (key 10) making sure the counterbore is facing the spindle.
5. Take the guide assembly and insert into the body with the O-ring on outside of guide assembly facing down towards the spring.
6. Press set by hand the guide assembly into the body and take an appropriate tool to pop the guide assembly into locking place.
7. Lubricate and install the bushing seal (key 3) into body on top of the nozzle.
8. Lubricate the threads of inlet bushing (key 1) and thread it down to tighten with torque wrench to 127 to 134 ft-lbf, except for the 1/2 NPT-4.
9. Remove the body from the vice.
10. Turn the body upright and screw the adjustment bolt (key 11) to the premeasurement noted in the disassembly procedure.
11. Lubricate insert (key 14) threads and loosely install the cap (key 12).

Type 81P-T (-4, -8 Orifice)

1. Pre-assemble guide assembly, which consists of guide (key 6), guide seal (key 7), nozzle (key 8), spindle (key 15), seat (key 17), seat retaining screw (key 18), spindle seals (key 16 and 19) per Figure 5.

NOTICE

The new plastic PTFE seals require special tooling with precise dimensions for assembly to avoid damaging the seal. The seal will need to be carefully stretched using a special assembly tool with a specific angle to minimize plastic deformation. Then once the seal reaches the groove, a resizing tool will go over the seal to compress it in the groove. The process is shown in Figure 9. If any damage is discovered on the seal during or after this assembly process, the seal will need to be removed and replaced with a new seal.

a. Put guide seal (key 7) on guide using the below instructions:

NOTICE

The guide spring energized seal has a PTFE exterior with an interior spring, and it will be FBN-H profile that consists of a more rounded backside and helical spring. The appropriate assembly and resizing tools should be use aligned the guide spring energized seal. See Figure 9 for generalized view of the assembly and resizing tools.

i. Slide guide assembly tool on the upper part of guide; the boss of the tool should fit inside the guide and the slope of the tool should taper from the smaller diameter at the top to the larger diameter by the seal groove.

ii. Apply appropriate cryogenic lubricant grease to slope of assembly tool to minimize damage and friction.

iii. Slide PTFE spring energized seal carefully down the slope of the assembly tool until it fits inside the groove. Make sure that the spring side of the seal should face down toward the seat, and the PTFE backside should face the top of the spindle.

iv. Remove the assembly tool.

v. Place resizing tool on guide with the interior sloped side facing downward.

vi. Carefully and slowly push resizing tool over seal until the resizing tool slides down the entire guide; the seal should be in the groove.

vii. Inspect seal and tool for any damage or plastic shavings. If any are discovered, remove the seal and try again.

b. Put drag seal (key 19) on spindle (key 15) using the below instructions:

NOTICE

The PTFE drag seal should not be overstretched, cut, dinged or otherwise damage in any way. The appropriate assembly and resizing tools should be use align the PTFE O-ring on the spindle. See Figure 8 for generalized view of the assembly and resizing tools.

i. Slide spindle assembly tool on the upper part of spindle; the slope of the tool should taper from the smaller diameter at the top to the larger diameter by the O-ring groove.

ii. Apply appropriate cryogenic lubricant grease to slope of assembly tool to minimize damage and friction.

iii. Slide PTFE O-ring carefully down the slope of the assembly tool until it fits inside the groove.

iv. Remove the assembly tool.

v. Place resizing tool on spindle with the interior sloped side facing downward.

vi. Carefully and slowly push resizing tool over O-ring until the resizing tool slides down the entire spindle; the O-ring should be in the groove.

vii. Inspect O-ring and tool for any damage or plastic shavings. If any are discovered, remove the O-ring and try again.

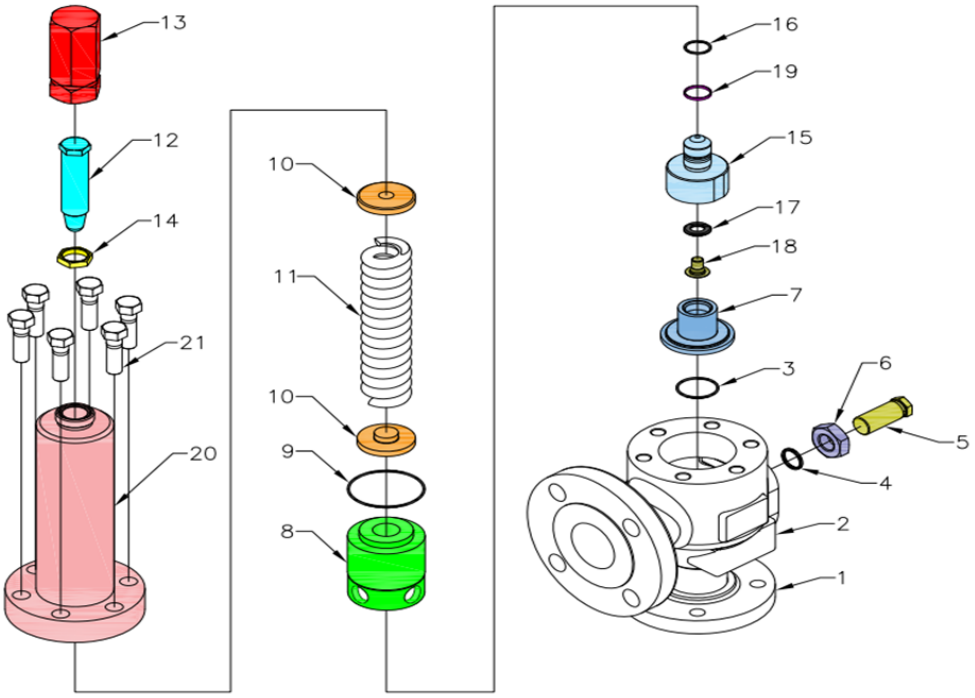


Figure 10. *Type 81P (G and J Orifices) Exploded Views*

Table 11. *Type 81P (G and J Orifices) Parts List*

KEY	PART NAME	KEY	PART NAME
1	Flange - Inlet (Slip-on as shown)	13	Cap
2	Body	14	Lock Nut, Pressure Adjustment Screw
3	Nozzle Seal	15	Spindle
4	Blowdown Adjustment Screw Seal	16	Spindle Seal (Not Shown)
5	Blowdown Adjustment Screw	17	Seat O-ring
6	Blowdown Adjustment Lock Nut	18	Seat Retainer Screw
7	Nozzle	19	Drag Ring (Not Shown)
8	Guide	20	Bonnet
9	Guide Seal	21	Flange Bolt
10	Spring Washer	22	Nameplate (Not Shown)
11	Spring	23	Drivescrew (Not Shown)
12	Pressure Adjustment Screw	- - - -	- - - -

c. Put spindle seal (spring energized seal) (key 16) on spindle using the below instructions:

NOTICE

The spindle spring energized seal has a PTFE exterior with an interior spring, and it will be FBK-V profile that consists of a more rectangular backside and cantilever spring.

i. Slide spindle spring energized seal onto the narrow portion spindle. The spring side of the seal should face down toward the seat, and the PTFE backside should face the top of the spindle.

ii. Slide spindle washer on top of backside of the seal.

iii. Insert retaining ring in groove above the spindle washer to lock the seal in place.

d. Carefully slide spindle into the guide using cryogenic grease.

NOTICE

Excessive lubrication may affect valve performance and should be avoided.

e. Insert spindle (key 15) into guide (key 6).

f. Press fit the nozzle (key 8) into the guide making sure the spindle (key 15) tip is not being compressed at the same time. This step completes the guide assembly.

NOTICE

Damage to the valve seat will occur if the spindle is compressed when press fitting the nozzle.

2. Hold body (key 2) in your hand and insert one spring washer (key 10). Make sure the washer counterbore faces the adjustment screw hole.
3. Insert the body into a vice making sure not to damage nameplate.
4. Insert the spring (key 9) and lower spring washer (key 10) making sure the counterbore is facing the spindle.
5. Take the guide assembly and insert into the body with the O-ring on outside of guide assembly facing down towards the spring.
6. Press set by hand the guide assembly into the body and take an appropriate tool to pop the guide assembly into locking place.
7. Lubricate and install the bushing seal (key 3) into body on top of the nozzle.
8. Lubricate the threads of inlet bushing (key 1) and thread it down to tighten.
9. Remove the body from the vice.
10. Turn the body upright and screw the adjustment bolt (key 11) to the pre-measurement noted in the disassembly procedure.
11. Lubricate insert threads and loosely install the cap (key 12).

Type 81P (G and J Orifices)

1. Pre-assemble guide assembly, which consists of guide (key 8), guide seal (key 9), nozzle (key 7), spindle (key 15), seat (key 17), seat retaining screw (key 18), spindle seal (key 16), and drag ring (key 19) per Figure 10.
   a. Put the seat (key 17) on the retaining screw (key 18). Add a small amount of lubricant to the retaining screw threads.
   b. Put the spindle (key 15) in a vice by the flat on the spindle skirt.
   c. Thread the retaining screw (key 18) with seat into the spindle (key 15) by hand as far as possible. If the screw threads in fully without resistance, the locking Heli-coil is damaged and the spindle must be replaced. Tighten the retaining screw until the seat contacts the spindle, then apply an additional 1/4 turn.

NOTICE

Do not overtighten the retainer screw as it will deform the seat.

d. Lubricate spindle seals (key 16 and 19) and proceed to install them on the spindle. Add an additional light coat of lubricant to the outside of seals after they have been installed.

NOTICE

Excessive lubrication may affect valve performance and should be avoided.

e. Insert spindle (key 15) into guide (key 8).

f. Press fit the nozzle (key 7) into the guide making sure the spindle (key 15) tip is not being compressed at the same time.

NOTICE

Damage to the valve seat will occur if the spindle is compressed when press fitting the nozzle.

g. Lubricate guide seal (key 9) and install guide seal on the OD of the guide. This step completes the guide assembly.

2. Hold bonnet (key 20) in your hand and insert one spring washer (key 10). Make sure the washer counterbore faces the adjustment screw hole.
3. Insert the spring (key 11) and lower spring washer (key 10) making sure the counterbore is facing the spindle.
4. Insert the bonnet into a vice.
5. Take the guide assembly and insert into the bonnet with the o-ring on outside of guide assembly facing down towards the spring.
6. Press set by hand the guide assembly into the bonnet and take an appropriate tool to pop the guide assembly into locking place.
7. Place the body (key 2) onto the bonnet and line up the flange holes.
8. Remove the bonnet from the vice and flip it right side up.
9. Bolt the bonnet into the body with the flange bolts (key 21).
10. Screw the adjustment bolt to the pre-measurement noted in the disassembly procedure.
11. Lubricate insert threads and loosely install the cap.

Set Pressure Changes

Set Pressure Changes

Set pressure changes beyond the specified spring range will necessitate a change in the valve spring assembly consisting of the spring and two spring washers potentially the body/bonnet assembly. Set pressure changes beyond the specified seat application range will necessitate a change in the valve seat. Set pressure changes beyond the specified spindle seals range will necessitate a change in the spindle seals and lubricant used. The new spring, spring washers, body/bonnet assembly, seat and seals must be obtained from Emerson and the valve must be reset by Emerson test facilities or Emerson authorized test facilities.

⚠ CAUTION

If above procedures are not followed, this could result in minor or moderate injury.

Set Pressure Adjustment

Adequate safety gear includes but is not limited to ear and eye protection and is highly recommended during the set pressure adjustment.

⚠ WARNING

Before making any adjustments, reduce the test pressure under the valve seat to at least 30% below the stamped set pressure. This will prevent seat damage and minimize the chance of an inadvertent valve opening. Unpredictable opening/relieving of valve might affect its operation adversely and can cause hazardous situation which could result in death or serious injury.

1. Remove the cap following the instruction for valve disassembly (see Valve Disassembly section).

2. Loosen the lock nut and turn the adjustment screw clockwise to increase set pressure or counterclockwise to reduce set pressure.

⚠ WARNING

Turning adjustment screw counterclockwise may cause the valve to popopen and can cause hazardous situation resulting in death or serious injury. Adequate safety gear includes but is not limited to ear and eye protection and is highly recommended during the set pressure adjustment.

3. Retighten the lock nut following each adjustment.
4. Two or three consecutive valve openings at the same pressure are necessary to verify the opening pressure accurately.
5. Opening pressure tolerance shall comply with the Standard Performance Requirements Section. Adjust the set pressure on the test stand 2 to 3% above nameplate set pressure.
6. Once the set pressure has been established, install the cap and tighten securely.
7. The secondary pressure zone of each valve shall be pressure tested on air or other gas at a pressure of at least 30 psig / 207 Kpag. The secondary pressure zone is defined as that area downstream of the nozzle seat to the valve outlet. There shall be no visible sign of leakage. At the body weep hole, bushing to body seal, blowdown adjustment screw and nut seal. Shop air may be used as the test medium.

NOTE

Secondary Pressure zone test (Back Pressure Test) shall be performed after the complete functional test.

8. Seal wire from the cap to blowdown adjustment screw with identifying seals.

Service Records

Service records should be completed before a valve is returned to service. These records are important and will provide guidance on establishing time intervals between repairs as well as providing the historical record of repairs and service conditions. Well maintained records will be useful in predicting when to retire a valve and which spare parts should be maintained in inventory to ensure uninterrupted plant operation.

Spare Parts

When ordering spare parts, assembly number or serial number should be given together with set pressure, part name and item number, valve size and style. Spare parts may be ordered from any Emerson regional sales office or representative. To ensure proper performance, safety, and warranty compliance, only Emerson genuine spare parts should be used.

Table 12. *Type 81P Repair Kits*

ORIFICE	SET PRESSURE RANGE, psig (kPag)	SEAT	O-RING	LEGACY PART NUMBERS	SAP PART NUMBERS
-2, -3	200 to 2000 / 1379 to 13,790	Polytetrafluoroethylene (PTFE)	Nitrile (NBR)	- - - -	11606450
			Ethylene Propylene Rubber (EPR)	- - - -	11606451
			Kalrez® 6375	- - - -	11606452
			Fluorocarbon (FKM)	- - - -	11606453
		PEEK®	Nitrile (NBR)	- - - -	11606459
			EPR	- - - -	11606460
			Kalrez® 6375	- - - -	11606461
			Fluorocarbon (FKM)	- - - -	11606463
	200 to 12,500 / 1379 to 86,184	Vespel®	Nitrile (NBR)	- - - -	11606454
			EPR	- - - -	11606456
			Kalrez® 6375	- - - -	11606457
			Fluorocarbon (FKM)	- - - -	11606458
-4/-8	50 to 6000 / 345 to 41,369	PTFE, PCTFE	Nitrile (NBR)	04.4805.029	10010831
			Fluorocarbon (FKM)	04.4805.032	10010834
			EPR	04.4805.071	10010851
			Aflas®	04.4805.348	10010905
-4/-8 (81P-T)	50 to 2000 / 345 to 13,790	PTFE, PCTFE	PTFE	- - - -	11573493
G	50 to 6000 / 345 to 41,369	PTFE, PCTFE	Nitrile (NBR)	04.4805.030	10010832
			Fluorocarbon (FKM)	04.4805.033	10010835
			EPR	04.4805.072	10010852
J	50 to 1620 / 345 to 11,170	PTFE, PCTFE	Nitrile (NBR)	04.4805.031	10010833
			Fluorocarbon (FKM)	04.4805.034	10010836
			EPR	04.4805.073	10010853
Note: For Type 81P-T, use 11573495 for the tool kit needed for removing and putting on seals.					

Table 13. *Type 81P Spring Repair Kit*

COMPONENTS	SPRING CHART NUMBER
Spring	03-0079
Washer	

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