Installation, Operation, Maintenance Instructions

Pneumatic Diaphragm On-Off Actuators

Series 2, Types: P2, P3, P4

Index

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 Kämmer original spare parts. Kämmer cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufactures. If Kämmer products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products. Fire protection for Kämmer 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 Kämmer for repair or service Kämmer must be provided with a certificate which confirms that the product has been decontaminated and is clean. Kämmer will not accept deliveries if a certificate has not been provided (a form can be obtained from Kämmer).*

1.8 Storage

In most cases Kämmer Products are manufactured from stainless steel. Products not manufactured from stainless steel are provided with an epoxy resin coating. This means that Kämmer products are well protected from corrosion. Nevertheless, Kämmer 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

Before operating, check the valve as follows:

4.1 Open and close the valve, and observe the movement of the actuator stem. The movement must be smooth and linear.

4.2 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).

4.3 Check all air connections for leaks.

4.4 Tighten packing nut (see table 1).

Thread	Torque PTFE	Torque 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.*

4.5 Check fail-safe position. To do this, close supply pressure and observe whether the valve opens or closes as defined.

4.6 After use at fluctuating temperatures, re-tighten all bolt connections and check for leaks.

5 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“.

5.1 Examine gaskets for leaks and if necessary re-tighten bolts (see Fig. 1).

5.2 Check bellows gasket and test connection - if present - for external leaks.

5.3 Check valve for damage caused by corrosive residues or corrosive vapours.

5.4 Clean valves and repaint as necessary.

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

5.5 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.*

5.6 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.*

5.7 Check all accessories for firm seating.

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

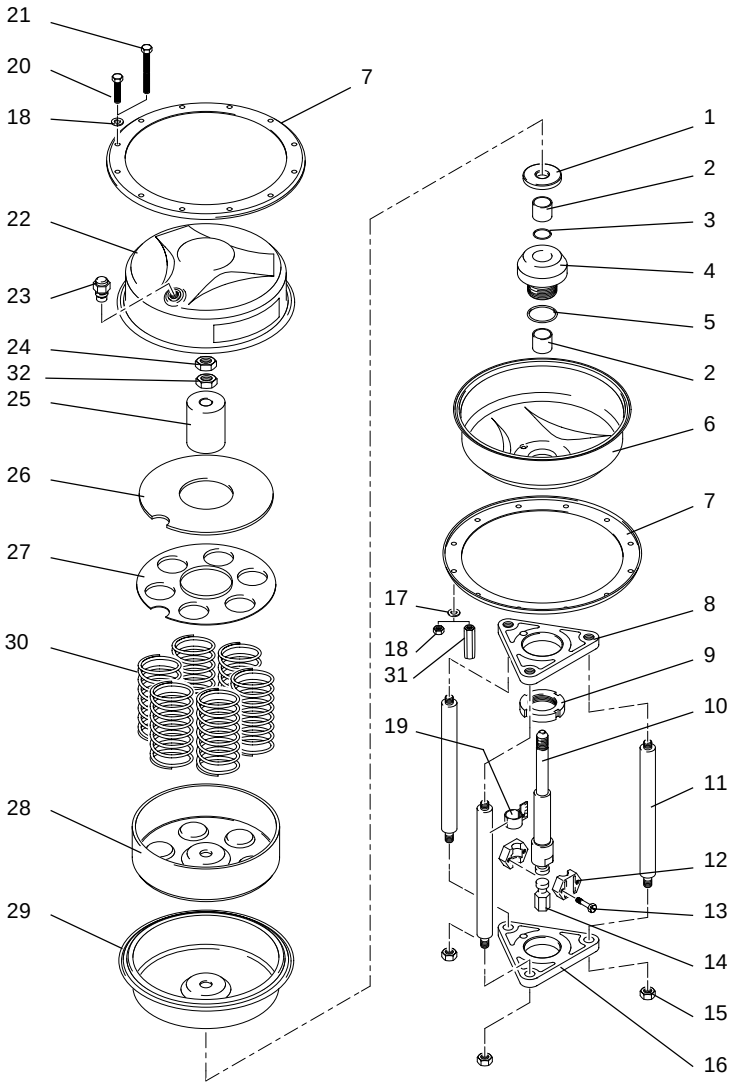
5.9 Check stem boot for wear.

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

5.11 Clean plug stem.

5.12 Check air filter, if present, and if necessary replace insert.

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



1	Washer
2	Bushing
3	O-Ring 22 x 2
4	Guide
5	O-Ring 32,99 x 2,62
6	Lower body
7	Flange
8	Yoke plate
9	Nut M 38 x 1,5
10	Actuator stem
11	Yoke rod
12	Coupling half
13	Screw
14	Coupling insert
15	Nut
16	Yoke plate
17	Washer, Ø 6,4
18	Nut, M 6
19	Travel indicator, assy.
20	Screw M 6 x 25
21	(De)Compression screw
22	Upper body
23	Vent plug
24	Locknut
25	Spacer
26	Plate
27	Spring plate
28	Piston
29	Diaphragm
30	Spring set
31	Nut
32	Nut

Fig. 1: Series 1 On-Off Actuator, Air-to-Open

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 REMOVING AND INSTALL ACTUATOR

6.1 REMOVING ACTUATOR

(refer to Fig. 1)

6.1.1 Shut off air supply.

WARNING: *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.*

6.1.2 Disconnect all tubing.

6.1.3 Remove 2 screws (13) and remove coupling (12).

6.1.4 Remove yoke rod retaining nuts (15) and lift actuator assembly from the valve.

6.1.5 Remove coupling insert (14) and it's locknut from plug stem.

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

6.2 INSTALL ACTUATOR

(refer to Fig. 1)

The actuator stem must be fully extended:
Actuators with air-to-open action must be fully vented.
Actuators with air-to-close action apply supply pressure.
Manually depress the plug stem to ensure the plug is fully seated.

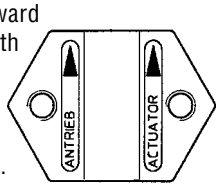
6.2.1 Screw coupling insert locknut and coupling insert as far as possible onto plug stem.

6.2.2 Place the actuator assembly on the valve engaging the yoke rod threads in the lower yoke plate and ensuring the actuator faces in the correct direction.

6.2.3 Unscrew the coupling insert until the yoke rods are raised from the lower yoke plate by around 2 mm.

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

6.2.4 Refit the coupling (12), ensuring that the arrows, embossed on the coupling halves, point upward towards the actuator, and secure with 2 retaining screws (13).



6.2.5 Apply supply pressure resp. vent actuator to half stroke and refit and tighten yoke rod retaining nuts (15).

6.2.6 Connect all tubing.

7 REVERSE THE ACTUATOR ACTION

(refer Fig. 1)

DANGER: *Actuators with "spring-to-close" action can be disassembled and reassembled by using long (de)compression screws. A suitable press is required to disassembled and reassemble actuators with "spring-to-open" action or to reverse the actuator action.*

7.1 Reverse actuator action from spring-to-close to spring-to-open

7.1.1 As required remove the actuator from the valve as described in section 1.1.

7.1.2 If long (de)compression screws are not already fitted to the actuator: **on type P2** remove 3 equally spaced case retaining screws (20), **on types P3/P4** remove 4 equally spaced case retaining screws (20).

7.1.3 Insert 3/4 longer (de)compression screws (21) according to table 2 and tighten the nuts hand tight.

Actuator	Screw length
Type P2	50 mm
Type P3	70 mm
Type P4	110 mm

Table 2
Screw lengths for (de)compression screws

7.1.4 Remove all the remaining short case retaining screws (20).

7.1.5 Unscrew the long compression screws (21) in equal measures until the actuator springs are fully decompressed and the upper case is loose.

7.1.6 Remove the upper case half.

7.1.7 Secure the actuator stem (10) against rotating with a wrench across the flats on the stem's lower part and remove the lock nut (24) and nut (32).

7.1.8 Remove following parts:

spacer (25), plate (26), spring plate (27), spring set (30), piston (28) diaphragm (29) and washer (1)

7.1.9 Replace the parts onto the actuator stem in reverse order.

7.1.10 With a suitable press compress the spring set.

7.1.11 Secure the actuator stem (10) from rotating with a wrench across the flats on the stem's lower part and retighten the nut (32) to the torque shown in table 2. Replace locknut (24) and secure with loctite 221.

Actuator	Torque
Type P2	20 Nm
Type P3	30 Nm
Type P4	35 Nm

Table 3 Torque value for nut (32)

7.1.12 Release the press and replace the upper case half.

7.1.13 Insert and tighten the case retaining screws (20) to a torque value of 12 Nm

7.1.14 As required refit the actuator assembly to the valve as described in section 1.2.

7.2 Reverse actuator action from spring-to-open to spring-to-close

7.2.1 As required remove the actuator from the valve as described in section 1.1.

7.2.2 Remove all case retaining screws (20).

7.2.3 Remove the upper case half (22).

7.2.4 With a suitable press compress the spring set.

7.2.5 Secure the actuator stem (10) against rotating with a wrench across the flats on the stem's lower part and remove the lock nut (24) and nut (32).

7.2.6 Remove following parts:

washer (1), diaphragm (29), piston (28), spring set (30), spring plate (27), plate (26) and spacer (25).

7.2.7 Replace the parts onto the actuator stem in reverse order.

7.2.8 Secure the actuator stem (10) from rotating with a wrench across the flats on the stem's lower part and retighten the nut (32) to the torque shown in table 3. Replace locknut (24) and secure with loctite 221.

7.2.9 Release the press and replace the upper case half.

7.2.10 Insert 3/4 longer (de)compression screws (21) (see table 2) through the upper and lower actuator case halves and tighten with long nuts (31) in equal measures until the casing halves contact.

7.2.11 Insert and tighten all remaining short case retaining screws (20) to a torque value of 12 Nm.

7.2.12 As required replace the long (de)compression screws/nuts with the short screws/nuts.

7.2.13 As required refit the actuator assembly to the valve as described in 1.2.

8 DISASSEMBLE AND ASSEMBLE ACTUATOR

(refer to fig. 1)

DANGER: *Actuators with "spring-to-close" action can be disassembled and reassembled by using long (de)compression screws. A suitable press is required to disassembled and reassemble actuators with "spring-to-open" action or to reverse the actuator action.*

8.1 DISASSEMBLE ACTUATOR

8.1.1 Actuator action spring-to-close

8.1.1.1 As required remove the actuator from the valve as described in section 1.1.

8.1.1.2 If long (de)compression screws are not already fitted to the actuator: **on type P2** remove 3 equally spaced case retaining screws (20), **on types P3/P4** remove 4 equally spaced case retaining screws (20).

8.1.1.3 Insert 3/4 longer (de)compression screws (21) according to table 1 and tighten the nuts hand tight.

8.1.1.4 Remove all the remaining short case retaining screws (20).

8.1.1.5 Unscrew the long compression screws (21) in equal measures until the actuator springs are fully decompressed and the upper case is loose.

8.1.1.6 Remove the upper case half.

8.1.1.7 Secure the actuator stem (10) against rotating with a wrench across the flats on the stem's lower part and remove the lock nut (24) and nut (32).

8.1.1.8 Remove following parts:

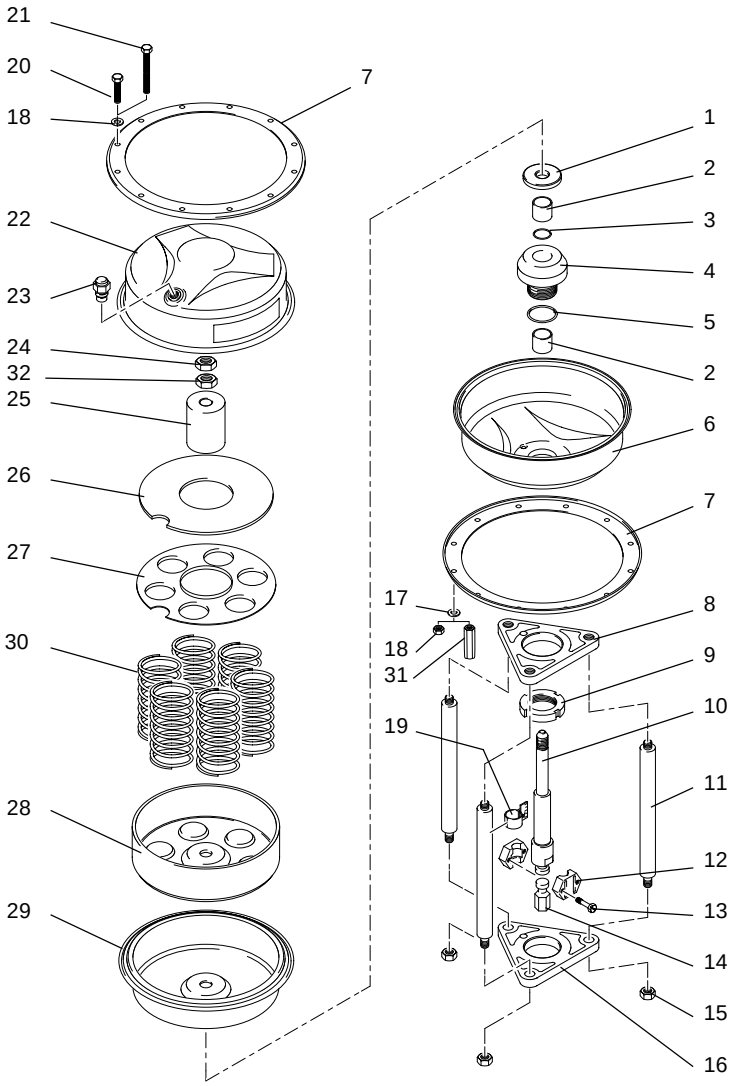
spacer (25), plate (26), spring plate (27), spring set (30), piston (28) diaphragm (29) and washer (1)

8.1.1.9 With a hooked spanner loosen and remove the slotted nut (9).

8.1.1.10 Remove the guide (4) and upper yoke plate (8).

8.1.2 Actuator action spring-to-open

8.1.2.1 As required remove the actuator from the valve as described



1	Washer
2	Bushing
3	O-Ring 22 x 2
4	Guide
5	O-Ring 32,99 x 2,62
6	Lower body
7	Flange
8	Yoke plate
9	Nut M 38 x 1,5
10	Actuator stem
11	Yoke rod
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24	Locknut
25	Spacer
26	Plate
27	Spring plate
28	Piston
29	Diaphragm
30	Spring set
31	Nut
32	Nut

Fig. 1: Series 1 On-Off Actuator, Air-to-Open

in section 1.1.

8.1.2.2 Remove all case retaining screws (20).

8.1.2.3 Remove the upper case half (22).

8.1.2.4 With a suitable press compress the spring set.

8.1.2.5 Secure the actuator stem (10) against rotating with a wrench across the flats on the stem's lower part and remove the lock nut (24) and nut (32).

8.1.2.6 Remove following parts:

washer (1), diaphragm (29), piston (28), spring set (30), spring plate (27), plate (26) and spacer (25).

8.1.2.7 With a hooked spanner loosen and remove the slotted nut (9).

8.1.2.8 Remove the guide (4) and upper yoke plate (8).

8.2 ASSEMBLE ACTUATOR

(refer to Figs. 1 and 2)

8.2.1 **Actuator action spring-to-close**

8.2.1.1 Insert the guide (4) into the lower body half.

8.2.1.2 Replace the upper yoke plate ensuring that the nose in the lower body rests in the bore of the upper yoke plate (see fig. 2).

8.2.1.3 Refit the slotted nut (9) and tighten with a hooked spanner.

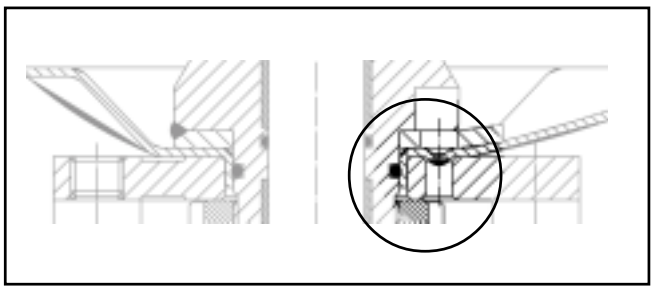

Fig. 2: Anti-rotation device

8.2.1.4 Refit the actuator stem (10), washer (1), diaphragm (29), piston (28), spring set (30), spring plate (27), plate (26) and spacer (25)

8.2.1.5 Secure the actuator stem (10) from rotating with a wrench across the flats on the stem's lower part and retighten the nut (32) to the torque shown in table 2. Replace locknut (24) and secure with loctite 221.

8.2.1.6 Replace the upper case half.

8.2.1.7 Insert 3/4 longer (de)compression screws (21) (see table 2) through the upper and lower actuator case halves and tighten with long nuts (31) in equal measures until the casing halves contact.

8.2.1.8 Insert and tighten all remaining short case retaining screws (20) to a torque value of 12 Nm.

8.2.1.9 As required replace the long (de)compression screws/nuts with the short screws/nuts.

8.2.1.10 As required refit the actuator assembly to the valve as described in 1.2.

8.2.2 Actuator action spring-to-close

8.2.2.1 Insert the guide (4) into the lower body half.

8.2.2.2 Replace the upper yoke plate ensuring that the nose in the lower body rests in the bore of the upper yoke plate (see fig. 2).

8.2.2.3 Refit the slotted nut (9) and tighten with a hooked spanner.

8.2.2.4 Refit the actuator stem (10), spacer (25), plate (26), spring plate (27), spring set (30), piston (28), diaphragm (29) and washer (1).

8.2.2.5 With a suitable press compress the spring set.

4.2.6 Secure the actuator stem (10) from rotating with a wrench across the flats on the stem's lower part and retighten the nut (32) to the torque shown in table 3. Replace locknut (24) and secure with loctite 221.

8.2.2.7 Release the press and replace the upper case half.

8.2.2.8 Insert and tighten the case retaining screws (20) to a torque value of 12 Nm

8.2.2.9 As required refit the actuator assembly to the valve as described in section 1.2.

8.3 NAMUR ACCESSORIES

(see Fig. 3)

8.3.1 Accessories according to NAMUR can be fitted by flanging them to the yoke. A special coupling half with threaded bosses is available to connect the actuating lever (see spare parts list for part-no.).

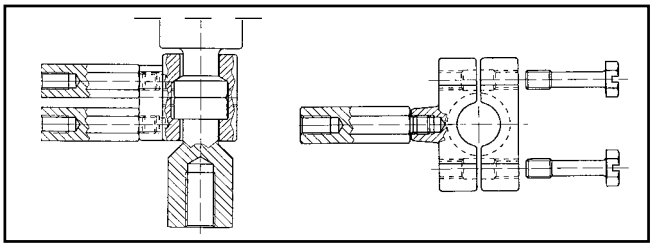

Fig. 3: NAMUR coupling half

9 Troubleshooting chart

Problem	Possible cause	Corrective Action
Stem pulsates	1. Unstable air supply 2. Vent or passage blocked	2. Adjust air supply 3. Clean vent or passage
Actuator slow	1. Air supply too low 2. Diaphram case leaks air 3. Spring case vent blocked	1. Adjust air supply 2. Seal diaphram case 3. Renew vent
Actuator will not return to end position	1. Air supply too low 2. Broken actuator spring 3. Actuator movement blocked	1. Adjust air supply 2. Renew all actuator springs 3. Dissassemble actuator and check
Actuator will not return to the failsafe position	1. Actuator not vented 2. Broken actuator spring 3. Actuator movement blocked	1. Vent actuator 2. Renew all actuator springs 3. Dissassemble actuator and check

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