Pfeiffer
Chemie-Armaturenbau GmbH

Maintenance instructions
3-way control valve Series 1d

Fig. 1 - 3-way valve, series 1d with Samson control valve

0. Contents

1. Introduction

These instructions are intended to assist the user in assembling and repairing the directional valve of series 1d.
Technical details, as a result of further development of the valve mentioned in these instructions are subject to modification without notice. The text and illustrations do not necessarily display the scope of supply, or an eventual order of spare parts. Drawings and graphics are not to scale. Customer related designs, which are not in accordance with our standard offer, are not shown.
The transfer of these instructions to third parties is only allowed with the written approval of Pfeiffer Chemie-Armaturenbau GmbH.

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

Skilled staff in the sense of these repair and assembly instructions are persons who, as a result of their training, experience, and knowledge of the relevant standards, are able to judge the tasks assigned to them, and to reconise possible dangers.

2. Design, operation and dimensions

Design, operation and dimensions, also all further technical details may be found in the **Data sheet** < **TB 01d_EN** >.

3. Installation, start-up and maintenance

Guidelines for the installation, start-up and maintenance can be found in the:

- for automatic 3-way valves
  operating instructions < **BA 01d-01_EN** >,
- for manual operated 3-way valves
  operating instructions < **BA 01d-02_EN** >

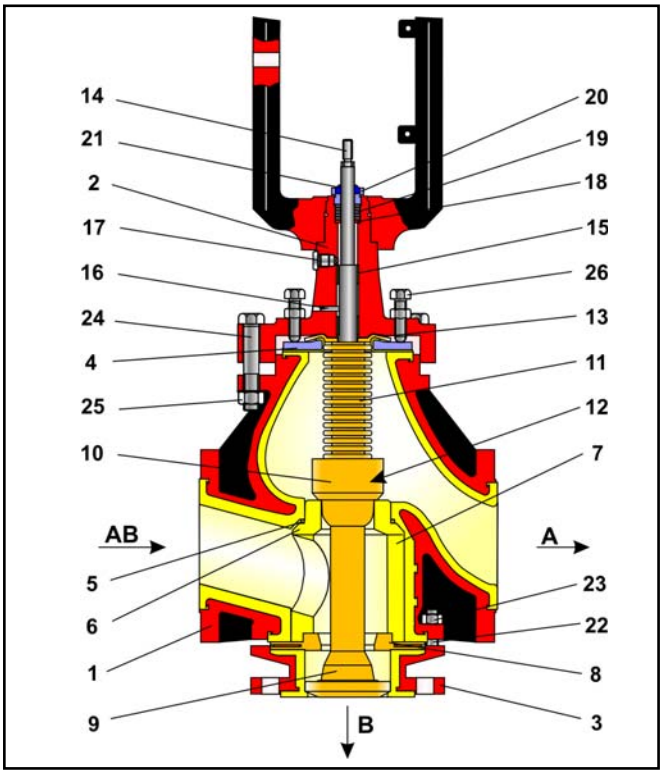

Fig. 2 - Sectional view of a 3-way control valve, series 1d, from DN 80 and 3“
Parts list, see Table 1 on page 3

4. Assembly of the 3-way control valves

The current versions of series 1d control valves have a different stem sealing design compared to the previous version, meaning, that they cannot be covered by the same instructions

The current valve version is first described from **page 3** onwards. Refer to **page 5** for the description of the previous valve version.

4.1 Assembly of current version of series 1d valve

4.1.1 Preparation for assembly

To assemble the control valve, clean all parts thoroughly, and lay them carefully on a soft padded surface (rubber mat, o.s.)
Take into consideration, that parts made of plastic are generally soft and sensitive, in particular the sealing surfaces must be handled with care, and not be damaged.

Attention: To avoid cold corrosion of the screws in the bodies, the manufacturer has used a high performance lubricating grease (i.e. Gleitmo 805. from. Fuchs). This grease however, may not be applied to valves, which are used in an oxygen environment. Valves which must be free of grease, especially for use in oxygen, an appropriate lubrication must be used.

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

4.1.2 Pre-assembly of the valve body

Place the valve body (1) with the bonnet sided flange on a flat clean surface, and positioned in a working height, so the bearing area of the seat is easily accessible.
Clean the PTFE-lining of the body with a cleaning agent.
Place the PTFE-O-ring (5), in the groove of the body.

Note: Depending on the temperature, it may be necessary to shrink the O-ring slightly, either by using a cooling spray, or placing it in a refrigerator.

Press the seat (6) into the body.
Press the spacer (7) onto the seat (6) in the body.

Note: Make sure, that the through hole in the spacer is aligned with the inlet port of the valve. Also, the upper edge of the spacer must be flat with the facing of the body flange.

Drill a 5mm hole into the spacer at an angle from the facing approx. 10mm deep. Thread a piece of PTFE cord (12) into the this drilled hole to secure the spacer from twisting.

4.1.3 Pre-assembly of the stem

Apply grease to the thread at the bottom of the one-pieced stem (14).

Note: Some versions have a stem consisting of three single parts. With the guide ready-mounted to the stem with a snap ring.

Screw tight the bellows (11) ready-mounted with washer and Ensat bushing onto the greased thread of the stem (14)

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

4.1.3.1 Stem assembly for DN 25 to DN 80 1“ to 3“

To neatly push the plug onto the stem, make a small notch in the bellows to let air escape. Push the plug (10) onto the bellows (11). Secure the connection between plug and bellows with PTFE-cord (12) inserted as far as possible.

4.1.3.2 Stem assembly for DN 100 and 4“

To avoid corrosion, apply grease to the metal side of the bordered flange (4). Push the bordered flange over the bellows as far as possible. To neatly push the plug (10) onto the stem, make a small notch in the bellows (11) to let air escape.
Secure the connection between plug and bellows with PTFE- cord (12). To complete the stem assembly, thoroughly grease the groove of the stem.

4.1.3.3 Stem assembly for DN 150 and 6“

The assembly is the same as described in section 4.1.3.2 however, the holes for assembling the cords (12) are closed with pin studs. (38) To avoid the pin studs from loosening, they are centre punched.

4.1.4 Pre-assembly of the bonnet flange

4.1.4.1 Bonnet flange assembly for DN 25 to DN 50 and 1“ to 2“

Place the O-ring (35) in the inside groove of the stuffing box (21).
Press the upper bearing bushing (34) into the bottom part of the stuffing box (21).
Screw the greased thread of the stuffing box (21) into the top threaded bore of the bonnet flange (2), so that the external relief groove is still visible.

Note:
Do not screw the stuffing box (21) to the end stop.

Clamp the bonnet flange (2) at the yoke in a vise, with the flange opening facing upwards.
Place the spring washer set (33) in the designated bore. Refer to the exploded drawing for (Fig. 3) layout and arrangement.
In the following order, insert the final ring, the PTFE - V-rings (32) and the distance bushing (31).

Press the lower bearing bushing (30) into the bore of the guide bushing (29). Screw the greased thread of the guide bushing (29) as far as possible in the bonnet flange (2).

Note: Ensure, that the guide bushing is not slanted when screwing into the bonnet flange.

Insert the disc spring (28), thrust washer (27) and the O-ring (26) in the bonnet flange (2). Refer to the explosion drawing (3) for the position and arrangement of the individual parts.

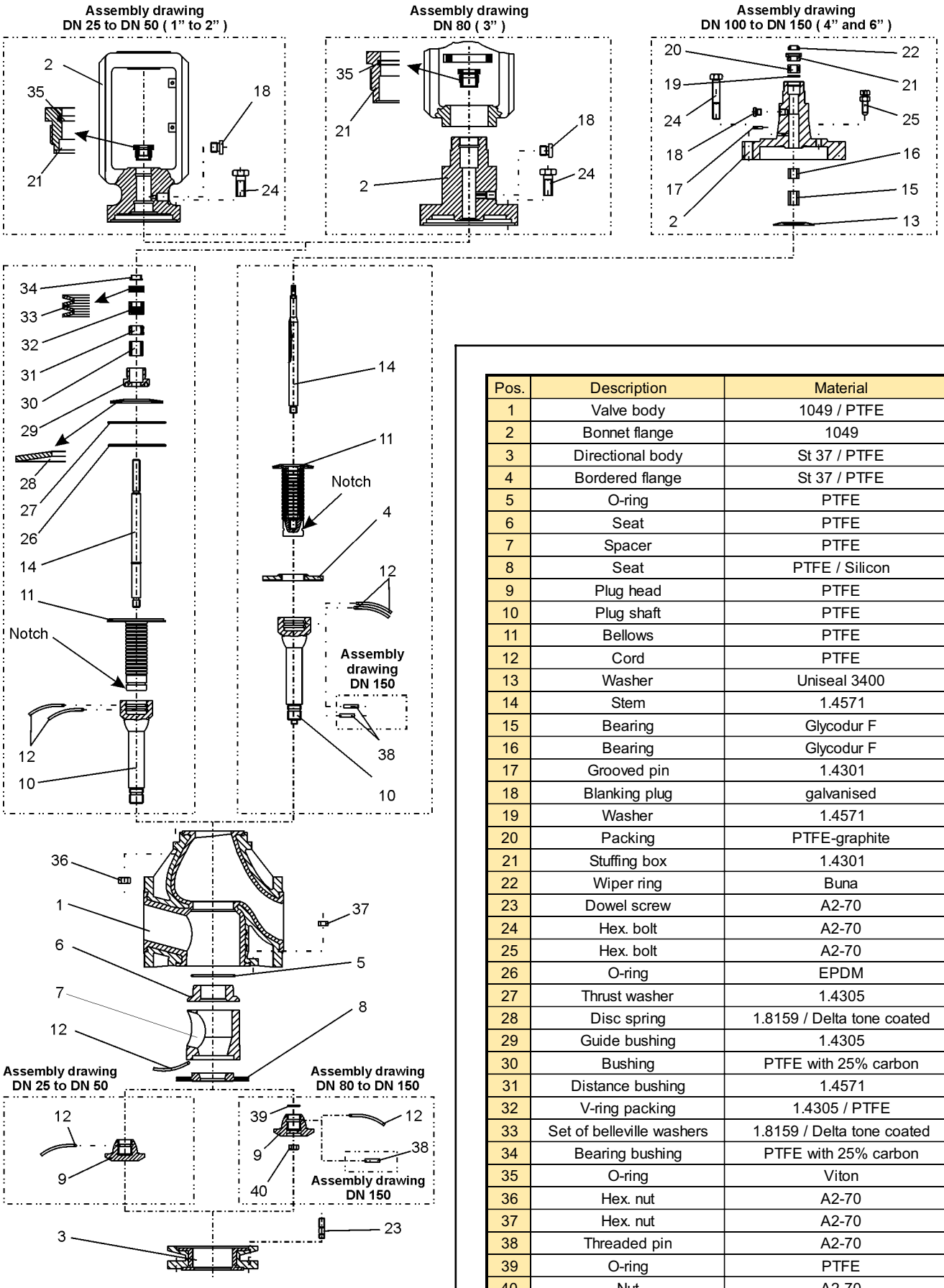

Fig. 3 - Explosion drawing of the 3-way control valve, series 1d

Pos.	Description	Material
1	Valve body	1049 / PTFE
2	Bonnet flange	1049
3	Directional body	St 37 / PTFE
4	Bordered flange	St 37 / PTFE
5	O-ring	PTFE
6	Seat	PTFE
7	Spacer	PTFE
8	Seat	PTFE / Silicon
9	Plug head	PTFE
10	Plug shaft	PTFE
11	Bellows	PTFE
12	Cord	PTFE
13	Washer	Uniseal 3400
14	Stem	1.4571
15	Bearing	Glycodur F
16	Bearing	Glycodur F
17	Grooved pin	1.4301
18	Blanking plug	galvanised
19	Washer	1.4571
20	Packing	PTFE-graphite
21	Stuffing box	1.4301
22	Wiper ring	Buna
23	Dowel screw	A2-70
24	Hex. bolt	A2-70
25	Hex. bolt	A2-70
26	O-ring	EPDM
27	Thrust washer	1.4305
28	Disc spring	1.8159 / Delta tone coated
29	Guide bushing	1.4305
30	Bushing	PTFE with 25% carbon
31	Distance bushing	1.4571
32	V-ring packing	1.4305 / PTFE
33	Set of belleville washers	1.8159 / Delta tone coated
34	Bearing bushing	PTFE with 25% carbon
35	O-ring	Viton
36	Hex. nut	A2-70
37	Hex. nut	A2-70
38	Threaded pin	A2-70
39	O-ring	PTFE
40	Nut	A2-70

Table 1 - Parts list of control valve, series 1d

Place the pre-assembled stem (see section 4.1.3.1) in bonnet, and press the flange of the bellows in the bore groove of the bonnet flange.
To complete the bonnet flange assembly, screw in the blanking plug (18).

4.1.4.2 Bonnet flange assembly for DN 80 and 3“

The bonnet flange assembly for DN 80 and 3“ is identical to the assembly described in section 4.1.4.1 for bonnet flanges DN 25 to 50 and 1“ to 2“.

The difference is, that the bonnet flange does not have an integrated yoke. For this reason, to assemble the bonnet flange (2) the shaft of the stem guide is clamped in a vice and not the the yoke.

Note: Make sure, that the bonnet flange, in particular the thread at the shaft end, is not damaged.

When the bonnet assembly is completed, mount the yoke on the bonnet flange, and screw together with the nut.

4.1.4.3 Bonnet flange assembly for DN 100 to DN 150 and 4“ to 6“

Apply grease to the inside of the bonnet flange (2) before assembly.
The support screws (25) are lightly screwed in, so they do not protrude on the inside of the bonnet.
To continue the assembly, clamp the bonnet flange with the stem guide facing downwards in a vice.

Note: Make sure, that the bonnet flange, in particular the thread at the shaft end, is not damaged.

Insert the glycodur bushing. If these have different lengths, insert the shorter bushing (16) first into the stem guide as far as possible, with loctite using a suitable mandrel. Following this, push the longer bushing (15) also into the stem guide with loctite and a mandrel, until it is flush with the inside surface of the bonnet.
Lightly hammer in the grooved pin (17).
Screw in the blanking plug (18).
Insert the washer (13) in the intended groove of the bonnet flange.
Now, insert the pre-assembled stem in the bonnet.

4.1.5 Valve body and bonnet flange assembly

The pre-assembled valve body, as described in section 3.1.2, is carefully mounted on the pre-assembled bonnet flange.

Note: The pneumatic connection (18) in the bonnet flange and the name plate on the valve body (1) must be facing in the same direction.

Insert the bolts (24) through the bonnet flange, depending on the design, align with the nuts (36) or screw direct into the valve body.
Tighten the screws evenly, and in alternating pattern.

Note: Tightening the screws, causes the position of the plug to change, Therefore, make sure, that the position of the plug remans centric.

When tightening the bolts, move the stem (14) occasionally to test, that it is easily moveable. If the stem gets jammed, the plug, seat and guide could become damaged.

4.1.5.1 Assembly of DN 25 to DN 80 and 1“ to 3“

After the valve has been adjustend, the stuffing box (2) is screwed on tightly.

4.1.5.2 Assembly of DN 100 to DN 150 and 4“ to 6“

Now the safety stuffing box can be assembled.
First, the washer (19) is positioned. Then with a special mandrel, the packing rings (20) are inserted in the bonnet.

Note: Make sure, that the packing rings are inserted offset to ensure, that the divisions of packing rings do not align.

Press the wiper ring (22) into the gland nut (21). Screw the pre-assembled stuffing box (21) into the bonnet. After tightening manually, unscrew by half a turn, and retighten again.

Note: Make sure, that the packing is pressed evenly and does not bulge through the stuffing box.

4.1.6 Directional valve assembly

Place the seat with the pre-assembled viton washer (8) in the thrust washer (7) in the body.
Apply grease to the thread of the assembled plug shaft (10).

4.1.6.1 Plug head assembly from DN 25 to DN 50

The plug head (9) is screwed on hand tight.
Press the pre-assembled stem (14) in the bonnet flange, so that the plug head is protruding from the body.
Secure the connection between plug shaft and plug head with a PTFE-cord (12) pushed in as far as possible.

4.1.6.2 Plug head assembly for DN 80

The O-ring (39) is inserted in the groove of the plug shaft (10).
The plug head (9) is screwed on hand tight.
Secure the connection between plug shaft and plug head with the nut (40).

Note: With single versions, the plug head can be secured with an additional PTFE-cord (12). With DN 150 the PTFE-cord can be secured with an additional grub screw (38). In such cases, this must be added to the assembly.

4.1.7 Final assembly of the 3-way valve

Apply grease to the dowel screws (23) and screw into the valve body (3).
After this, mount the directional valve (3) carefully onto the valve body.

Note: Make sure, that the seat (8) fits centric in the directional valve body.

Align the body with the nuts (37) then tighten evenly, and in alternating pattern.

Refer to the tightening torques in table 2.

Nominal size	DN 25	DN 40	DN 50	DN 80	DN 100	DN 150
Torque	10 Nm	15 Nm	25 Nm	30 Nm	30 Nm	40 Nm

Table 2 - Tightening toques

4.1.8 The assembly of the 3-way valve is complete.

If the 3-way valve and the Samson control valve are delivered seperately, it is necessary to adjust the stroke.

Details regarding the stroke adjustment are explained in section 4.3.

4.2 3-way valve assembly, series 1a of the previous version

4.2.1 Preparation for assembly

Before assembling the 3-way valve, clean all parts thoroughly, and lay them on a soft padded surface (rubber mat or similar).
Take into consideration, that parts made of plastic are generally soft and sensitive, in particular the sealing surfaces must be handled with care, and not be damaged.

Attention: To avoid cold corrosion of the screws in the bodies, the manufacturer has used a high performance lubricating grease (i.e. Gleitmo 805. from Fuchs).
This grease however, may not be applied to valves, which are used in an oxygen environment. Valves which must be free of grease, especially for use in oxygen, an appropriate lubrication must be used.

Note: The position and arrangement of the individual parts shown in the explosion drawing (Fig. 4) must be observed when assembling the valve.

4.2.2 Pre-assembly of the valve body

Place the valve body (1) with the bonnet flange facing downwards on a flat, clean working surface, positioned in a height for easy access to the bearing area of the seat.
Clean the PTFE-lining of the body with a cleaning agent.
Place the PTFE O-ring (5) into the groove of the valve body

Note: Depending on the temperature, it may be necessary to shrink the O-ring slightly, either using a cooling spray, or placing in a refrigerator.

Push the seat (6) into the body
Press the spacer (7) into the body, onto the seat (6).

Note: Make sure, that the through hole in the spacer is aligned with the inlet port of the valve, also the top edge of the spacer must lie flush with the facing of the body flange.

Drill a 5mm hole, approx. 10mm deap into the spacer, at a slight angle from the facing. Thread a piece of PTFE-cord (12), into the drilled hole, to secure the spacer against twisting.

4.2.3 Pre-assembly of the stem

Apply grease to the thread, at the bottom of the one piece stem (14).

Note: Some versions have a stem consisting of three parts, with the guide ready-mounted to the stem with a snap ring.

Screw tight the bellows (11) ready-mounted with washer and Ensat bushng, onto the greased thread of the stem (14).

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

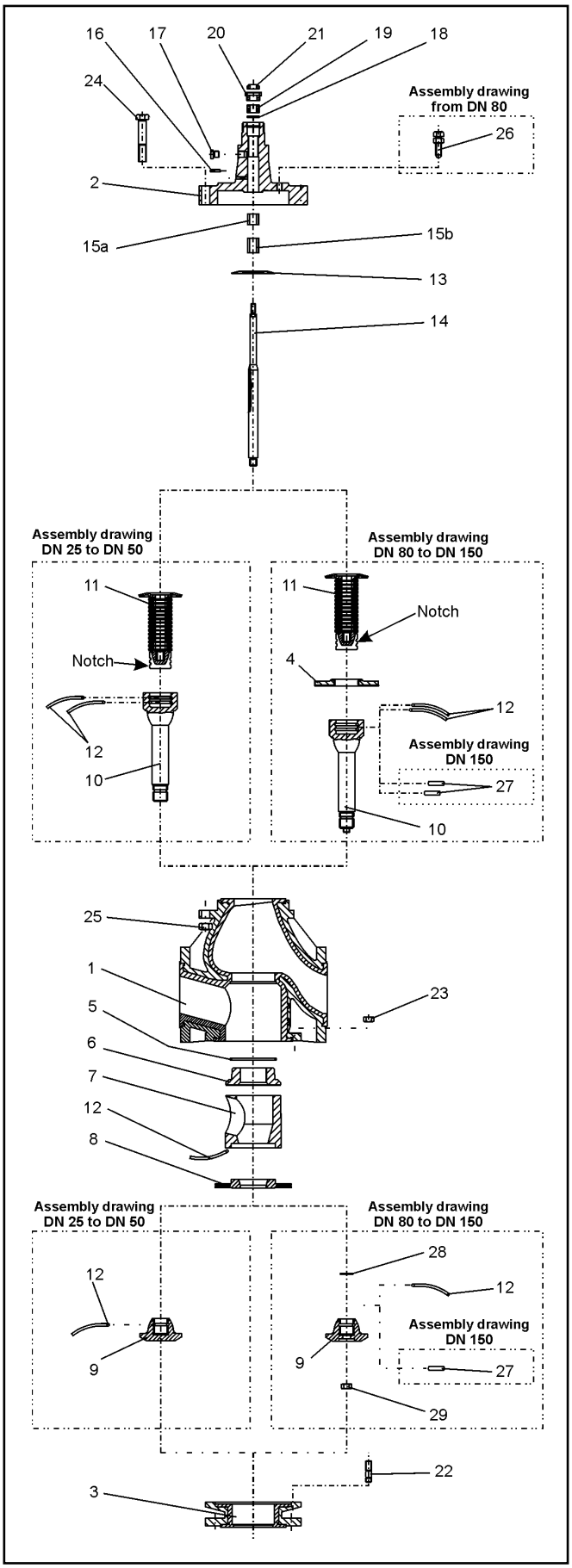

Fig. 4 - Explosion drawing of 3-way valve, series 1d

Pos.	Description	Material
1	Valve body	EN-JS 1049 / PTFE
2	Bonnet flange	EN JS-1049
3	Directional body	St 37 / PTFE
4	Bordered flange	St 37 / PTFE
5	O-ring	PTFE
6	Seat	PTFE
7	Spacer	PTFE
8	Seat	PTFE / Silicon
9	Plug head	PTFE
10	Plug shaft	PTFE
11	Bellows	PTFE
12	Cord	PTFE
13	Washer	Uniseal 3400
14	Stem	1.4571
15	Bearing	Glycodur F
16	Grooved pin	1.4301
17	Blanking plug	Galvernised
18	Washer	1.4571
19	Packing	PTFE-graphite
20	Stuffing box	1.4301
21	Wiper ring	Buna
22	Dowel screw	A2-70
23	Hex. screw	A2-70
24	Screw	A2-70
25	Hex. screw	A2-70
26	Schraube	A2-70
27	Threaded pin	A2-70
28	O-ring	PTFE
29	Nut	A2-70

Table 3 - Parts list

4.2.3.1 Stem assembly for DN 25 to DN 50

To neatly push the plug onto the stem, make a small notch in the bellows to let air escape. Push the plug (10) onto the bellows (11) Secure the connection between plug and bellows with PTFE-cords (12) inserted as far as possible.

4.2.3.2 Stem assembly for DN 80 to DN 100

To avoid corrosion, apply grease to the metal side of the bordered flange (4). Push the bordered flange over the bellows as far as possible. To neatly push th plug (10) onto the bellows (11), make a small notch in the bellows to let air escape. Secure the connection between plug and bellows with PTFE-cords (12) as far as possible. To complete the stem assembly, apply grease to the groove of the stem.

4.2.3.3 Stem assembly for DN 150

The assembly is the same as described in section 4.2.3.2 however, the holes for assembling the cords (12) are closed with pin studs (38) To avoid the pin studs from loosening, the pins are centre punched.

4.2.4 Pre-assembly of the bonnet flange

Apply grease to the inside of the bonnet flange (2) before assembly. The supporting screws (26) are lightly screwed in, so they do not protrude on the inside of the bonnet.

Note:
3-way control valves with nominal size DN 25 to DN 50 are assembled without support screws (26).

To continue the assembly, clamp the bonnet flange with the stem guide facing downwards in a vice.
Insert the Glycodur bushings. If these have different lenghts, insert the shorter bushing (15a) first into the stem guide as far as possible, with loctite and using a suitable mandral.
Following this, push the longer bushing (15b) until it is flush with the inside surface of the bonnet, also with loctite and using a suitable mandrel.
Hammer in the grooved pin (16).
Screw in the blank plug (17).
Insert the washer (13) in the groove intended for it, in the bonnet flange.
Place the ready-assembled stem into the bonnet.

4.2.5 Final assembly of the valve

Carefully place the ready-mounted valve body on the bonnet flange.

Note: The pneumatic connetion (17) in the bonnet flange, and the name plate on the valve body (1) must face in the same direction.

Insert the bolts (24) and align with the nuts (25). Tighten the bolts evenly, and in alternating pattern.

Attention: Tightening the screws, causes the position of the plug to change. Therefore, make sure, that the position of the plug remains centric. When tightening the bolts, move the stem (14) occasionally to test, that it remains easily moveable. If the stem gets jammed, the plug seat and guide could become damaged.

Now the safety stuffing box can be assembled.
First, the washer (18) is positioned. Then with a special mandrel, the packing rings (19) are inserted into the bonnet.

Note: Make sure, that the packing rings are inserted off-set, to ensure, that the divisions of packing rings do not align.

Press the wiper ring (21) into the stuffing box (20). Screw the ready-assembled stuffing box into the bonnet. After tightening it by hand, unscrew it half a turn, and retighten again.

Note: Make sure, that the packing is pressed neatly and does not bulge through the stuffing box.

Place the seat with the pre-assembled viton sealing washer (8) in the spacer (7) in the body.
Apply grease to the thread of the assembled plug shaft.

4.2.5.1 Plug head assembly for DN 25 to DN 50

The plug head (9) is screwed on, hand tight.
Press the pre-assembled stem (14) in the bonnet flange, so that the plug head is protruding from the body.
Secure the connection between plug shaft and plug head with the PTFE- cords (12) as far as possible.

4.2.5.2 Plug head assembly for DN 80

The O-ring (28) is inserted into the groove of the plug shaft (10)
The plug head (9) is screwed on, hand tight.
Secure the connection between plug shaft and plug head with the nut (29).

Note: With single versions, the plug head can be secured with an additional PTFE cord (12) With DN 150 the PTFE-cord can be secured with an additional grub screw (27). In such cases, the assembly instructions must be amended.

Apply grease to the dowel screws (22) and screw into the directional valve (3).
Then, carefully mount the directional valve (3) onto the main body.
Make sure, that the seat (8) fits centric in the directional valve.
Align the body with the nuts (23), then tighten evenly and in alternating pattern.

Refer to the tightening toques in table 4

Nominal size	DN 25	DN 40	DN 50	DN 80	DN 100	DN 150
Torque	10 Nm	15 Nm	25 Nm	30 Nm	30 Nm	40 Nm

Table 4 - Tightening torques

4.2.6 The assembly of the 3-way valve is now complete.

If the directional valve, and the Samson control valve are delivered seperately, it is necessary to adjust the stroke.

Details regarding stroke adjustment, are explained in section 4.3.

4.3 Stroke adjustment

If the control valve and Samson actuator are delivered seperately, the Measurement „ *A* “ from the top edge of the stem drive nut, to the top of the joke is adjustend according to table 5. Check this when assembling.

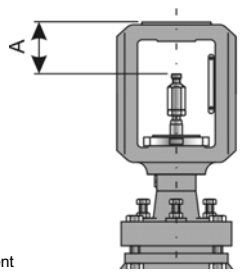

Fig. 5 - Stroke adjustment

Stroke adjustment for Samson actuator (Valve closed)	
DN	A
25 to 80	75 ± 0,1
100 to 150	90 ± 0,1

Table 5 - Stroke adjustment

5. Trouble shooting

Refer to **section 7** of operating instructions:
- for automatic 3-way valves
  Operating instructions < **BA 01a-01_EN** >,
- for manually operated 3-way valves
  Operating instructions < **BA 01a-02_EN** >

6. Repairing the directional valve

6.1 Replacing the bellows

If a leak is detected at the leak-off connection (18/17), the bellows (11) may be defect. We therefore recommend checking the condition of the bellows.
To remove the bellows, disassemble the valve in reverse order to the instructions described in section 3.
Check the bellows, as with all plastic parts for damage. In case of doubt, replace the parts with new parts.

6.2 Replacing the bellows and packing

If the directional valve leaks at the packing, the packing and the bellows may be defect. It is therefore recommended to check all the sealing and the bellows.
Zum Ausbau der Packung und des Faltenbalges wird die Armatur in umgekehrter Reihenfolge wie unter Kapitel 3 beschrieben demontiert.
Check the packing and the bellows, including all plastic parts for damage. In case of doubt, replace the parts with new parts.

6.3 Further repair work

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

7. Customer inquiries

(Should you have any inquiries, please state the following details)

1. Commission no. (embossed on the nameplate)
2. Type, product no. nominal size, and version of valve
3. Pressure and temperature of process medium
4. Flow rate in m³/h
5. Installation drawing, if possible

For your special requirements, please contact our technical sales department.

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