

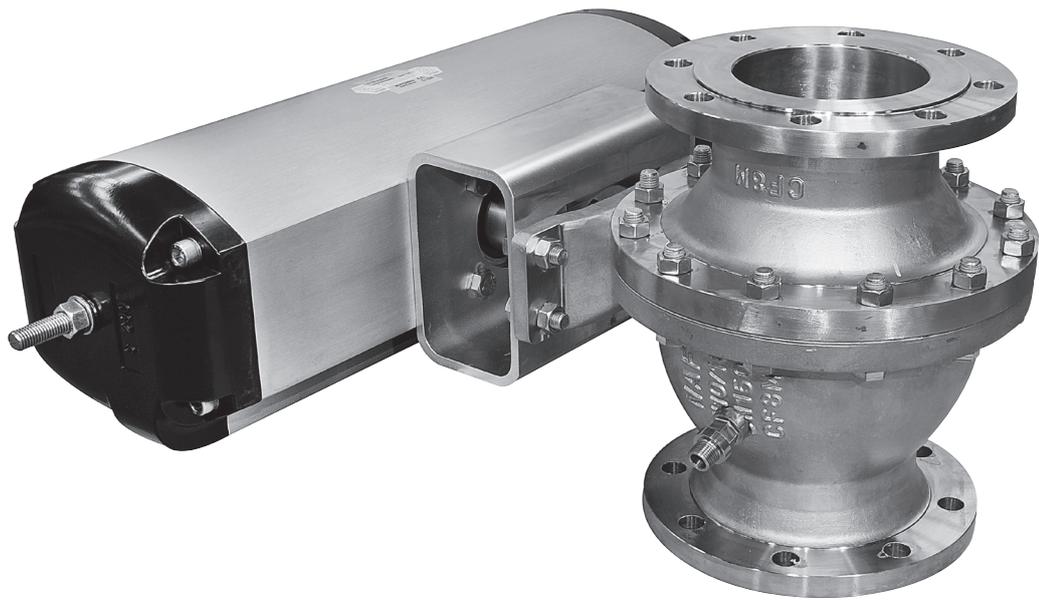


USER INSTRUCTIONS

NAF Duball DL Pocket Valve

FCD NFENIM4163-00-A4 05/17

*Installation
Operation
Maintenance*



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SAFETY

- Assess all risks to eliminate the possibility of personal injury and material damage. Read these instructions thoroughly.
- Always use the necessary protective equipment and comply with applicable safety directives when working with hazardous or hot/cold media.
- Never operate a valve without first ensuring there is no risk of crush injuries. The risk is highest with automated valves. Take necessary safety precautions to avoid unintentional stroking of the actuator / valve.
- Never dismantle a valve or part of a valve without ensuring the line is free of pressure and media.
- Ball valves must always be dismantled in the semi-open position to avoid trapping pressure and media.
- Always check that the valve type and material is suitable for its intended use. This applies especially to highly oxidizing and corrosive media. Observe also the risk of erosion or explosion, as well as decaying medium. If in doubt, always request a written recommendation from Flowserve.

1 General

This instruction provides necessary information for the correct handling of the NAF Duball DL Pocket Valve. For additional equipment used together with the valve, please refer to their corresponding instructions.

If you have any doubt about the correct use and handling of a specific version of NAF Duball DL Pocket Valve, please contact your Flowserve representative.

The instructions and list of spare parts in this document are applicable to the NAF Duball DL Pocket Valve in accordance with our Technical Bulletin NFENTB4163.

As the NAF Duball DL Pocket Valve is a special applications valve, special terms and conditions may apply. Please refer to specific purchase.

2 Lifting

All lifting must be carried out on the valve itself and not on the actuator. The mounting connection between the valve and the actuator is designed principally for carrying the operating torque and the deadweight of the actuator and is not designed to support the weight of the valve. See Figure 1.

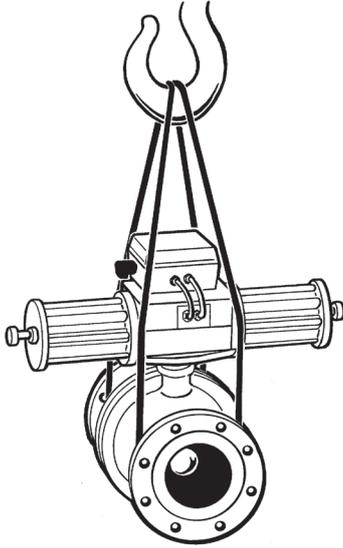


Figure 1: Schematic lifting of a valve with mounted actuator. Note that the final lifting of the valve into a vertical pipe requires different lifting points.

3 Receiving Inspection

All valves leaving our facility are inspected and tested in accordance with the relevant requirements or in accordance with the special provisions specified by the purchaser. Valves equipped with actuators are subjected to functional testing and are adjusted in such a manner that every unit is ready for direct installation in the pipework. However, NAF always recommend that a receiving inspection is to be carried out.

We suggest the following inspection procedure:

- Check that the valve delivered is correct in terms of type, size, equipment, etc.
- Examine the valve, actuator and valve positioner for possible damage that may have occurred during transport.

4 Installation

Before installing the valve, please ensure that:

- The pipework is free from impurities
- The pipe end connectors between which the valve is to be installed are parallel and are correctly aligned
- The distance between the pipe ends correspond to the valve length, including gaskets.

The valve must not be used for pulling together or aligning incorrectly run pipes as this will cause improper loads on the valve and pipe which could lead to severe problems during operation. See Figure 2.

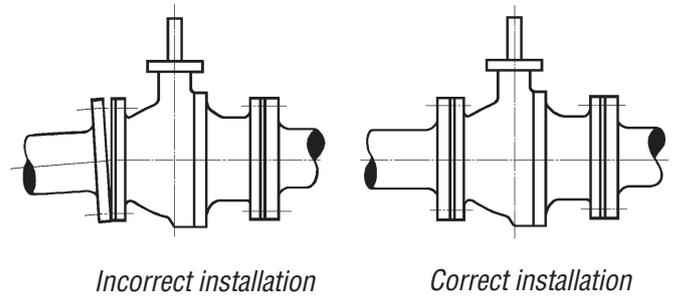


Figure 2: Ensure that the pipe ends align and have the correct gap

A typical application for the NAF Duball DL Pocket Valve is when it's installed in the reject pipe of a sand separator. See Figure 3. Make sure that the valve is mounted in the correct flow direction as indicated by the flow arrow on the valve body.

NAF strongly recommend that a Duball DL valve is installed upstream of the Pocket Valve. This valve is to be open in normal operation and only shut when the Pocket Valve is to be inspected/serviced.

If not supplied by NAF, two on/off valves should be installed on each of the flush connections (1 & 2 as shown in Fig. 3) in close proximity to the Pocket Valve. The Pocket Valve and the on/off valves should be operated as described in Section 5, "Operating sequence".

The pipes should be supported on each side of the valve in order to relieve the valve of unnecessary loads and avoid vibrations.

The actuator used on the Pocket Valve should be supported in order not to introduce unnecessary loads and to minimize any potential influence from vibration.

Locate the valve so it will be easily accessible for inspection and service.

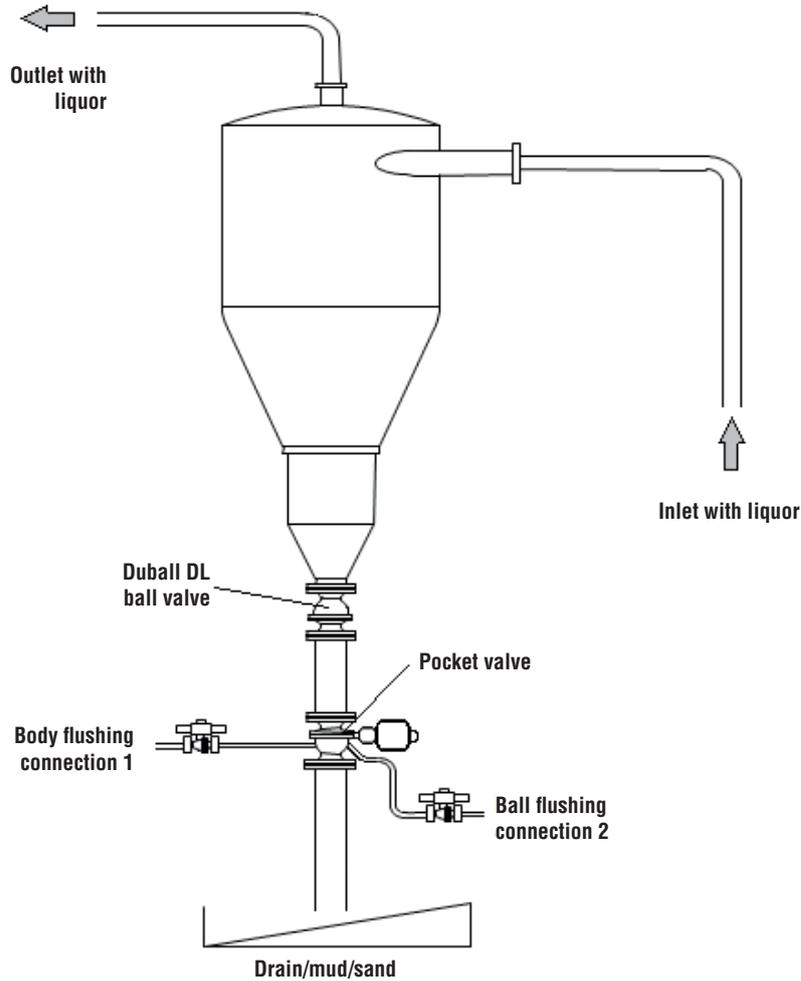


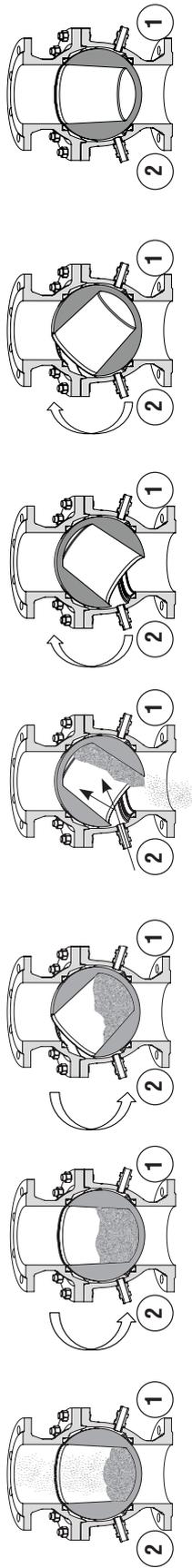
Figure 3: Mounting of the Pocket Valve in a Sand Separator application

5 Operating sequence

The NAF Duball DL Pocket Valve is operated by the following sequence:

1. The Pocket Valve is in "Filling mode". Sand/debris is collected in the Pocket ball.
2. When the Pocket ball volume is approximately 50% full (volumes for the different sizes can be seen in Table 1) the "Discharge sequence" (emptying) is initiated and CCW (counterclockwise) rotation of the Pocket ball starts. Connection 1 is set to "ON" (open) and body flushing starts. This flushing inhibits sand/debris to be collected in the body of the Pocket Valve. Body flushing at connection 1 should remain "ON" until the Pocket Ball has completed a full discharge sequence.
3. CCW rotation continues from 0 to 140 degrees.
4. Final Discharge position is reached at 140° and rotation stops. Connection 2 is set to "ON" (open) and ball flushing starts. It is recommended that the Pocket ball remains in this position for at least 10 seconds. However, due to the nature of the debris in the Pocket ball, a longer flushing may be needed.
5. Discharging is completed and connection 2 is set to "OFF" (close) and ball flushing stops. The Pocket ball starts CW (clockwise) rotation back to the open/fill position.
6. CW rotation continues from 140 to 0 degrees.
7. The "Discharging sequence" is now completed and rotation stops. Body flushing from connection 1 is set to "OFF" (close) and stops. The valve is now back in "filling mode".

A schematic figure of the operating sequence can be seen in Figure 4.



Sequence no.	Sequence description.	1	2	3	4	5	6	7
	Filling mode							
	Discharge sequence starts with CCW rotation							
	CCW rotation continues							
	Final discharge position is reached - rotation stops							
	Discharge is completed - CW rotation starts							
	CW rotation continues							
	Discharging sequence completed - The valve is now back in "filling mode".							

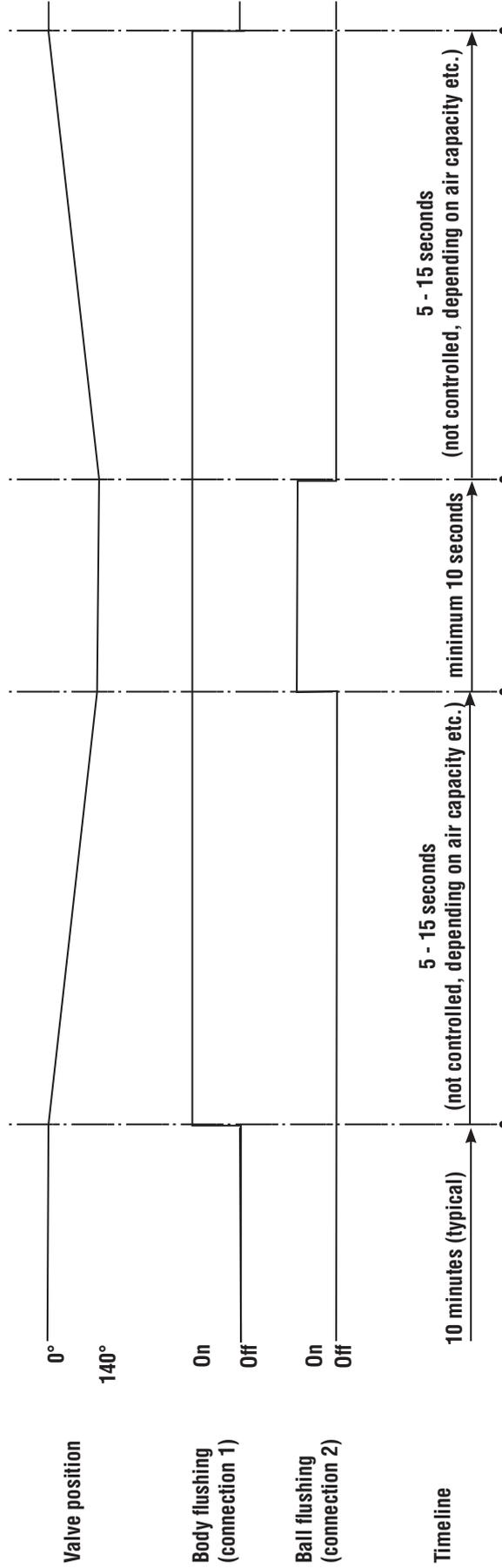


Figure 4: Schematic figure of the Pocket Valve operating sequence

6 Commissioning

Before starting up, flush the pipework and run a discharge sequence, assuming the sequence is set according to “Operating sequence” above. This allows any impurities that may damage the sealing surfaces of the valve or impede its operation to be flushed away.

7 Operation

The NAF Duball DL Pocket Valve is installed to safely remove sand/debris out of the process as effectively as possible while maintaining process pressure.

It is of great importance that the number of discharging sequences of the Pocket Valve is adjusted to the process where the valve is installed. Over-filling of the Pocket Valve can cause excessive wear and significantly shorten the life time of the valve. However, excessive operation of the Pocket Valve causes wear to both stem and actuator.

The volume of the Pocket ball cavity can be seen in Table 1. The volume of the ball, together with the expected volume of sand/debris to be removed from the process can be used to calculate the suitable size of the valve. We recommend that a Pocket Valve should not be calculated to operate more than 5 times per hour using 50% of the total volume of Pocket ball. This will give some marginal for not over-filling the valve due to process variations. At the same time the number of discharge cycles will be not be excessive, creating unnecessary wear of the valve.

Example: The process has an expected need of removing 10 liters of sand per hour. This means that each discharging sequence must be able to remove $10/5=2$ liters per sequence. Based on only using 50% of the ball cavity volume per sequence, at least 4 liters of cavity is needed. The correct size will therefore be a DN200/8” Pocket Valve.

Valve size	Pocket ball cavity volume (liters)
DN80/3”	0,44
DN100/4”	0,82
DN150/6”	2,76
DN200/8”	6,86

Table 1: The total volume of the Pocket ball cavity

When the Pocket Valve is taken into operation, it is recommended that the emptying frequency is set to 3 minutes, i.e. the Pocket Valve is in the filling position for 3 minutes followed by a discharge sequence. Once the process is stable, commence with measurements to adjust the sequence time to allow the Pocket ball to be 50% full by volume. If sand/debris content varies with time/product, please adjust sequences time to reach the recommended 50% filling of the Pocket ball.

NOTE: After adjusting the cycle time as per above, the needed number of discharge sequences exceeds 8 per hour, it must be considered to replace the valve with a bigger size. Exceeding 8 discharge sequences per hour will result in an increased need for maintenance and a significantly higher risk of failure. More than 12 discharge sequences per hour is not at all recommended and must be avoided.

The water pressure in connection 1 and connection 2 must exceed inlet pressure by at least 500 kPa during the entire flushing sequence, to ensure that water is flushed into the valve body and Pocket ball is cleaned correctly.

The NAF Duball DL Pocket Valve normally operates with an actuator with travel stops set to 140°. During operation, the valve should rotate counterclockwise (CCW) to the discharge position and clockwise (CW) when returning to the filling position. NAF do not recommend running the valve with a 360° actuator as full rotation may cause additional wear to the Pocket ball and seat rings.

8 Bill of Materials and recommended spare part kits

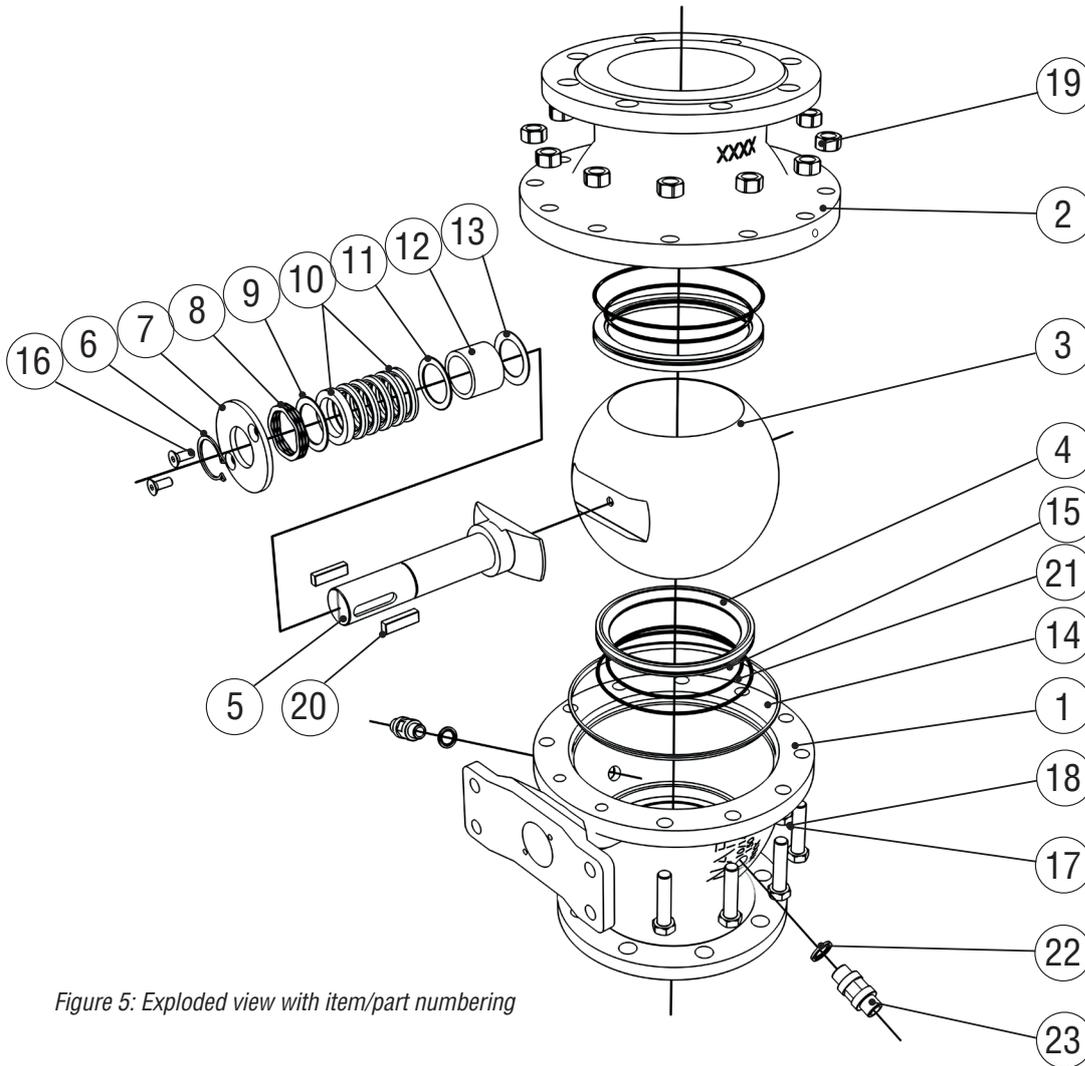


Figure 5: Exploded view with item/part numbering

Item	Qty	Part	Kit A Stem sealing kit	Kit D Seat and ball kit	Kit E Seat seal kit
1	1	Body, main			
2	1	Body, cover			
3	1	Pocket Ball		X	
4	2	Seat ring		X	
5	1	Stem			
6	1	Circlip	X		
7	1	Cover			
8	1	Spring	X		
9	1	Washer	X		
10	1	Stem packing	X		
11	1	Washer	X		
12	1	Bushing	X		

Item	Qty	Part	Kit A Stem sealing kit	Kit D Seat and ball kit	Kit E Seat seal kit
13	1	Anti-friction Washer	X		
14	1	Body seal	X		
15	2	Inside seat seal			X
16	¹⁾	Screw			
17	2	Stud			
18	¹⁾	Bolt			
19	¹⁾	Nut			
20	2	Key			
21	2	Outside seat seal			X
22	2	Seal ring			
23	2	Water flushing fittings			

¹⁾ Quantity depending on size of the valve.

Material and design of the parts vary depending on the version of the valve. Version is determined by NAF No. on the identification plate of the valve.

Table 2: Bill of Materials and Recommended Spare Parts Kits

9 Ordering of spare parts

We recommend that a spare valve is always available for the majority of applications where the Pocket Valve is used. This is based on the fact that wear can be significant and a regular maintenance need will occur over time. Having another valve available will minimize the process downtime.

When placing an order for spare parts, specify:

- NAF-No: specified on the identification plate of the valve.
- Recommended spare part kit according to Section 8.
- Quantity required.

Ordering example:

NAF-No: 8883KF-0200-BBAHEA-P
 Spare part kit: A
 Quantity: 1 pc

10 Maintenance

Many valves are installed in locations where their performance is of critical importance to the entire process. Such valves should be inspected regularly and any issues should immediately be corrected. As the NAF Duball DL Pocket Valve is used in high wear and high cycle applications, we highly recommend that an inspection is performed regularly. If the valve is in need of service, schedule maintenance as soon as possible and make sure that necessary spare part kits are available.

10.1 Removing the valve from the pipework

The procedure for inspection and maintenance requires no special tools.

 **Ensure the process line is shut off, free of pressure and drained of media.**

1. Ensure that the recommended spare parts and gaskets for the pipe flanges are available.
2. Before removing the valve from the pipeline, operate it several times between the open and closed position to ensure that any trapped media / pressure is released.
3. Shut off all compressed air connections and isolate all electrical connections to the actuator.
4. Disconnect all compressed air lines and electric cables connected to the actuator.

 **Caution. Liquid in the valve may be harmful.**

5. Release the flanged joint between the valve and the pipework. Then lift out the valve. Don't use the actuator for lifting. **Apply all lifting forces to the valve itself and not to the actuator.** See Figure 1.

10.2 Disassembling the valve for inspection and replacement of ball, seats and stem packing

For part numbers, see Figure 5. For spare part kits, refer to Table 2.

1. **The actuator does not need to be removed** for replacing the seat rings and ball. However if the stem seal is leaking, the stem packing must be replaced. Even if the stem seal does not leak, we always recommend replacing the stem packing and body seal every time the valve is disassembled. This preventative maintenance will avoid unnecessary extra work and downtime caused by leakage in the future. We always recommend the use of a stem sealing kit, spare part kit A. For further instructions on replacing the stem packing, please see Section 10.6.
2. Operate the valve to make **certain that it is completely empty of process media.**
3. Put the valve on a suitable, flat surface with the body cover (2) facing upwards. Remove the body cover (2).
4. Remove the ball (3), which is done when the ball is in the position shown in Figure 6. Secure the ball (3), inhibiting it from moving/rolling.
5. Clean all parts thoroughly. First use hot water and then, if necessary, degreasing agent. Do not scrape any of the machined surfaces with hard tools.
6. Carefully inspect parts individually and replace parts as per descriptions below.

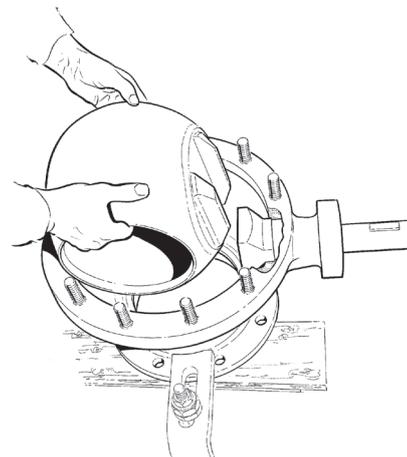


Figure 6. Lifting the ball

10.3 Reassembly of the valve

To replace parts, see sections 10.4-10.6 below. After the inspection and/or part replacements have been made, reassemble the valve as described below. For part numbers, see Figure 5. For spare part kits, refer to Table 2.

1. If the Pocket ball has been lapped with the seat rings, it is of great importance that the Pocket ball and seat rings are cleaned before being assembled in the valve body. Use a suitable solvent and carefully clean the lapping paste from the Pocket ball and seat rings. Make sure that no lapping paste remains.
2. Grease the seat rings (4) with Klüber Barrierta L55/3 grease (or similar). The coat of grease must be thin and evenly distributed.
3. Fit the body seal (14) between the two halves (1, 2) of the body. It is always recommended to use a new body seal from the stem seal kit.
4. Fit the ball (3) in the main body (1). See Figure 4. Then fit the body cover (2). Note: The main body (1) and body cover (2) will only fit in one position.
5. Check that the Pocket ball opening is facing upwards in the direction of the body cover (2). If not, turn the ball 180 degrees.
6. Lubricate all studs/bolts (17, 18) with suitable anti-galling grease.
7. Lubricate the contact surface of the nuts (19) with a suitable anti-galling grease and put the nuts onto the studs/bolts (17, 18). Start to tighten the bolted joint of the two body halves (1, 2) of the body alternately in several stages in a diagonal sequence. Make sure that the body seal (14) remains in its designated position.
8. Inspect that there is no visible gap between the body halves and finally tighten according to the torque in accordance with Table 3.

Bolt	Torque Nm	Bolt	Torque Nm
UNC 1/2"	89	M12	76
UNC 5/8"	175	M16	187
UNC 3/4"	308	M20	364
UNC 7/8"	493	M24	629
UNC 1"	737		

Table 3. Required torque for the bolted joint of the two body halves

9. Operate the valve between the closed and open positions.

10. There should be a small gap between the Pocket ball and the seat ring to get the correct torque while restricting big particles from entering the body. Inspect that the gap between the Pocket ball (3) and seat ring (4) is correct by moving the Pocket ball to approximately 45°. The gap between the Pocket ball and seat ring should measure approx. 0.2-0.3 mm.
11. If possible, pressure test the valve with water to check its tightness after reassembly. Testing should be done when the Pocket ball is in filling position. If the valve has been pressure tested, please check and, if needed, re-tighten the bolts according to step 3 above.



Testing with the use of gaseous media is not recommended due to safety issues. Testing the valve body tightness should not be performed at a pressure higher than 1.5 x maximum allowed working pressure. Refer to Technical Bulletin NFENTB4163. Due to the floating action of the ball, the ball needs a certain volumetric flow to effectively seal the ball against the seat. We recommend for valve sizes DN150/6" and larger, that the inlet pipe connection is a minimum of 25 mm/1".

10.4 Replacing seat rings

To remove the locket seat rings, use a suitable precision power tool with a cutting blade (or similar equipment) to carefully remove the lockings from the seat ring without further damaging the seat ring.

To ensure tightness of the valve, fit new seat rings (4) if the original ones are severely worn or damaged.

Visually inspect the sealing surfaces of the seat rings (4). A groove on the inside diameter of the seat facilitates the removal of the seat ring. Minor damage to the seats can be rubbed down with fine emery cloth. Check the seats on a face plate to ensure that they are perfectly flat. Change the seats if they are severely worn or damaged.

The ball (3) and seat rings (4) can be temporarily overhauled by lapping them together. This can be done manually with a compound with grit size 200. Take great care to ensure that the ball and seat rings do not become oval.

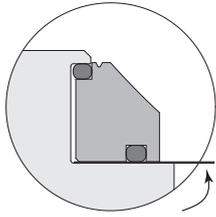


Figure 7. Venting using a feeler gauge

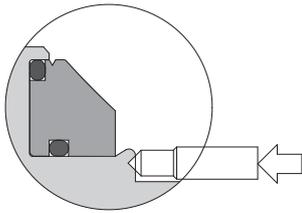


Figure 8. Locking the seat rings into place

New seat rings (4) can be supplied that have been ground and lapped together with a "Master-ball". Some additional machining of the rear side of the rings may be necessary in order to optimize fit. However, NAF always recommended to order a complete Ball kit D to ensure best possible tightness and sealing effect. Please refer to table 2 for spare part kits.

The Pocket Valve is equipped with seat rings with an outside and one inside seats seal (21,15). Furthermore, the seat rings are locked mechanically in place.

1. Fit the outside seat seal (21) and the inside seat seal (15) onto one of the seat rings (4). Use some silicone grease. Repeat for the other seat ring (4).
2. Gently push the seat ring (4), including the outside and inside seat seal (21, 15), into the seat area. During the assembly, the seat ring seals (o-rings) need to be vented. The easiest way to do this is to use a feeler gauge. See Figure 7. Place the feeler gauge at the outside location where there is a small flat surface on the outside of the seat ring (4).
3. After seat rings have been vented and fitted properly, they are to be locked in position. Push the seat ring down into the body and lock the seat rings in accordance with Figure 8. Locking should be done in equally the same number of locations as the original locking. It's important that the locking is done thoroughly in order to make sure the seat rings are properly fixed.

10.5 Replacing the Pocket ball

Due to the application, it is of great importance to routinely inspect the status of the Pocket ball. Wear and damage to the ball will not only increase risk of leakage but also likely increase needed torque risking damaging the valve body, stem and actuator.

Inspect the ball (3) visually. Minor damage to the sealing surface can be removed by rubbing down with fine emery cloth. If the ball has sustained major damage, it must be replaced to ensure satisfactory sealing.

The ball (3) and seat rings (4) can be temporarily overhauled by lapping them together. This can be done manually with a compound with grit size 200. Take great care to ensure that the ball and seat rings do not become oval.

If the sealing areas on the Pocket ball are damaged, we recommend that the valve is returned to Flowserve for overhaul. This applies in particular if the ball must be reground before lapping. Assemble the valve before dispatching it to Flowserve NAF.

10.6 Replacing the stem packing

If the stem seal is leaking, the stem packing must be replaced. Even if the stem seal does not leak, we always recommend replacing the stem packing every time the valve is disassembled. This will prevent unnecessary extra work and downtime caused by a stem leakage in the future. We always recommend the use of a stem sealing kit, spare part kit A.

Make sure that the valve is not under pressure.

- 1 Remove the actuator.
- 2 Remove the keys (20).
- 3 Remove the circlip (6), back off the screws (16), and remove the cover (7) and the spring (8).
- 4 Disassemble the valve as described in section 10.2.
- 5 Press the stem (5) down into the body and remove it.
- 6 Press the bushing (12) down into the body and remove it.
- 7 Remove the stem packing (10) and washers (9) and (11). See Figure 9.
- 8 Fit a new anti-friction washer (13) to the stem (5) followed by a new bushing (12). Then fit the stem assembly (5, 12, 13) into the valve body.
- 9 Fit washer (11) and a new stem packing (10) using a suitable silicon grease.
- 10 Fit washer (9) and spring (8).
- 11 Fit cover (7) and tighten the screws (16) alternately in several stages.
- 12 Fit the circlip (6).



NAF AB

SE-581 87 Linköping

Sweden

Telephone: +46 13 31 61 00

Facsimile: +46 13 13 60 54

e-mail: salesnaf@flowserve.com

Website: www.flowserve.com

www.naf.se

NFENIM4163-00-A4 05/17

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