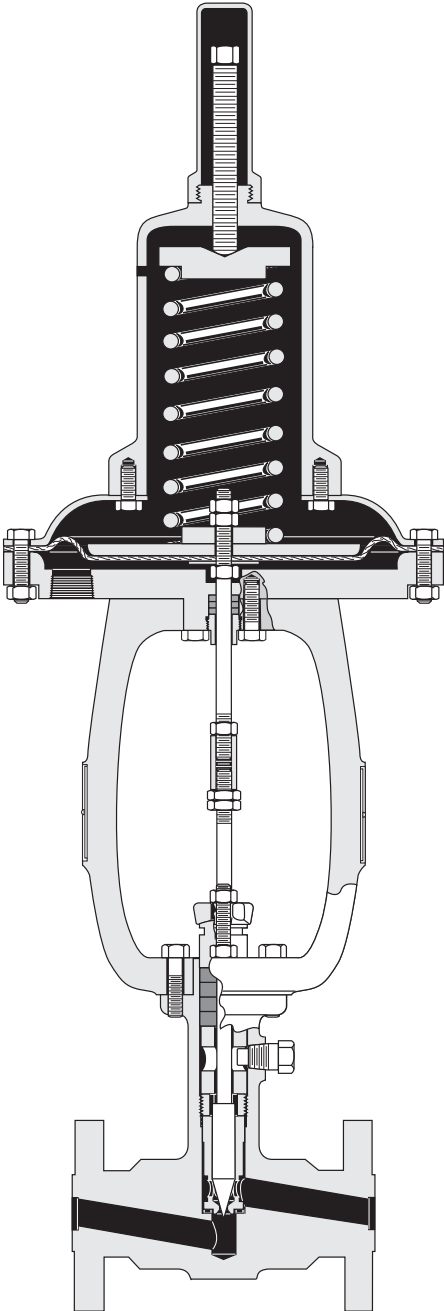


# 536V Series

## Back Pressure Microflow Regulators

Instruction Manual (Rev. A)



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## Safety Information

### Important - Please read before installation

These instructions contain **DANGER**, **WARNING**, and **CAUTION** labels, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your regulator. **DANGER** and **WARNING** hazards are related to personal injury. **CAUTION** hazards involve equipment or property damage. Operation of damaged equipment can, under certain operational conditions, result in degraded process system performance that can lead to injury or death. Total compliance with all **DANGER**, **WARNING**, and **CAUTION** notices is required for safe operation.



This is the safety alert symbol. It alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



When used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**Note: Indicates important facts and conditions.**

## About this Manual

- The information in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without Baker Hughes's written permission.
- Please report any errors or questions about the information in this manual to your local supplier.
- This model is the "Microflow" equivalent of the 526-536 Back Pressure Regulators.
- These instructions are written specifically for the **Masoneilan™** Model 536V Back Pressure Regulator, and do not apply for other regulators outside of this product line.

## Useful Life

The current estimated useful life period for the Masoneilan regulator model 536V is 25+ years. To maximize the useful life of the product, it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

## Spare parts

When performing maintenance, always use Masoneilan replacement parts. Parts are obtainable through your local Baker Hughes Representative or Spare Parts Department. When ordering parts, always include Masoneilan Model and serial numbers shown on serial plate.

## After sales Department

Baker Hughes has a highly skilled After Sales Department available for start-up, maintenance and repair of our regulators and components parts. Contact the nearest Masoneilan Sales Office or Representative.

## Training

Baker Hughes regularly holds training seminars for technicians in its factory. Please contact your local Masoneilan Representative or our Training Department.

**Note: Care must be exercised when unpacking the regulator to prevent damage. Should any problems arise, contact After Sales Department. Be sure to include Masoneilan Serial and Model numbers in all correspondence.**

## Warranty

Items sold by Baker Hughes are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment, provided said items are used according to Baker Hughes recommended usages. Baker Hughes reserves the right to discontinue manufacture of any product or change product materials, design or specifications without notice.

**Note: Prior to installation:**

- The regulator must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.
- All surrounding pipelines must be thoroughly flushed to ensure all entrained debris has been removed from the system.
- Under certain operating conditions, the use of damaged equipment could cause a degradation of the performance of the system which may lead to personal injury or death.
- Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

# Description-Operation

The 536V Direct Operated Regulators are designed to maintain a uniform upstream pressure. Microflow bodies of regulators are offered in single seat type.

The actuator of the 536V is a simple powerful mechanical device. It is Air-to-Retract Stem type. The nominal range of an actuator is the pressure range in pounds per square inch (psi) in which the pressure setting can be obtained by adjustment.

Conformation of the diaphragm to the diaphragm plate (40) or lower spring seat (34) serves as a flexible upper guide for the actuator stem (26). Nylon reinforced neoprene diaphragms permit smooth, sensitive operation. The packing box acts as a lower guide for the actuator stem.

**Note: On request, for special services, the nylon reinforced neoprene diaphragm may be provided with PTFE coating.**

The actuators are designated by the nominal range (psi). See the following chart.

Range (psi)	Case Size
0,5 - 3	11
2 - 5	9
3 - 15	5
10 - 40	5
30 - 85	5
60 - 170	5

## Operation

The adjustable spring is set for the required controlled pressure. This spring holds the plug closed. An increase in controlled pressure above the set point retracts actuator stem and causes regulators to open.

Variations in the controlled pressure thus cause the necessary regulators movement to restore the controlled pressure to set point.

## Plug and seat ring combination (trim)

Eight plugs and five seat rings can be used in combination to obtain ten different plug and seat ring assemblies (See Figure 2).

Each plug design and the seat ring orifice diameter permit to identify parts in relation to figure 2.

The four plugs corresponding to trim Nos 6 to 9 differ by the angle of the flat, machined on the point. The same seat ring (3e) and the same spacer (3f) are used in the four cases.

See figure 2 to select the plug and seat ring combination to obtain the required Cv.

# Installation

Before installing, blow out line thoroughly to remove all foreign matter which might foul the regulator.

Place the regulator vertically in a horizontal run of pipe so that the controlled fluid will flow through the body in the direction indicated by the arrow on the body or the words "IN & OUT" marked on the connections. On steam service, the regulator should be installed with the diaphragm chamber down so that the diaphragm will be protected by a water seal. If installed otherwise, an adequate water seal or seals must be provided.

A three valve by-pass around the regulators permits removing the regulator from the line without shutting off the flow.

See figure 1 for typical installation diagram.

Pipe the controlled pressure from a convenient upstream point in the line 6-10 feet (1,8 to 3 m) from the regulator to the 1/2" NPT connection in the diaphragm case.

Install a gauge and a needle valve in the controlled pressure line, to protect diaphragm case against any overpressure.

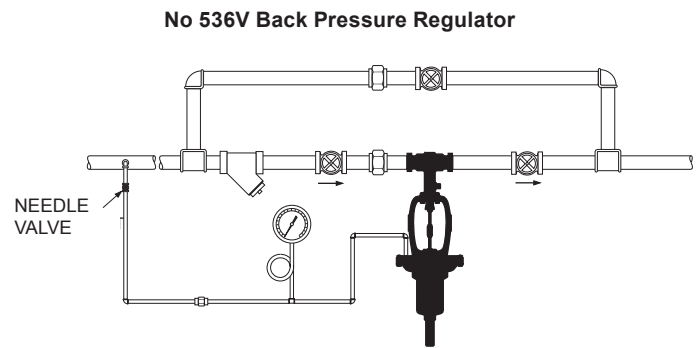


Figure 1 - Typical Installation

Needle valve permits shutting off the control line and also serves as an adjustable choke to prevent cycling of the regulator, which may result from the pulsation of a pump in the system.

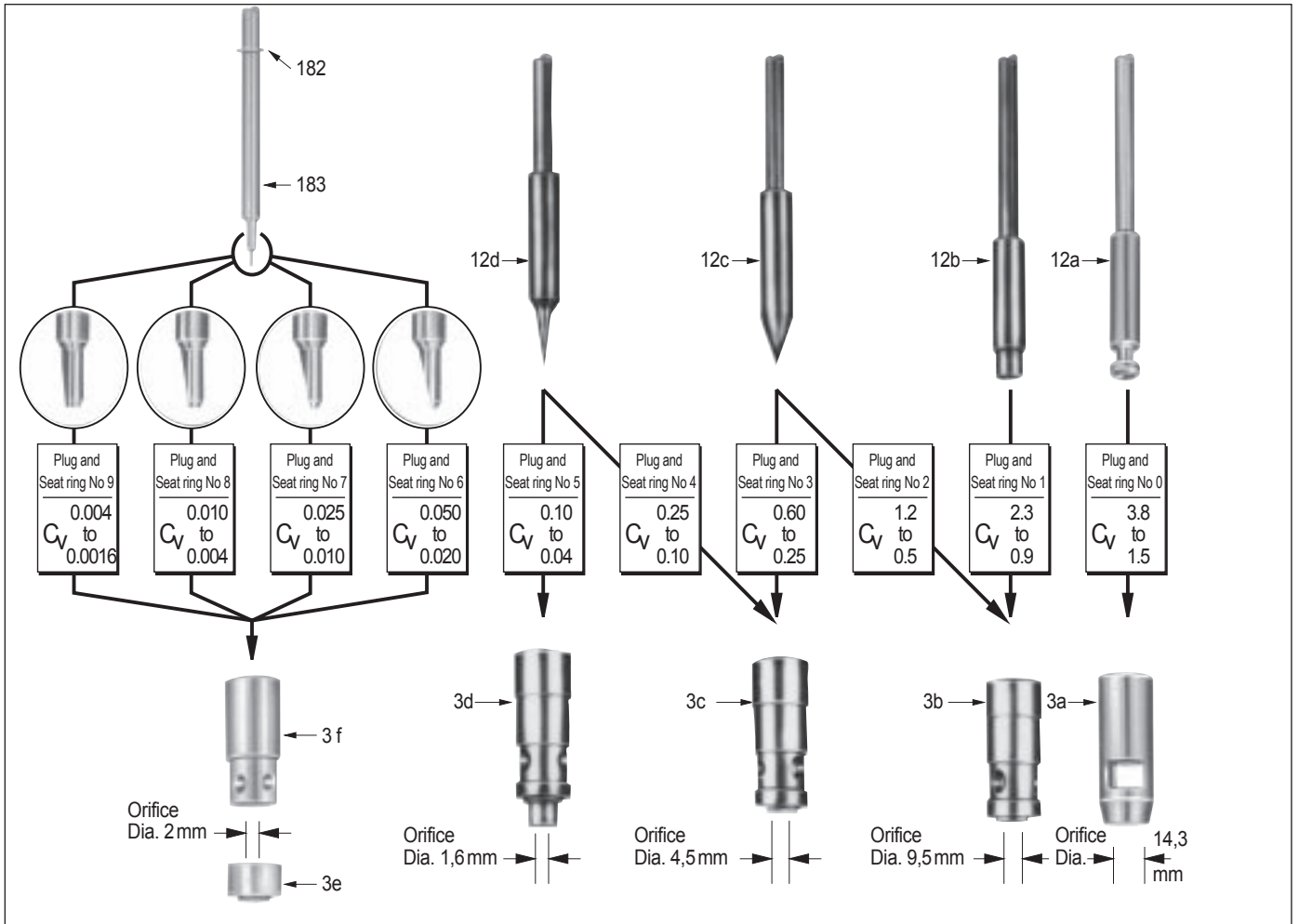


Figure 2 - Ten plug and seat ring assemblies (trim)

# Set Point Adjustment

## CAUTION

Tests have been performed at the factory to check correct operation of the regulator on its full nominal spring range. After that, the spring compression has been fully removed to avoid unnecessary stress of parts (diaphragm, spring) during storage.

**THEREFORE IT IS NECESSARY TO PROCEED WITH ADJUSTMENT BEFORE SERVICING.**

The regulator pressure range is engraved on the serial plate.

To adjust spring compression (set point), proceed as follows:

- Open stop valve on the outlet side of the regulator and partially open stop valve on the inlet side, allowing pressure in the system to build up slowly.
- Open controlled pressure line valve and check setting by means of the gauge. Set by means of spring adjuster screw (36).

**Note: To increase pressure setting, turn adjusting screw clockwise to compress the spring. To decrease the setting, turn adjusting screw counterclockwise to relieve spring compression).**

- Fully open stop valve on the inlet side of the regulator.

## Maintenance

If there is excessive leakage through the regulator when it is shut off, the cause may be:

1. Foreign matter holding valve off seat: disassemble and clean.
2. Normal wear of seating surfaces: disassemble and replace plug and/or seat ring.
3. Seat ring gasket (2) damaging (except with trim for Cv max. 3.8): replace gasket.

## Part Replacement in Body S/A

## CAUTION

**Regulator must be isolated and pres-sure vented before disassembly.**

### Disassembly (Figures 3, 5, 6 & 7)

- a. Disconnect the control line at the diaphragm case and connect a temporary supply air line.
- b. Admit on the diaphragm sufficient pressure to open the plug about 1 mm.
- c. Remove the two packing flange nuts (8b). Raise packing flange (10) up the plug stem and remove the two nuts (8a) as well as the two mounting screws (16).

- d. By means of two 17 mm flat spanners, unlock the plug stem nuts (27) and unscrew them to the threaded end of the plug stem (12 or 183). Tighten nuts one against the other in this position.
- e. Fasten the actuator to a hoisting gear and very slowly pull out the actuator-plug S/A.
- f. With a flat spanner applied on the upper nut (27), unscrew the plug stem from the coupling (101) while pulling out actuator vertically and slowly. Carry on until plug stem is fully unscrewed from coupling.

## CAUTION

**Carefully avoid that seating surface of the plug contacts the seat ring during the plug unscrewing.**

- g. Separate actuator and packing flange (10) from the body S/A. Shut off temporary supply on actuator.
- h. Remove two nuts (27) and packing follower (9) from the plug stem.
- i. Using a packing hook, remove the largest number of packing rings (6) from packing box. Remove safety pin (11) and pull plug stem to remove packing spacer (5) and the remainder of packing rings.
- j. Using a 9/16" or 14 mm piece of hex stock and a wrench, unlock and pull out seat ring retainer (4).
- k. Pull out seat ring (3) and gasket (2) using a hook made from steel wire, diameter about 3 mm. Carefully fettle the hook end.

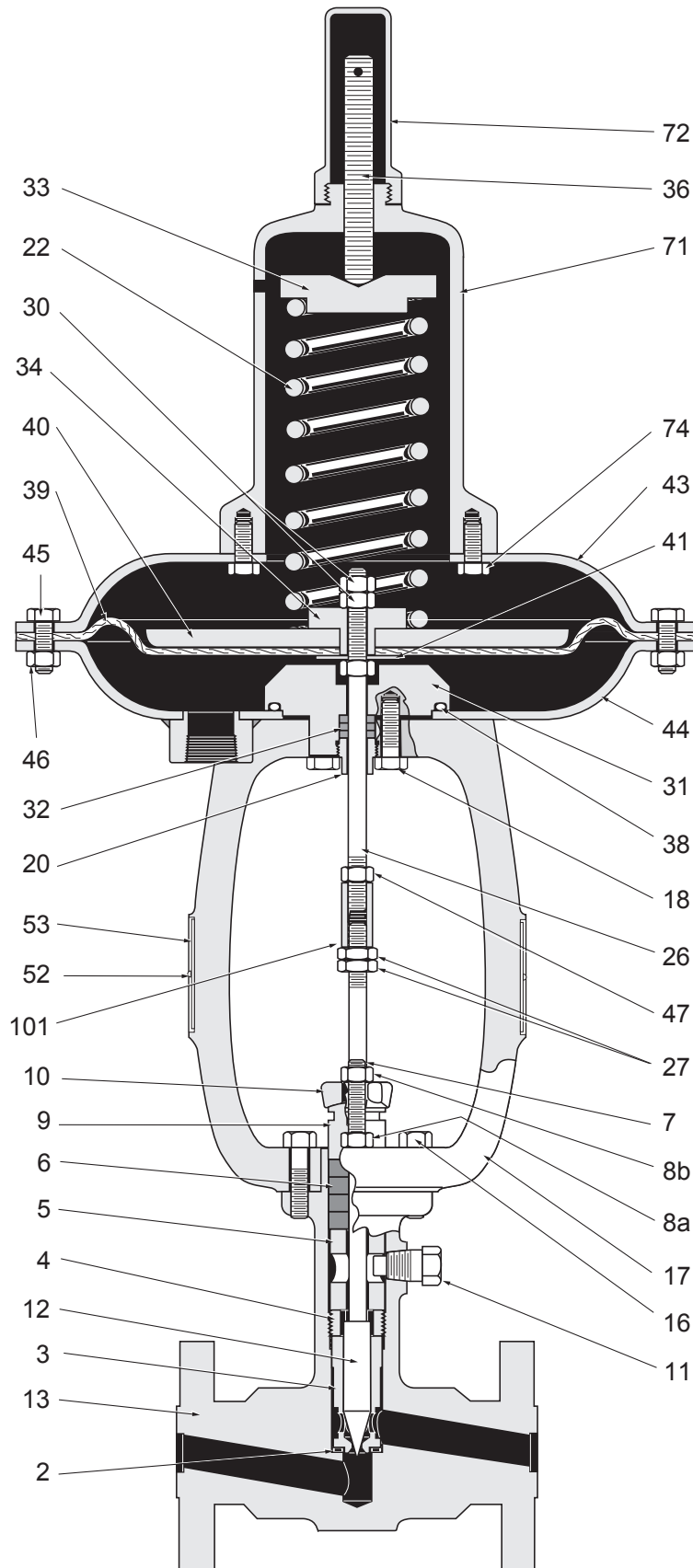
**Note: The seat ring with Cv < 0.10 consists of two parts: The seat ring proper (3e) and a spacer (3f). The small size of orifice of these parts does not allow for their removal by means of a hook. Therefore, it is necessary to remove the body from the pipe, turn it over and, if needed, to hit the bottom with a wooden mallet. Should the seat ring be jammed in its housing, it is possible to move it using a screwdriver inserted through the outlet orifice. Regulator with Cv 3.8 does not feature any seat ring gasket (2).**

### Reassembly and Plug Stem Adjustment (Figures 3, 5, 6 & 7)

Before reassembly, thoroughly clean the inside of the valve body and parts. Mating surfaces must be tho-roughly cleaned. On reassembly, new seat ring gasket (2) and new packing (6) must be used.

- Place a new seat ring gasket (2) in the valve body (13) and install the seat ring (3) taking care to correctly center the gasket on the seat ring shoulder. Orient it in such a manner that one of its ports lines up with the body outlet orifice.

**Note: For a Cv smaller than 0.10, the seat ring (3e) shall first be positioned on the new gasket (2) taking the same precautions as shown above. Next, engage spacer (3f) and orient one of its ports towards the body outlet orifice. Regulator with Cv 3.8 does not feature any seat ring gasket (2).**



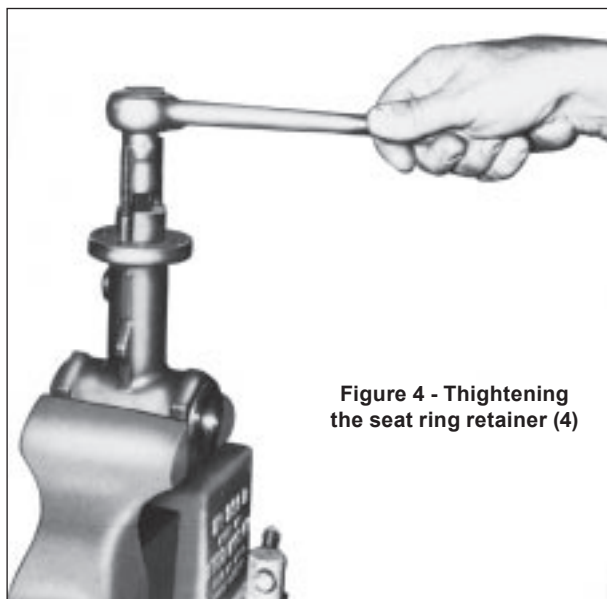
**Figure 3 - Cross Section of Type 536 V Regulator. Range 0,5-3 psi**  
 See Parts References page 10



- Carefully apply Never Seez grease (or equivalent) to threads and bottom of retainer (4). With a 9/16" or 14 mm piece of hex stock and a wrench, torque the retainer to 59 ft-lbs (8 daN.m) if a graphite gasket st. st. reinforced, or to 40 ft-lbs (5,5 daN.m) if a glass filled PTFE gasket (See Figure 4).

**Note: On regulator with Cv 3.8 torque the retainer to 15 ft-lb (2 daN.m).**

- Insert the plug-stem (12 or 183) into the seat ring (3). For a Cv < 0.10, ensure that there is no binding during the stroking of the plug. If binding occurs, loosen the retainer (4) and replace the seat ring (3e) in the correct position until the stem smoothly slides.



**Figure 4 - Tightening the seat ring retainer (4)**

- Slide spacer (5) aligning the hole in the spacer with the safety pin (11) hole in the valve body.

**Note: For a Cv smaller than 0.10, ensure that the retaining ring (182) is placed on the plug before engaging it in the spacer (3f). If the retaining ring is damaged, replace it.**

- Wrap the safety pin (11) with two turns of PTFE tape (Teflon). Screw it into the bonnet five and a half to six turns from where threads engagement starts.

**Note: To find start of threads engagement, proceed as follows:**

- Screw safety pin about one turn,**
- Pull safety pin outwards while unscrewing it.**

- Install packing, positioning the skive cut of each packing ring 120° away from the cut of an adjacent ring. Slightly push down rings one after another using a tube 1/2" schedule 160 size. Install packing follower (9) on the plug stem.
- Insure that any pressure is admitted on diaphragm case. Hold actuator above body S/A. Before that coupling (101) contacts the plug stem, screw two nuts (8a) on the two studs (7), slide packing flange (10) on the plug stem and studs then screw the two nuts (27) to the threaded end of plug stem. Tighten nuts one against the other in this position
- While holding the plug in "Open" position (as far as possible), slowly pull down the actuator and screw the plug stem as long as possible into the coupling (101).

**Note: This operation will be facilitated turning the plug by means of a wrench applied on the nuts (27) tightened one against the other. Carefully avoid that seating surface of the plug contacts the seat ring during the plug screwing. Pulling down motion of the actuator and plug stem screwing must be simultaneously performed: carry on until the lower part of actuator yoke contacts the body flange (13).**

- Place actuator in correct orientation in relation to regulator body S/A: the 1/2" NPT connection must be 90 degrees apart from controlled pressure line.
- Screw and tighten the two screws (16). Tighten also the two nuts (8a). Finger tight the two packing flange nuts (8b).
- Turn the nuts (27) to unscrew plug stem until the seating area of the plug just contacts the seat ring.
- Admit on actuator diaphragm a supply pressure higher than setting point value.
- Turn nuts (27) to unscrew plug stem by one turn and a half. Loosen the two nuts (27) and screw the upper nut against the coupling (101). During this step, the coupling must be held by means of a 14 mm flat spanner or pliers. Tighten second nut (27) against the first, using the two 17 mm flat spanners. Shut off air supply and disconnect temporary air line from the actuator.
- Connect the controlled pressure line to diaphragm case.
- Place back in service and tighten the nuts (8b) only as much as is necessary to stop any leakage.

## Packing box

### Adding Packings

To add a ring of packing, depressurize the regulator, back off packing flange nuts (8b) all the way, lift the packing flange and follower and insert one ring of packing. Tighten nuts (8b) finger tight plus one full turn.

### Packing Quick Change Method (For regulators Cv 0.6 to 3.8 only)

The fastest and simplest way to replace packing is to remove the entire actuator without disturbing actuator parts or calibration. However, this is not recommended for regulators with a small Cv (Cv < 0.6), due to the very fineness of their plug. In this event, disassemble the regulator to replace the packing (See under "Disassembly", page 3).

## CAUTION

**Regulator must be isolated and pressure vented before disassembly.**

- Remove safety pin (11) from body. The safety pin engages the packing spacer (5). The function of safety pin and spacer is to prevent the plug from being pushed out if the actuator is removed while the regulator is still pressurized. The regulator internal parts can-not be removed unless the safety pin is removed first. Remove two packing flange nuts (8b) and two mounting nuts (8a). Remove also two mounting screws (16).
- Remove the actuator-plug assembly off the regulator.
- Clean the packing box and plug stem and carefully place new rings of packing around the stem. Position the skive cut of each packing ring 120° from that of the adjacent ring.

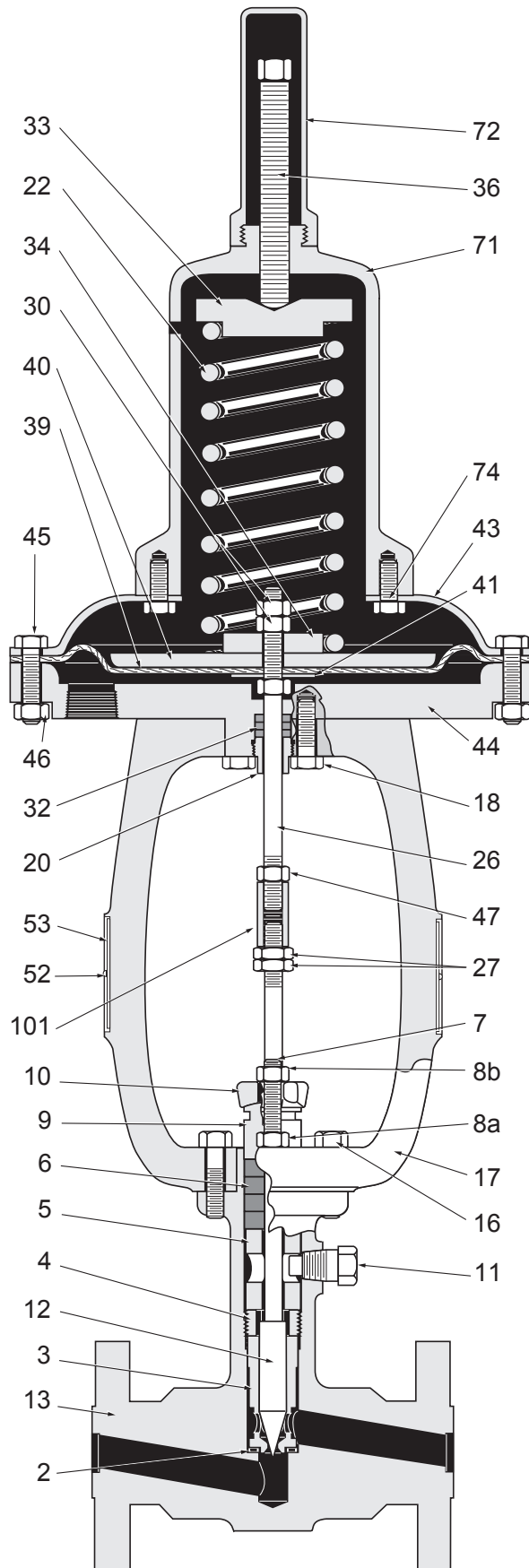


Figure 5 - Cross Section of Type 536 V Regulator. Range 2-5 psi  
See Parts References page 10

- Reassemble the actuator-plug assembly to the regulator body, taking care: (a) to align hole in spacer (5) with safety pin hole ; (b) to replace two mounting nuts (8a) before nuts (8b) ; (c) to take extra care in guiding each ring into the packing box.
- Tighten two nuts (8a) and two screws (16) on the actuator yoke.
- Wrap the safety pin (11) with two turns of PTFE tape (Teflon). Screw it into the bonnet five and a half to six turns from where threads engagement starts.

**Note: To find start of threads engagement, proceed as follows:**

- Screw safety pin in about one turn,**
- Pull safety pin outwards while unscrewing it.**

- Replace packing follower, packing flange and flange nuts (8b). Tighten nuts finger tight plus one full turn. Place back in service.

## Replacing Diaphragm

### CAUTION

**Regulator must be isolated and pressure vented before disassembly.**

- Disconnect the controlled pressure line from actuator case connection. Remove spring barrel cap (72). By means of a paint spot, make a mark on the spring adjuster screw (36) with regard to upper part of spring barrel (71) ; this is a reference of the service set point, in preparation to reassembly. Fully unscrew the spring adjuster screw (36) to remove (or release as far as) the spring compression.

### CAUTION

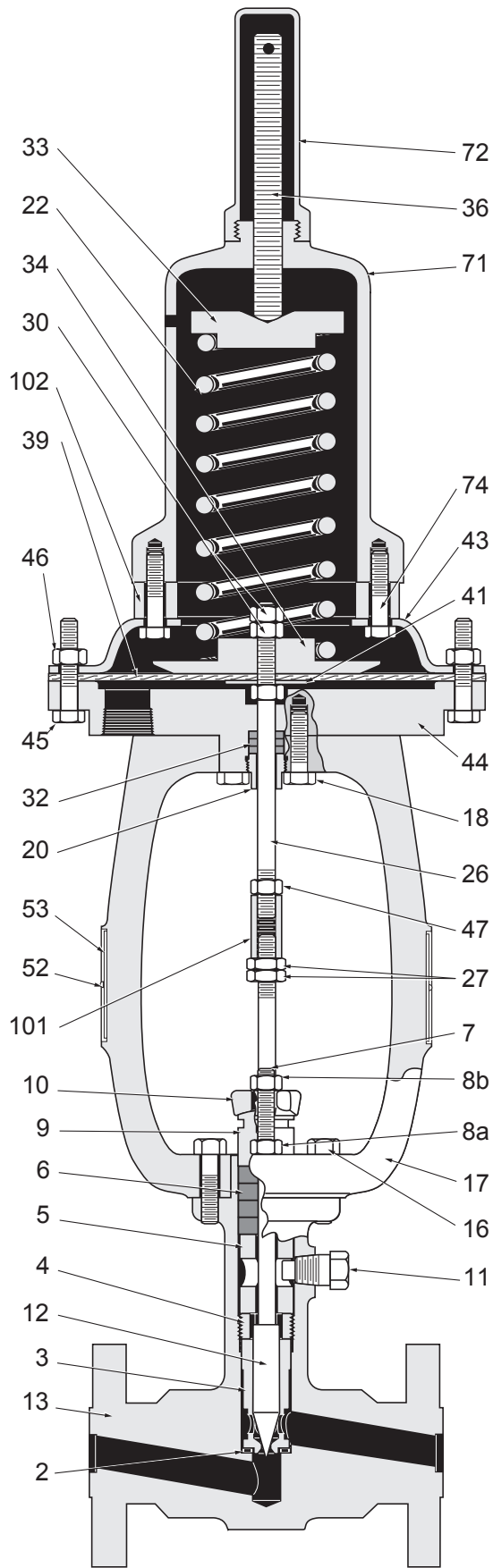
**In case of ranges 3-15 ; 10-40 ; 30-85 and 60-170 psi, the spring is always under light compression after fully unscrewing of spring adjuster (36). So, prior removal upper diaphragm case and spring barrel subassembly, the nuts (46) — located above diaphragm case in these configurations — must be evenly and progressively unscrewed until spring compression is fully relieved.**

- Unscrew nuts (46) then remove cap screws (45) and upper diaphragm case (43) - spring barrel (71) -spring adjuster (36) subassembly, (as well as spring barrel spacer (102) in case of ranges 3-15 ; 10-40; 30-85 and 60-170 psi).
- Remove upper spring seat (33) and spring (22). In case of ranges 10-40 ; 30-85 and 60-170 psi, remove also the reducing ring (23).
- By means of two 1/2" or 13 mm flat spanners, unlock the upper stem nut (30).
- By means of a 17 mm flat spanner applied on upper plug stem nut (27), prevent the rotation of actuator stem (26) and unscrew the second nut (30).
- Remove lower spring seat (34). In case of ranges 0,5-3 and 2-5 psi, remove also the diaphragm plate (40).
- Remove the diaphragm (39). Clean thoroughly all parts in preparation for reassembly.

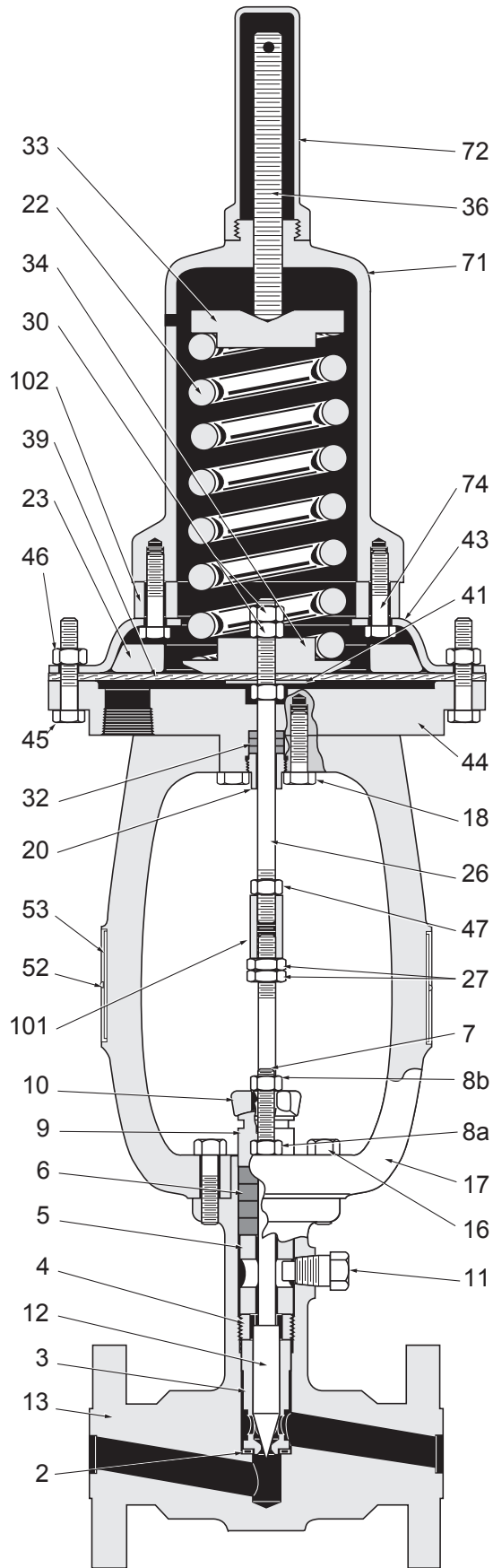
- Place new diaphragm and reassemble by reversing of the above description order. Adjust spring compression to set point, proceeding as indicated under "Set Point Adjustment". Place back in service.

## Replacing O-ring (38) (Only in case of 0,5-3 psi range)

- Perform steps a. to g. of the above chapter "Replacing Diaphragm". Remove diaphragm washer (41) and loosen the packing nut (20).
- By means of two 17 mm flat spanners, unlock the plug stem nuts (27) and unscrew them to the threaded end of the plug stem (12 or 183). Tighten nuts one against the other in this position.
- By means of a 14 mm flat spanner or pliers, hold the coupling (101) and, with a 17 mm flat spanner applied on the upper nut (27), unscrew the plug stem from the coupling. Do not unlock the coupling nut (47).
- Remove the four screws (18) and together raise the actuator packing box (31), packing box parts (32-20), O-ring (38) and actuator stem (26).
- Remove O-ring (38) from its box. Carefully clean all parts.
- Place a new O-ring, then place the packing box subassembly, using the four cap screws (18). Insure that orientation and centering of the lower diaphragm case (44) are correctly achieved.
- Screw the actuator stem and coupling (26-101) as far as possible on the plug stem. (Do not overtighten).
- Place diaphragm washer (41), diaphragm, diaphragm plate (40), lower spring seat (34) then, finger tight one of the two nuts (30) on the actuator stem end (26).
- By means of a 14 mm flat spanner or pliers, applied on the coupling (101), hold actuator stem (26) and firmly tight nut (30). With two 1/2" or 13 mm flat spanners tighten second nut (30) against the first.
- Place spring (22), its upper spring seat (33) and upper diaphragm case (43) - spring barrel (71) -spring adjuster (36) subassembly, with screws (45) and nuts (46). Tighten actuator packing nut (20).
- Turn spring adjuster screw (36) until the paint mark previously performed flushes with the upper part of the spring barrel.
- Connect a temporary supply air line on the lower diaphragm case connection (44).
- Admit on actuator diaphragm a supply pressure higher than setting point value.
- Turn nuts (27) to unscrew plug stem by one turn and a half. Unlock the two nuts (27) and screw the upper nut against the coupling (101). During this step, the coupling must be held by means of a 14 mm flat spanner or pliers. Tighten second nut (27) against the first, using the two 17 mm flat spanners. Shut off air supply and disconnect temporary air line from the actuator.
- Connect the controlled pressure line to diaphragm case. Adjust the set point, proceeding as indicated under "Set Point Adjustment". Place back in service.



**Figure 6 - Cross Section of Type 536 V Regulator. Range 3-15 psi**  
 See Parts References page 10



**Figure 7 - Cross Section of Type 536 V Regulator. Range 10-40 ; 30-85 & 60-170 psi  
See Parts References page 10**

## Maintenance of the actuator packing box

The actuator packing box requires minimum maintenance. The PTFE - Kevlar packing rings have a square section and a skive cut allowing easy replacement. The packing may be added to or completely replaced without disassembling either the actuator or regulator body S/A. Be sure to tighten packing nut (20) lightly. Overtightening will cause excessive friction resulting in sluggish performance.

## Parts Reference

Ref.	Part Name	Ref.	Part Name	Ref.	Part Name
● 2	Seat Ring Gasket*	17	Yoke	41	Diaphragm Washer
● 3	Seat Ring	18	Cap Screw (L. diaph. case to yoke)	43	Diaphragm Case (Upper)
3e	Seat Ring (Only on Cv < 0.10*)	20	Packing Nut	44	Diaphragm Case (Lower)
3f	Spacer (Only on Cv < 0.10*)	22	Actuator Spring	45	Cap Screw (Diaph. case)
4	Seat Ring Retainer	① 23	Reducing Ring	46	Nut (Diaph. case)
5	Packing Spacer	26	Actuator Stem	47	Actuator Stem Nut (Coupling)
6	Packing	27	Plug Stem Nut	52	Drive Screw
7	Packing Flange Stud	30	Actuator Stem Nut	53	Serial Plate
8a	Mounting Nut	② 31	Actuator Packing Box	71	Spring Barrel
8b	Packing Flange Nut	● 32	Actuator Packing	72	Spring Barrel Cap
9	Packing Follower	33	Upper Spring Seat	74	Cap Screw (Spring Barrel)
10	Packing Flange	34	Lower Spring Seat	101	Coupling
11	Safety Pin	36	Spring Adjuster	④ 102	Spring Barrel Spacer
12	Plug and Stem	● 38	O-Ring ③	● 182	Retaining Ring (Only on Cv < 0.10*)
13	Body	● 39	Diaphragm	183	Plug-Stem (Only on Cv < 0.10*)
16	Mounting Screw	③ 40	Diaphragm Plate		

● Recommended spare parts

\* Complete subassembly includes: Plug-stem (183), Retaining ring (182), Seat ring (3e) and Spacer (3f). (See figure 2)

+ Non-existent on Cv 3.8

① Only on range 10-40 ; 30-85 and 60-170 psi

② Only on range 0,5-3 psi

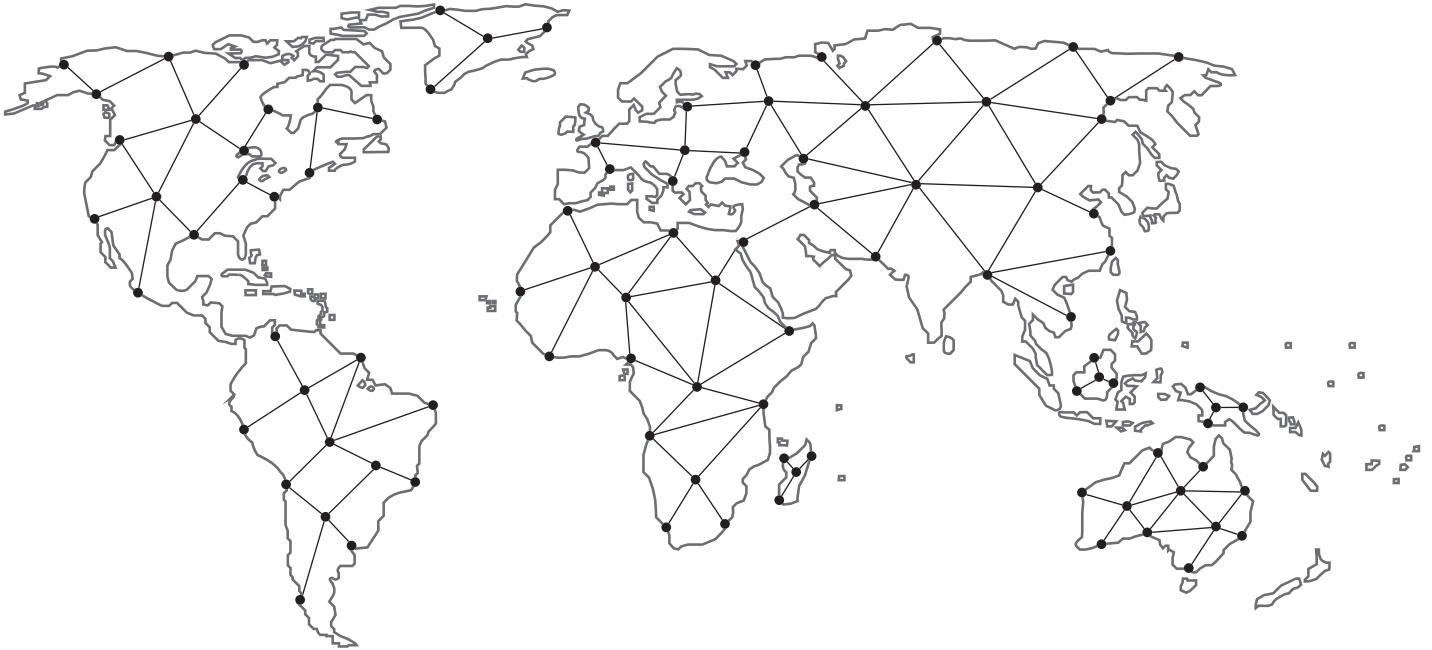
③ Only on range 0,5-3 and 2-5 psi

④ Only on range 3-15 ; 10-40 ; 30-85 and 60-170 psi

## Notes

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