

Installation, Operation, Maintenance Instructions

Pneumatic and Electropneumatic Actuators Series 4, Types 37, 38, 39, 3D and 47, 48, 49, 4D

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1 USING KÄMMER VALVES AND ACTUATORS CORRECTLY

1.1 General

The following instructions are designed to assist in unpacking, installing and performing maintenance as required on Kämmer products. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance.



DANGER: In most cases Kämmer valves and actuators are designed for specific applications (e.g. with regard to medium, pressure, temperature). For this reason they should not be used in other applications without first contacting the manufacturer.

1.2 Terms concerning safety

The safety terms **DANGER**, **WARNING**, **CAUTION** and **NOTE** are used in these instructions to highlight particular dangers and/or to provide additional information on aspects that may not be readily apparent.



DANGER: indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.



WARNING: indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.



CAUTION: indicates that minor personal injury and/

or property damage can occur if proper precautions are not taken.



NOTE: indicates and provides additional technical information, which may not be very obvious even to qualified personnel.

Compliance with other, not particularly emphasised notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g. in the operating instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

1.3 Protective clothing

Kämmer products are often used in problematic applications (e.g. extremely high pressures, dangerous, toxic or corrosive mediums). In particular valves with bellows seals point to such applications. When performing service, inspection or repair operations always ensure, that the valve and actuator are depressurised and that the valve has been cleaned and is free from harmful substances. In such cases pay particular attention to personal protection (protective clothing, gloves, glasses etc.).

1.4 Qualified personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorised by those responsible for the safety of the plant to perform the necessary work and who can recognise and avoid possible dangers.

1.5 Installation



DANGER: Before installation check the order-no, serial-no. and/or the tag-no. to ensure that the valve/ actuator is correct for the intended application.

Do not insulate extensions that are provided for hot or cold services.

Pipelines must be correctly aligned to ensure that the valve is not fitted under tension.

1.6 Spare parts

Use only Kammer original spare parts. Kammer cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufactures. If Kammer products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products. Fire protection for Kammer products must be provided by the end user.

1.7 Service / repair

To avoid possible injury to personnel or damage to products, safety terms must be strictly adhered to. Modifying this product, substituting nonfactory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties. Between actuator and valve there are moving parts. To avoid injury Flowserve provides pinch-point-protection in the form of cover plates, especially where side-mounted positioners are fitted. If these plates are removed for inspection, service or repair special attention is required. After completing work the cover plates must be refitted.

Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognised regulations for safety and good engineering practices must be followed.



WARNING: Before products are returned to Kammer for repair or service Kammer must be provided with a certificate which confirms that the product has been decontaminated and is clean. Kammer will not accept deliveries if a certificate has not been provided (a form can be obtained from Kammer).

1.8 Storage

In most cases Kammer Products are manufactured from stainless steel. Products not manufactured from stainless steel are provided with an epoxy resin coating. This means that Kammer products are well protected from corrosion. Nevertheless, Kammer products must be stored adequately in a clean, dry environment. Plastic caps are fitted to protect the flange faces and to prevent the ingress of foreign materials. These caps should not be removed until the valve is actually mounted into the system.

1.9 Valve and actuator variations

These instructions cannot claim to cover all details of all possible product variations, nor in particular can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personal where the product is being used for is defined purpose. If there are any uncertainties in this respect particularly in the event of missing product-related information, clarification must be obtained via the appropriate FLOWSERVE sales office.

2 UNPACKING

2.1 Each delivery includes a packing slip. When unpacking, check all delivered valves and accessories using this packing slip.

2.2 Larger valves can be lifted using slings on the yoke rods or, if present, on the lugs provided for this purpose. If slings are used, attach them so that the outer tubing or attaching parts are not damaged.



WARNING: If slings are used, be aware that the centre of gravity of the valve may be above the lifting point. In this case, secure or support the valve against rotating, to prevent damage or personnel injury.

2.3 Report transport damage to the carrier immediately.

2.4 In case of discrepancies, contact your nearest FLOWSERVE sales office.

3 INSTALLATION

3.1 Clean tubing prior to installing.

3.2 If possible, install the valve in an upright position (actuator on top), to ease maintenance. An upright installation position is important with low-temperature applications, in order to keep the distance between the packing material and the medium as large as possible. The packing material then retains the ambient temperature as much as possible.



NOTE: Do not insulate extension bonnets that are provided for hot or cold services

3.3 Make sure that sufficient overhead clearance above the actuator is maintained, to allow for disassembly of plug from the valve body (see following table).

Actuator size	Clearance (mm)	Actuator size	Clearance (mm)
37/47	95	P2	140
38/48	140	P3	140
39/49	140	P4	140
39D/49D	140	P5	140

3.4 After installing, check direction of flow again. The direction of flow is shown by the arrow on the housing.

3.5 If the valve is to be welded into the line, make sure that the valve is shielded from excessive heat.

3.6 Connect supply pressure and signal lines. Control valves are supplied with a positioner. The end connections for supply pressure and signal are clearly marked. Series 4 actuators and positioners are suitable for max. 4.2 bar (60 psi) supply pressure. If the supply pressure exceeds the pressure specified on the nameplate, a pressure reducing station is required. If instrument air is not available, install an oil separator/air filter in the air inlet line. All connections must be leak free.

4 QUICK CHECK / MAINTENANCE

4.1 QUICK CHECK

Before operating, check the valve as follows:

- 4.1.1 Open and close the valve, and observe the movement of the actuator stem. The movement must be smooth and linear.
- 4.1.2 Check for maximum stroke through change of signal (for pneumatic positioners, 0.2 - 1.0 bar or corresponding split-range values; for IP positioners, 4-20 or 0-20 mA).
- 4.1.3 Check all air connections for leaks.
- 4.1.4 Tighten packing nut (see table 1).

Thread	Torque	
	PTFE	Grafoil
M20 x 1,5	1	3
M30 x 1,5	6	15
M38 x 1,5	15	35
M45 x 1,5	17	40

Table 1



NOTE: An excessively tightened gland nut can cause excessive packing wear and can hinder the free movement of the plug stem.

- 4.1.5 Check fail-safe position. To do this, close supply pressure and observe whether the valve opens or closes as defined.
- 4.1.6 After use at fluctuating temperatures, re-tighten all bolt connections and check for leaks.

4.2 Maintenance

Check valves for correct functioning at regular intervals (at least once every 6 months) as follows. This check can be made when installed and in many cases without interrupting production. If internal defects are suspected, see section „Disassembly and Assembly of Valve“.

- 4.2.1 Examine gaskets for leaks and if necessary re-tighten bolts (see Fig. 1).
- 4.2.2 Check bellows gasket and test connection - if present - for external leaks.

- 4.2.3 Check valve for damage caused by corrosive residues or corrosive vapours.

- 4.2.4 Clean valves and repaint as necessary.



Warning: To prevent a buildup of electrostatic charge clean the actuator/valve with a damp cloth only.

- 4.2.5 Check gland nut for correct torque (see table 1).



NOTE: An excessively tightened gland nut can cause excessive packing wear and can hinder the free movement of the plug stem.

- 4.2.6 If possible, open and close valve and check for maximum stroke and smooth movement of the plug stem. Irregular movement of the plug stem may indicate internal defects.



NOTE: With graphite packing, irregular movement of the plug stem is normal.



WARNING: Keep hands, hair, clothing, etc. away from all moving parts. Failure to do so can lead to serious injury.

- 4.2.7 Check all accessories for firm seating.

- 4.2.8 If possible, close supply pressure and check the fail-safe position.

- 4.2.9 Check stem boot for wear.

- 4.2.10 Check actuator for leaks. To do this, spray housing, air connections and plug stem guide with leak spray and check for any bubble formation.

- 4.2.11 Clean plug stem.

- 4.2.12 Check air filter, if present, and if necessary replace insert.



Note: For further information regarding service and maintenance please contact your nearest FLOWSERVE office.



DANGER: On actuators with aluminium cases the actuator springs must be renewed with original spare parts every 10 years or after 50.000 operating hours which ever occurs first.

5 Method of operation (actuators with integral Kämmer positioner)

5.1 P/P Actuator

The actuator with integrated pneumatic positioner works on the force balance principal, which ensures that the position of the actuator stem is proportional to the value of the input signal (see figs. 1 and 2).

An increased signal to the double diaphragm assembly creates an unbalanced condition. The pilot valve then moves to cover the vent, increasing the positioner output pressure to the actuator diaphragm until the forces of the positioner spring and the double diaphragm are equal. The positioner output is then stabilized at an amount necessary to maintain the desired valve position.

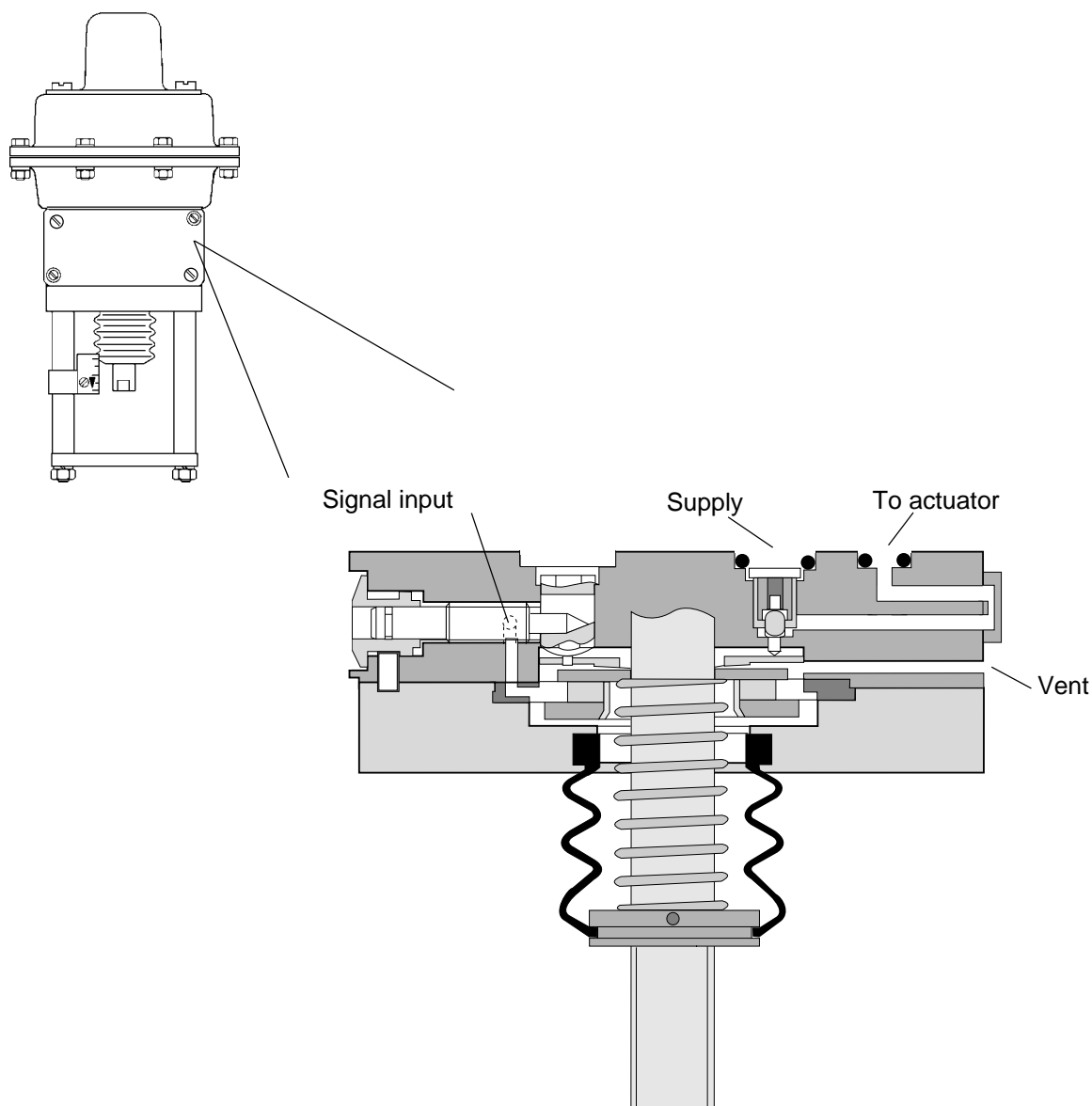


Fig. 1: P/P - Positioner

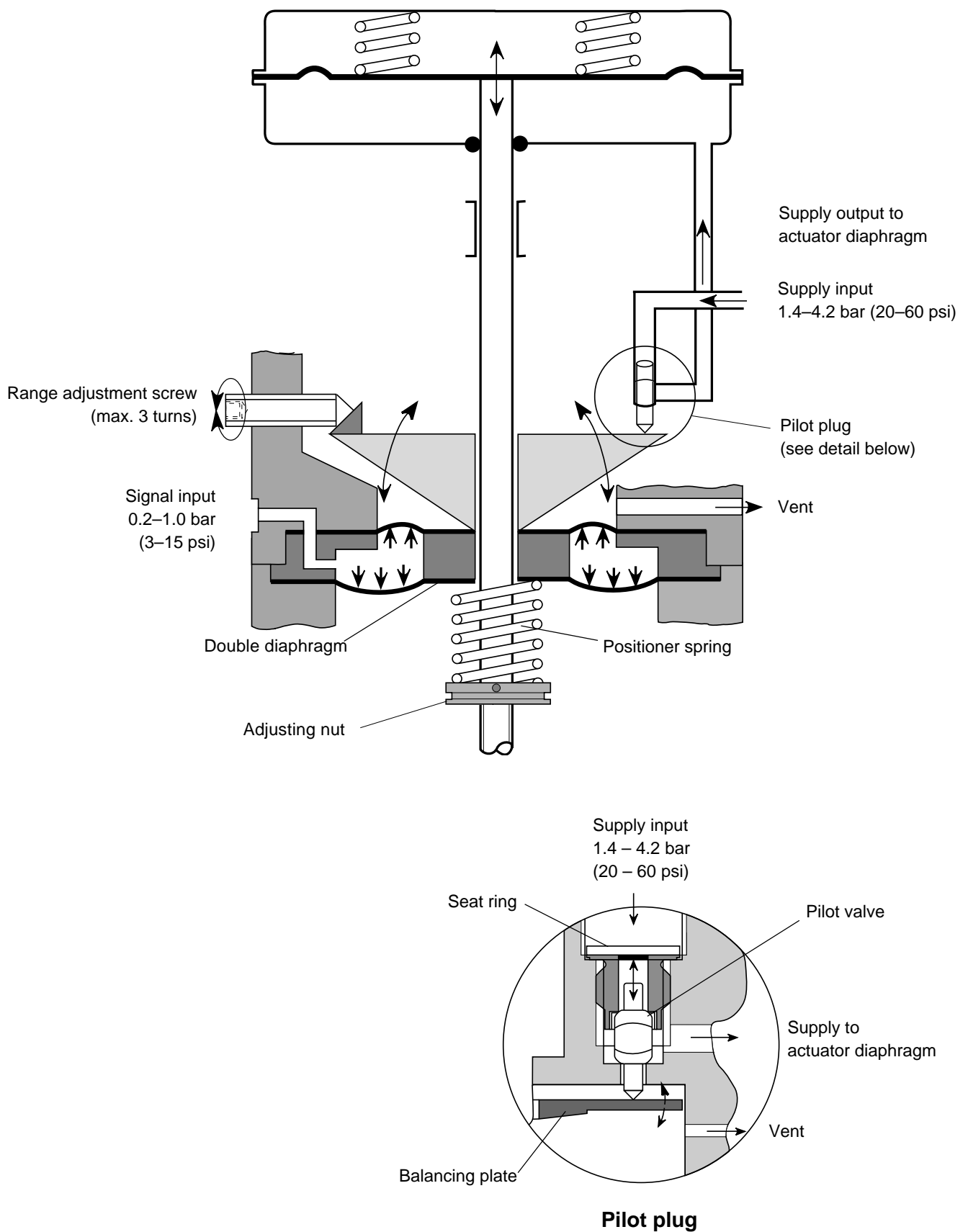


Fig. 2: P/P - Positioner

5.2 I/P Actuator

The I/P transducer, which is an integral part of the actuator, converts the standard electric signal (0/4 – 20 mA) into a standard pneumatic signal (0.2 – 1.0 bar) by means of a system of light weight moving parts. This form of signal conversion is extremely insensitive to shocks. The pneumatic signal is supplied to the integrated pneumatic positioner.

The pneumatic positioner works on the force balance principal, which ensures that the position of the actuator diaphragm is always directly proportional to the value of the instrument input signal pressure (see figs. 3 and 4). An increased signal to the double diaphragm assembly creates an unbalanced condition. The pilot valve then moves to cover the vent, increasing the positioner output pressure to the actuator diaphragm until the forces of the positioner spring and the double diaphragm are equal. The positioner output is then stabilized at an amount necessary to maintain the desired valve position.

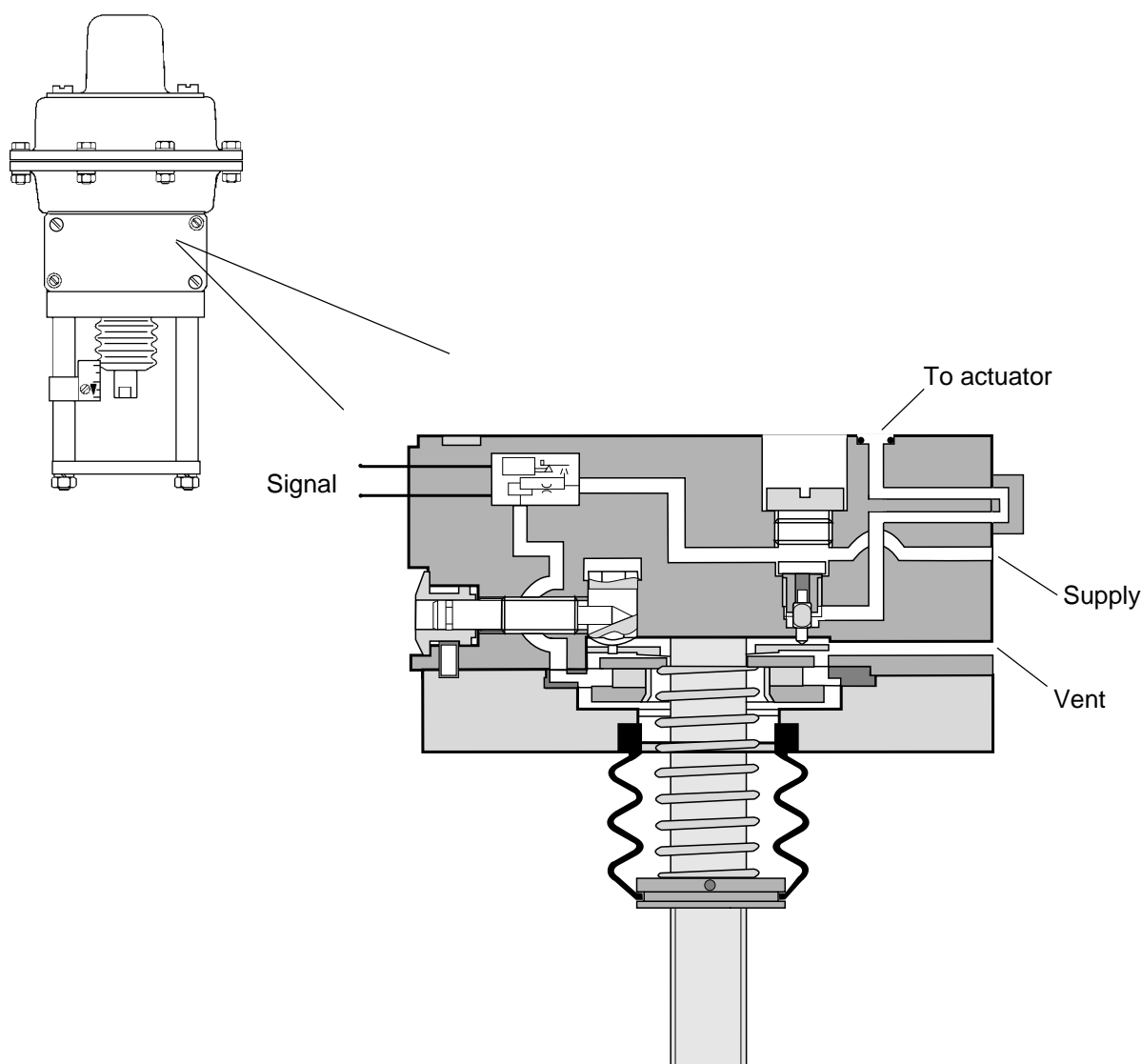


Fig 3: I/P Positioner

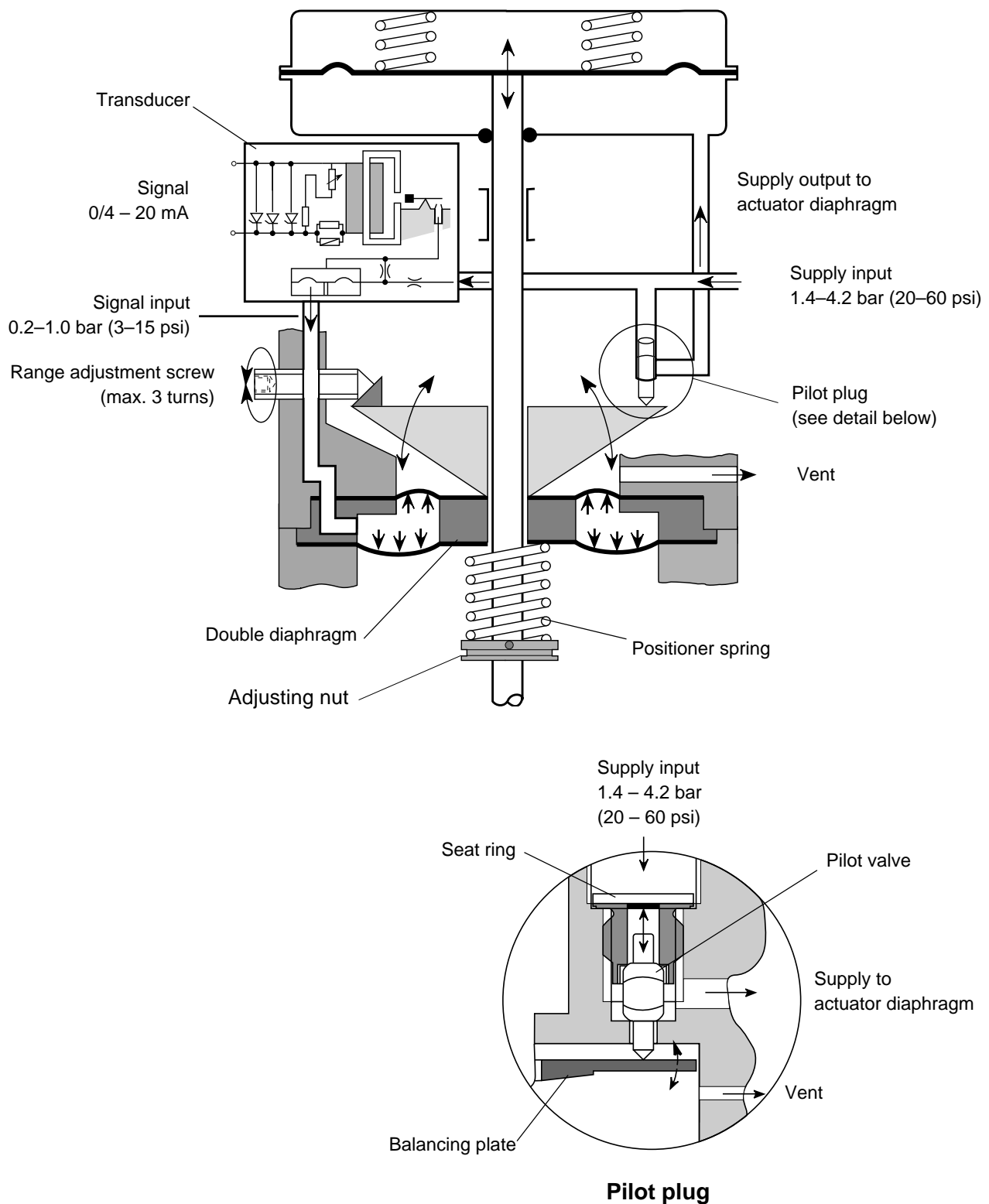
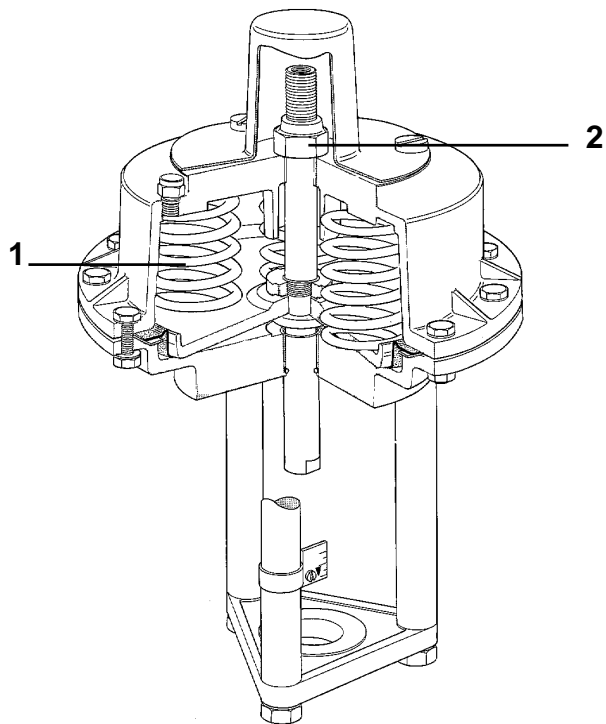
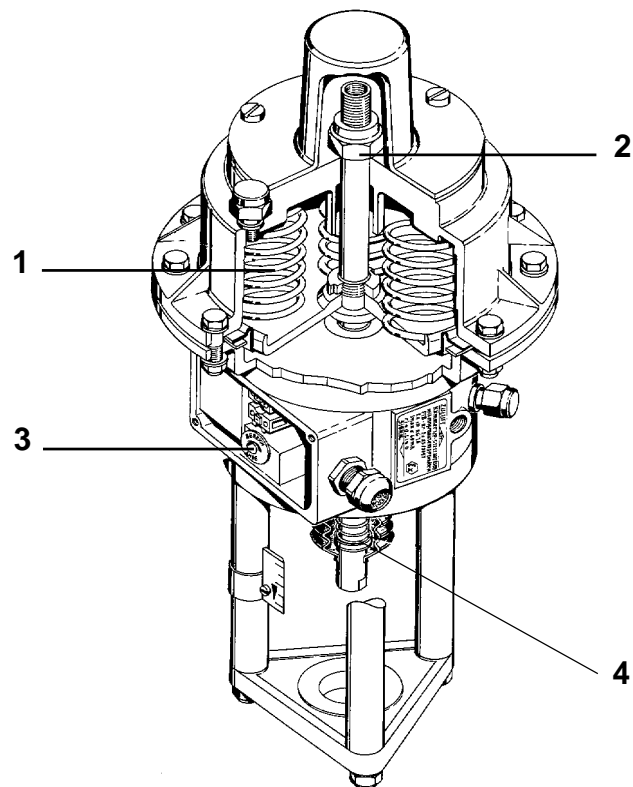


Fig. 4: I/P Positioner



**Series 47 / 48 / 49
(without positioner)**



**Series 37 / 38 / 39
(with positioner)**

Fig. 5

5.3 Actuator Springs - (fig. 5 pos. 1)

Different actuator spring sets are available depending on the actuator thrust requirements and the fail position of the actuator. The appropriate spring set can be chosen from the spare parts list.

5.4 Zero Adjustment Locknut - (fig. 5 pos. 2)

The zero adjustment locknut is used as a mechanical stop so that the actuator just begins to travel when the desired signal is applied to the positioner.

5.5 Range Adjustment - (fig. 5 pos.3)

(Actuator with positioner only)

The actuator travel is adjusted by means of the range adjustment screw. Turn the range adjustment screw so that the actuator stem travels the required distance in response to the positioner input signal.

5.6 Positioner Spring - (fig. 5 pos. 4)

(Actuator with positioner only)

To change the signal range from full to split range the positioner spring must be changed.

Examples:

from 3-15 psi to 3-9 psi or 9-15 psi
from 4-20 mA to 4-12 mA or 12-20 mA

Notice that split ranging on electro-pneumatic actuator is also done by means of the positioner spring.

After removal of the spring boot and retaining ring on older actuators or by removing the boot, positioner spring adjustment nut on newer actuators, the spring can be replaced.

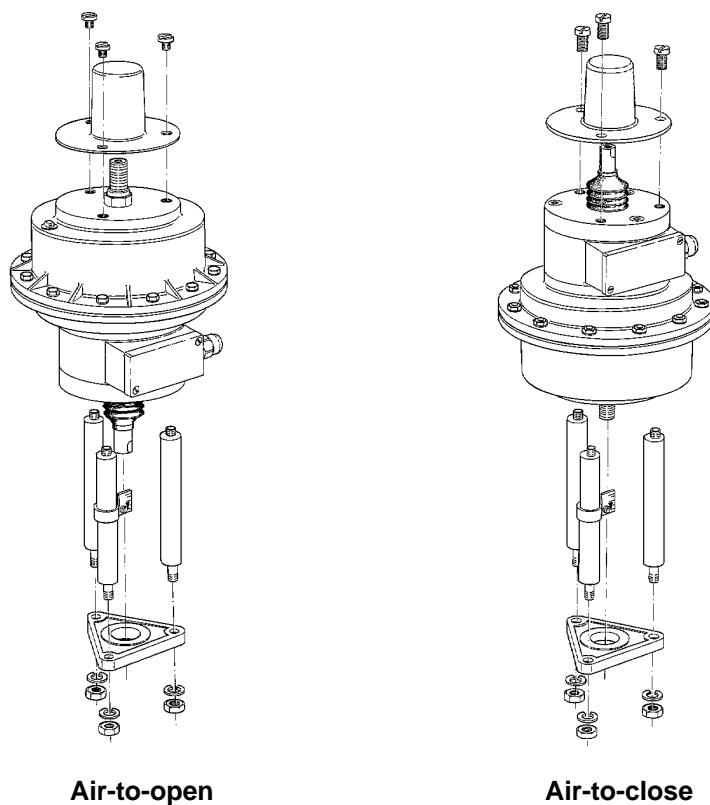


Fig. 6

5.7 Changing the Actuator Action

To change the actuator action from fail-open to fail-closed, or vice versa, the complete actuator must be reversed. Remove the yoke assembly and actuator cap, invert the actuator and replace all parts. If necessary, use other spring sets (see spare parts list) according to the actuator thrust requirements.

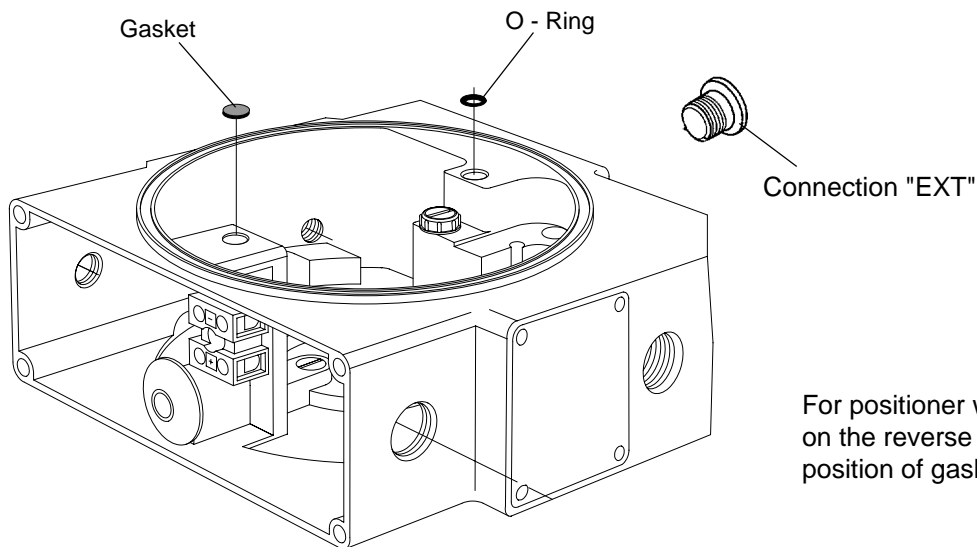


Fig. 7a

For positioner without "EXT" cover on the reverse side exchange position of gasket and O-ring.

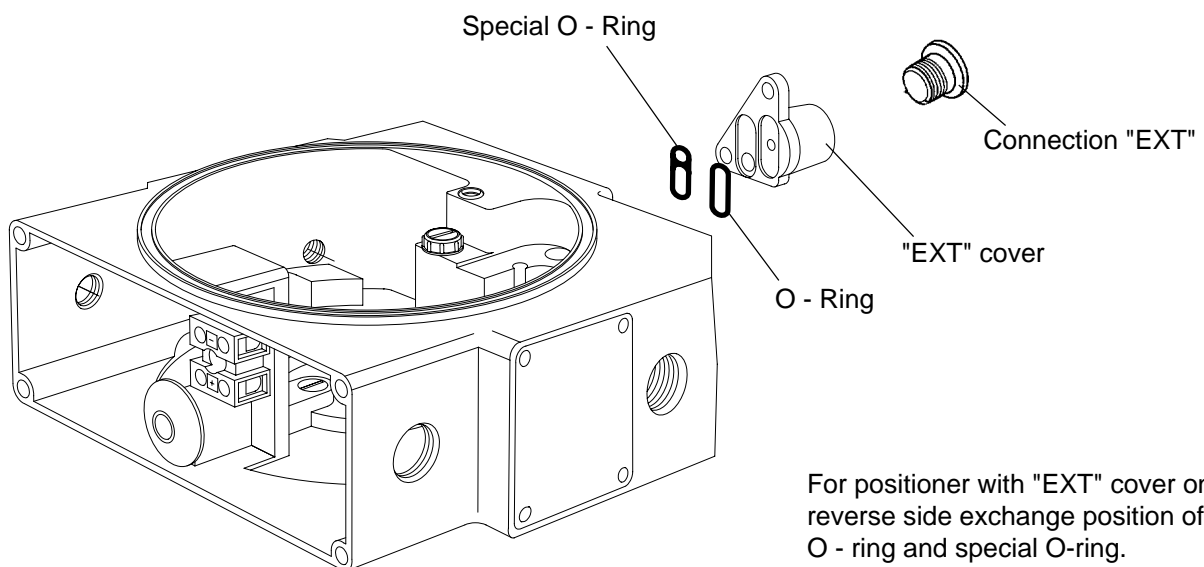


Fig. 7b

For positioner with "EXT" cover on the reverse side exchange position of O - ring and special O-ring.

5.8 External Piping

When using solenoid valves (not NAMUR), lock-up valves, volume boosters, etc.; external piping is possible without the need of additional parts. Solenoid valves to NAMUR-standard (modified) can be bolted directly onto the positioner body.

Positioner **without** "EXT" cover on the reverse side:

Exchange position of gasket and O - ring (Fig. 7a).

Remove the plugs marked "EXT" from the positioner body and diaphragm case.

Accessories can now be piped between the positioner and diaphragm case.

Positioner **with** "EXT" cover on the reverse side:

Exchange the position of the O - ring and special O - ring in the "EXT" cover. (Fig. 7b)

Remove the plugs marked "EXT" from the positioner body and diaphragm case.

Accessories can now be piped between the positioner and diaphragm case.

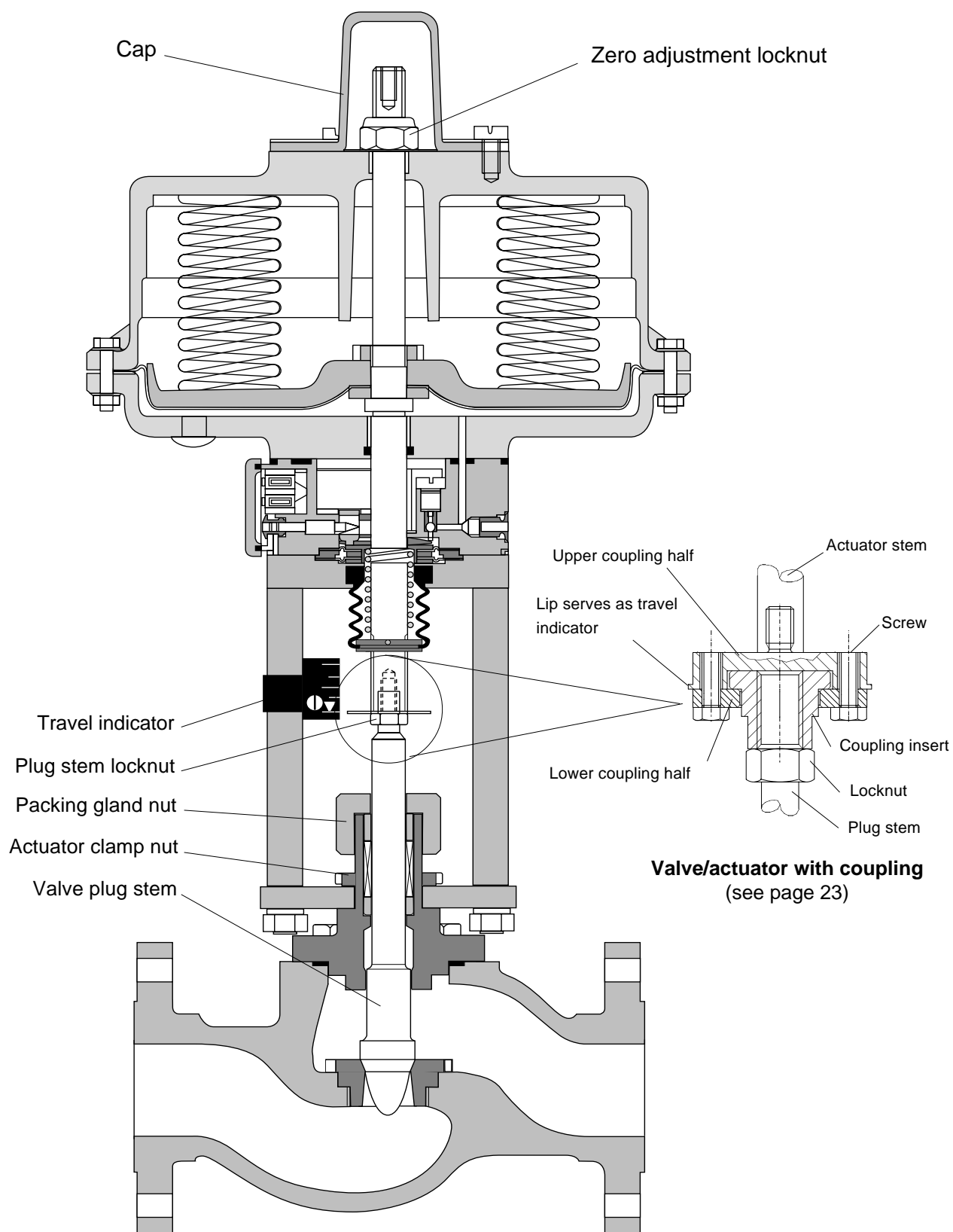


Fig. 8: Typical actuator and valve configuration

6 GENERAL SERVICE INFORMATION

Service to the actuator is best performed when the actuator is removed from the valve body.

For the purpose of these instructions, consider the actuator as a separate subassembly with the procedures described in these instructions being performed on a bench. However, many service repairs and adjustments can be accomplished in the field while the actuator and valve body are still connected to each other.

6.1 REMOVING ACTUATOR FROM VALVE BODY



DANGER: *Depressurise the line to atmospheric pressure and drain all fluids from the valve before working on the actuator. Failure to do so can cause serious injury.*

For air-to-open actuators start with 6.1.1

For air-to-close actuators start with 6.1.2.1

- 6.1.1** Remove the valve cap and nameplate. Turn the zero adjustment locknut until it just makes contact with the actuator spring case (this removes the spring force from the valve plug).

6.1.2 Valve/actuator without coupling

- 6.1.2.1** With a wrench, hold the actuator stem to prevent it from rotating while using a second wrench to loosen the plug stem locknuts.



NOTE: *If the actuator stem is rotated the diaphragm will be twisted and this may cause irreparable damage.*

- 6.1.2.2** Loosen the packing gland nut and the actuator clamp nut.

- 6.1.2.3** Being sure not to turn the plug stem, rotate the actuator assembly counterclockwise to disengage the actuator stem from the valve plug stem.



NOTE: *Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.*

- 6.1.2.4** Lift the actuator assembly from the valve body subassembly. At the same time, remove the plug stem locknuts, the travel indicator disc, packing gland nut, and clamping nut.

6.1.3 Valve/actuator with coupling

- 6.1.3.1** With a wrench, hold the actuator stem to prevent it from rotating while using a second wrench to loosen and remove coupling screws.

- 6.1.3.2** Remove the yoke rod nuts and lift actuator assembly from the valve.

6.2 CONNECTING ACTUATOR TO VALVE BODY



General Notes:

• *The actuator must be calibrated before connecting it to the valve body. See section 3 "Calibration" of these instructions.*

• *All worn or damaged parts must be replaced. All parts to be reused should be cleaned for ease of reassembly.*

6.2.1 Valve/actuator without coupling

- 6.2.1.1** Place the actuator assembly onto the valve body subassembly. At the same time, install the clamping nut, packing gland nut, plug stem locknuts, and the travel indicator disc.

6.2.1.2 "Air-to-open/fail-to-close" actuators only:

Rotate the actuator assembly clockwise, threading the actuator stem onto the plug stem until the yoke plate just makes contact with the bonnet flange, and the actuator is properly aligned for installation.



NOTE: *Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.*

"Air-to-close/fail-to-open" actuators only:

Lift the plug stem to the actuator stem. Thread the plug stem into the actuator stem so that the distance "plug in seat", to "plug raised", is approximately the distance of the specified stroke.

- 6.2.1.3** Tighten the clamping nut and the packing gland nut (see valve service instructions for torque values).

- 6.2.1.4** Adjust the valve plug for seat off by threading the plug stem further into or out of the actuator stem.



NOTE: *rotate the plug stem while the valve is in the closed position. Open the valve first, make the adjustment while the valve is open, and then close the valve to check for seat-off.*

- 6.2.1.5** After final adjustments are made, lock the two stem nuts against the actuator stem and set the position of the travel indicator on the yoke rod.

6.2.2 Valve/actuator with coupling

- 6.2.2.1** Place actuator onto valve.

- 6.2.2.2** Screw on and tighten yoke rod nuts.

- 6.2.2.3** Fit the coupling screws finger tight.

- 6.2.2.4** Adjust the valve plug for seat off by threading the plug stem further into or out of the coupling insert.



NOTE: *rotate the plug stem while the valve is in the closed position. Open the valve first, make the adjustment while the valve is open, and then close the valve to check for seat-off.*

- 6.2.2.5** After final adjustment tighten the coupling screws and set the position of the travel indicator on the yoke rod.

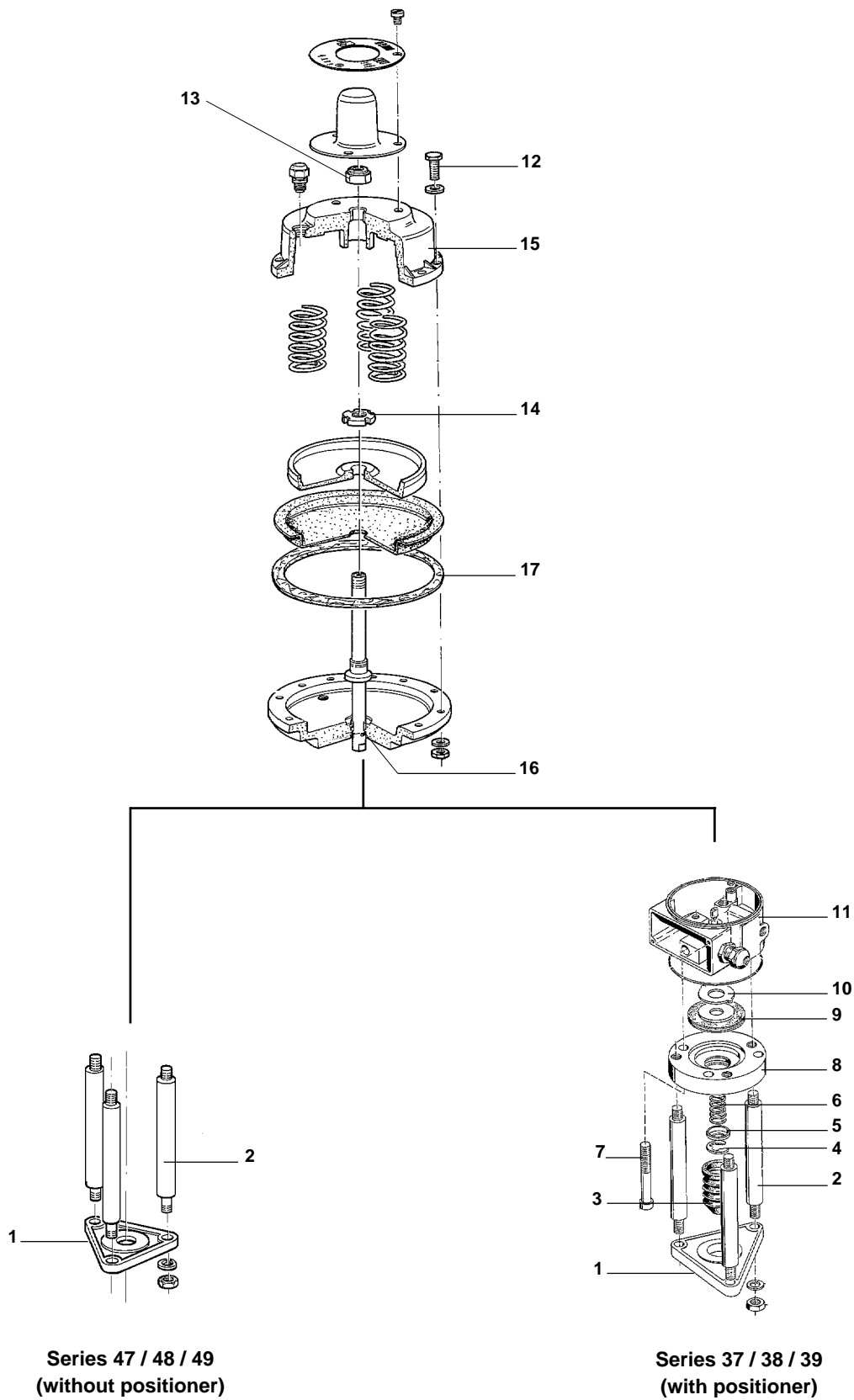


Fig. 9

7 ACTUATOR DISASSEMBLY and ASSEMBLY

7.1 ACTUATOR DISASSEMBLY

(refer to figs. 9 and 11)



NOTE: To help reassembly note or mark the relationship between the parts to be disassembled.

7.1.1 Remove yoke plate (1) and yoke rods (2).

For actuators without positioner continue with 7.1.5.

7.1.2 Actuators without adjustable positioner spring (see Fig. 9)

Remove the positioner spring boot (3), retaining ring (4), seating washer (5), and positioner spring (6).

Actuators with adjustable positioner spring (see Fig. 15)

Loosen the set screw in the positioner spring adjusting nut and remove the nut. Remove boot and positioner spring.

7.1.3 Loosen and remove the positioner cover screws (7), positioner cover (8), double diaphragm (9) and balancing plate (10).

7.1.4 Remove the positioner (11). All inner positioner parts are now accessible for replacement or maintenance (for positioner details see figs. 10 and 11).

7.1.5 Loosen and remove all case screws (12).



DANGER: Actuators with high thrust spring sets and/or actuators with 40 mm (1.5") stroke must be held in a press to prevent possible injury when removing the case screws.

7.1.6 Unscrew the zero adjustment lock nut (13).

7.1.7 The spring case and diaphragm case can now be separated, and the springs removed.

7.1.8 Holding the actuator stem, unscrew and remove the clamping nut (14) to service the actuator diaphragm and diaphragm plate.

7.2 ACTUATOR ASSEMBLY

(refer to figs. 9 to 13)

7.2.1 Install the diaphragm and diaphragm plate on the actuator stem. Use Loctite® #242 on the threaded portion of the actuator stem where the clamping nut (14) is to be installed. Install and tighten the clamping nut, being sure not to kink the diaphragm.

7.2.2 Place the spring set into the spring case so that they sit in the recessed area of the case (15). Smaller diameter springs are placed inside of larger diameter springs.

7.2.3 Insert the actuator stem through the hole in the spring case (15).

7.2.4 Install the zero adjustment locknut (13) on the actuator stem and tighten it down fully to compressing the springs.



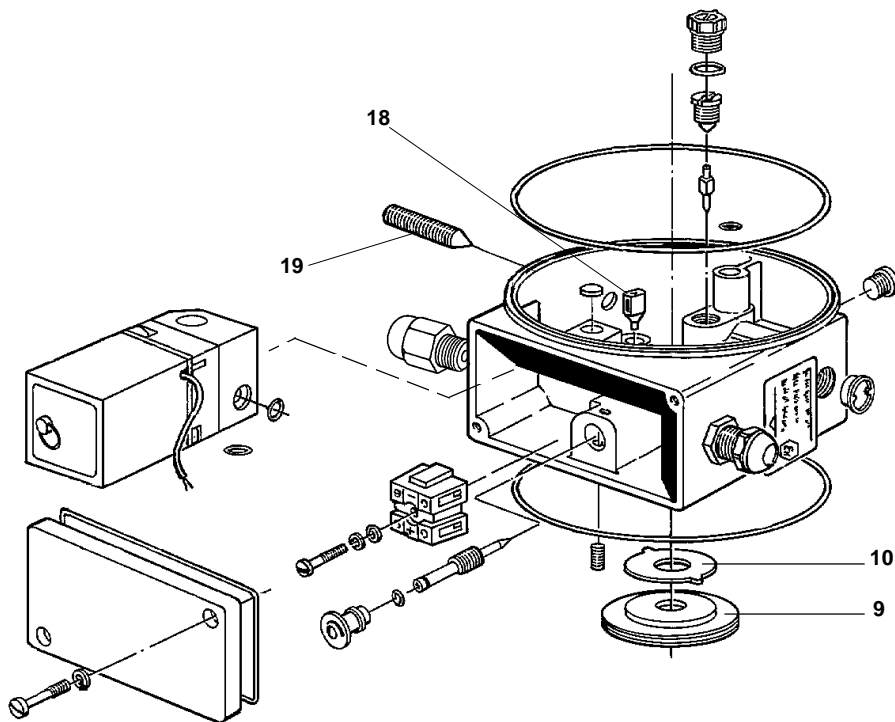
DANGER: A press must be used to compress the springs when high thrust spring sets are installed or when actuator stroke is 40 mm.

7.2.5 Before inserting a new O-ring (16) in the diaphragm case, pack the O-ring groove with a multi-temperature assembly paste

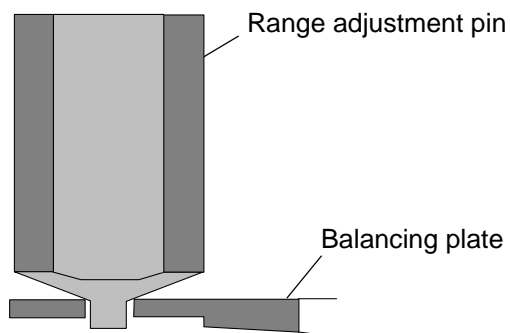
7.2.6 Replace the diaphragm gasket (17) and install the diaphragm case onto the spring case assembly.

7.2.7 Install and tighten all case screws (12), washers and nuts using a crisscross pattern.

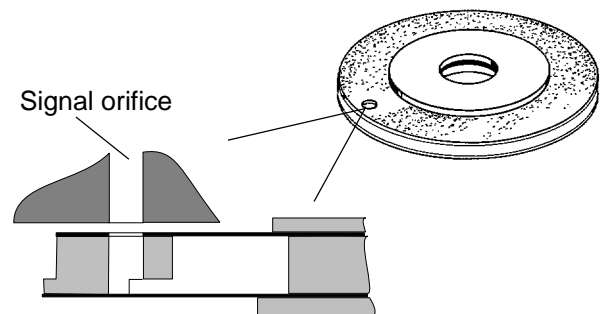
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Positioner
Fig. 11



Balancing plate assembly
Fig. 12



Double diaphragm
Fig. 13

(7.4 Actuator assembly continued)

7.4.8 to 7.4.11 for actuator with positioner only.

- 7.2.8** Assemble the positioner using new O-rings, gas-kets and filters and install the positioner body (see figs. 11).
- 7.2.9** Install the balancing plate (10) so that the small hole fits over the plastic range adjustment pin (see fig.12), and the bevelled side faces the double diaphragm (flat side to positioner).
- 7.2.10** Install the double diaphragm assembly (9) aligning the small hole in the diaphragm with the hole in the diaphragm ring and the signal orifice in the positioner body (see fig. 13).

7.2.11 Actuator without adjustable positioner spring
(see Fig 9)

Install the positioner cover (8), positioner cover screws (7), positioner spring (6), seating ring (5), retaining ring (4), and positioner spring boot (3).

Actuator with adjustable positioner spring
(see Fig 15)

Install the positioner cover, positioner cover screws, positioner spring and positioner spring boot. Thread adjusting nut onto actuator stem and adjust roughly using the gauge (lower edge of adjusting nut the underside of positioner cover).

7.2.12 Refit yoke rods (2) and yoke plate (1).

The actuator is now ready to be calibrated.

7.3 POSITIONER SERVICE

The KÄMMER integral positioner is designed to be a maintenance free unit. However; moisture, oil and dirt entering the positioner can dampen its performance, which will cause the need for maintenance and repair. When this happens, remove all internal parts and clean them thoroughly. Replace all O-rings, filters and damaged parts, and reassemble the positioner body according to fig. 11.

Positioners with integral I/P transducers are more sensitive to contaminants than those without. Therefore, it is very important that all parts to be reused are extremely clean and dry.

I/P transducer

To remove the I/P transducer, disconnect the wires from the terminal block and loosen the set screw (19) on the side of the positioner housing. The I/P transducer can then be pulled from the front of the positioner housing. The main cause of transducer malfunction is a polluted air supply. Filters are situated in the input and output orifices of the transducer and are readily accessible after removing the O-rings. Apart from the O-rings and filters the transducer contains no user serviceable parts. The transducer is factory adjusted to exactly 4 – 20 mA or 0 – 20 mA (documented by a sticker on the transducer cover) and an attempt to field calibrate is not recommended. For repair and/or calibration the transducer assembly should be returned to Kämmer.

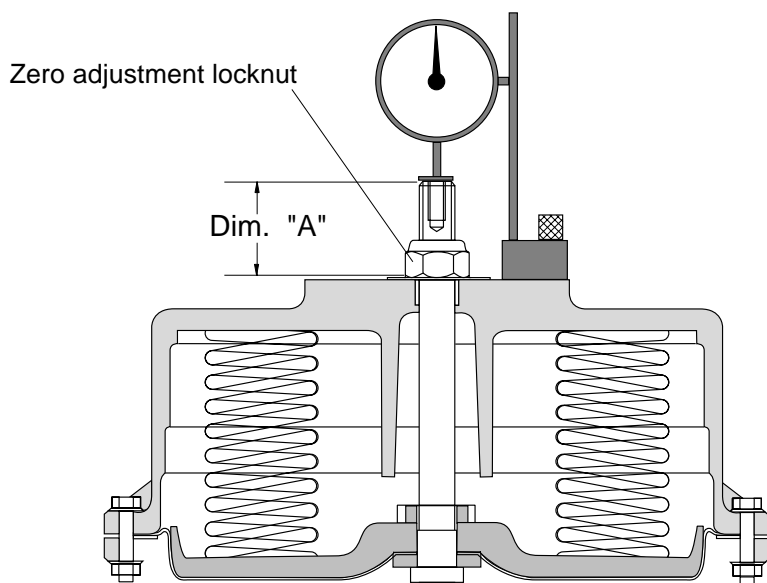
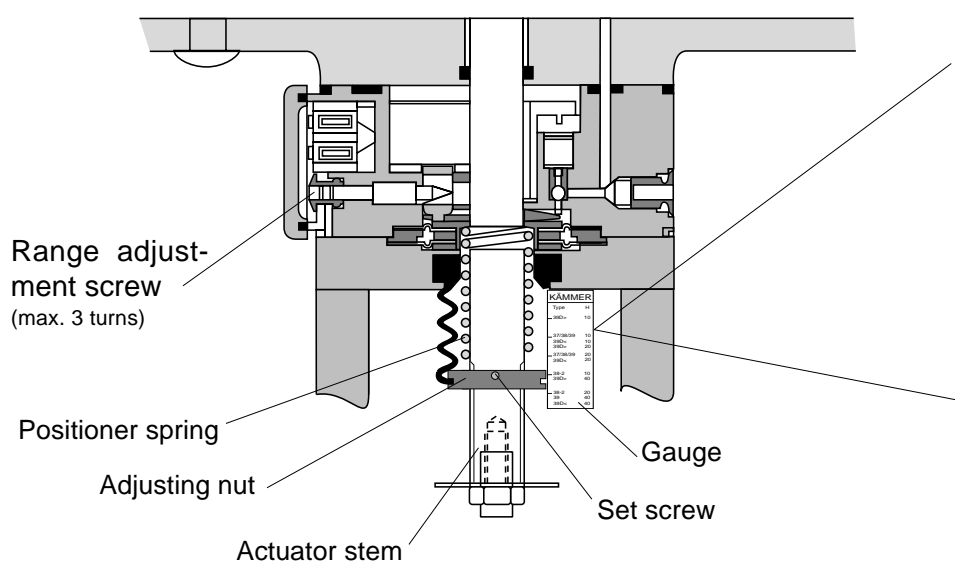


Fig. 14: Dial gauge



KÄMMER	
Type	H
39D>	10
37/38/39	10
39D<	10
39D>	20
37/38/39	20
39D<	20
38-2	10
39D>	40
38-2	20
39	40
39D<	40

63 mm

Gauge (scale 1:1)

Adjust positioner spring with gauge
Fig. 15

8 Calibration

Calibrate actuator

(actuator without adjustable positioner spring)

8.1 Range adjustment

See nameplate for signal range, supply pressure and stroke.

- 8.1.1** Connect air supply to the "SUPPLY" port of the actuator and an adjustable signal source to the

"SIGNAL" connection. Attach a dial gauge to the actuator (see Fig 14).

- 8.1.2** Undo the zero adjustment locknut until it is a few threads free of the actuator housing. Set the signal to the low end value (e.g. 0,2 bar or 4 mA). Adjust the dial gauge to zero.

- 8.1.3** Set the signal to the high end value (e.g. 1,0 bar or 20 mA).

8.1.4 Using the range adjusting screw set the actuator to full stroke + 1.5 mm (e.g. stroke 20 + 1.5 mm = 21.5 mm).

8.1.5 Make adjustment with the range adjusting screw as required until desired stroke is obtained

8.2 Zero adjustment

8.2.1 The zero adjustment can only be set after the final range adjustment has been made.

8.2.2 Maintain the low end signal (e.g. 0.2 bar or 4 mA) and turn the zero adjustment locknut until it just makes contact with the actuator housing.

8.3 Calibrate actuator

(actuator with adjustable positioner spring)

See nameplate for signal range, supply pressure and stroke.

8.3.1 Connect air supply to the "SUPPLY" port of the actuator and an adjustable signal source to the "SIGNAL" connection. Attach a dial gauge to the actuator (see Fig 14).

8.3.2 Undo the zero adjustment locknut until it is a few threads free of the actuator housing.

Loosen the set screw and thread the adjusting nut on the actuator stem until it's lower face is in alignment with the appropriate type designation on the gauge.

8.3.3 Set the signal to the low end value (e.g. 0.2 bar or 4 mA). Adjust the dial gauge to zero.

8.3.4 Set the signal to the high end value (e.g. 1.0 bar or 20 mA).

8.3.5 Using the range adjusting screw set the actuator to full stroke + 1.5 mm (e.g. stroke 20 + 1.5 mm = 21.5 mm).

8.3.6 Set signal and dial gauge to zero.

8.3.7 Set the signal to the low end value. Adjust the positioner spring adjusting nut to compress/decompress the positioner spring until the actuator stem rises 1.5 mm.

8.3.8 Set the signal to the high end value (e.g. 1.0 bar or 20 mA). Using the range adjusting screw set the actuator to full stroke + 1.5 mm (e.g. stroke 20 + 1.5 mm = 21.5 mm).

8.3.9 Repeat adjustments **8.3.3** to **8.3.8** until both adjustments are correct.

8.3.10 Set signal to zero and tighten the set screw in the adjusting nut. Set the signal to the low end value. Set the dial gauge to zero and tighten zero adjustment locknut, until the dial gauge pointer just moves (nut contacts the actuator housing) and then a further 1/4 turn (around 3/10 mm pretension).

8.3.11 Check all adjustments for correctness.

8.4 Calibrate actuator/valve

8.4.1 Connect air supply to the "SUPPLY" port of the actuator and an adjustable signal source to the "SIGNAL" connection. Undo the zero adjustment locknut until it is a few threads free of the actuator housing. Attach a dial gauge to the actuator and set it to zero.

8.4.2 Determine the instrument signal at which the plug should begin moving off the seat and apply that signal to the valve. If the plug stem does not begin to move at the predetermined signal, adjust the signal to midrange until the plug is off the seat, loosen the plug stem locknut and turn the plug stem in or out of the actuator stem.

For example, if the plug begins to move at a lower signal than the predetermined one, turn the plug stem out of the actuator stem. If the plug begins to move at a higher signal than the predetermined one, turn the plug into the actuator stem. Repeat this process until the actuator is calibrated as required and re-tighten the plug stem locknut. Adjust the zero adjustment locknut until it is 2 mm off the actuator and replace the actuator cap.



NOTE: Do not turn the plug stem when the plug is seated; otherwise, the plug and seat ring may be damaged.

8.5 Calibrate actuators without a positioner

8.5.1 With no air supply to the actuator, adjust the zero adjustment locknut until dimension "A" as shown in the table below is achieved.

Actuator size	Stroke		Dimension "A" (mm)
	Inch	mm	
47	3/8	10	35
47	3/4	20	25
48 / 49	3/8	10	55
48 / 49	3/4	20	45
48 / 49	1 1/2	40	25
49D	1 1/2	40	55

8.6 TECHNICAL DATA

		Actuator without positioner				Actuator with P/P positioner				Actuator with I/P positioner			
		47	48	49	49D	37	38	39	39D	IP-37	IP-38	IP-39	IP-39D
Diaphragm area	cm ²	80	200	500	2 x 500	80	200	500	2 x 500	80	200	500	2 x 500
Thrust max.	kg	160	400	1000	2000	160	400	1000	2000	160	400	1000	2000
Stroke	mm	10/20	10/20	10/20/40	10/20/40	10/20	10/20	10/20/40	10/20/40	10/20	10/20	10/20/40	10/20/40
Time at stroke	10 mm s*	0.1	0.25	0.5	1	0.5	1	2.5	5	0.5	1	2.5	5
	20 mm s*	0.2	0.5	1	2	1	2	5	10	1	2	5	10
	40 mm s*	–	–	2	4	–	–	10	20	–	–	10	20
Signal range		3 – 15 psi 0.2 – 1.0 bar 20 – 60 kPa				3 – 15 / 3 – 9 / 9 – 15 psi 0.2 – 1.0 / 0.2 – 0.6 / 0.6 – 1.0 bar 20 – 100 / 20 – 60 / 60 – 100 kPa				0/4 – 20, 4 – 12, 12 – 20 mA or rev. – –			
Input resistance		–				–				260/170 Ohm**			
Inductivity / Capacitance		–				–				negligible (≈0)			
Spring range		see appropriate spare parts list				see appropriate spare parts list				see appropriate spare parts list			
Supply pressure		20 – 60 psi 1.4 – 4.2 bar 140 – 420 kPa				20 – 60 psi 1.4 – 4.2 bar 140 – 420 kPa				20 – 60 psi 1.4 – 4.2 bar 140 – 420 kPa			
Accuracy		–				±1%				≦ 1%			
Hysteresis		–				< 1%				≦ 1%			
Operating sensitivity		–				–				≦ 0.1%			
Amplification factor		–				50				50			
Supply pressure influence		–				0.4% / 0.1 bar				0.4% / 0.1 bar			
Air consumption at 1,4 bar		–				0.6 Nm³ / h				0.6 Nm³ / h			
Electrical protection		–				–				EEx ia C T6, PTB No. Ex-93.C. 2104X Suitable for connection to intrinsical safe circuits with I max. ≦ 60 mA (T6) thru 150 mA (T4)			
Housing protection		–				–				IP 54			
Allowable ambient temp.		– 30 to + 80 °C (-22 to +176° F)											
Actuator action		air-to-open / air-to-close, reversible											
Installation position		optional											
Air supply		dry and oil-free (instrument air)											

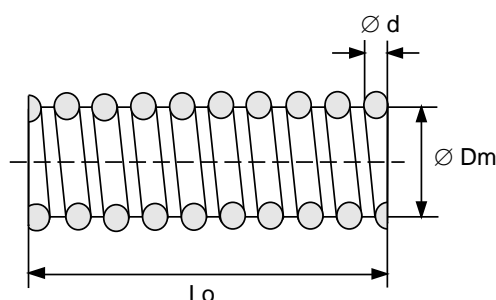
* Stroking time with 1.4 bar supply pressure.

** Transducer adjustable = 260 Ohm, not adjustable = 170 Ohm

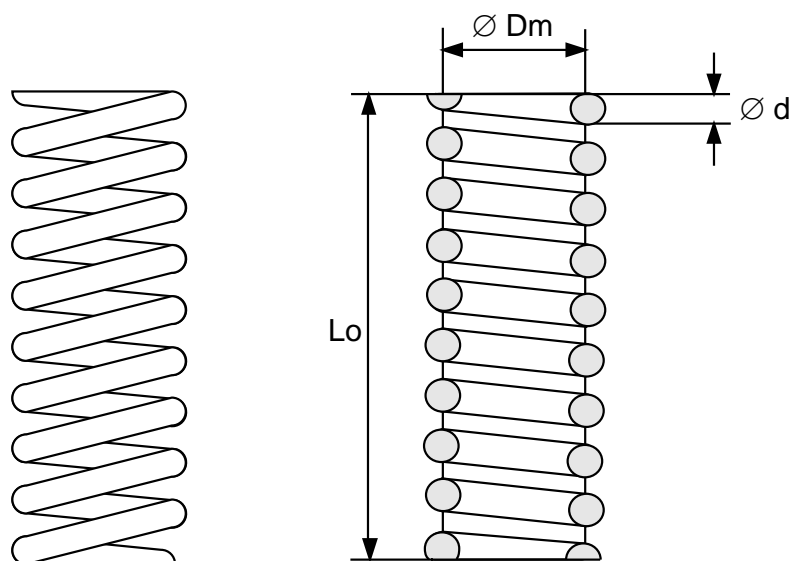
Spring set No.	Spring range (bar)	Spring set consists of:							
		Qty.	Part No.	Colour code	Dimensions * Ø Dm / Ø d / L o	Qty.	Part No.	Colour code	Dimensions * Ø Dm / Ø d / L o
710	0,2 - 1,0	3	37 10 10	W	20,5 / 3,20 x 42,5	-	-	-	-
711	0,3 - 0,9	3	37 10 40	S	23,0 / 3,20 x 45,0	-	-	-	-
712	0,5 - 1,1	3	37 10 20	B	22,0 / 3,20 x 48,3	-	-	-	-
713	1,0 - 1,9	3	37 10 20	B	22,0 / 3,20 x 48,3	3	37 10 30	R	14,0 / 2,2 x 56,7
714	1,0 - 2,2	6	37 10 20	B	22,0 / 3,20 x 48,3	-	-	-	-
715	1,5 - 2,7	3	37 10 20	B	22,0 / 3,20 x 48,3	6	37 10 30	R	14,0 / 2,2 x 56,7
716	1,5 - 3,0	6	37 10 20	B	22,0 / 3,20 x 48,3	3	37 10 30	R	14,0 / 2,2 x 56,7
717	2,0 - 3,8	6	37 10 20	B	22,0 / 3,20 x 48,3	6	37 10 30	R	14,0 / 2,2 x 56,7
722	0,5 - 1,1	3	37 20 20	B	26,0 / 2,75 x 56,7	-	-	-	-
723	0,9 - 1,9	3	37 20 20	B	26,0 / 2,75 x 56,7	3	37 20 30	R	19,7 / 2,2 x 60,0
724	1,0 - 2,2	6	37 20 20	B	26,0 / 2,75 x 56,7	-	-	-	-
725	1,3 - 2,7	3	37 20 20	B	26,0 / 2,75 x 56,7	6	37 20 30	R	19,7 / 2,2 x 60,0
726	1,4 - 3,0	6	37 20 20	B	26,0 / 2,75 x 56,7	3	37 20 30	R	19,7 / 2,2 x 60,0
727	1,8 - 3,8	6	37 20 20	B	26,0 / 2,75 x 56,7	6	37 20 30	R	19,7 / 2,2 x 60,0
810	0,2 - 1,0	3	38 10 10	W	35,5 / 5,60 x 62,5	-	-	-	-
811	0,3 - 0,9	3	38 10 40	S	32,0 / 5,00 x 65,0	-	-	-	-
812	0,5 - 1,1	3	38 10 20	B	39,0 / 5,60 x 68,3	-	-	-	-
813	1,0 - 1,9	3	38 10 20	B	39,0 / 5,60 x 68,3	3	38 10 30	R	26,5 / 4,0 x 76,7
814	1,0 - 2,2	6	38 10 20	B	39,0 / 5,60 x 68,3	-	-	-	-
815	1,5 - 2,7	3	38 10 20	B	39,0 / 5,60 x 68,3	6	38 10 30	R	26,5 / 4,0 x 76,7
816	1,5 - 3,0	6	38 10 20	B	39,0 / 5,60 x 68,3	3	38 10 30	R	26,5 / 4,0 x 76,7
817	2,0 - 3,8	6	38 10 20	B	39,0 / 5,60 x 68,3	6	38 10 30	R	26,5 / 4,0 x 76,7
820	0,2 - 1,0	3	38 20 10	W	40,0 / 5,00 x 65,0	-	-	-	-
821	0,3 - 0,9	3	38 20 40	S	36,5 / 4,50 x 70,0	-	-	-	-
822	0,5 - 1,1	3	38 20 20	B	42,5 / 5,30 x 76,7	-	-	-	-
823	0,9 - 1,9	3	38 20 20	B	42,5 / 5,30 x 76,7	3	38 20 30	R	26,5 / 3,6 x 80
824	1,0 - 2,2	6	38 20 20	B	42,5 / 5,30 x 76,7	-	-	-	-
825	1,3 - 2,7	3	38 20 20	B	42,5 / 5,30 x 76,7	6	38 20 30	R	26,5 / 3,6 x 80
826	1,4 - 3,0	6	38 20 20	B	42,5 / 5,30 x 76,7	3	38 20 30	R	26,5 / 3,6 x 80
827	1,8 - 3,8	6	38 20 20	B	42,5 / 5,30 x 76,7	6	38 20 30	R	26,5 / 3,6 x 80
921	0,3 - 0,9	3	39 20 40	S	55,0 / 8,00 x 110	-	-	-	-
922	0,5 - 1,1	3	39 20 20	B	66,0 / 9,00 x 116,7	-	-	-	-
923	1,0 - 1,9	3	39 20 20	B	66,0 / 9,00 x 116,7	3	39 20 30	R	43 / 6,3 x 133,3
924	1,0 - 2,2	6	39 20 20	B	66,0 / 9,00 x 116,7	-	-	-	-
925	1,5 - 2,7	3	39 20 20	B	66,0 / 9,00 x 116,7	6	39 20 30	R	43 / 6,3 x 133,3
926	1,5 - 3,0	6	39 20 20	B	66,0 / 9,00 x 116,7	3	39 20 30	R	43 / 6,3 x 133,3
927	2,0 - 3,8	6	39 20 20	B	66,0 / 9,00 x 116,7	6	39 20 30	R	43 / 6,3 x 133,3
941	0,3 - 0,9	3	39 40 40	S	57,0 / 7,00 x 120	-	-	-	-
942	0,5 - 1,0	3	39 40 20	B	67,0 / 7,20 x 138	-	-	-	-
943	0,8 - 1,6	3	39 40 20	B	67,0 / 7,20 x 138	3	39 40 30	R	45,7 / 5,25 x 148
944	0,9 - 1,9	6	39 40 20	B	67,0 / 7,20 x 138	-	-	-	-
945	1,2 - 2,3	3	39 40 20	B	67,0 / 7,20 x 138	6	39 40 30	R	45,7 / 5,25 x 148
946	1,3 - 2,6	6	39 40 20	B	67,0 / 7,20 x 138	3	39 40 30	R	45,7 / 5,25 x 148
947	1,7 - 3,3	6	39 40 20	B	67,0 / 7,20 x 138	6	39 40 30	R	45,7 / 5,25 x 148

* All dimensions in mm

Colour code: W = White
(Each spring is marked with a spot of paint)
B = Blue
R = Red
S = Black

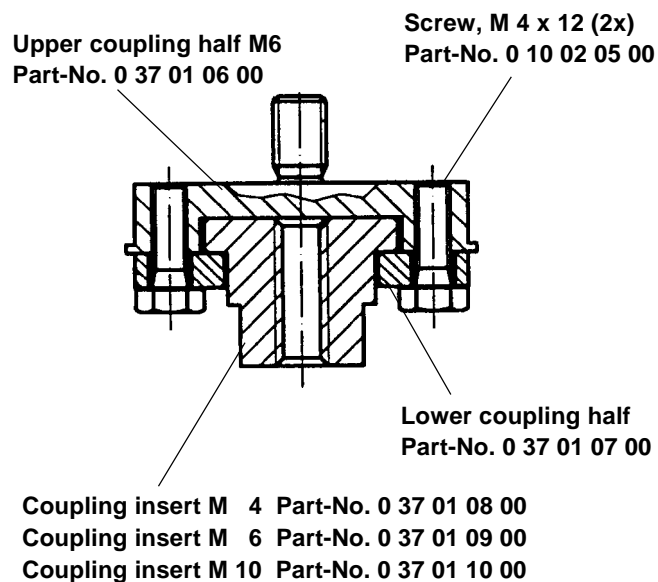


Positioner spring



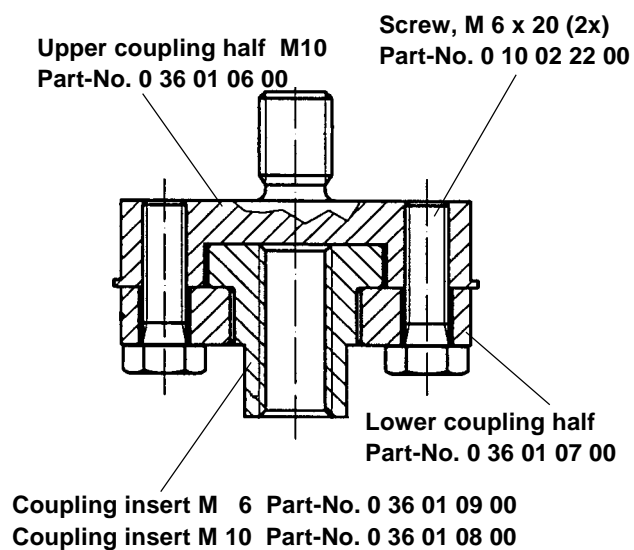
Part - No.	Spring range [bar]	Spring range [mA]	Stroke [mm]	Lo [mm]	Ø Dm [mm]	Ø d [mm]
0 36 00 10 00	0.2 - 1.0	0/4 - 20	10	39.75	20.0	2.0
0 36 00 20 00	0.2 - 0.6	0/4 - 10/12	10	42.5	20.0	1.6
0 36 00 30 00	0.2 - 1.0 0.6 - 1.0	0/4 - 20 10/12 - 20	20 10	55.5	19.5	1.7
0 36 00 40 00	0.2 - 0.6	0/4 - 10/12	20	60.0	22.5	1.5
0 36 00 50 00	0.2 - 1.0 0.6 - 1.0	0/4 - 20 10/12 - 20	40 20	85.0	20.5	1.6
0 36 00 60 00	0.2 - 0.6	0/4 - 10/12	40	100	21.0	1.4
0 36 00 70 00	0.6 - 1.0	10/12 - 20	40	140.0	18.7	1.4

Coupling for actuators with 2 yoke rods



Coupling assy. M 6 / M 4 Part-No. 0 37 01 03 00
Coupling assy. M 6 / M 6 Part-No. 0 37 01 01 00
Coupling assy. M 6 / M 10 Part-No. 0 37 01 02 00

Coupling for actuators with 3 yoke rods



Coupling assy. M 10 / M 6 Part-No. 0 36 01 01 00
Coupling assy. M 10 / M 10 Part-No. 0 36 01 02 00

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