FLOWSERVE

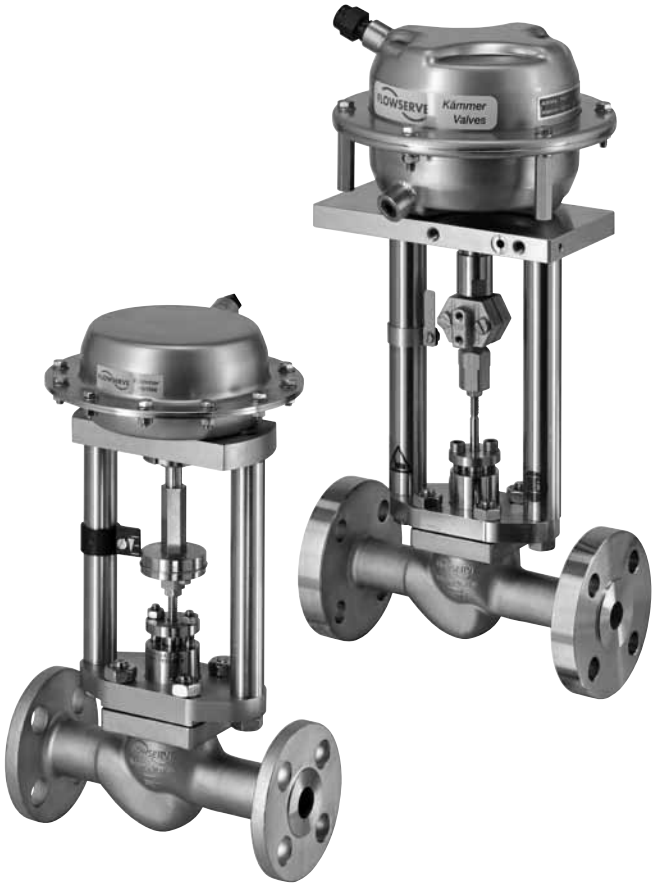
# USER INSTRUCTIONS

## *Kämmer® SmallFlow™ - 385000 / 385300*

Low and Micro Flow Valves

*FCD KMENIM5000-01 07/11*

***Installation***
***Operation***
***Maintenance***




***Experience In Motion***

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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.

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

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 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.

**WARNING:** *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 | P1<br>P2 | 90<br>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. Actuator and positioner 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. Please also observe the User instructions for I/P actuators.

## 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 bridge nuts (see table 1 )

| Bridge nut torque in Nm | |
|---|---|
| **PTFE** | **Grafoil** |
| 0.5 | 1.0 |

**Table 1**

**NOTE:** *An excessively tightened packing bridge nuts 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.

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 if necessary repaint.

5.5 Check packing nuts for correct torque (see table 1)..

**NOTE:** *An excessively tightened packing nuts 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: K***eep 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.

## 6 REMOVE AND INSTALL ACTUATOR

**General Information**
We recommend separating the actuator from the valve during all repair work. However, many maintenance and adjusting operations can be carried out in an installed condition.

6.1 **Remove actuator**
(see Fig. 1 and 1a)

6.1.1 Shut off air supply.

**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.*

6.1.2 Disconnect all tubing.

6.1.3 Remove 2 screws. Remove coupling (only series P2).

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

6.1.5 Remove coupling insert and it’s locknut from plug stem (only series 37/47/P1).

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

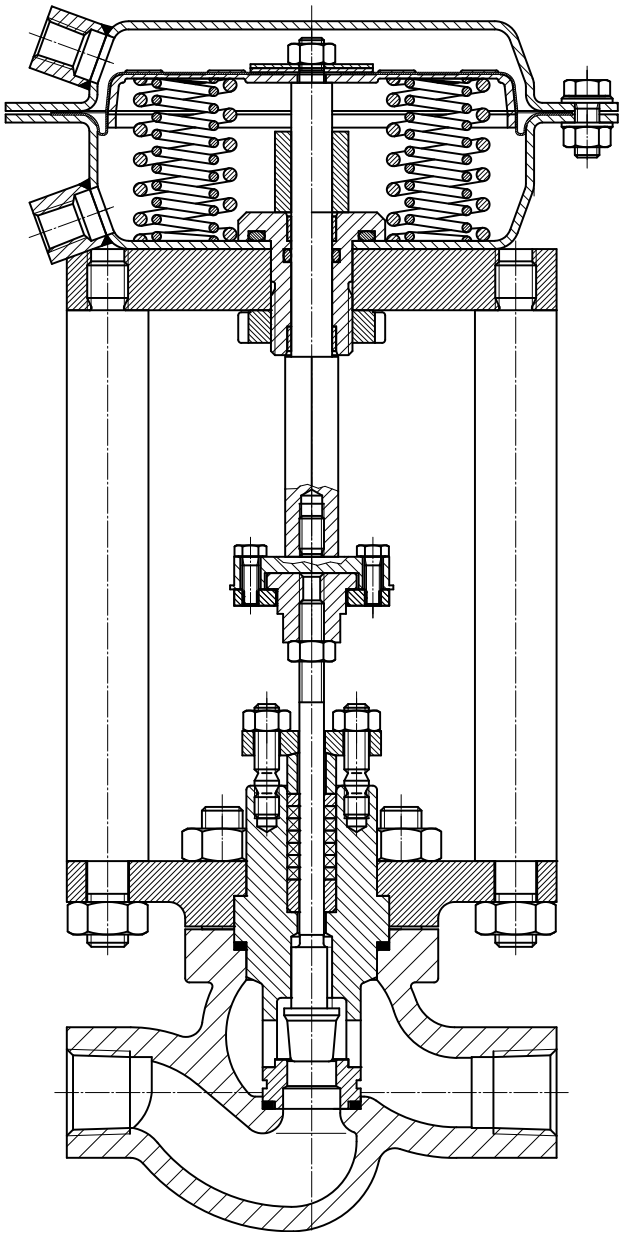
**6.2 Install series 2 actuator**

(see Fig. 1 and 1a)
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.

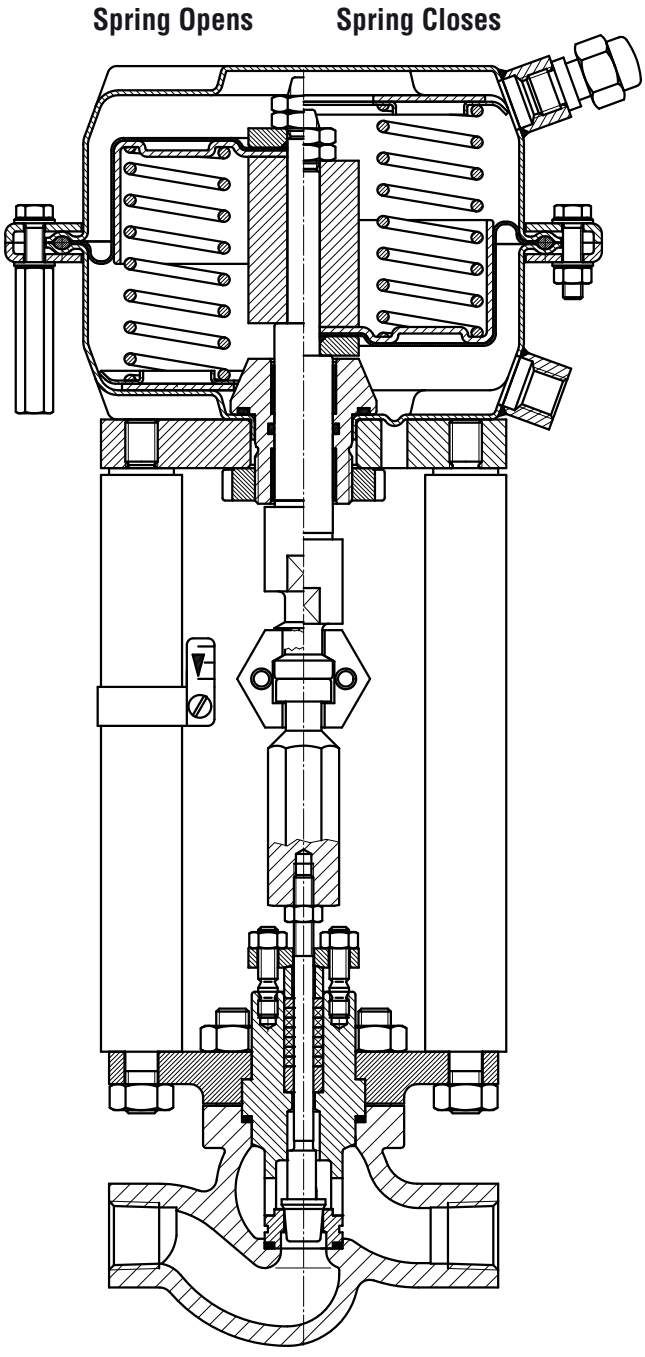
6.2.1 Screw coupling insert locknut and coupling insert as far as possible onto plug stem.

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.

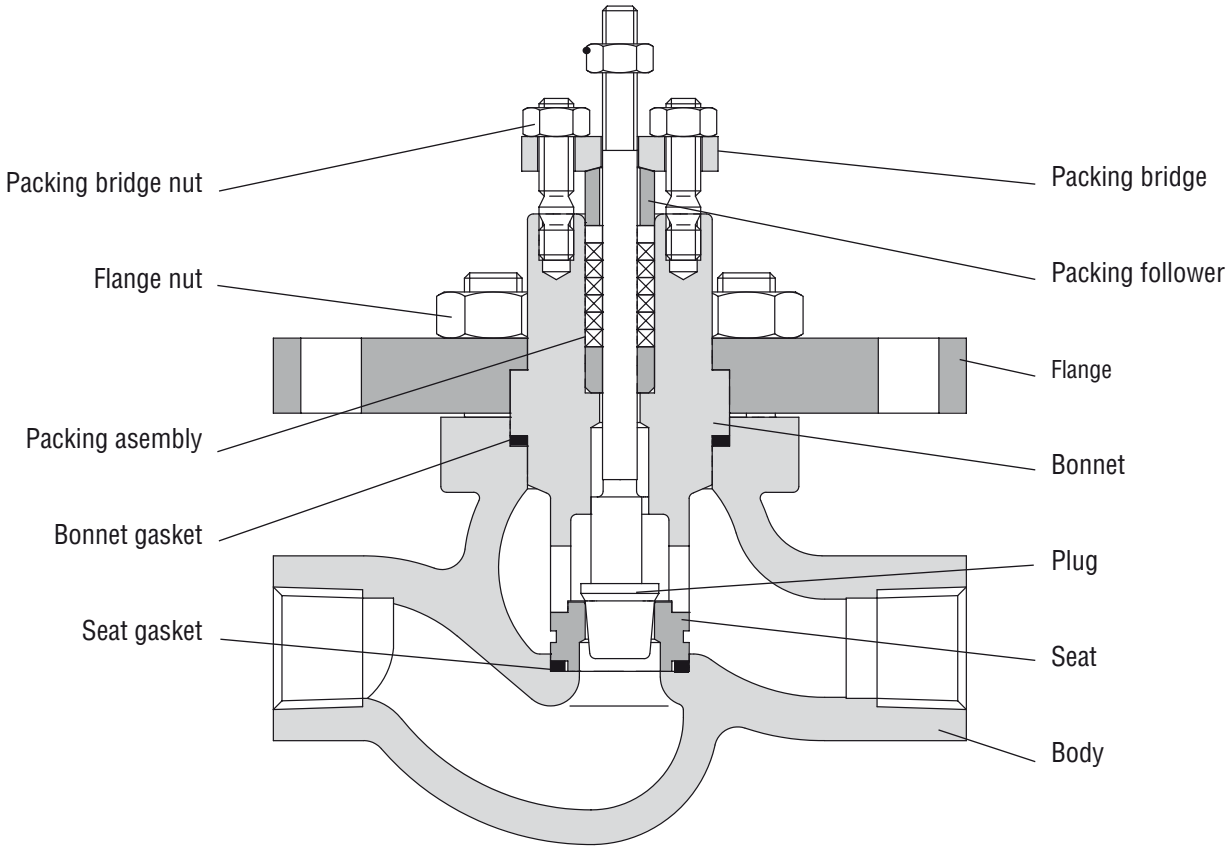
6.2.3 Unscrew the coupling insert until the yoke rods are raised from the lower yoke plate by around 2 mm (only series 1).



**Actuator series 2, type P1**
**(Serie 37/47 not shown)**
**Fig. 1**




**Actuator series 2, type P2**
**Fig. 1a**




**Typical standard valve configuration**
**Fig. 2**

**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 and secure with 2 retaining screws.

6.2.5 Connect all tubing.

## 7 DISASSEMBLE AND ASSEMBLE STANDARD VALVE

**General Information**

We recommend separating the actuator from the valve before commencing repair work.

However, many maintenance and adjusting operations can be carried out with the valve installed.

**NOTE:** *Never turn plug or perform any service on the valve while the plug is seated in the seat ring. Doing so may cause irreparable damage to the trim set. To ensure against this, always hold the plug out of the seat while working on the valve assembly.*

### 7.1 Disassemble valve

7.1.1 Disconnect actuator from valve body

7.1.2 Hold the plug out of the seat. Remove the nuts from the yoke plate retaining studs.

7.1.3 Carefully remove the yoke plate / bonnet from the valve body

7.1.4 Carefully remove the plug assembly through the packing.

**NOTE:** *The threaded section of the plug stem is slightly smaller in diameter than the guided section, this helps prevent damage to the packing when removing the plug from the bonnet.*

7.1.5 Using a drift from below, press out guides, packing and packing follower (the drift must have a slightly larger diameter than the plug stem)

7.1.6 Remove the bonnet gasket.

7.1.7 Remove seat and seat gasket.

7.1.8 Clean all parts and inspect for damage.

### 7.2 Assemble valve

**NOTE:** *All worn or damaged parts must be replaced. Reusable parts must be clean. All consumable items such as seals, O-Rings and gaskets must always be renewed.*

7.2.1 Insert new seat ring gasket and position seat ring within the valve body.

7.2.2 Replace bonnet gasket.

7.2.3 Insert the plug into the bonnet. Install the guide bushing into the packing chamber with bevelled end facing down.

7.2.4 Coat the yoke plate retaining studs with a small amount of lubricant. Hold the plug stem fully retracted in the bonnet and place the yoke plate /bonnet assembly into the body. Replace the yoke plate retaining nuts and tighten to the prescribed torque (see following table), alternating crosswise:

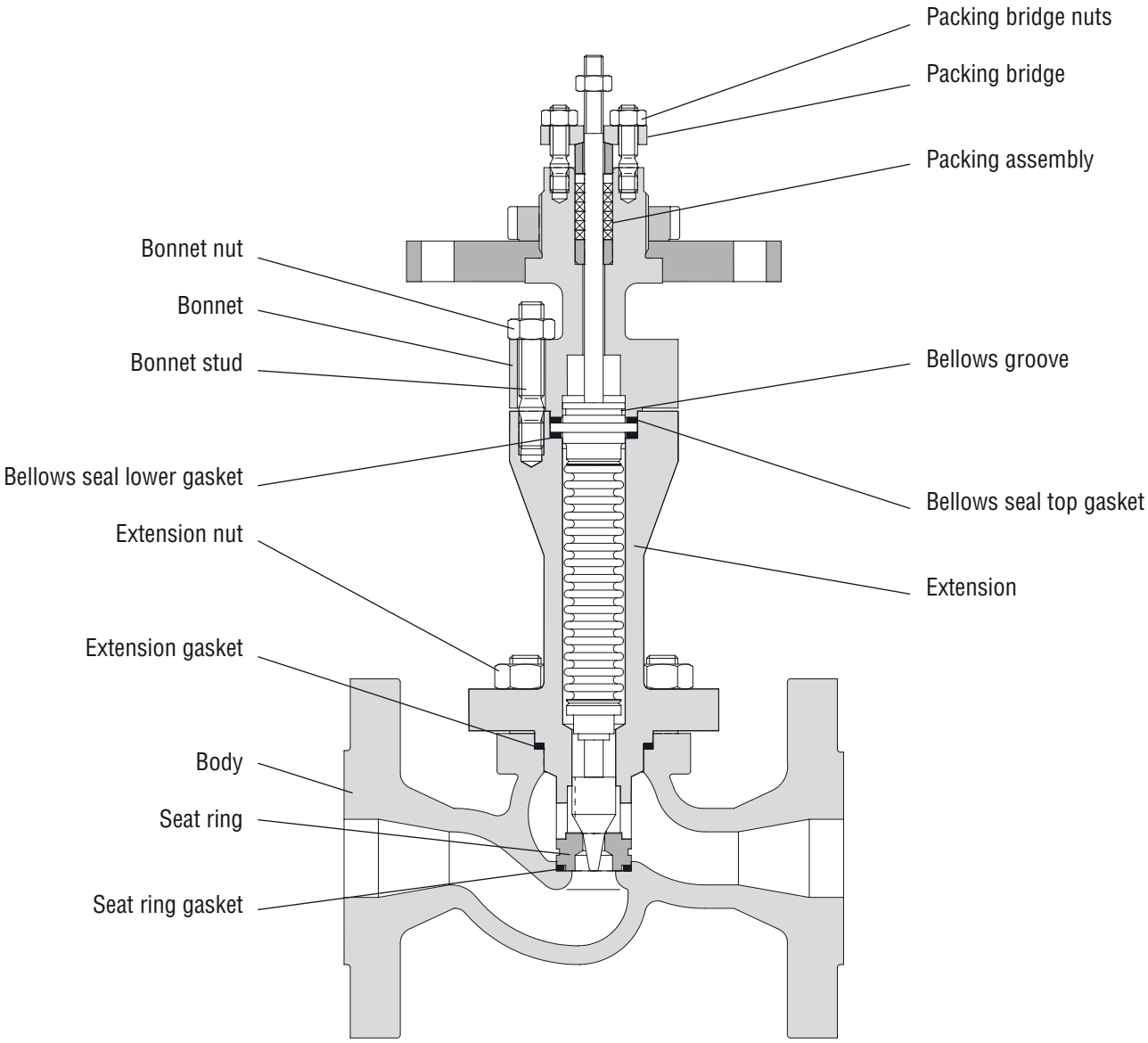
| |
|---|
| Flange nuts M10 = 35Nm |
| Flange nuts M12 = 36Nm |

7.2.5 Replace packing by inserting packing rings one at a time tapping each one down with a suitable bushing.

**NOTE**: *ensure that the gaps in the packing rings are distributed evenly around the circumference in the packing box (gaps not in line). Around 3mm should remain free to enter the packing follower.*

**NOTE:** *Different packing configurations and their fitting sequences are shown in the spare parts list.*

7.2.6 Insert packing follower, replace packing bridge and tighten retaining nuts to value shown in table 1.




**Typical bellows seal valve configuration**
**Fig. 3**

## 8 DISASSEMBLE AND ASSEMBLE BELLOWS SEAL VALVE

### 8.1 Disassemble Valve

(see Fig. 3)

**DANGER**: *As poisonous or hazardous materials may be present, the system must be depressurized and all processing materials must be drained. As required, decontaminate the valve. Keep hands, hair, clothing, etc. away from all moving parts. Wear face and eye protection. Failure to do so can lead to serious injury.*

8.1.1 Carefully loosen test connection and check whether medium has collected within the bellows seal bonnet (defective bellows).

8.1.2 Remove bonnet nuts and remove bonnet.

**NOTE**: *Due to the friction coefficient between packing and stem, the bellows is usually also extracted when the bonnet is removed. In this case, support the bellows to ensure that it does not drop and be damaged.*

8.1.3 Without stretching the bellows, pull the plug/bellows assembly out of the bonnet. Do not lose anti-rotation pin. Remove packing bridge nuts and remove packing

bridge. Using a drift from below, press out guides, packing and packing follower (the drift must have a slightly larger diameter than the plug stem).

**NOTE:** *The threaded section of the plug stem is slightly smaller in diameter than the guided section, this helps prevent damage to the packing when removing the plug from the bonnet.*

8.1.4 If the bellows remains in the extension, the bellows can be carefully levered free by using two screwdrivers inserted in the outer groove of the bellows upper part.

8.1.5 With soft seat version, loosen plug tip with appropriate tool and remove soft seat gasket.

**DANGER**: *When the tip of the plug is loosened, medium residue, which has diffused through the gasket, may be released.*

8.1.6 Remove extension nuts and remove extension.

8.1.7 Remove seat ring and seat ring gasket.

8.1.8 Check seal faces of seat ring and plug for damage. Gasket surfaces must be clean and free of damage.

**NOTE**: *To prevent damage to the seat, plug or plug stem, follow the above instructions precisely.*

8.1.9 If a seating surface needs re-machining, **both** seat **and** plug seating surfaces must be reworked. The seat angle on the plug is 30°, on the seat ring 25°. If the valve is assembled correctly, lapping is not required.

**NOTE**: *When re-machining the plug, protect plug stem and bellows from damage and support upper part of bellows towards plug stem. The seat surface must be concentric to the plug stem.*

**8.2 Assemble Valve**

(see Fig. 3)

8.2.1 All worn or damaged parts must be replaced. Reusable parts must be clean. Expendable parts such as gaskets, packing and O-rings must always be renewed.

8.2.2 Insert new seat ring gasket and position seat ring within the valve body.

8.2.3 Insert new extension gasket in valve body and position extension. Uniformly tighten extension nuts hand-tight, only alternating crosswise.

8.2.4 With soft seat: using a new soft seat gasket, screw plug tip back on.

8.2.5 Insert new lower gasket for bellows seal extension. Carefully insert plug/bellows assembly into extension and install anti-rotation pin.

8.2.6 Using a torque wrench, gradually tighten all extension retaining nuts to the prescribed torque (see following table), alternating crosswise:

| |
|---|
| Extension M10 = 35Nm |
| Extension M12 = 36Nm |

8.2.7 Insert new bellows upper gasket

8.2.8 Position bellows seal bonnet (test connection forwards) and uniformly tighten bonnet nuts hand-tight, alternating crosswise.

8.2.9 Using a torque wrench, gradually tighten all bonnet nuts to the prescribed torques (see following table), alternating crosswise:

| |
|---|
| Bonnet nuts M 8 = 20Nm |
| Bonnet nuts M12 = 36Nm |

8.2.10 Install the guide bushing into the packing chamber with bevelled end facing down. Replace packing by inserting packing rings one at a time tapping each one down with a suitable bushing.

**NOTE**: *ensure that the gaps in the packing rings are distributed evenly around the circumference in the packing box (gaps not in line).*

**NOTE:** *Different packing configurations and their fitting sequences are shown in the spare parts list.*

8.2.11 Insert packing follower, replace packing bridge and tighten retaining nuts to value shown in table 1.

8.2.12 When performing subsequent pressure test, observe the max. permissible pressure for the bellows. After the check for leaks, seal test connection with a plug or suitable gauge.

***Notes***

***Notes***

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