

Maintenance Instructions

Series 1b Control Valve



Fig 1 - Series 1b Control Valve with SAMSON actuator

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1. General

These instructions are intended to assist the user on assembling and repairing Series 1b Control Valves.

Technical specifications, as a result of further development of valves mentioned in these instructions, are subject to modification without notice.

The text and illustrations do not necessarily display the scope of supply or any ordering of spare parts. Drawings and graphics are not to scale. Customer-specific designs not in accordance with our standard product range are not shown.

Distribution of these instructions to third parties is not permitted, unless expressly granted.



This equipment may only be dismantled and disassembled by skilled staff who are familiar with the assembly, start-up and operation of this product.

In these instructions, the term skilled staff refers to individuals who are able to judge the responsibilities assigned to them as well as recognize potential hazards due to their specialized training, knowledge and experience as well as their special knowledge of the relevant standards.

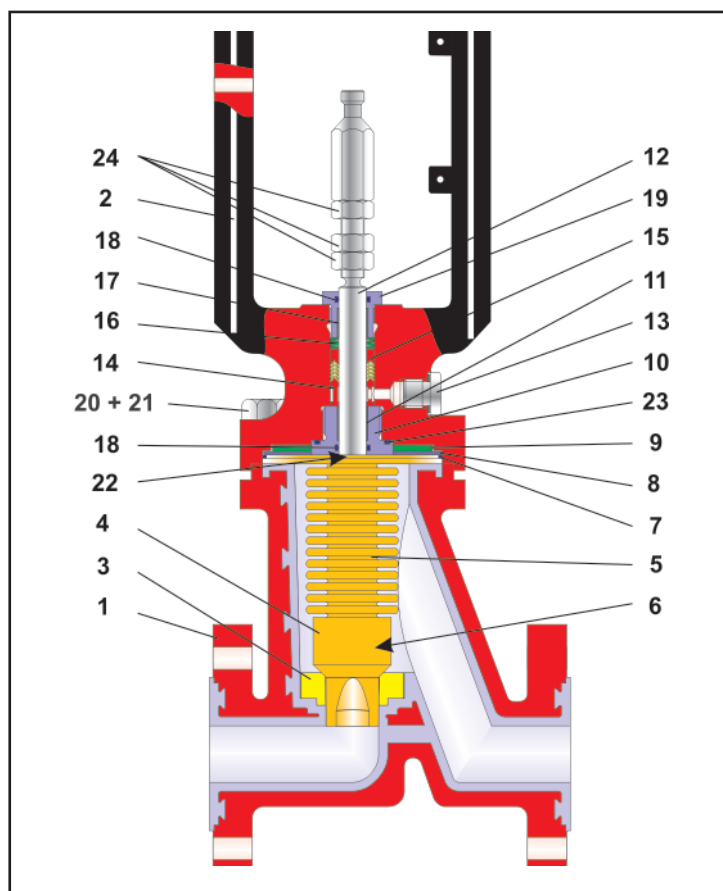


Fig. 2 - Sectional view of Series 1b Control Valve => See Table 1 for parts list

2. Design, operation and dimensions

Design, operation and dimensions as well as all further technical details can be found in the **Data sheet < TB 01b_EN >**.

3. Installation, start-up and maintenance

Guidelines for the installation, start-up and maintenance can be found in the **Operating Instructions < BA 01a-01_EN >** for automated control valves or **< BA 01a-02_EN >** for manually operated control valves.

4. Assembly of the valve

The current version of the Series 1b Control Valve, **manufactured from 2006**, has a different construction of the stem sealing than the previous version, **manufactured before 2006**. As a result, the changes have not been documented in any assembly instructions.

On **page 2**, the current control valve is described.

On **page 4** you can find the description of the previous control valve version.

4.1 Assembly of the current valve version (manufactured from 2006)

4.1.1 Preparation for assembly

Before assembling the control valve, carefully clean all parts and place them on a soft surface (rubber mat or similar).

Plastic parts are nearly always soft and very sensitive. Take particular care when handling the sealing surfaces to ensure that they do not get damaged.



Note: A high-performance grease paste (Fuchs Gleitmo 805) is used during manufacturing to prevent the screws from cold welding in the bodies.

Do not use this lubricant with valves intended for oxygen service. Use a lubricant suitable for valves that are free of grease, especially for oxygen service.

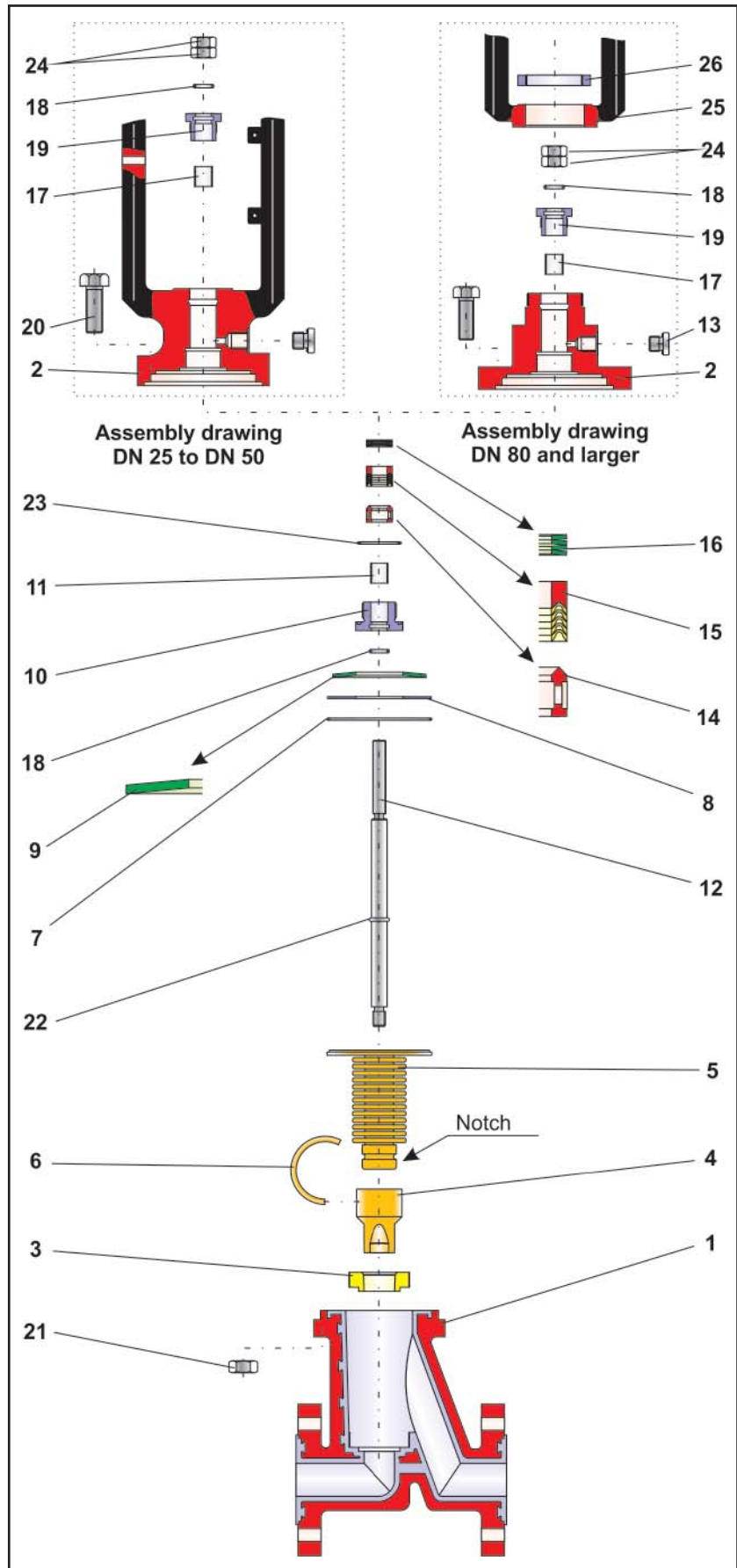


Fig 3 - Explosion drawing of the Series 1b Valve **manufactured from 2006**

Item	Description	Material
1	Valve body	EN-JS 1049/PFA
2	Bonnet flange	EN-JS 1049
3	Seat	PTFE
4	Plug	PTFE
5	Bellows	PTFE
6	Cord	PTFE
7	O-ring	EPDM
8	Thrust washer	1.4305
9	Spring washer	1.8159/Deltatone coated
10	Threaded bushing	1.4305
11	Bearing bushing	PTFE with 25 % carbon
12	Stem unit	1.4571
13	Screw plug	St. / yellow zinc-plated
14	Distance bushing	1.4571
15	V-ring packing	1.4305/PTFE
16	Set of spring washers	1.8159/Deltatone coated
17	Bearing bushing	PTFE with 25 % carbon
18	O-ring	Viton
19	Stuffing box	1.4305
20	Bolt	A2-70
21	Nut	A2-70
22	Retainer ring	1.4310
23	O-ring	Viton
24	Lock nut	A2-70
25	Yoke	EN-JS 1049
26	Nut	1.0038/zinc-plated

Table 1 - Parts list



Note: The position and arrangement of individual parts shown in explosion drawing (Fig. 3) must be observed when assembling the valve.

4.1.2 Pre-assembly of the valve body

Use a special tool to screw the PTFE seat (3) into the body (1).

Refer to Table 2 for tightening torques:

Nominal size	Tightening torque
DN 25 / NPS 1	Approx. 7 Nm
DN 40 / NPS 1½	Approx. 10 Nm
DN 50 / NPS 2	Approx. 10 Nm
DN 80 / NPS 3	Approx. 30 Nm
DN 100 / NPS 4	Approx. 50 Nm

Table 2 - Tightening torques



NOTICE: On screwing the seat into the body, make sure the seat is aligned properly and the thread does not get damaged.

Machine the seat's inside diameter to the required diameter.

4.1.3 Pre-assembly of the stem unit

Push the retainer ring (22) into the groove on the short threaded side of the stem (12).

Apply grease to the lower end of the stem (12) (e.g. Micro-Gleit GP350).

Screw the ready-assembled bellows (5) together with washer and bushing tightly onto the greased thread of the stem (12).



Note: Due to the sliding property of PTFE, we recommend using emery cloth to prevent the bellows from sliding when screwing it onto the stem.

In order to push the plug stem onto the bellows, make a small notch in the bellows to let air escape. Push the plug (4) onto the bellows (5).

Secure the connection between plug stem and bellows with PTFE cord (6). Insert it as far as possible. Use a sharp knife to cut off any projecting cord.

4.1.4 Pre-assembly of the bonnet flange

Place the O-ring (18) into the inside groove of the stuffing box (19).

Press top bearing bushing (17) into the lower part of the stuffing box (19).

Screw the greased thread of the stuffing box (19) into the top of the bonnet flange (2), ensuring the outer groove of the stuffing box is still visible.



Note: Do not screw the stuffing box (19) into the bonnet flange as far as it will go.

Clamp the bonnet flange (2) at the yoke in a vise with the flange opening facing upwards.



Note: In valves DN 80 and 100, the yoke is assembled at a later stage.

For this reason, clamp the bonnet flange (2) in a vise with the stem guide on the stuffing box side facing downwards.



NOTICE: Make sure that the bonnet flange, in particular the thread at the stem end, does not get damaged.

Place the set of spring washers (16) in the intended bore. Refer to the explosion drawing (Fig. 3) for the arrangement. Insert the final ring, the V-rings of the packing (15) and the distance bushing (14) in the correct order. Refer to the explosion drawing (Fig. 3) for the correct order.

Press the lower bearing bushing (11) into the top part of the threaded bushing (10).

Place the O-ring (18) in the inside groove and the O-ring (23) in the collar groove of the threaded bushing.

Screw the greased threaded bushing (10) as far as it will go into the bonnet flange (2).



Note: The threaded bushing must not be inserted at a slanted angle on screwing it into the bonnet flange.



Only for DN 80 and DN 100: Push the yoke (25) onto the bonnet flange and tighten the nut (26).

4.1.5 Final assembly of the bonnet flange

Insert the spring washer (9), thrust washer (8) and O-ring (7) into the bonnet flange (2). Refer to the explosion drawing (3) for the arrangement of the parts.

Place the ready-assembled stem unit (**see section 4.1.3**) into the bonnet. Press the flange of the bellows into the turned recess of the bonnet flange.

To complete the bonnet assembly, screw the screw plug (13) into the flange.

4.1.6 Final assembly of the valve (standard packing version)

Clamp the ready-assembled valve body (**see section 4.1.2**) in a vise with the bonnet opening facing upwards. Carefully place the ready-assembled bonnet flange (**see section 4.1.5**) onto the body. Insert the bolts (20) and align using the nuts (21).



Note: To prevent the plug from becoming jammed, pull the stem upwards as far as possible before tightening the bolted joints. Tighten the nuts and bolts evenly in a criss-cross pattern using the torques in Table 3.

Nominal size	Bolts Ø	Tightening torque
DN 25 / NPS 1	M12	120 Nm
DN 40-50 / NPS 1½-2	M12	120 Nm
DN 80 / NPS 3	M20	250 Nm
DN 100 / NPS 4	M24	250 Nm

Table 3 - Tightening torques

After adjusting the valve, tighten the stuffing box (19).

Screw the lock nuts (24) onto the stem (**see section 4.3 concerning tightening the nuts**).

4.1.7 Final assembly of the valve (version with optional adjustable backup packing)

For the final assembly of the valve, proceed as described in **section 4.1.6**. However, do not tighten the stuffing box (19). Instead, unscrew it completely and remove it from the valve.



Note: Clean the removed stuffing box to ensure it is free of grease.

Apply Loctite 668 to the thread of the stuffing box (19). Screw the stuffing box back into the bonnet flange.



NOTICE: Do not screw tight the stuffing box. The distance between the collar of the stuffing box and the bonnet must be 3 mm!

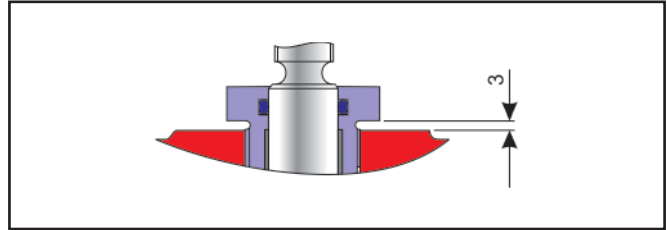


Fig. 4 - Adjustable packing

Seal the stuffing box with a dot of red paint.

4.2 Assembly of the valve version (manufactured before 2006)

4.2.1 Preparation for assembly

Before assembling the control valve, carefully clean all parts and place them on a soft surface (rubber mat or similar). Plastic parts are nearly always soft and very sensitive. Take particular care when handling the sealing surfaces to ensure that they do not get damaged.



Note: A high-performance grease paste (Fuchs Gleitmo 805) is used during manufacturing to prevent the screws from cold welding in the bodies. Do not use this lubricant with valves intended for oxygen service. Use a lubricant suitable for valves that are free of grease, especially for oxygen service.



Note: The position and arrangement of the individual parts shown in the explosion drawing (Fig. 5) must be observed when assembling the valve.

4.2.2 Pre-assembly of the valve body

Use a special tool to screw the PTFE seat (3) into the body (1). Refer to Table 4 for tightening torques:

Nominal size	Tightening torque
DN 25 / NPS 1	Approx. 7 Nm
DN 40 / NPS 1½	Approx. 10 Nm
DN 50 / NPS 2	Approx. 10 Nm
DN 80 / NPS 3	Approx. 30 Nm
DN 100 / NPS 4	Approx. 50 Nm

Table 4 - Tightening torque

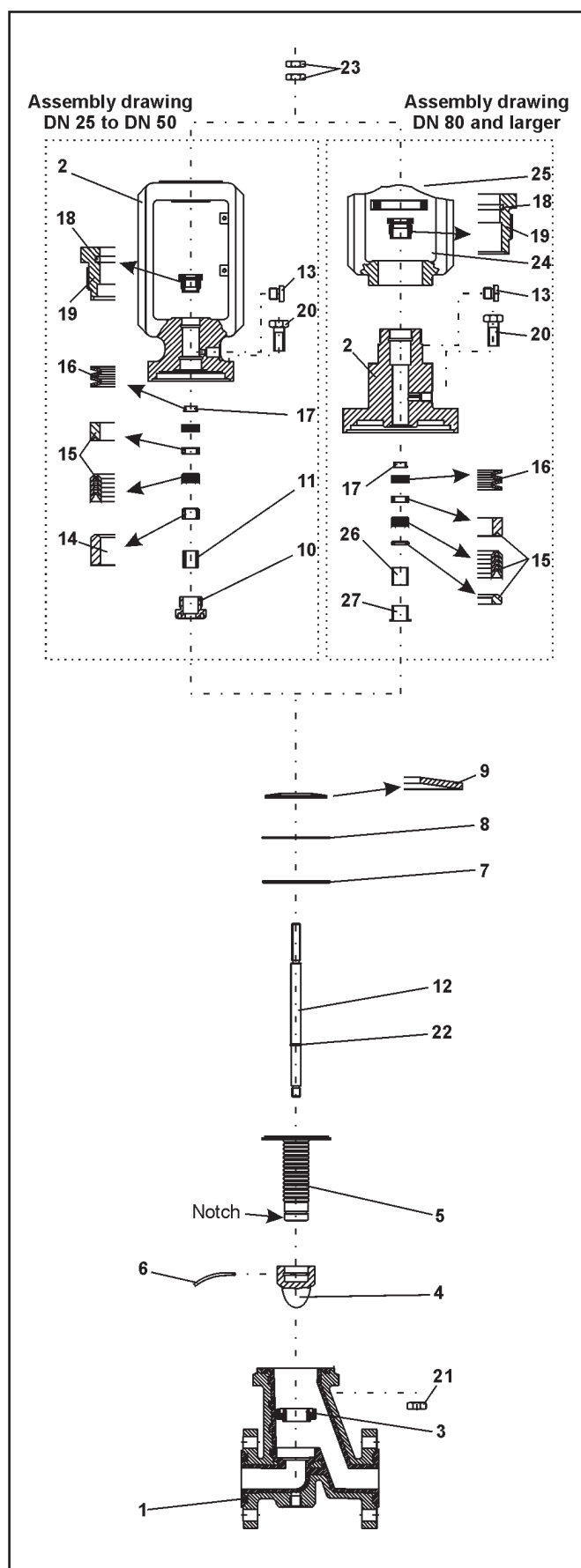


Fig 5 - Explosion drawing of Series 1b Control Valve, manufactured before 2006

Item	Description	Material
1	Valve body	EN-JS 1049/PFA
2	Bonnet flange	EN-JS 1049
3	Seat	PTFE
4	Plug	PTFE
5	Bellows	PTFE
6	Cord	PTFE
7	O-ring	EPDM
8	Thrust washer	1.4305
9	Spring washer	1.8159/Deltatone coated
10	Threaded bushing	1.4305
11	Bushing	PTFE with 25 % carbon
12	Stem unit	1.4571
13	Screw plug	St./yellow zinc-plated
14	Distance bushing	1.4571
15	V-ring packing	1.4305/PTFE
16	Set of spring washers	1.8159 / Deltatone coated
17	Bearing bushing	PTFE with 25% carbon
18	O-ring	Viton
19	Stuffing box	1.4305
20	Bolt	A2-70
21	Lock nut	A2-70
22	Retainer ring	1.4310
23	Hex nut	A2-70
24	Yoke	EN-JS 1049
25	Nut	1.0038/zinc-plated
26	Bushing	Glycodur
27	Collar bushing	Glycodur
28	Threaded pin	A2-70

Table 5 - Parts list



NOTICE: On screwing the seat into the body, make sure the seat is aligned properly and the thread does not get damaged.

Machine the seat's inside diameter to the required diameter.

4.2.3 Pre-assembly of the stem unit

Push the retainer ring (22) into the groove on the short threaded side of the stem (12).

Apply grease to the lower end of the stem (12) (e.g. Micro-Gleit GP350).

Screw the ready-assembled bellows (5) together with washer and bushing tightly onto the greased thread of the stem (12).



Note: Due to the sliding property of PTFE, we recommend using emery cloth to prevent the bellows from sliding when screwing it onto the stem.

In order to push the plug stem onto the bellows, make a small notch in the bellows to let air escape. Push the plug (4) onto the bellows (5).

Secure the connection between plug stem and bellows with PTFE cord (6). Insert it as far as possible. Use a sharp knife to cut off any projecting cord.

4.2.4 Pre-assembly of the bonnet flange

4.2.4.1 Bonnet flange assembly for DN 25 to DN 50

Place the O-ring (18) into the inside groove of the stuffing box (19). Press top bearing bushing (17) into the lower part of the stuffing box (19).

Screw the greased threaded bushing (10) as far as it will go into the bonnet flange (2), ensuring that the outer groove of the the stuffing box is still visible.



Note: Do not screw the stuffing box (19) into the bonnet flange as far as it will go.

Clamp the bonnet flange (2) at the yoke in a vise with the flange opening facing upwards.

Place the set of spring washers (16) in the intended bore. Refer to the explosion drawing (Fig. 5) for the arrangement. Insert the final ring, the V-rings of the packing (15) and the distance bushing (14) in the correct order. Refer to the explosion drawing (Fig. 5) for the correct order.

Press the lower bearing bushing (11) into the top part of the threaded bushing (10).

Screw the greased thread of the stuffing box (19) into the top of the bonnet flange (2).



Note: The threaded bushing must not be at a slanted angle on screwing it into the bonnet flange.

4.2.4.2 Bonnet flange assembly for DN 80

Clamp the bonnet flange (2) in a vise with the stem guide facing downwards.



NOTICE: Make sure that the bonnet flange, in particular the thread at the stem end, does not get damaged.

Using a suitable mandrel and applying Loctite, insert the Glycodur bushing (26) into the shaft guide. Press the Glycodur collar bushing (27), also using Loctite, as far as it will go into the stem guide.

To continue the assembly, place the bonnet flange (2) with the flange side facing downwards on a clean surface at working height to allow for easy working access of the top opening.

Press the thrust washer, PTFE V-rings, final ring into the intended bore in the correct order. Refer to the explosion drawing (Fig. 5) for the arrangement of the V-ring packing. Insert the set of spring washers (16). Refer to the explosion drawing (Fig. 5) for the correct arrangement of the spring washers.

Place the O-ring (18) into the inside groove of the stuffing box and the O-ring (23) in the collar groove of the threaded bushing. Press the top bearing bushing (17) into the bottom part of the stuffing box (19).

After applying grease to the thread of the stuffing box (19), screw the stuffing box into the top of the bonnet flange (2), ensuring that the outer groove of the the stuffing box is still visible.



Note: Do not screw the stuffing box (19) into the bonnet flange as far as it will go.

Slide the yoke (24) onto the bonnet flange and tighten with the nut (25).

4.2.5 Final assembly of the bonnet flange

Insert the spring washer (9), thrust washer (8) and O-ring (7) into the bonnet flange (2). Refer to the explosion drawing (Fig. 5) for the arrangement of the parts.

Place the ready-assembled stem unit (**see section 4.2.3**) into the bonnet. Press the flange of the bellows into the turned recess of the bonnet flange.

Screw in the threaded pin (28). Observe the depth of the slot in the stem.

To complete the bonnet assembly, screw the screw plug (13) into the flange.

4.2.6 Final assembly of the valve (standard packing version)

Clamp the ready-assembled valve body (**see section 4.2.2**) in a vise with the bonnet opening facing upwards.

Carefully place the ready-assembled bonnet flange (**see section 4.2.5**) onto the body.

Insert the bolts (20) and align using the nuts (21)



Note: To prevent the plug from becoming jammed, pull the stem upwards as far as possible before tightening the bolted joints.

Tighten the nuts and bolts evenly in a criss-cross pattern using the torques in Table 6.

Nominal size	Bolts Ø	Tightening torque
DN 25 / NPS 1	M12	120 Nm
DN 40-50 / NPS 1½-2	M12	120 Nm
DN 80 / NPS 3	M20	250 Nm
DN 100 / NPS 4	M24	250 Nm

Table 6 - Tightening torques

After adjusting the valve, tighten the stuffing box (19).

Screw the lock nuts (23) onto the stem (**see section 4.3 concerning tightening the nuts**).

4.2.7 Final assembly of the valve (version with optional adjustable backup packing)

For the final assembly of the valve, proceed as described in **section 4.2.6**.

However, do not tighten the stuffing box (19). Instead, unscrew it completely and remove it from the valve.



Note: Clean the removed stuffing box to ensure it is free of grease.

Apply Loctite 668 to the thread of the stuffing box (19). Screw the stuffing box back into the bonnet flange.



NOTICE: Do screw tight the stuffing box. The distance between the collar of the stuffing box and the bonnet must be 3 mm!

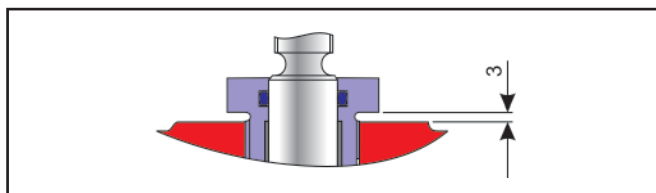


Fig. 6 - Adjustable packing

Seal the stuffing box with a dot of red paint.

4.3 Travel adjustment

If the valve and SAMSON actuator are delivered separately, adjust the dimension A from the top of the stem connector nut to the top of the yoke as specified in Table 7. Check this dimension on assembling the valve and actuator.

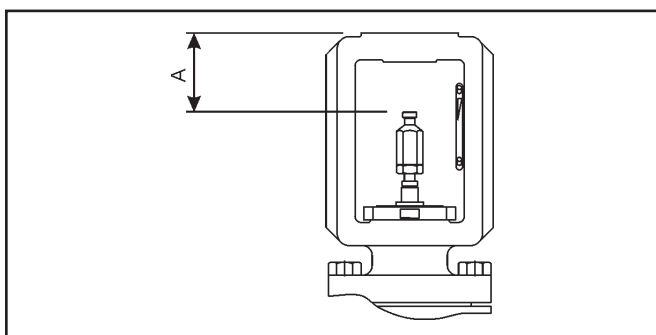


Fig. 7 - Travel adjustment

Travel adjustment with SAMSON actuators (valve CLOSED)	
Valve size	A
DN 25 to 80 / NPS 1 to 3	75 ± 0.1
DN 100 / NPS 4	90 ± 0.1

Table 7 - Travel adjustment

4.3.1 Travel limit

• Mechanical limit stop for actuator fail-safe action Actuator stem extends (fail-close)

The mechanical limit stop for the actuator with fail-close action is adjusted using a retainer ring (22) inside on the valve stem. The valve is delivered with this travel limit setting.

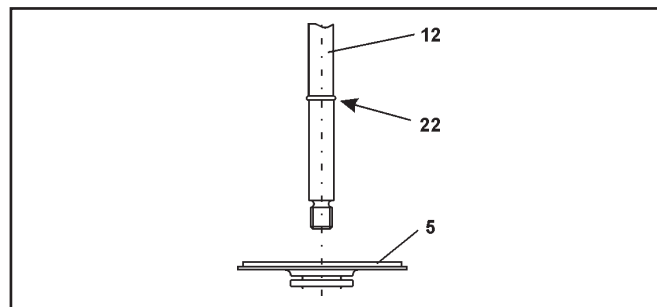


Fig 8 - Travel limit for fail-close actuator

• Mechanical limit stop for actuator fail-safe action Actuator stem retracts (fail-open)

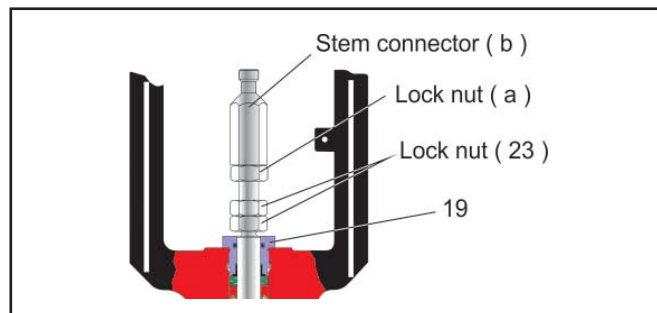


Fig 9 - Travel limit for fail-open actuator

The mechanical limit stop for the actuator with fail-open action is implemented by two lock nuts (23) mounted on the outside of the valve stem.

Secure the nuts (23) in position with approx. 2 mm clearance to the top of the stuffing box (19).

Theoretical travel (SAMSON actuator) 15 +0.5 to 1 mm

Assembly of the control valve is now completed.

5. Troubleshooting

Refer to **Section 7** in the **Operating Instructions**

< BA 01a-01_EN > for automated control valves

< BA 01a-02_EN > for manually operated control valves

6. Repairing the control valve

6.1 Replacing the bellows

If leakage is detected at the test connection (13) the bellows (5) may be defective. We therefore recommend checking the condition of the bellows.

To remove the bellows, disassemble the valve in reverse order to the assembly instructions described in section 4. Check the bellows and all the plastic parts for damage. In case of doubt, replace the parts with new ones.

6.2 Replacing the bellows and V-ring packing

If leakage is detected at the stuffing box, the V-ring packing and the bellows may be defective. We therefore recommend checking the sealing of the packing and the bellows.

To remove the bellows and the packing, disassemble the valve in reverse order to the assembly instructions as described in section 4.

Check the packing, bellows and all the plastic parts for damage. In case of doubt, replace the parts with new ones.

6.3 Readjustment of the packing (option)

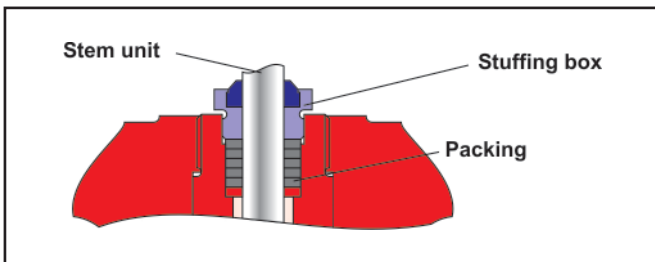


Fig. 10 – Version with adjustable backup packing

This version does not have a test connection on the bonnet.

The backup packing:

- Not gas tight from around 2 bar in the delivered state
- Stuck in position with Loctite 668
- Sealed with red paint as a visual marking
- Adjustment YES/NO
- Can be tightened a further approx. 3 mm, making it gas tight up to 16 bar.

The glued connection:

- Constantly stuck, but the packing can still be tightened with a tool
- Designed for a temperature range between -10 and +200 °C

If the valve leaks at the stuffing box, the bellows is defective.



NOTICE: All necessary safety measures must be taken to avoid any possible accidents. Always take into account that you are nearly always dealing with dangerous medium.

Tighten the stuffing box.



NOTICE: The valve no longer leaks, however, it should be repaired as quickly as possible, as there is no primary sealing. The valve should only be sealed by the stuffing box for a short period.

Perform repair work as described in section 6.1.

6.4 Further repair work

In case of severe damage, we recommend the repair work to be carried out by Pfeiffer.

7. Customer inquiries

Should you have any inquiries, please submit the following details:

1. Order number (embossed on the control valve body)
2. Type, product number, nominal size and version of the valve
3. Pressure and temperature of the process medium
4. Flow rate in m³/h
5. Installation sketch, if possible