

# Type 971 Pilot-Operated Pressure Regulator

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Figure 1. Regulator Type 971

## Product Description

The 971 pilot operated regulators are “top entry” type and are used in regulating, distribution and transmission stations of suitably filtered natural gas.

This product has been designed to be used with fuel gases of 1<sup>st</sup> and 2<sup>nd</sup> family according to EN 437, and with other non aggressive and non fuel gases. For any other gases, other than natural gas, please contact your local sales agent.

The following versions are available:

**971** : Regulator

**971-E**: Monitor

Also available version with type SR silencer.

All standard gas pressure devices (regulators) used in assemblies will comply to EN 12186 and EN 12279 standards.

Any accessories (e.g. pilots or filters) used on the Emerson Process Management range of pressure regulators, with or without built-in safety shut-off devices, must be manufactured by one of the Emerson Process Management companies and bear that label.

If this is not respected, Emerson Process Management will not be responsible in the case of any inefficiency.

## INTRODUCTION

### Scope of Manual

This manual provides instructions for installation, startup, maintenance and spare parts ordering for the 971 type pilot operated regulators. It also contains information for the pilots, booster valves and filter.

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## P.E.D. CATEGORIES AND FLUID GROUP

This product may be used as a stand-alone safety accessory in its fail-to-close and integral strength configuration to protect pressure equipment in the following Pressure Equipment Directive 97/23/EC categories.

Downstream equipments, protected by this product, shall have technical features such as not to be category higher than per table below according Directive 97/23/EC "PED".

**Table 1.** P.E.D. Category for 971 Type Regulators

PRODUCT SIZE	CATEGORY	FLUID GROUP
DN 250	III	1

Possible built-in pressure accessories (e.g. pilots PRX/, PS/ series or filters SA/2, FU/ and FD-GPL/) conform to Pressure Equipment Directive (PED) 97/23/EC Article 3 section 3 and were designed and manufactured in accordance with sound engineering practice (SEP).

Per Article 3 section 3, these "SEP" products must not bear the CE marking.

## CHARACTERISTICS

### Body Sizes and End Connection Styles

DN 250

ANSI 300 - 600 flanged



## WARNING

The pressure/temperature limits indicated in this instruction manual or any applicable standard or code limitation should not be exceeded.

### Maximum Operating Inlet Pressure

ANSI 300: 50 bar

ANSI 600: 100 bar

At average ambient temperature.

### Outlet Set Pressure Ranges

ANSI 300 - 600: 0.5 ÷ 70 bar

### Minimum/Maximum Allowable Temperature (TS)

See label

### Functional Features

Accuracy Class AC : up to ± 1%

Lock-up Pressure Class SG : up to + 5%

Class of Lock-up Pressure Zone SZ : up to 5%

## Temperature

Standard Version: Working -10° to 60°C

Low Temperature Version: Working -20° to 60°C

## Materials

Body, covers, sleeve: Steel

Seat: Stainless steel

Diaphragm: Fabric Nitrile (NBR)+PVC

Pad: Nitrile (NBR) rubber

## LABELLING

**Figure 2.** Label for 971 Type Regulators

**Note 1:** 971 or 971-E

**Note 2:** Year of manufacture

**Note 3:** Class 1: -10°/60°C

Class 2: -20°/60°C

**Note 4:** ANSI 300 PS: 50 bar

ANSI 600 PS: 100 bar

**Note:** Over 70 bar the regulator 971/1 is differential strength.

## OVERPRESSURE PROTECTION

The recommended safety pressure limitations are stamped on the regulator nameplate.

Some type of overpressure protection is needed if the actual outlet pressure exceeds the actual maximum operating outlet pressure rating (see Wa on the pilot label).

Overpressure protection should also be provided if the regulator inlet pressure is greater than the maximum operating inlet pressure.

Regulator operation below the maximum pressure limitations does not preclude the possibility of damage from external sources or debris in the line.

The regulator should be inspected for damage after any overpressure condition.

## TRANSPORT AND HANDLING

Established transport and handling procedures shall be followed to avoid any damage on the pressure containing parts by shocks or anomalous stresses.

Ringbolts are designed just for handling of equipment weight.

Built-up sensing lines and pressure accessories (e.g. pilots) shall be protected by shocks or anomalous stresses.

## ATEX REQUIREMENTS

If the provisions of EN 12186 & EN 12279, national regulations, if any, and specific manufacturer recommendations are not put into practice before installation and if purge by inert gas is not carried out before equipment's start-up and shut-down operations, a potential external and internal explosive atmosphere can be present in equipment & gas pressure regulating/measuring stations/installations.

If a presence of foreign material in the pipelines is foreseen and purge by inert gas is not carried out, the following procedure is recommended to avoid any possible external ignition source inside the equipment due to mechanical generated sparks :

- drainage to safe area via drain lines of foreign materials, if any, by inflow of fuel gas with low velocity in the pipe-work ( 5m/sec)

In any case,

- provisions of Directive 1999/92/EC and 89/655/EC shall be enforced by gas pressure regulating/measuring station/installation's end user
- with a view to preventing and providing protection against explosions, technical and/or organizational measures appropriate to the nature of the operation shall be taken (e.g. : filling/exhausting of fuel gas of internal volume of the isolated part/entire installation with vent lines to safe area - 7.5.2 of EN 12186 & 7.4 of EN 12279 ; monitoring of settings with further exhaust of fuel gas to safe area ; connection of isolated part/entire installation to downstream pipeline; ....)
- provision in 9.3 of EN 12186 & 12279 shall be enforced by pressure regulating/measuring station/installation's end user
- external tightness test shall be carried out after each reassembly at installation site using testing pressure in accordance with national rules
- periodical check/maintenance for surveillance shall be carried out complying with national regulations, if any, and specific manufacturer recommendations.

## PILOTS

971 type regulators are equipped with the PS/ or PRX/ series pilots.

**Table 2. Pilot Type PS/ and PRX/ Characteristics**

Regulator or Monitor	Application		Allowable Pressure PS (bar)	Set Range W <sub>g</sub> (bar)	Body and Covers Material
	Regulator	Monitor			
PS/79	PSO/79	REO/79	100	0.5 - 40	Steel
PS/80	PSO/80	REO/80		1.5 - 40	
PRX/120	PRX/120	PRX/125		1 - 40	
PRX-AP/120	PRX-AP/120	PRX-AP/125		30 - 70	

N.B.: All PS Series pilots are supplied with a filter (5 μ filtering degree) and built-in pressure stabilizer, with the exception of Types PSO/79 and PSO/80. The Type SA/2 stabilizer filter must be used with PRX Series pilots. All pilots are supplied with 1/4" NPT female threaded connections.

**Table 3. Stabilizer Filter Type SA/2 Characteristics**

Model	Allowable Pressure PS (bar)	Supplied Pressure	Body and Covers Material
SA/2	100	3 bar + Downstream pressure	Steel

N.B.: The Type SA/2 stabilizer filter is supplied with a filter (5 μ filtering degree) and is suitable for heating. Supplied with 1/4" NPT female threaded connections.

**Table 4. Booster Valve Type PRX/131 and PRX-AP/131 Characteristics**

Model	Allowable Pressure PS (bar)	Set Range W <sub>g</sub> (bar)	Body and Covers Material
PRX/131	100	0.5 - 40	Steel
PRX-AP/131		30 - 70	

N.B.: 1/4" NPT female threaded connections

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## DIMENSIONS AND WEIGHTS

Weight of regulator with pilot = 1700 Kg

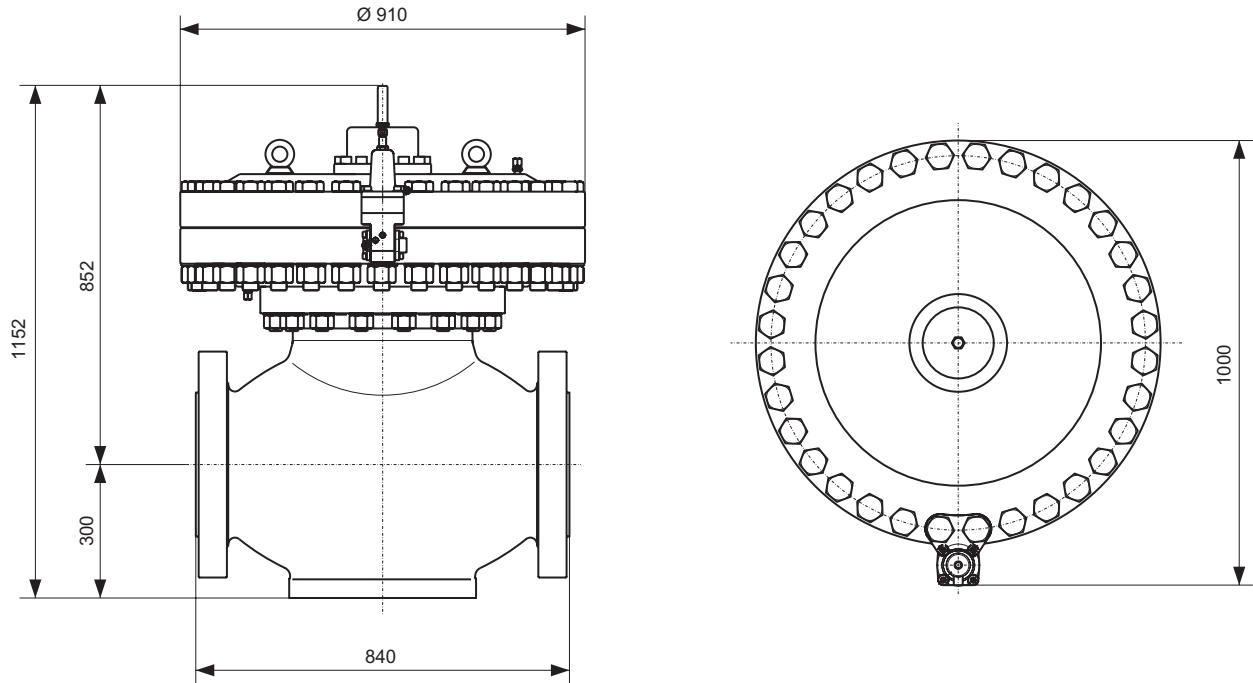
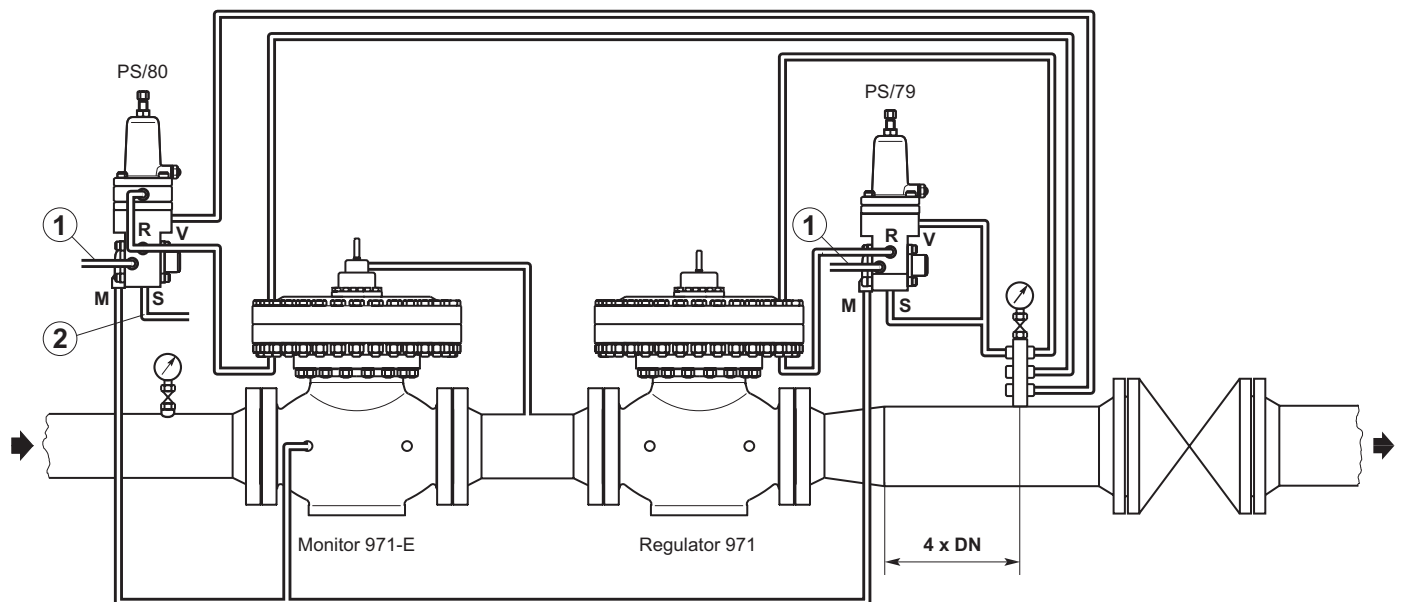


Figure 3. Regulator Type 971 Dimensions (mm)

## CONNECTIONS SCHEME



LEGEND:

- ① TO THE HEATING
- ② DOWNSTREAM OR TO A SAFE AREA

NOTE: RECOMMENDED PIPING IS STAINLESS STEEL WITH 10 mm DIAMETER.

Figure 4. Monitor Type 971-E and Regulator Type 971 Connections Scheme

## OPERATION

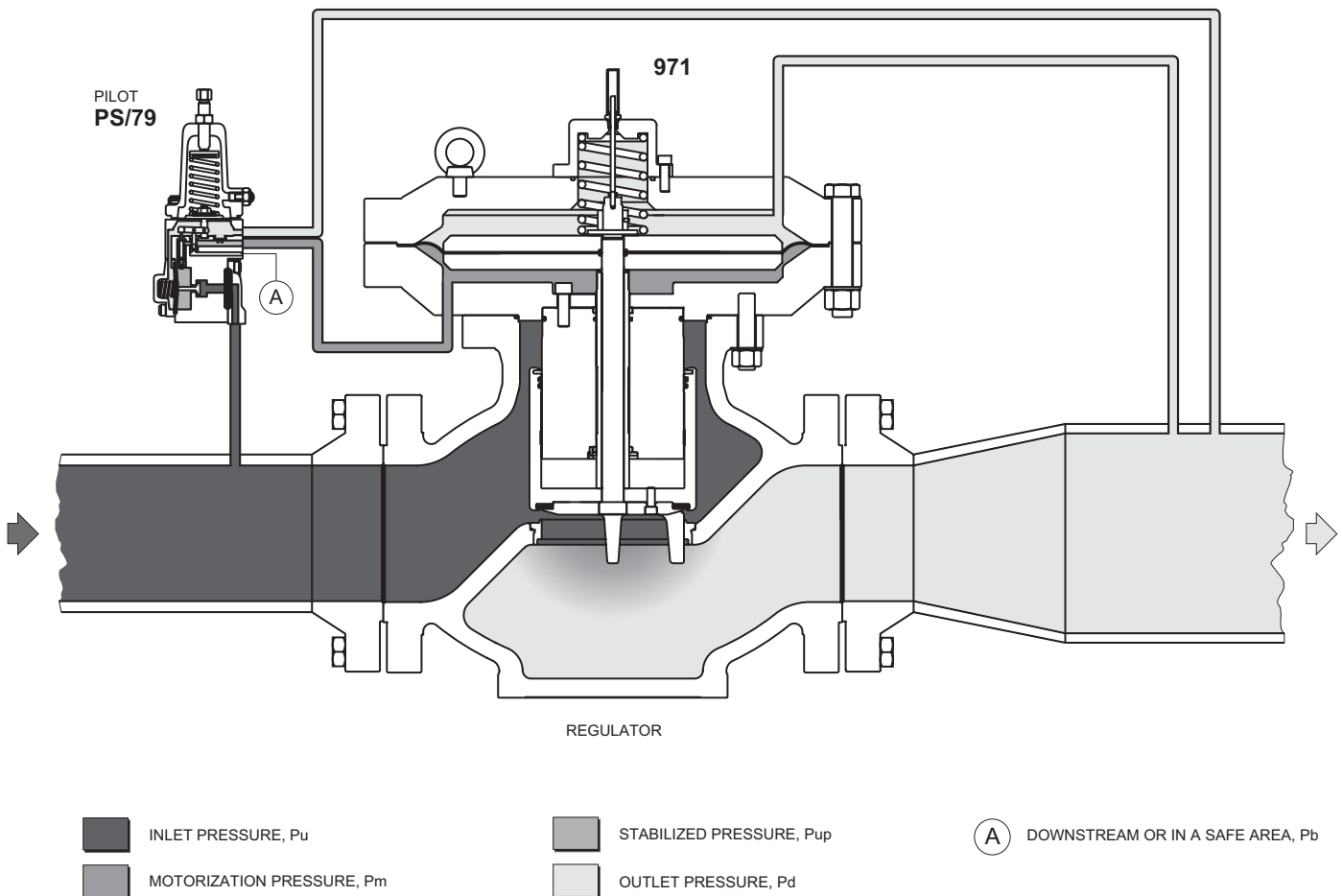


Figure 5. Type 971 Operational Schematic

### Regulator

The Diaphragm Unit (permanently connected to the shutter) divides the regulator control head into two chambers.

One of the chambers is connected to regulated pressure ( $P_d$ ), and the other to motorization pressure ( $P_m$ ) produced by the pilot according to pressure downstream.

Due to underpressure, the regulator spring acts on the diaphragm unit and closes the shutter.

The shutter moves to an open position when the force produced by motorization pressure ( $P_m$ ) acting on the diaphragm unit becomes greater than the force produced by downstream regulated pressure ( $P_d$ ) added to the load of the regulator spring. The shutter stays idle when the two forces are equal, under these conditions, downstream pressure is equal to the system's set value.

Any change in requested flow-rate produces a variation in downstream regulated pressure and the regulator controlled by the pilot opens or closes to deliver the requested flow-rate while keeping downstream pressure stable.

### Monitor

The Monitor or emergency regulator is used as a safety device in gas pressure reduction systems.

The purpose of this device is to protect the system against possible overpressure, while keeping the reduction line in service.

The monitor controls downstream pressure at the same point as the main regulator and is set a little higher than the latter.

Under normal operation, the monitor is fully open as it detects a pressure value lower than its set value. If, due to any regulator fault, downstream pressure increases, when it exceeds the tolerated level, the monitor comes into operation and adjusts pressure to its own set value.

## INSTALLATION

- Ensure that the data found on the regulator plate are compatible with usage requirements.
- Ensure that the regulator is mounted in accordance with the direction of flow indicated by the arrow.
- Make the connections as indicated in figure 4.



### WARNING

Only qualified personnel should install or service a regulator.

Regulators should be installed, operated, and maintained in accordance with international and applicable codes and regulations.

If the regulator vents fluid or a leak develops in the system, it indicates that servicing is required.

Failure to take the regulator out of service immediately may create a hazardous condition.

Personal injury, equipment damage, or leakage due to escaping fluid 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 “Characteristics” section, or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding limits.

Additionally, physical damage to the regulator could result in personal injury and property damage due to escaping fluid.

To avoid such injury and damage, install the regulator in a safe location.

Before installation, check if service conditions are consistent with usage limitations and if pilot set-up or possible built-in safety slam-shut device, is in accordance with service conditions of protected equipment.

All means for venting must be provided in assemblies where the pressure equipment is installed (ENs 12186 and 12279).

All means for draining must be provided for any equipment installed before regulators and slam-shut devices (ENs 12186 and 12279).

According to EN 12186 and 12279, where this product is used:

- Provide a cathodic protection and electrical isolation to avoid any corrosion;
- In accordance with clause 7.3/7.2 of aforesaid standards, the gas shall be cleaned by proper filters / separators / scrubbers to avoid any technical and reasonable hazard of erosion or abrasion for pressure containing parts.

All pressure equipment should be installed in a non-seismic area and should not undergo fire and thunderbolt action.

All pipelines should be cleaned before installation of the regulator and checked that the regulator has not been damaged or contains foreign material after shipment.

Use suitable line gaskets and approved piping and bolting practices.

Install the regulator in a horizontal position, and check that flow through the body is in the direction indicated by the arrow on the body.

Installation must be performed avoiding to create pressure force on the body and using suitable joint means according to equipment dimensions and service conditions.

The user should check and carry out any protection suitable for assembly’s specific environment.

**Note:** It is important that the regulator be installed so that the vent hole in the spring case is unobstructed at all times.

For outdoor installations, the regulator should be located away from vehicular traffic and positioned so that water, ice, and other foreign materials cannot enter the spring case through the vent.

Avoid placing the regulator beneath eaves or downspouts, and be sure it is above the probable snow level.

## STARTUP

The regulator is factory set at approximately the midpoint of the spring range or the pressure requested, so an initial adjustment may be required to obtain desired results.

With proper installation completed and relief valves properly adjusted, slowly open the upstream and downstream line valves.

- a. Let the filtered, and if necessary preheated, gas reach the regulator.
- b. Slightly open the On-Off valve located downstream.
- c. Open the On-Off valve located upstream just slightly and very slowly.
- d. Wait until the downstream pressure is stabilized.
- e. Finish opening the upstream and downstream valves slowly.

## PILOT ADJUSTMENT

To change the regulator outlet pressure, turn the pilot adjusting screw clockwise to increase pressure or counter clockwise to decrease pressure.

Monitor the outlet pressure with a test gauge during the adjustment.

## SHUTDOWN



### WARNING

**To avoid personal injury resulting from sudden release of pressure, isolate the regulator from all pressure before attempting disassembly and release trapped pressure from the equipment and pressure line.**

**In case of disassembly of main pressure retaining parts for checks and maintenance procedures, external and internal tightness tests have to be done according to applicable codes.**

## PERIODICAL CHECKS



### CAUTION

**It is recommended that checks be made periodically on the efficiency of the regulator and pilots.**

Slowly close the On-Off valve located downstream and check the pressure in the line section between the regulator and the valve.

Some increase in the downstream pressure should be observed, due to overpressure closure.

The pressure will then stabilize.

If a steady increase in the downstream pressure occurs, this is a clear sign that the unit is not tightshut.

Check whether the leakage is due to the regulator or the pilot and then proceed with maintenance as required.

## REGULATOR MAINTENANCE (SEE FIGURE 6)



### WARNING

**All maintenance procedures must be carried out only by qualified personnel.**

**If necessary, contact our technical support representatives or our authorized dealers.**

The regulator and its pressure accessories are subject to normal wear and must be inspected periodically and replaced if necessary.

The frequency of inspection/checks and replacement depends upon the severity of service conditions and according to applicable National or Industry codes, standards and regulations/recommendations.

In accordance with applicable National or Industry codes, standards and regulations/recommendations, all hazards covered by specific tests after final assembling before applying the CE marking, shall be covered also after every subsequent reassembly at installation site, in order to ensure that the equipment will be safe throughout its intended life.

Before proceeding with any maintenance work, shutoff the gas upstream and downstream from the regulator, also ensure that there is no gas under pressure inside the body by loosening the upstream and downstream connections.

Upon completion, check for leaks using suds.

## Replacing Pad

- a. Remove all connections holding down the covers and unscrew. Mark the position of the covers and valve body.
- b. Remove the nuts (key 40) and lift the cover assembly straight up using the eyebolts (key 13) and place it on adequate supports.
- c. Remove the screws (key 34), remove the pad retainer (key 35), and replace the pad (key 30).
- d. Check the seat (key 32) mounted inside of the body, if worn or scored, use appropriate wrench to unscrew and replace. Check the O-ring (key 31) if worn replace it.
- e. Reassemble by reversing the above steps, taking care not to damage the O-ring (key 21).

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## General Maintenance

- a. Remove all connections holding down the covers and unscrew. Mark the position of the covers and valve body.
- b. Remove the nuts (key 40) and lift the cover assembly straight up using the eyebolts (key 13) and place it on adequate supports.
- c. Remove the screws (key 34), remove the pad retainer (key 35), and replace the pad (key 30).
- d. Check the seat (key 32) mounted inside of the body, if worn or scored, use appropriate wrench to unscrew and replace. Check the O-ring (key 31) if worn replace it.
- e. Remove the screws (key 46), lift the upper cover (key 17) using the eyebolts (key 13) and remove the spring (key 52).
- f. Dismount from the upper cover the indicator's connection (key 4) and replace the O-ring (key 1 and 5).
- g. For 971 type: remove the screws (key 53), remove the cap (key 54) and replace the O-ring (key 8).
- For 971-E type: remove the screws (key 53), remove the cap (key 57), the bush (key 55) and replace the O-ring (key 8,56 and 60).
- h. Remove the screw (key 10) and remove the gasket (key 11). For 971-E type only: unscrew the piston (key 59). Lock the stem (key 36) by inserting wrench into the proper grooves and unscrew nut (key 51).
- i. Remove the pad holder (key 27), the stem (key 36) and the spacer (key 37). Replace the O-ring (key 20 and 26).
- j. Remove the plates (key 15 and 19) and replace the diaphragm (key 16) and the O-ring (key 14).
- k. Remove the screws (key 45), dismount the stem guide (key 25) and replace the O-ring (key 21, 22 and 24).

## Reassembling

Lubricate all seals with "MOLYKOTE 55 M" and be very careful not to damage them when reassembling.

Reassemble by reversing the above steps.

As you proceed, make sure that parts move freely and without friction.

In addition:

- a. Carefully reassemble and making sure not to damage seat seal surface (key 32).
- b. Tighten all screws uniformly to ensure proper sealing.
- c. Reconnect the impulse lines

## PILOTS MAINTENANCE

### TYPE PRX/120, PRX/125, PRX-AP/120 AND PRX-AP/125 PILOTS (SEE FIGURE 7)

#### Installation

- a. Make sure that specifications on the pilot label comply with the intended use.
- b. Make sure that all connections are correctly made.

#### Startup

Refer to the regulator startup instructions.

#### Adjustment

Adjusting response stability and rapidity is achieved by means of the appropriate adjusting screws, R (restrictor) and D (damper).

The register D is normally completely unscrewed; by screwing the register, the response of the regulator can be slowed down.

The register R is normally completely screwed; in case of hunting of the set pressure, we suggest unscrewing slowly the register until pressure steadiness is reached.

By unscrewing the register, the set pressure decreases; intervene on register screw (key 1) in order to re-establish the correct pressure.



## CAUTION

**If register R is completely unscrewed, the regulator can not deliver the maximum requested capacity.**

**In order to better assess the effects of adjustments, it is advisable to turn the adjusting screws only one fourth of a turn at a time and to verify the new conditions before carrying out the further rotation.**

## Periodical Checks

### Gas-tightness Test

When starting up the regulator, and at regular intervals, check gas tightness as follows:

- a. Slowly close downstream cut-off valve.



- b. In order to avoid excessive lock-up pressures, close the valve and simultaneously open the outlet vent tap. In case of safety slam-shut device being fitted, keep this valve manually open in order to prevent it from tripping.
- c. Slowly close the vent tap and read the lock-up pressure value. An increase in outlet pressure will initially be detected, after which pressure will stabilize. If, on the contrary, outlet pressure continues increasing, then the seal is defective. Check if leak is ascribable to pilot or regulator.

## Checking Pilot Gas Tightness

- a. Link up together connection A, connection B, a vent tap and a pressure gauge with appropriate scale.
- b. Close connection L.
- c. Slightly open vent tap, feed either gas or compressed air to the pilot through connection S. Pressure gauge will show the pilot set pressure.
- d. Close vent tap and read the lock-up pressure value, which should be less than 0.4 bar. If this value is higher than 0.4 bar, pilot pad or seal seat are worn out or damaged.
- e. Use soapy water to check there are no gas leaks.

## Maintenance



### CAUTION

**Maintenance should be carried out by skilled personnel to ensure good servicing results. Contact our technical support representatives or our authorized dealers for any information.**

**Let gas under pressure flow out of the relevant part of the system before servicing.**

## General Maintenance

- a. Disconnect and remove the pilot from the line.
- b. Fully unscrew the adjusting screw (key 1).
- c. Unscrew the cap (key 3), remove the spring holder (key 6) and the spring (key 7). Replace the O-rings (key 4 and 5).
- d. Loosen screws (key 10), remove the upper cover (key 8) and the lower cover (key 21). Replace the O-ring (key 18).

- e. Lock the stem (key 23) by inserting a key into the notches and unscrew nuts (key 20 and 26).
- f. Disassemble the parts and replace the diaphragm (key 14) and the pad (key 22).
- g. Unscrew the seat (key 19) and replace the O-ring (key 17).
- h. Use petrol to cleanse the pilot body and all metal parts. Blow them thoroughly with compressed air and check for clear holes along the gas conduits. Replace any worn parts.

## Reassembly

Reassemble all parts by following in reverse order the assembly as described above (see General Maintenance section).

As parts are assembled, make sure they move freely causing no friction.

Make sure to:

- a. O-rings and diaphragms should be lubricated by applying a thin layer of 'Molykote 55 M' grease.  
  
Pay attention not to damage them during reassembly. All other pilot parts require no lubrication.
- b. The cover clamping screws (key 10) should be tightened evenly to ensure proper tightness.
- c. Pilot operation, calibration and tightness should be tested as described in the Gas-tightness test section.
- d. Previously disassembled fittings must be connected. Check for leaks by using suds.

## Calibration

See the paragraph Pilot Adjustment on page 7.

## TYPE PRX/131 BOOSTER VALVE (SEE FIGURE 8)

### Installation

Identical to Type PRX/120, PRX/125 series (see page 8).

### Startup

Identical to Type PRX/120, PRX/125 series (see page 8).

### Periodical Checks

Pilot tightness should be tested regularly by referring to the following procedure:

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- a. Supply fitting A with normal operating pressure.
- b. Make sure there is no gas outflow from fitting B.

## Maintenance

Identical to Type PRX/120, PRX/125 series (see page 9).

## Calibration

Identical to Type PRX/120, PRX/125 series (see page 9).

## TYPE PS/79, RE/79, PS/80 AND RE/80 PILOTS (SEE FIGURE 9)

### Installation

- a. Make sure that data on the pilot's label are compatible with actual working conditions.
- b. Install as directed for regulator.

### Startup

Refer to the startup instructions applying to the regulator.

### Periodical Checks

Slowly close the outlet slam-shut and check line pressure between it and regulator.

A slight increase in pressure should be detected: this results from overload due to closing, and is followed by pressure stabilization. If, however, outlet pressure continues to rise, then seal is defective. Check if leak is coming from regulator or pilot, and service.

## Maintenance



### CAUTION

**Servicing should be carried out by qualified, skilled personnel only. For further information, please contact our Technical Support Representatives or our authorized dealers.**

**Let gas under pressure flow out of the relevant part of the system before servicing.**

### Replacing Filter

- a. Remove the screws (key 41), cover (key 59) and replace felt (key 61).

Reassemble by reversing the above sequence.

### Replacing Stabilizer Diaphragm and Seal Pad

- a. Remove screws (key 41), cover (key 64), spring (key 47) and diaphragm assembly (key 48, 49, 50, 51, 52, and 53). Replace diaphragm if necessary.
- b. Unscrew seat (key 54) and replace pad holder (key 56).
- c. Reassemble by reversing the above sequence, make sure not to "pinch" O-rings (key 55).

### Replacing Valve Seal Pads

- a. Remove plug (key 27) and seat (key 30). Slide out spring (key 32), pad holder unit (key 34) and forked stem (key 35).
- b. Replace pad holder (key 34) and O-ring (key 37).

Reassemble by reversing above sequence.

### General Maintenance

- a. Completely release spring (key 5) by turning the adjusting screw (key 1) counter clockwise.
- b. Remove screws (key 7) and cover (key 4).
- c. Keep plate (key 9 or 75 for the AP version) blocked with a box wrench, unscrew nut (key 6). This must be done exactly as described to prevent damage to or breaking of safety valve (key 20).
- d. Unscrew plate (key 9 or 75 for the AP version) from stem (key 13) remove parts (key 10, 11, and 12 or 76, 78, 10, 77 and 12 for the AP version).

For PS/80 and PS/80-AP version:

Unscrew plate (key 9 or 75 for the AP version) from stem (key 13) remove parts (key 10, 68, 69, 11, and 12 or 76, 78, 68, 69, 10, 77 and 12 for the AP version).

- e. Slide off split pin (key 40). Remove locknut (key 16) with appropriate wrench and slide out parts (key 17, 18, 19 and 20).
- f. Make sure that the surface of seat (key 26) which is sealed by pad (key 21) is in proper condition.
- g. Replace diaphragms (key 10) and all seals.
- h. Proceed as directed in the replacement of filter, stabilizer diaphragm and seal pad, and valve seal pads (see instructions above).

### Reassembly

Lubricate the static O-rings with a thin layer of Molykote 55 M, be very careful not to damage the O-rings when

reassembling. No other pilot parts are to be lubricated.

Reassemble parts by reversing the above steps. As you proceed, make sure that parts move freely and without friction.

In addition:

- a. Once lever (key 39) and stem (key 13) have been mounted with stem (key 13) against body (key 25), check that a clearance between forked stem (key 35) and register (A) of lever (key 39) is 0.2 to 0.3 mm. If this is not the case, use register to correct.



## CAUTION

**The above clearance can be checked by gently pulling stem (key 13) upward.**

**Use the proper tool to make sure that the top plate (key 9) is on the same plane as the supporting the diaphragm (key 10) in the body (key 25).**

- b. Mount diaphragm (key 10) and screw on plate (key 9), first by hand then with box wrench, (always holding upper diaphragm (key 10) firmly in place) in order to avoid damage to stem (key 13) and levers below.
- c. Holding plate (key 9) firmly in place with box wrench, tighten nut (key 6).
- d. Before remounting cover (key 4), center diaphragm as follows:
  - mark a reference point (with pencil) on the diaphragm;
  - turn it to the right without forcing and mark another reference on body
  - turn diaphragm to the left and mark a further reference
  - position the diaphragm mark midway between the two marks on the body.
- e. Tighten all screws uniformly to ensure proper sealing.

## Calibration

See the paragraph Pilot Adjustment on page 10.



## CAUTION

**The pilot has a wide range of self-adjustment values. However, given actual operating conditions, it may necessary to assist it at**

**times by finding the best setting of register/ pin screw (key 29) or the most suitable calibration jet (key 15).**

## TYPE SA/2 STABILIZER FILTER MAINTENANCE (SEE FIGURE 10)

### Maintenance

#### Replacing Filter

- a. Remove screws (key 2), cover (key 11); replace felt (key 12) and O-ring (key 13). Reassemble in reverse order the above sequence.

#### Replacing Stabilizer Diaphragm and Seal Pad

- a. Remove cover (key 19); spring (key 1) and diaphragm assembly (key 21, 20, 3, 4, 18, and 17). Replace diaphragm if necessary.
- b. Unscrew seat (key 5), replace pad holder (key 15) and O-ring (key 6).
- c. Reassemble in reverse order the above sequence.

## SPARE PARTS

Spare parts storage shall be done by proper procedures according to national standard/rules to avoid over aging or any damage.

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## TROUBLESHOOTING

**Table 5. General Troubleshooting for 971 Type Regulators**

SYMPTOMS	CAUSE	ACTIONS
The regulator does not open	Lack of incoming gas	Check the station feeding
	Pilot is not being supplied	Check pilot connections
	Regulator diaphragm is broken	To be replaced
Drop in pressure downstream from the regulator	Insufficient upstream pressure	Check the station feeding
	Flow requirements higher than the flow that the regulator can supply	Check the regulator sizing
	Faulty supply to or leakage from the pilot	Check pilot connections and internal parts
	Filter upstream is obstructed	Clean or replace it
Increase in pressure downstream from the regulator	Tight shutoff gaskets are worn	To be replaced
	Deposits of grime on the tight shutoff pad are obstructing proper positioning of the shutter	Clean or replace it
Regulator hunting	Control intakes in incorrect positions	Check connections position
	Very low flow demand	Check the pilots setting and tuning
	Pilot supply and discharge valves are not adjusted perfectly	Check supply and discharge valves opening position
Freezing occurs	Heating insufficient or lacking	Increase gas heating temperature or dry the gas

**Table 6. Troubleshooting for Type PS/79, RE/79, PS/80, and RE/80 Pilots**

SYMPTOMS	CAUSE	ACTIONS
Desired set point is not reached	Calibration spring (key 5) is too weak	Check the springs catalogue and replace it with a stronger one
	Leaks from pilot connections	Check pilot feed connections and proper gas flow feeding
Outlet pressure drops well below set point	Filter (key 61) is clogged preventing proper through-flow of gas	Clean or replace it
	Pad holder (key 56) is swollen preventing proper feed flow	To be replaced
	Pad holder (key 34) is swollen preventing proper feed flow	To be replaced
Outlet pressure increases over set point	Faulty sealing of pad holder (key 56)	To be replaced
	Faulty sealing of pad holder (key 34)	To be replaced
Slow response to changes in gas demand	Insufficient flow rate of valve seat (key 30)	Increase flow by means of register/pin screw (key 29)
	Over-large calibration jet (key 15) (only for types PS/79 and PS/80)	To be replaced with a smaller one
Over rapid response to changes in gas demand, i.e. Hunting	Excessive flow rate of valve seat (key 30)	Reduce flow by means of a pin screw (key 29)
	Calibration jet (key 15) is too small (only for types PS/79 and PS/80)	To be replaced with a larger one
	Not proper internal parts assembly	Check clearance between lever (key 39) and forked stem (key 35)
Gas continually escaping from relief (S)	Defective seal of pad (key 21)	To be replaced
The outlet pressure is not within the usual values	Diaphragm (key 10) are damaged	Replace diaphragm
	Upper diaphragm (key 10) is damaged (only for types PS/80 and RE/80)	Replace diaphragm

## PARTS LISTS

### REGULATOR (SEE FIGURE 6)

Key	Description
1*	O-ring
2	Sheath
3	Label
4	Connection
5*	O-ring
6	Washer
7	Indicator
8*	O-ring
9	Nut
10	Screw
11	Gasket
12	Washer
13	Eyebolt
14*	O-ring
15	Plate
16*	Diaphragm
17	Upper cover
18	Lower cover
19	Plate
20*	O-ring
21*	O-ring
22*	O-ring
23	Bush
24*	O-ring
25	Stem guide
26*	O-ring
27	Pad holder
28	Bush
29	Ring
30*	Pad
31*	O-ring
32	Seat
33	Body
34	Screw
35	Pad retainer
36	Stem
37	Spacer
38	Screw
39	Stud bolt
40	Nut
41	Washer
42	Connection
43	Nut
44	Washer
45	Screw
46	Screw
47	Connection
50	Label
51	Nut
52	Spring
53	Screw

Key	Description
54	Cap
55	Bush
56*	O-ring
57	Cap
58	Indicator
59	Piston
60*	O-ring
61	Screw
63	Silenced seat unit
64	Screw
65	Plug
74	Elastic pin
75	Pilot bracket
100	Indicator
101	Washer
102*	O-ring
103	Connection
104	Nut
105	Ratchet
106	Spring
107	Transducer
108	Bracket
109*	O-ring
200	Washer
201*	O-ring
202*	O-ring
203	Connection
204	Bracket
205	Nut
206	Disk
207	Support
208	Connection
209	Proximity
210	Screw
211	Indicator

### TYPE PRX/120, PRX/125, PRX-AP/120 AND PRX-AP/125 PILOTS (SEE FIGURE 7)

Key	Description
1	Adjusting screw
2	Nut
3	Cap
4*	O-ring
5*	O-ring
6	Spring carrier plate
7	Spring
8	Upper cover
9	Spring carrier plate
10	Screw
11	Washer
12	Filter
13	Plate

Key	Description
14*	Diaphragm
15	Plate
16	Body
17*	O-ring
18*	O-ring
19	Seat
20	Nut
21	Lower cover
22*	Pad holder unit
23	Stem
24	Plate
25*	O-ring
26	Nut
27	Adjusting screw
28*	O-ring
29	Plate
30	Ring nut
31	Screw
32	Adjusting screw with hole
33	Plug
34	Plug
35	Spring barrel extension for AP

### TYPE PRX/131 BOOSTER VALVE (SEE FIGURE 8)

Key	Description
1	Adjusting screw
2	Nut
3	Cap
4*	O-ring
5*	O-ring
6	Spring carrier plate
7	Spring
8	Upper cover
9	Spring carrier plate
10	Screw
11	Washer
12	Filter
13	Plate
14*	Diaphragm
15	Plate
16	Body
17*	O-ring
18*	O-ring
19	Seat
20	Nut
21	Lower cover
22*	Pad holder unit
23	Stem
24	Plate
25*	O-ring
26	Nut
28*	O-ring
29	Plate
31	Screw
33	Plug
34	Plug

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## TYPE PS/79, RE/79, PS/80 AND RE/80 PILOTS (SEE FIGURE 9)

Key	Description
1	Adjusting screw
2	Nut
3	Spring holder
4	Cover
5	Spring
6	Nut
7	Screw
8	Washer
9	Plate
10*	Diaphragm
11	Plate
12*	O-ring
13	Stem
14*	O-ring
15*	Jet
16	Locking nut
17*	"GACO" Ring
18	Thrust bearing
19	Spring
20	Safety valve
21*	Pad
22*	O-ring
23*	O-ring
24	Plug
25	Body
26	Seat
27	Plug
28*	O-ring
29	Pin screw
30	Seat
31*	O-ring
32	Spring
34*	Pad holder unit
35	Forked stem
36	Spacer
37*	O-ring
38*	O-ring
39	Lever unit
40	Split pin
41	Screw
42	Washer
43	Seeger
44	Data plate
45	Silencer
46	Pin
47	Spring
48	Autolocking nut

Key	Description
49	Washer
50	Washer
51	Plate
52*	Diaphragm
53	Screw unit
54	Seat
55*	O-ring
56*	Pad holder unit
57	Spring
58*	O-ring
59	Filter cover
60	Filter net
61*	Felt
62*	O-ring
63	Pawl
64	Cover
65	Plug

### Type PS/80 only

Key	Description
66	Elbow Fitting
67	Screw
68	Middle flange
69	Hub

### Type RE/79, RE/80, REO/79 and REO/80 only

Key	Description
15	Plug

### Type PS/79-D and PS/80-D only

Key	Description
70	Extension
71*	O-ring
72	Seeger
73*	O-ring

### Type PS/79-AP and PS/80-AP only

Key	Description
75	Plate
76	Spacer
77	Plate
78*	O-ring
79	Spring holder

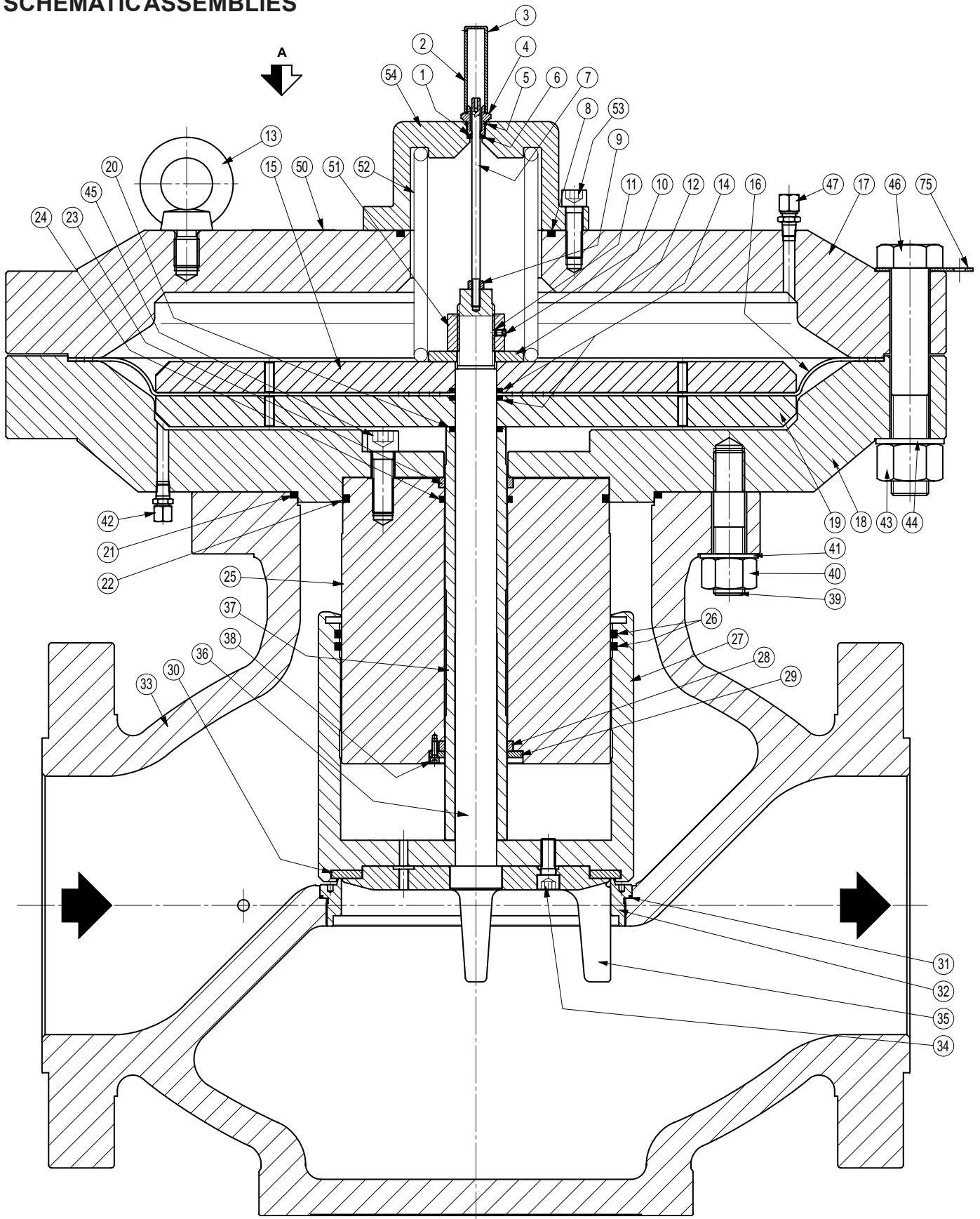
## TYPE SA/2 STABILIZER FILTER (SEE FIGURE 10)

Key	Description
1	Spring
2	Screw
3	Washer
4	Plate
5	Seat
6*	O-ring
7	Body
8	Net
9	Washer
10	Nut
11	Filter cover
12*	Felt
13*	O-ring
14	Spring
15	Pad holder unit
16	Data plate
17	Screw plate unit
18*	Diaphragm
19	Upper cover
20	Washer
21	Nut

Rubber parts marked with (\*) are supplied in the "spare parts kit", recommended as stock.

To order the kit it is necessary to communicate to us the type of the regulator or pilot and its serial number.

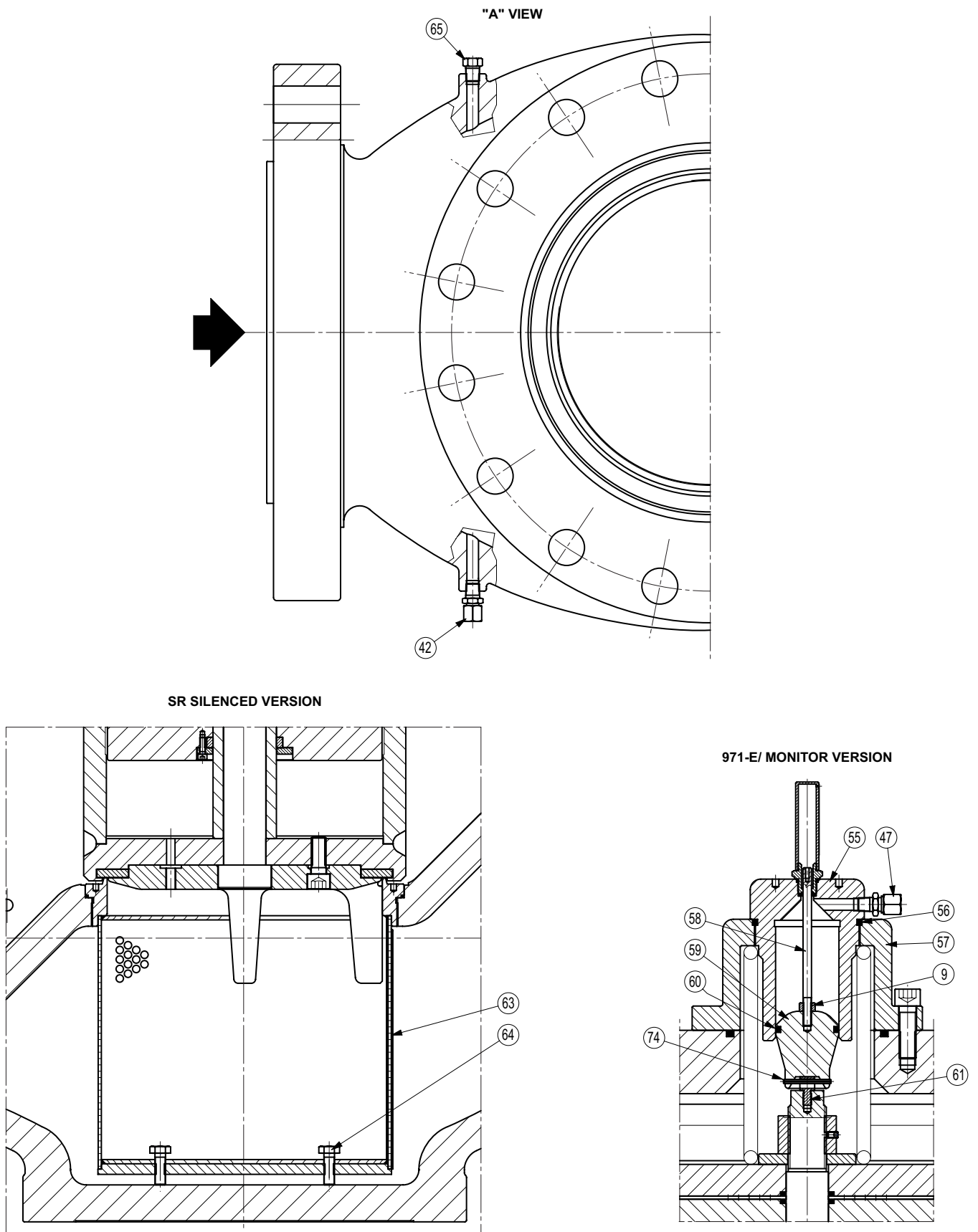
**SCHEMATIC ASSEMBLIES**



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Figure 6. Type 971 Regulator Assembly

# Type 971

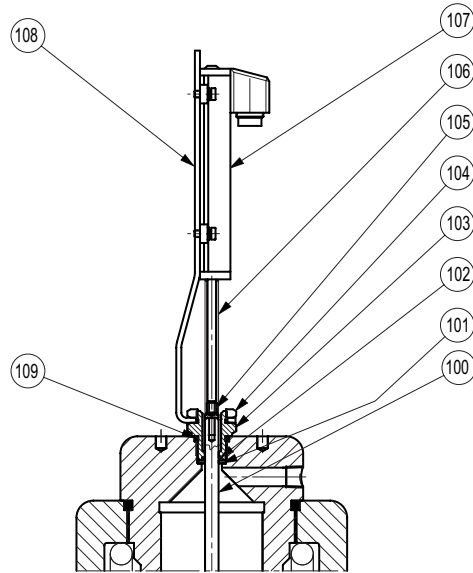


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Figure 6. Type 971 Regulator Assembly (continued)



## TRANSDUCER DETAIL



## PROXIMITY SWITCH DETAIL

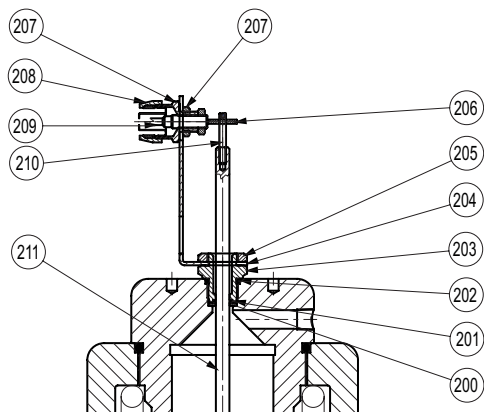
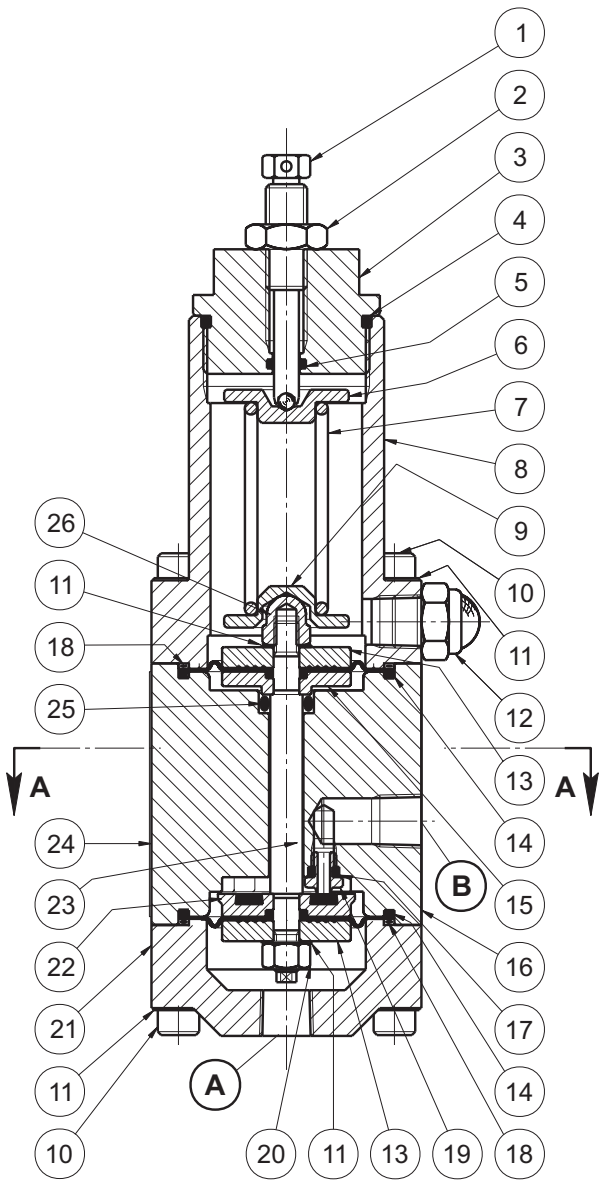
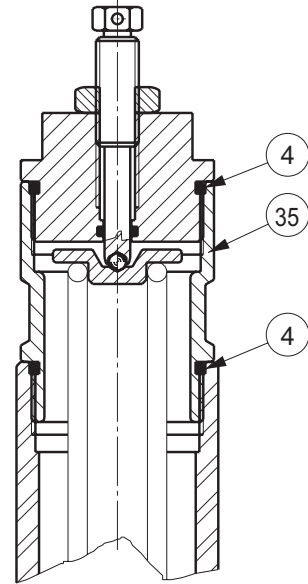


Figure 6. Type 971 Regulator Assembly (continued)

# Type 971



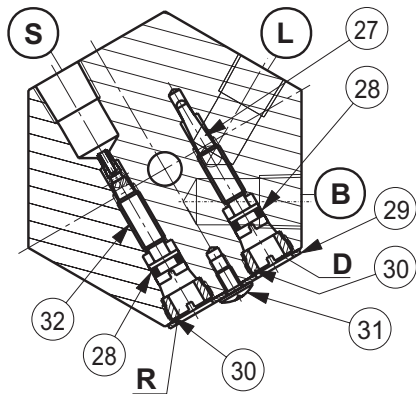
TYPE PRX/120 AND PRX/125



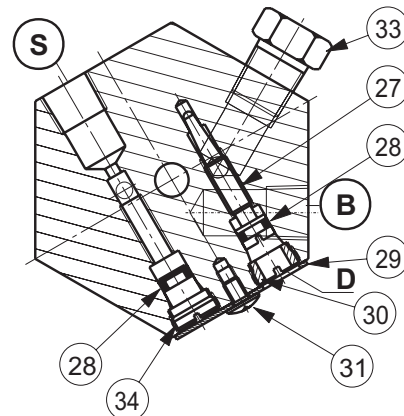
AP VERSION

Table 7. PRX/120 Connections

CODE	BOOT TRIM	TUBE AND HARD TRIM
A	Downstream impulse	Downstream impulse
B	Outlet discharge	Pilot feed
S	Pilot feed	Outlet discharge
L	To regulator loading pressure chamber	To regulator loading pressure chamber



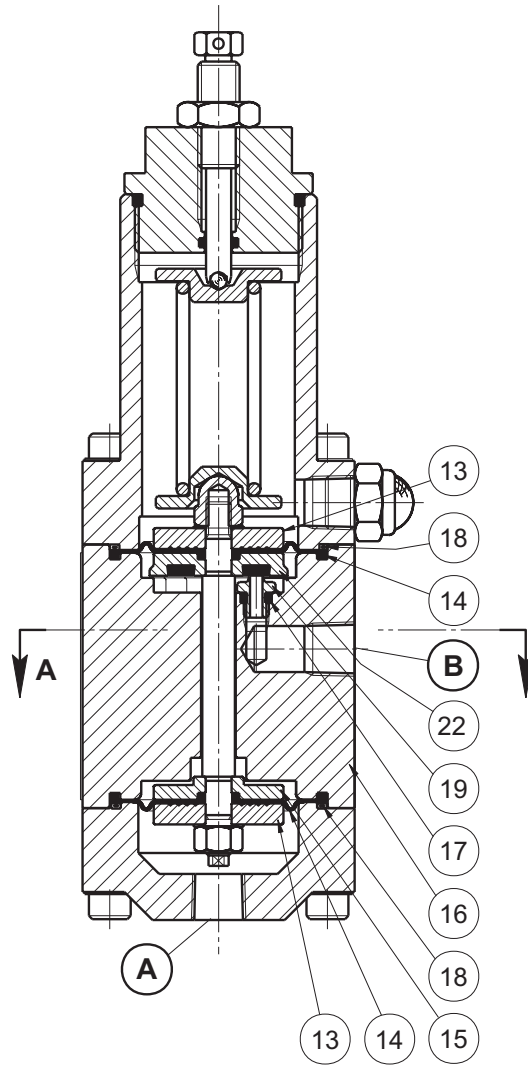
TYPE PRX/120 VERSION - SECTION A-A



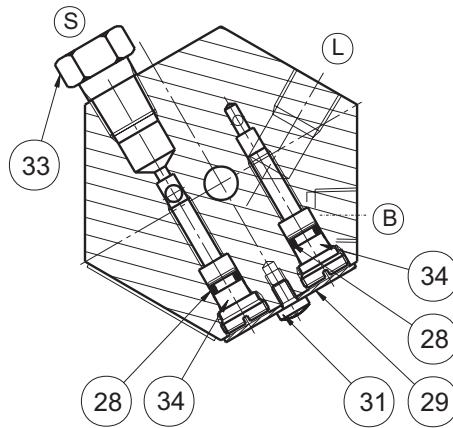
TYPE PRX/125 VERSION - SECTION A-A

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Figure 7. Type PRX/120 and PRX/125 Pilots Assemblies



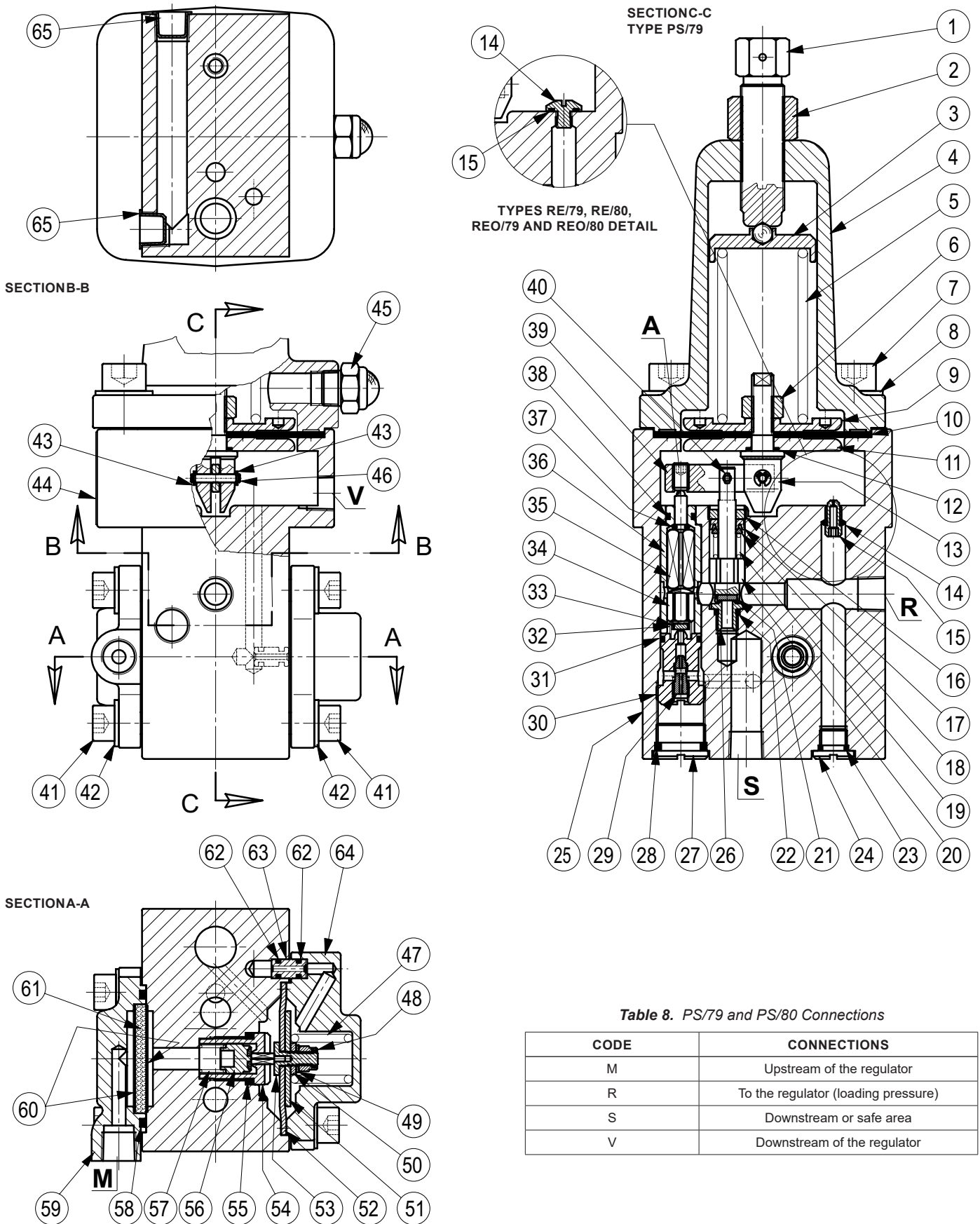
TYPEPRX/131



SECTION A-A

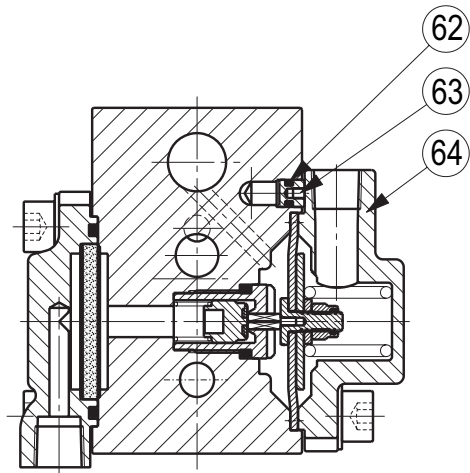
Figure 8. Type PRX/131 Pilot Assembly

# Type 971

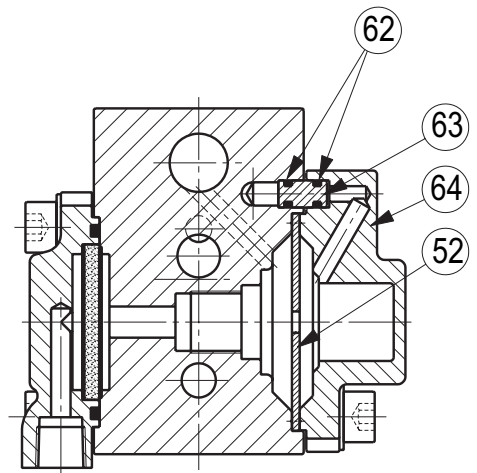


LM/1346

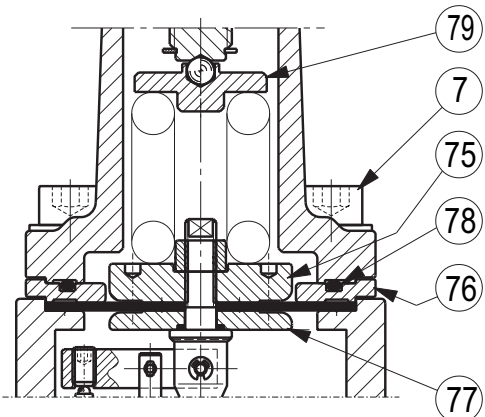
Figure 9. Type PS/79, PS/80, RE/79, and RE/80 Pilots Assemblies



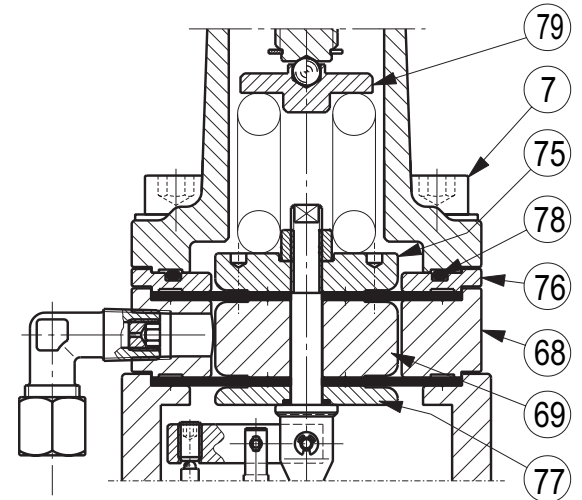
TYPES REO/79 AND REO/80



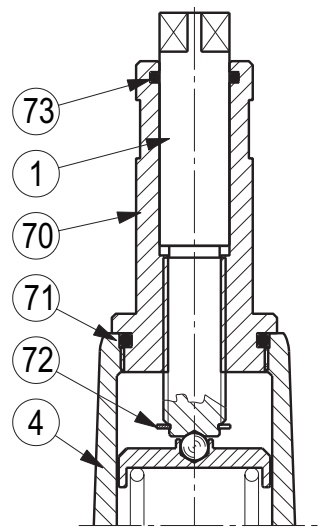
TYPES PSO/79 AND PSO/80



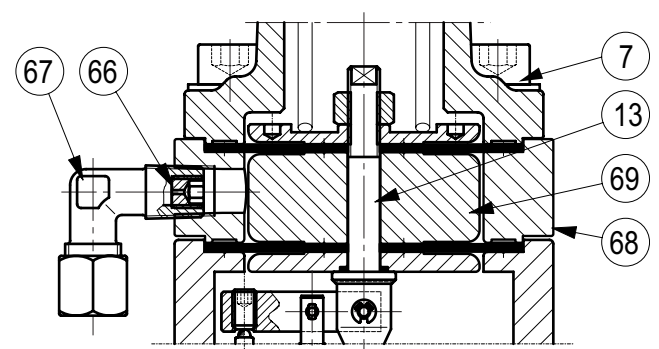
TYPE PS/79-AP



TYPE PS/80-AP



TYPES PS/79-D AND PS/80-D

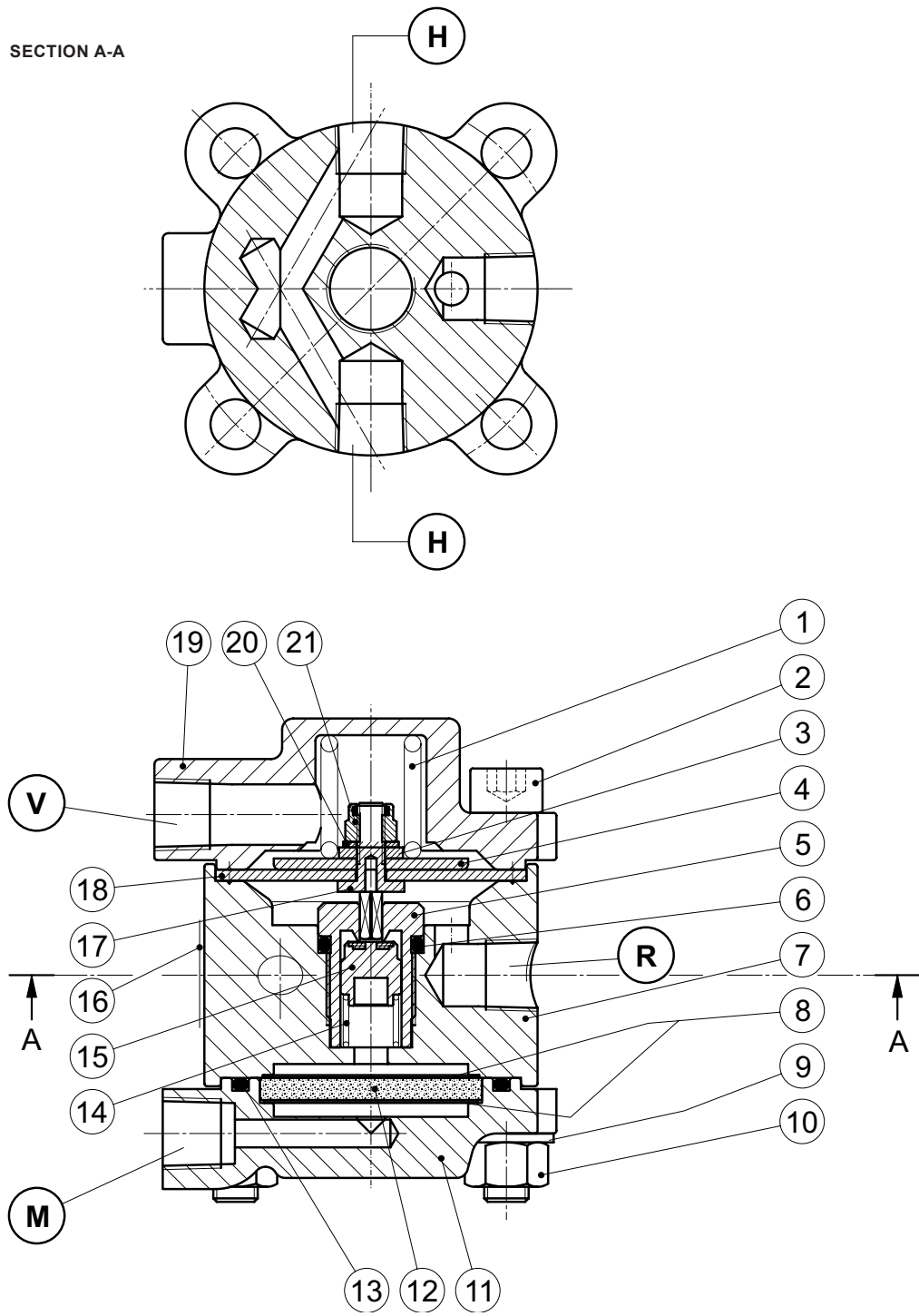


TYPE PS/80

LM/1346

Figure 9. Type PS/79, PS/80, RE/79, and RE/80 Pilots Assemblies (continued)

# Type 971



**Table 9. SA/2 Connections**

CODE	CONNECTIONS
H	Water inlet/outlet
M	Upstream of the regulator
R	To the pilot feed
V	Downstream of the regulator

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**Figure 10. Type SA/2 Stabilizer Filter Assembly**



# Type 971

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