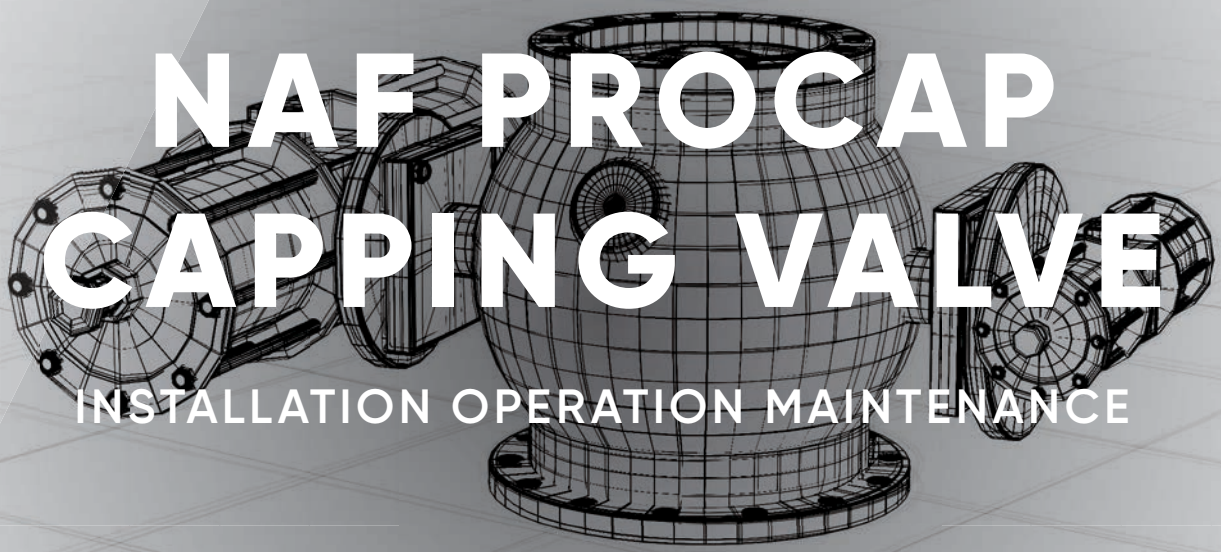
AUTOMATION AND DIGITALIZATION

NAF PROCAP CAPPING VALVE



INSTALLATION OPERATION MAINTENANCE

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1 General Information

1.1 SCOPE OF MANUAL 1.1SCOPE OF MANUAL

These instructions must be kept close to the product's operating location or directly with the product.

These instructions must be read prior to installing, operating, using, or maintaining the equipment in any region worldwide. The equipment must not be put into service until all of the safe operating conditions noted in the instructions have been met. Failure to comply with the information provided in the User Instructions is considered to be misuse. Personal injury, product damage, delay in operation, or product failure caused by misuse are not covered by the ANDRITZ warranty.

This instruction provides necessary information for the correct handling of the NAF ProCap Capping 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 ProCap Capping Valve, please contact your ANDRITZ representative.

The instructions and list of spare parts in this document are applicable to the NAF ProCap Capping Valve in accordance with our Technical Bulletin NFENTB4155.

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

1.2 VALVE DESIGN

The NAF ProCap Capping Valve is intended to be used in batch digesters. The valve is mounted to the top flange of the digester and it automates the filling of wood chips into the digester. During the cooking sequence, the valve is closed and gives a tight seal to avoid gas/media leakage from the digester.

The valve shall be mounted to the digester top flange using the lower flange connection of the valve. The chip chute can be connected to the ProCap valve using the bolt pattern in the clamping ring on the top side of the valve.

The unique design of the ProCap is based on a ball sector which is lifted and lowered from the seat by a lifting mechanism. This lifting mechanism is an eccentric hub which is operated by a separate, smaller actuator.

The main parts of the complete automated ProCap, seen in Figure 1, are:

- NAF ProCap valve, including a safety locking device, the "jammer".
- NAF Turnex (big) pneumatic actuator, for the opening/closing of the valve
- NAF Turnex (small) pneumatic actuator, for the lifting/lowering of the ball sector
- Limit switches

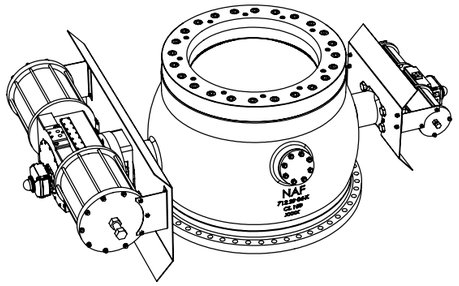


Figure 1: ProCap including actuators, jammer and limit switches

There are also several optional devices available. We strongly recommend to use these in order to facilitate the installation, maintain a high tightness and minimize maintenance.

These are the main optional devices:

- Pressure Safety Switch Unit- includes pressure switches for interlocking of digester pressure
- Local Control Box- simplifies the installation as it automates the sequences, including flushing, and makes it possible to run the valve locally
- Pneumatic Cabinet- compact mounting of solenoid valves
- Water Mirror- prevents build-up on ball sector surface and traps potential gases
- Flushing system- effectively flushes the ball sector and helps the valve to maintain a high tightness and to minimize maintenance

2 Safety Information

2.1 INTENDED USE

- The NAF ProCap Capping Valve is intended to be used for filling of wooden chips into a batch digester. For any other use, please contact ANDRITZ NAF.
- 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 the capping valve.

The valve should only be installed, operated and maintained by qualified personnel. Qualified personnel personnel are people who on account of their education, experience, training and knowledge of relevant standards, specifications, accident prevention and operating conditions have been authorized by those responsible for the safety of the plant to perform the necessary work, and recognize and avoid possible dangers

Do not open the valve during cooking! Make sure that the valve control is set up so the valve can't be opened during cooking.

The valve can be hot! During cooking the valve body becomes hot. Use necessary protective equipment to prevent getting burned.

Be aware of moving parts! Never operate a valve without first ensuring there is no risk of crush injuries when the ball sector is moving. Take necessary safety precautions to avoid unintentional stroking of the actuator/valve.

Never dismantle a valve or part of a valve while there is pressure in the valve!

When lifting the valve package, be aware of its weight and high centre of gravity! Please read instructions under 2.2 "Lifting"

If the valve has been delivered with the Pressure Safety Switch Unit option, please make sure to follow the instructions in Section 5.2 in order to make sure the Pressure Switches are connected to the digester pressure and that the flushing valves are locked in the closed position during normal operation!

- The product must not be operated beyond the parameters specified for the capping valve. If there is any doubt as to the suitability of the capping valve, contact ANDRITZ NAF for advice.
- Installing, operating, or maintaining the product/system in any way that is not covered in this User Instruction could cause death, serious personal injury, or damage to the equipment. This includes any modification to the product/system or use of the parts not provided by ANDRITZ.
- Only operate the product/system when it has successful passed all inspection acceptance criteria
- Do not operate the product/system in a partially assembled condition.

3 Receiving Inspection

All ProCap valves leaving our facility are inspected and tested in accordance with the relevant requirements. Valves equipped with actuators are subjected to functional testing and are adjusted in such a manner that every unit is ready for direct installation to the digester. 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 accessories for possible damage that may have occurred during transport.

4 Lifting and handling

When lifting the valve package, be aware of its weight and high centre of gravity!

All lifting must be carried out on the valve itself and not on the actuators, limit switches or other accessories. The valve has a high centre of gravity and may rotate if the valve is only lifted in the valve body necks. We recommend that the valve is lifted using a minimum of 3 pcs high strenght lifting eye bolts. In order to better balance the valve to an upright position, please use one lifting point around the upper valve body neck (near the bigger sized actuator). See Figure 2. Table 1 shows approximate weight and lifting eye bolt thread sizes.

Figure 2: Lifting of a NAF ProCap with mounted actuators.

DN	Size	Lifing Eye Bolts Thread	Weight (approx.) Kg/Lbs
500/700	20/28	M20	850/1873
600/800	24/32	M20	1440/3174
750/950	30/38	M20	2700/5952

Table 1: Approximate weights and lifting eye bolt threads

Note: During all handling of the valve, make sure that the digester connection flange surface doesn't get damaged. Never place the valve on a hard surface, e.g. on a concrete floor. Instead place it on a soft and clean material, e.g. a new and clean wooden board.

The ProCap is normally delivered as a complete and pre-tested valve assembly with actuators, jammer, limit switches etc. We always recommend to keep the valve assembly complete during the entire transportation and installation. However, if space is limited, the big actuator can be removed during transportation without the need to re-adjust the entire assembly after it has been re-installed to the valve. Follow the steps below for disassembly and reassembly of the big actuator. For part numbers, see Figure 22 and Table 2.

1. Remove heat shield (65) by removing the 4 pcs screws indicated in Figure 3. Be careful when last set of fasteners are removed.
2. Use a marker/pencil and mark a line on both jammer plate (22) and actuator (101). This line will help later getting the actuator back to the same position.
3. Secure the actuator with lifting straps.
4. Remove the screws.

Do not remove the screws (33) as these are holding the jammer in place, avoiding the ball segment to rotate due to its own weight.

5. Remove the big actuator by moving it horizontally, out from the valve.

Be aware of the weight of the actuator and always use appropriate lifting straps!

6. Reverse all the steps above after the valve and actuator have been transported to the digester top. Make sure to align the big actuator with the valve using the line on actuator and jammer made in step 2.

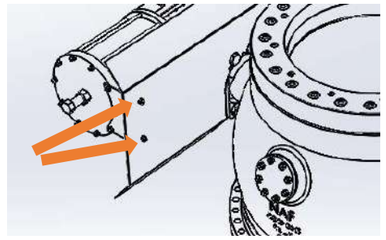


Figure 3: Removing the heat shield

5 Installation

5.1 MOUNTING THE PROCAP VALVE ON THE DIGESTER

The NAF ProCap capping valve is intended to be used for cooking of wooden chips in a batch digester. The valve shall be mounted to the digester top flange using the lower flange connection of the valve.

We suggest the following inspection procedure:

During the lifting of the valve to its position on the digester top, please make sure to follow the safety precausions in Section 4!

When installing the valve to the digester, make sure that the valve is installed in a position enabling the actuators and other equipment to be removed without the need to remove the valve from the digester.

The chip chute can be connected to the ProCap valve using the bolt pattern in the clamping ring on the top side of the valve. If a water mirror should be used (see Section 5.5), the water mirror should be connected to the top of the valve and the chip chute connected on top of the water mirror. We recommend to use an inspection hatch located at least 400 mm/16" above the valve.

If the ProCap is operated directly from the DCS without the Local Control Box and the Pneumatic Cabinet, the solenoid valves used are normally of the type 5/2 function for all the pneumatic parts; big actuator, jammer and small actuator.

We recommend:

- The jammers (5/2 function, mono stable, fail safe position= jammers locked)
- Valve open/close action (5/2 function, bistable)
- Ball sector up/down action (5/2 function, bistable)

Note: It's important that the valve isn't opened or closed with the ball sector in the upper position. Therefore we recommend that a bistable 5/2 solenoid valve is used for the actuation of the smaller actuator. This will prevent the sector from being in the wrong position after a power failure.

Note: During the operation of the ProCap valve it is mandatory that the valve can't be opened before the pressure in the digester has dropped to zero or almost zero. Therefore, the pressure in the digester must be used to interlock the opening of the valve. Pressure switches may already exist, sitting in the digester itself, or can be attached using the DN80 PN 25 connections on the valve body. The valve is delivered with both these connections sealed with two blind flanges.

At delivery, the ProCap is also:

- Prepared for stem seal surveillance: In the covers (Fig 18, item 50 and 51) there are G ¼" ports that are plugged at delivery. In these ports, it is possible to connect a pressure gauge, or pressure transmitter, for indication of pressure due to a leakage over the stem seals. Alternatively, it can also be used for sealing water.
- Prepared for segment flushing: Built into the clamp ring (Fig 18, item 8) there is a G 1" pipe connection where water for flushing can be connected. Please see Section 5.6 for more details. At delivery, the connection has been plugged.

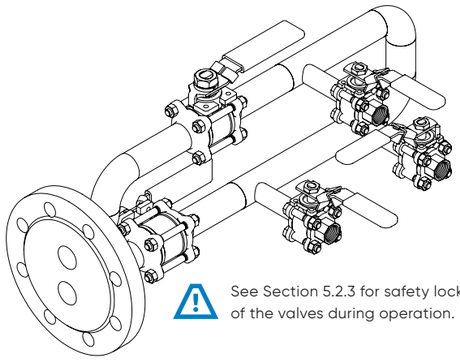
5.2 OPTION: PRESSURE SAFETY SWITCH UNIT

As an option, a Pressure Safety Switch Unit can be delivered with the valve. It is delivered with two pressure switches which also can be integrated with the NAF ProCap Local Control Box. By having a double pipe connection, pressure can be detected even if one pipe is blocked. The Pressure Safety Switch Unit can be cleaned while in service as it comes with a connection for flushing water.

5.2.1 PRESSURE SAFETY SWITCH UNIT DESIGN AND SPECIFICATIONS

The Pressure Safety Switch Unit has a total of five ball valves integrated into a pipe loop with a flange connection.

- Flange connection: DN 80
- Flange material: EN 1.4401/1.4436
- Ball valves:
  - Feed pipes: 2 pcs NAF Triball DN 25, PN 40, PTFE seated in EN 1.4408
  - Pressure switch and water connections: NAF Triball DN 15, PN 40, PTFE seated in EN 1.4408. Threaded female connection Rp ½"
- Pressure switches: 2 pcs, female NPT ½" in 316 stainless steel, DPDT circuitry



See Section 5.2.3 for safety locking of the valves during operation.

Figure 4: Pressure Safety Switch Unit.

Figure 5: Pressure Safety Switch Unit mounted on the ProCap valve

5.2.2 MOUNTING OF THE PRESSURE SAFETY SWITCH UNIT TO THE VALVE

In order to minimize the risk of damage during transportation, the Pressure Safety Switch Unit is normally supplied separately and needs to be mounted to the valve after the valve has been mounted to the digester. For part identification, please see Figure 17.

1. Untighten the nuts (32) and remove the lid (27) on the right side of the valve, seen from the big actuator when the valve is standing on the digester connection flange (see Figure 5).
2. Mount the Pressure Safety Switch Unit onto the studs (31) using the existing gasket (35).
3. Lubricate the contact surface of the nuts (32) with a suitable anti-galling grease and put the nuts onto the studs (31).
4. Tighten the nuts (32) alternately in several stages, and finally tighten them firmly

5.2.3 CONNECTING THE PRESSURE SWITCHES TO THE PRESSURE SAFETY SWITCH UNIT

Note: The two pressure switches included in the delivery of the Pressure Safety Switch Unit, are supplied separately and must be connected to the Pressure Safety Switch Unit at the valves no. 3 and 4 using suitable tubing (not included in delivery). For identification of the valves, see Figure 6.

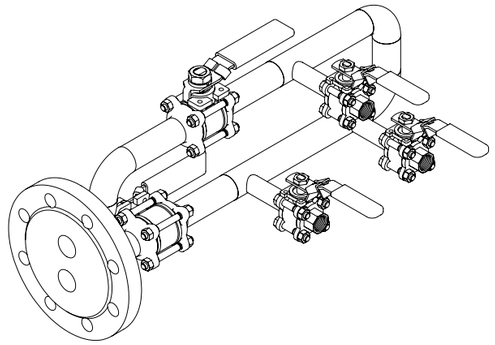


Figure 6. Valves in the Pressure Safety Switch Unit

Threading of valve/pressure switch is specified in Section 5.2.1. We recommend that the pressure switches are mounted to a wall with an elevated position with a tubing which is minimum 1 m/40" long. This will minimize temperature impact and any potential condensate in the tubing can flow back to the digester.

All valves in the Pressure Safety Switch Unit must be locked at all times during normal operation! Valve n:o 1-4 must be locked in the open position in order to make sure that the digester pressure is connected to the pressure switches. Valve n:o 5 should be locked in the closed position and should only be opened if there is a need for flushing of the Pressure Safety Switch Unit, digester pressure is zero and a water flushing line has been connected to the valve.

5.2.4 CONNECTING THE PRESSURE SWITCHES TO THE LOCAL CONTROL BOX

When delivered from NAF, the default setting of the pressure switches is set to give signal "1" when pressure <0.1 bar. The pressure switch type is of DPDT model and the connection terminal in the switch is seen below. If using the NAF ProCap Local Control Box, connect to switch 1 (see Figure 7). The signal/supply should go to 1C and the signal back to the box should be 1 N.C. When the pressure <0.1 bar the pressure switch activates and connects the two i.e. sends a signal back to the Local Control Box.

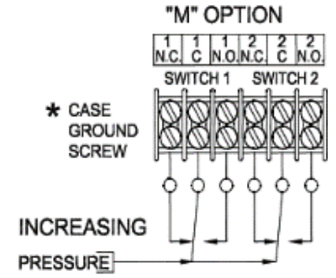


Figure 7. Terminal in pressure switch

5.2.5 FLUSHING OF THE PRESSURE SAFETY SWITCH UNIT

The Pressure Safety Switch Unit has a total of five ball valves integrated into a pipe loop. If either one or both ends of the Pressure Safety Switch Units inlets become plugged, follow the steps below. See Figure 6 for valve identification.

Make sure there is no pressure in the digester!

1. Unlock valve no. 1-5
2. Close valve No. 3 & 4 to protect the pressure switches from damage
3. Connect a flushing pipe to valve no. 5 if not already connected
4. Open valve no. 5
5. Close valve no. 1
6. Let flush for 1 – 2 minutes
7. Open valve no. 1
8. Close valve no. 2
9. Let flush for 1 – 2 minutes
10. Open valve no. 2
11. Close valve no. 5
12. Open valve no. 3 & 4
13. Lock all the valves.

All valves in the Pressure Safety Switch Unit must be locked at all times during normal operation! Valve n:o 1-4 must be locked in the open position in order to make sure that the digester pressure is connected to the pressure switches. Valve n:o 5 should be locked in the closed position and should only be opened if there is a need for flushing of the Pressure Safety Switch Unit, digester pressure is zero and a water flushing line has been connected to the valve.

5.3 OPTION: LOCAL CONTROL BOX

The Local Control Box (see Figure 8) is a unit that greatly simplifies installation and automates the operating sequence (see Section 6.1) of the ProCap valve. It also grants the user the possibility to run a step-by-step open/close sequence of the valve and to get feedback to an independent safety system.

When the ProCap valve is used with the Flushing System, the Local Control Box also automates the flushing of the ball sector each time the ball sector is operated. It controls a solenoid valve as well as making sure there is a water flow by interlooking the sequence to a flow switch. For further details please, see Section 5.6.

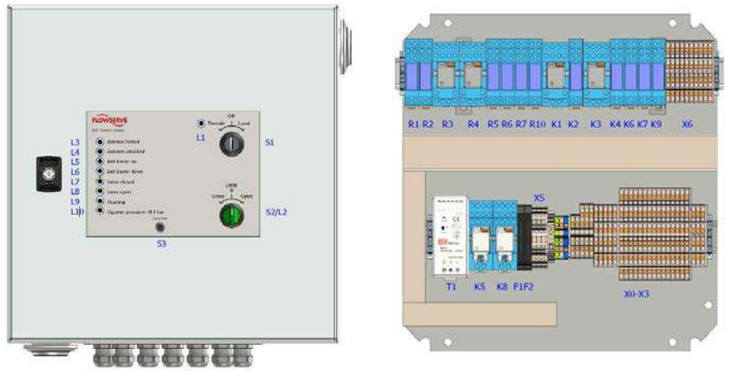


Figure 8: Local Control Box

5.3.1 LOCAL CONTROL BOX DESIGN AND SPECIFICATIONS

- Control Box material: AISI 316
- Supply voltage: 100-240 VAC
- Signal: 24 VDC
- Electrical cable entries: 12 pcs M20x1,5
- Max. allowed ambient temperature: 70°C
- Enclosure protection: IP65
- Enclosure size: approx. 400x400x200 mm

DESIGN

The Local Control Box door is equipped with 9 LED's, a "Lamp test" button, a maneuverable button and a key slot. See Figure 8. The Local Control Box is also equipped with four mounting brackets for wall mounting.

The 8 pcs of LED's to the left on the door are indicator lamps. These will indicate the valve's current position, the position of the ball sector, if the jammer is in the locked position, if the digester pressure is <0.1 bar and if there is a water flow in the flushing system. The LED to the upper right is to indicate whether the Local Control Box is set in the function "Remote". For increased safety, the Local Control Box is equipped with a LED test. Simply by holding down the button "Lamp test", all LED's will glow to indicate proper function.

The Local Control Box also contains two adjustable relays (see Figure 8):

K5: adjustable time delay relay. This adds a delay of 0-10 seconds between the rotation of the ball sector and vertical movement up and down of the ball sector. This allows the bigger actuator to settle before the small actuator is moving the ball sector up or down. This delay is set to function "on-delay" and is normally set to 5 seconds at delivery and there should normally be no need to change this. (If needed, see Section 5.6.2 for adjustment of a similar relay. Don't change dipswitch 4).

K8: adjustable relay for an extra flushing sequence. When closing the valve with flushing, this relay adds an additional, time controlled flushing sequence which again opens the valve during the selected time. The relay is set to "interval" function and the time normally set to 0.5 sec from factory but can be adjusted up to 100 sec if there is a need to flush the sector even more. For further details, please see Section 5.6.2.

5.3.2 FUNCTION MODES

The Local Control Box is equipped with three functions. To set it to a specific function, turn the key in the upper right corner of the box to point to the desired function.

The functions available are:

- "Remote mode": The Local Control Box is controlled by a DCS open/close signal. The Local Control Box cannot be maneuvered by using the green control knob.
- "Off mode": The Local Control Box is turned off. The NAF ProCap cannot be operated neither from the DCS nor manually from the green control knob.
- "Local mode": The green control knob is activated and it is possible to control the NAF ProCap by turning the green control knob.

USING THE LOCAL CONTROL BOX IN "LOCAL MODE"

The Local Control Box can be used to do step-by-step opening or closing sequence of the NAF ProCap.

To operate the valve locally, set the box to function "Local mode". By turning the green control knob to either the right; to open the valve or to the left; to close the valve. The green control knob will illuminate when turned and the valve will start to operate. The knob need to be held in the desired position to proceed with the entire sequence. By releasing the knob, the valve opening or closing will freeze in the current position. This allows the user to inspect the valve in a desired position.

Note: For safety purposes, the local mode can only be used when there is no pressure inside the digester.

USING THE LOCAL CONTROL BOX IN "REMOTE MODE"

During normal operation, the ProCap valve is in the "remote mode" and the Local Control Box is controlled by an open/close signal from the DCS. When the Local Control Box receives an open/close signal, it automates the operating sequence (see Section 6.1) of the ProCap valve. From the Local Control Box the DCS can also receive signals for indication of pressure, valve position etc. There is also a separate, independent safety system as both the jammers and the limit switch for "valve closed" is equipped with an extra switch. This independent safety system can be connected to a separate safety loop in the customer DCS for additional safety. For further information about detailed functionality and functional, please see section 5.3.3 and Annex E.

5.3.3 ELECTRIC WIRING

This is a description for connecting the Local Control Box to customer DCS and how to connect the Local Control Box with the NAF ProCap Capping Valve. The NAF ProCap Local Control Box is wired according to drawing 33414591 (see Figure 10-14 below). Please refer to this drawing for further details on wiring of the Local Control Box. Figure 9 shows the terminal layout.

Note: If Flushing System is not used: Move the jumpers at terminal section 5. Move jumper connecting 1 and 2 to connect 2 and 3 instead. Move jumper between 4 and 5 to 5 and 6 instead. (see Figure 8).

Terminal block section X0: Power Supply (see Figure 10)

The Local Control Box uses a 100 – 240 VAC power supply. This, together with ground connection, is to be connected to section "X0" of the terminal block.

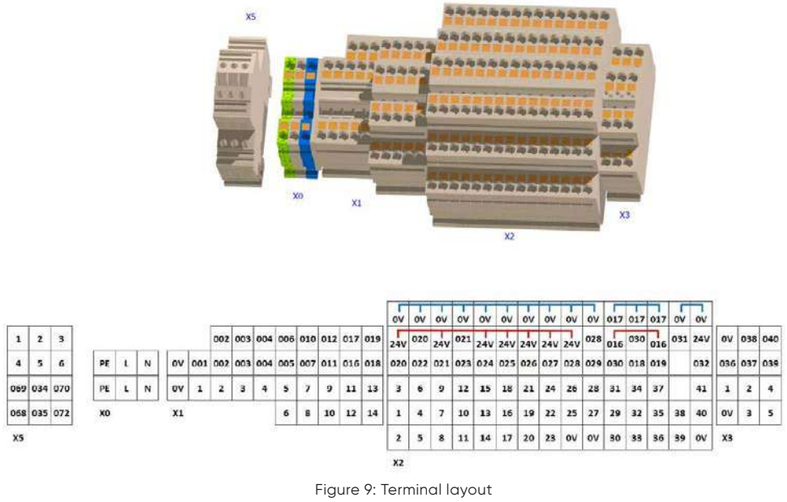


Figure 9: Terminal layout

Terminal block section X1: DCS (see Figure 10)

- Position 1: connect to the DCS, which will give signal when the Local Control Box is set to “Remote mode” function. From position 1 & 2, there is the possibility to connect indication lights for “Remote mode” and “Local mode”.
- Position 3: Signal from the DCS: OPEN VALVE
- Position 4: Signal from the DCS: CLOSE VALVE

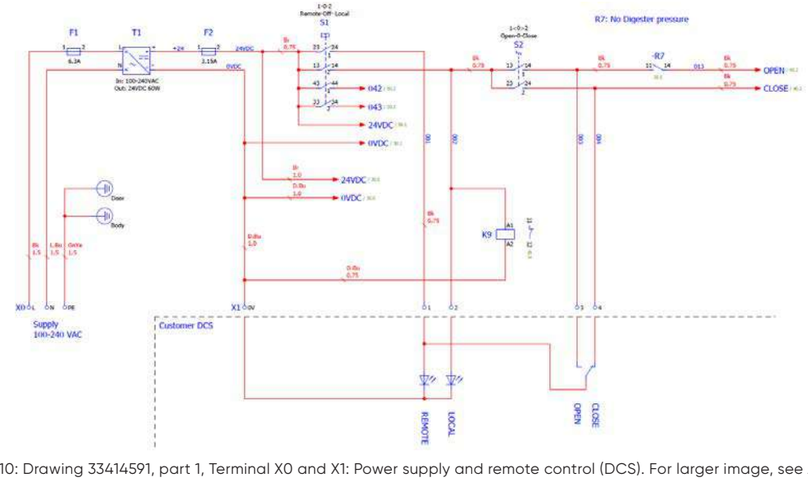


Figure 10: Drawing 33414591, part 1, Terminal X0 and X1: Power supply and remote control (DCS). For larger image, see Annex A.

Terminal block section X1 and X2: DCS signals and Independent Safety System (see Figure 11)

- X1, Position 5 – 10: Local Control Box can be connected to DCS to send signal indicating
  - Position 5 – 6: Pressure switch signal: DIGESTER PRESSURE < 0.1 BAR
  - Position 7 – 8: Limit switch signal: VALVE CLOSED
  - Position 9 – 10: Limit switch signal: VALVE OPEN
- X1, Position 11 – 14: The Local Control Box is equipped with an optional independent safety system as both the jammers and the limit switch for “valve closed” are equipped with an extra, separate switch. This independent safety system can be connected to a separate safety loop in the customer DCS for additional safety. This is to be supplied with 24 VDC separately. See Figure 11.
- X2, Position 29-37: Connections for extra, separate limit switches from jammers and “valve closed”, for the optional separate independent safety system

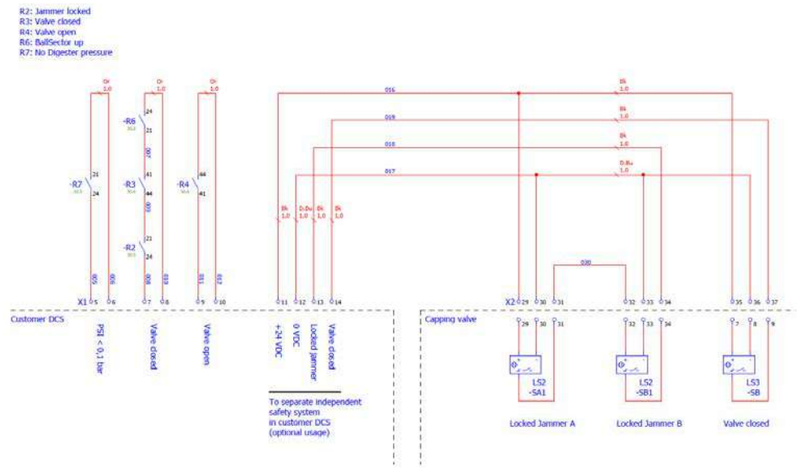


Figure 11: Drawing 33414591, part 2, Terminal X1 and X2: Signals back to DCS plus Independent Safety System including extra limit switches for jammers and closed valve. For larger image, see Annex B.

Terminal block section X2: Inductive limit switches for jammers and valve position (see Figure 11)

- Position 1 - 18: The connections between the Local Control Box and the limit switches for two jammers and valve open/closed.

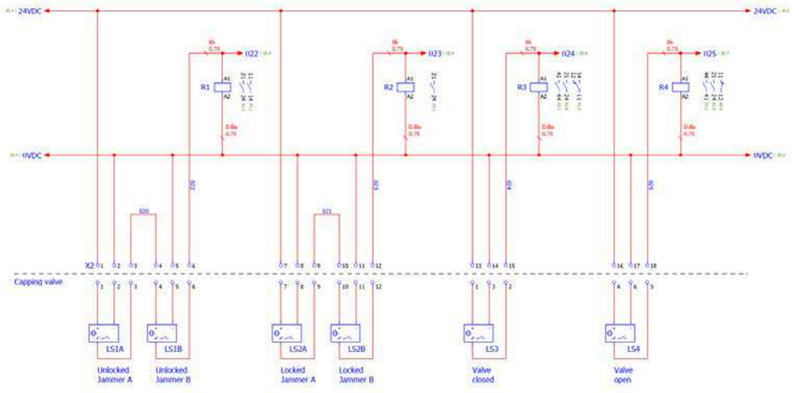


Figure 12: Drawing 33414591, part 3: Terminal X2: Inductive limit switches for jammers and valve position. For larger image, see Annex C.

Terminal block section X2: Inductive limit switches for ball sector up/down, pressure switches, flushing valve and flushing flow switch (see Figure 13)

- Position 19 - 24: The connections between the Local Control Box and ball sector up/down.
- Position 25 - 28: The connections between the Local Control Box and two pressure switches.
- Position 38 - 41: The connections between the Local Control Box and the flushing valve and the flushing flow switch.

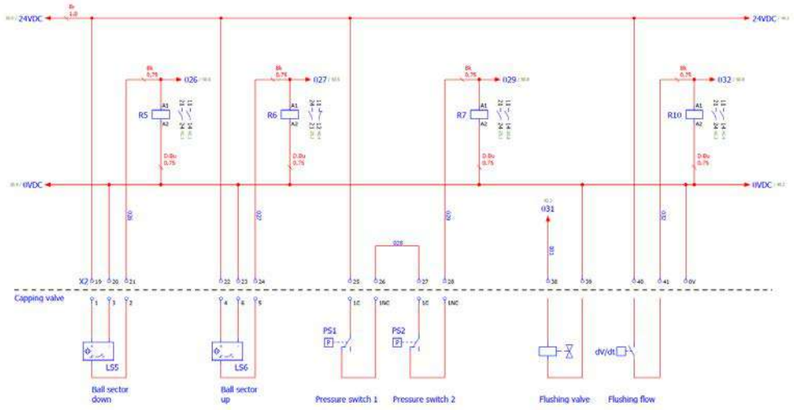


Figure 13: Drawing 33414591, part 4: Terminal X2: Inductive limit switches for ball sector up/down, pressure switches and flushing valve and flushing flow switch. For larger image, see Annex D.

Terminal block section X3: Solenoid valves (see Figure 14)

- Position 1 - 5: The connections between the Local Control Box and the solenoid valves that operate:
  - Y1: the jammers (5/2 function, mono stable, fail safe position= jammers locked)
  - Y2/Y3: the valve open/close action (5/3 function, closed center)
  - Y4: the ball sector up/down action (5/2 function, bi-stable)

Please note that the solenoid valves are not provided with the Local Control Box. They can either be bought as a part of the NAF ProCap Pneumatic Cabinet (see Section 5.4) or installed by customer's preference.

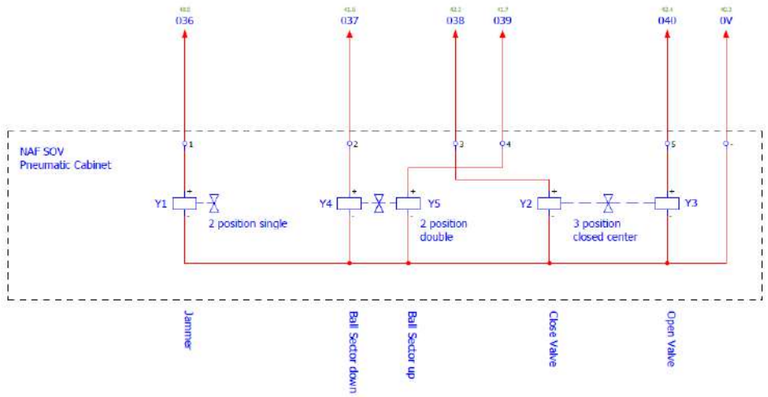


Figure 14: Drawing 33414591, part 5: Terminal X3: Solenoid valves. For larger image, see Annex E.

Terminal block section X5: Flushing System

Note: If Flushing System is not used: Move the jumpers at terminal block section 5. Move jumper connecting 1 and 2 to connect 2 and 3 instead. Move jumper between 4 and 5 to 5 and 6 instead. (see Figure 8).

5.4 OPTION: PNEUMATIC CABINET

The solenoid valves controlling the jammer and actuators for the ProCap can be mounted in several ways, including directly on the units, separately on a wall or in a rack.

The Pneumatic Cabinet simplifies the installation of the solenoid valves that pneumatically control the jammer and the actuators. The cabinet has all necessary pneumatic parts included with exception of tubing and fittings between pneumatic cabinet and the jammer/actuators. In the cabinet the solenoid valves are protected from direct radiation heat and included in the cabinet is also an air filter regulator. See Figure 15.

The pneumatic cabinet is especially designed to be used together with the Local Control Box.

5.4.1 PNEUMATIC CABINET DESIGN AND SPECIFICATIONS

- Pneumatic Cabinet enclosure material: AISI 316
- Enclosure protection: IP65
- Enclosure size: approx. 300x380x210 mm
- Supply voltage: 24 VDC
- Air supply connection: G3/8"
- Air ports connection: G3/8"
- Electrical cable entry: 1 pcs M16x1,5
- Max. allowed ambient temperature: 50°C
- Solenoid valves:
  - Y1: the jammers (5/2 function, mono stable, fail safe position= jammers locked)
  - Y2/Y3: the valve close/open action (5/3 function, closed center)
  - Y4/Y5: the ball sector down/up action (5/2 function, bi stable)

Note: If the ProCap is operated directly from the DCS without the Local Control Box and the Pneumatic Cabinet, the solenoid valves used are normally of the type 5/2 function for all the pneumatic parts; big actuator, jammer and small actuator. See section 5.1.

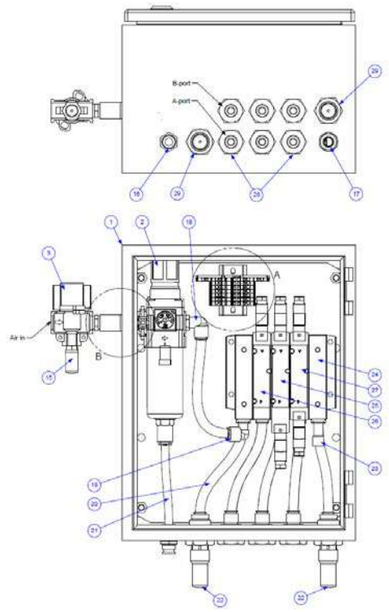


Figure 15: Pneumatic Cabinet

5.4.2 INSTALLATION OF THE PNEUMATIC CABINET

The Pneumatic Cabinet needs to be wired to the Local Control Box and pneumatically connected to the jammer and the pneumatic actuators. The electric wiring is described in Section 5.3.3. The pneumatic connections are described in Figure 16. Please note that the solenoid valves are shown de-energized and all pneumatic connections are G1/4".

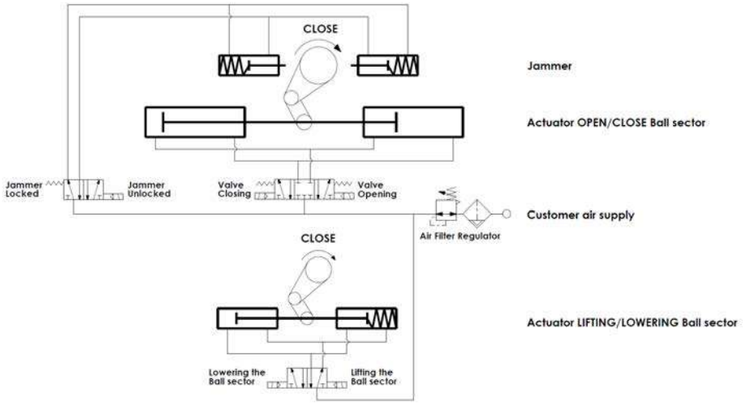


Figure 16. Pneumatic Chart (NAF Drawing 3340981) when used with Local Control Box

5.5 OPTION: WATER MIRROR

In many capping valve applications, there is an advantage adding a device called Water Mirror. The Water Mirror is mounted on top of the ProCap.

The NAF Water Mirror is added to the NAF ProCap to:

- Avoid getting debris, that have fallen onto the ball sector during cooking, from burning and sticking to the sector surface. Stuck objects could damage the sealing area during operation of the ball sector and create leakage through the valve.
- Trap leaked gases. In the event of a gas leakage the running water would help to flush away the dissolved gases, thus minimizing the gases from entering the atmosphere.

The NAF Water Mirror is a single walled design and its basic construction can be seen in Figure 17.

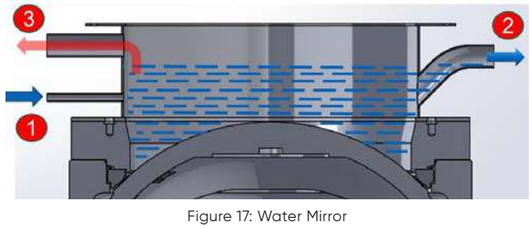


Figure 17: Water Mirror

The basic connections are:

1. Water supply
2. Water outlet
3. Gas evacuation

It is recommended to use a constant water flow during cooking of 5-10 liters/minute during normal applications in order to avoid the water from boiling.

5.6 OPTION: FLUSHING SYSTEM

Wood chips and fibers that fall down onto the ProCap after it has been closed, either fall directly on the ball sector or, if installed, in the water of the Water Mirror. While bigger chips get scraped away during the opening sequence, smaller fibers may get trapped between ball sector and seat and may prevent the valve from being absolutely tight.

The NAF ProCap Flushing System effectively flushes the ball sector, removing all chips and fibers. The flushing system is preferably controlled from the Local Control Box, making sure that there is a water flush every time the valve is opened and closed.

The NAF ProCap Flushing System is especially effective and important when used in sulphite processes to prevent SO2 gas leakage and should always be used together with a water mirror in order to prevent debris, that have fallen onto the ball sector during cooking, from burning and sticking to the sector surface

5.6.1 FLUSHING SYSTEM DESIGN AND SPECIFICATIONS

- Design: Nozzle and piping are built into the clamp ring of the ProCap and is a part of the standard delivery. NAF Triball ball valve (incl. actuator and solenoid valve) and flow switch for the operation included in the delivery of the Flushing System.
- Material: AISI 316
- Supply voltage to solenoid valve and flow switch: 24 VDC
- Flush port connection: G1″
- Water flow requirements: Normally 0.7-1.5 liters/sec depending on size of valve and amount of fibers to be flushed.

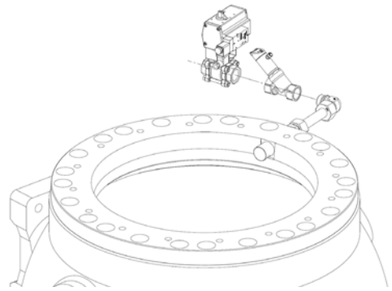


Fig 18. Flushing System

Note: The ball valve assembly and the flow switch are usually delivered as separate parts to be assembled according to customer requirements. Depending on space availability, the amount of vibration etc, it may be better not to mount the parts directly to the flushing piping. Configuration of the flow switch has been done before delivery. If there is a need to adjust, please follow the manufacturer's instructions.

5.6.2 EXTRA FLUSHING SEQUENCE

When using the Local Control Box, there is a possibility to add an extra flushing sequence if needed. This can be used if the amount of debris (fibers, chips etc) falling onto the ProCap is huge. The extra flushing will be added to the sequence step 8 (see Fig 19). When the valve has reached the closed position it will immediately start to open again for a few seconds before it finally closes completely. During this additional opening and closing, the segment will be flushed.

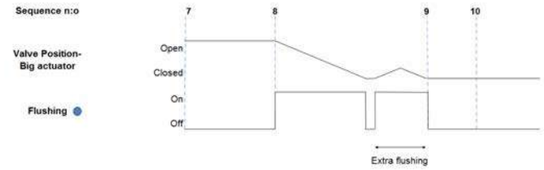


Fig 19. Extra flushing sequence

In order to add this extra flushing, please adjust the time setting of the relay K8 (se Fig 8 and Fig 20) in the Local Control Box. Set the timescale for the dipswitches C1-C3 and adjust the time with the time delay adjustment trimmer B. Dipswitch C4 should remain in the upper position, "interval" function. A suitable time setting could be 5-30 sec.

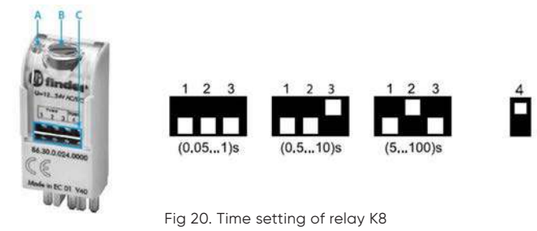


Fig 20. Time setting of relay K8

6 Operation

6.1 OPERATING SEQUENCE

The NAF ProCap Capping Valve should be operated by the following sequence:

1. The ProCap is in the closed position. Cooking sequence has ended and the pressure switches indicate that there is no pressure in the digester.
2. The jammer unlocks the stem.
3. Small actuator rotates the lower eccenter CCW (counter clockwise), thus lowering the ball sector, releasing it from the seat.
4. Big actuator rotates the ball sector CCW (counter clockwise) to the fully open position while flushed with water (if used).
5. The jammer locks the upper stem in the open position.
6. The digester is filled with wooden chips.
7. Filling of the digester has ended and the jammer unlocks the stem.
8. Big actuator rotates the ball sector CW (clockwise) to the fully closed position while flushed with water (if used).
9. Small actuator rotates the lower eccenter CW (clockwise) thus lifting the ball sector until it loads the seat.
10. The jammer locks the stem. Filling sequence is now completed.

A schematic figure of the operating sequence can be seen in Figure 21.

The sequence is preferrably controlled through the use of the Local Control Box as described in Section 5.3. Alternatively, it can be controlled from the customer DCS with the help of the limit switches, pressure switches and solenoid valves. Example of sequence control can be found in Annex E wich is used for the Local Control Box.

The opening of the valve must be interlocked to pressure switches, preventing the valve to open when there is pressure in the digester. Make sure that the pressure switches can't be blocked at any time.

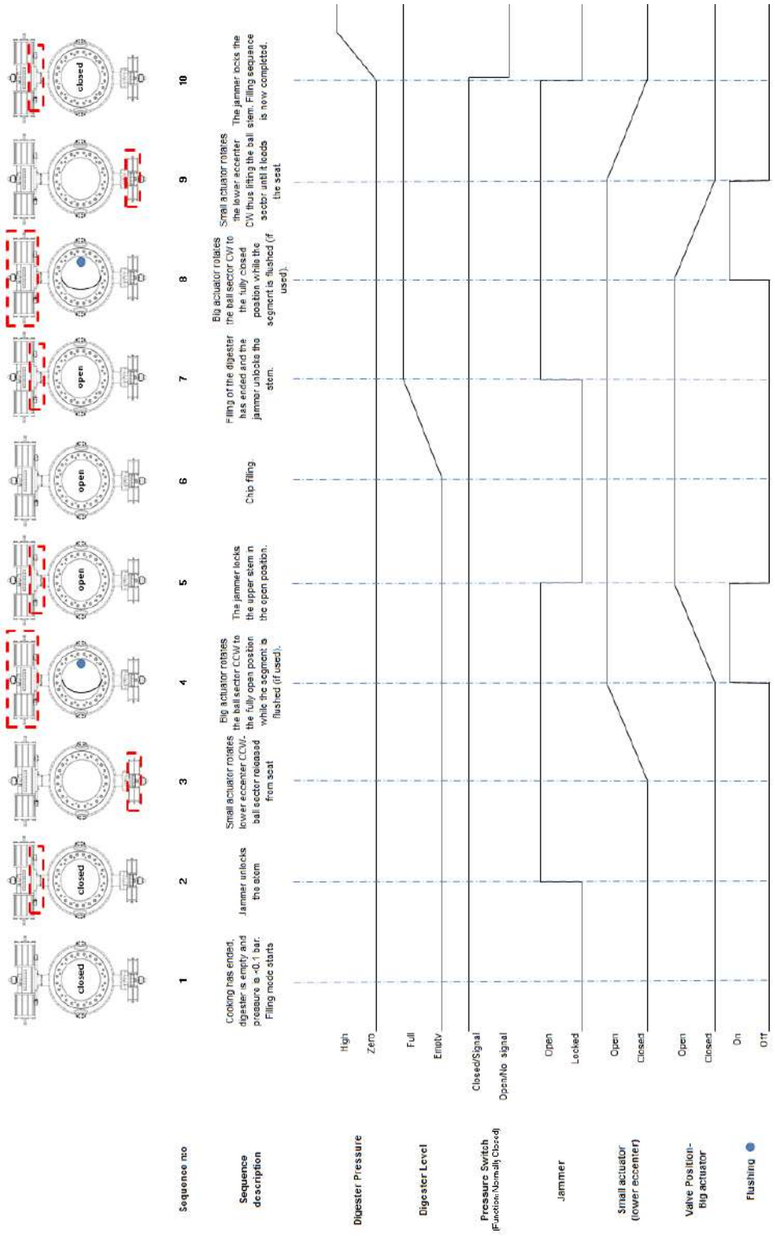


Figure 21: Schematic figure of the operating sequence

7 Bill of Materials and recommended spare part kits

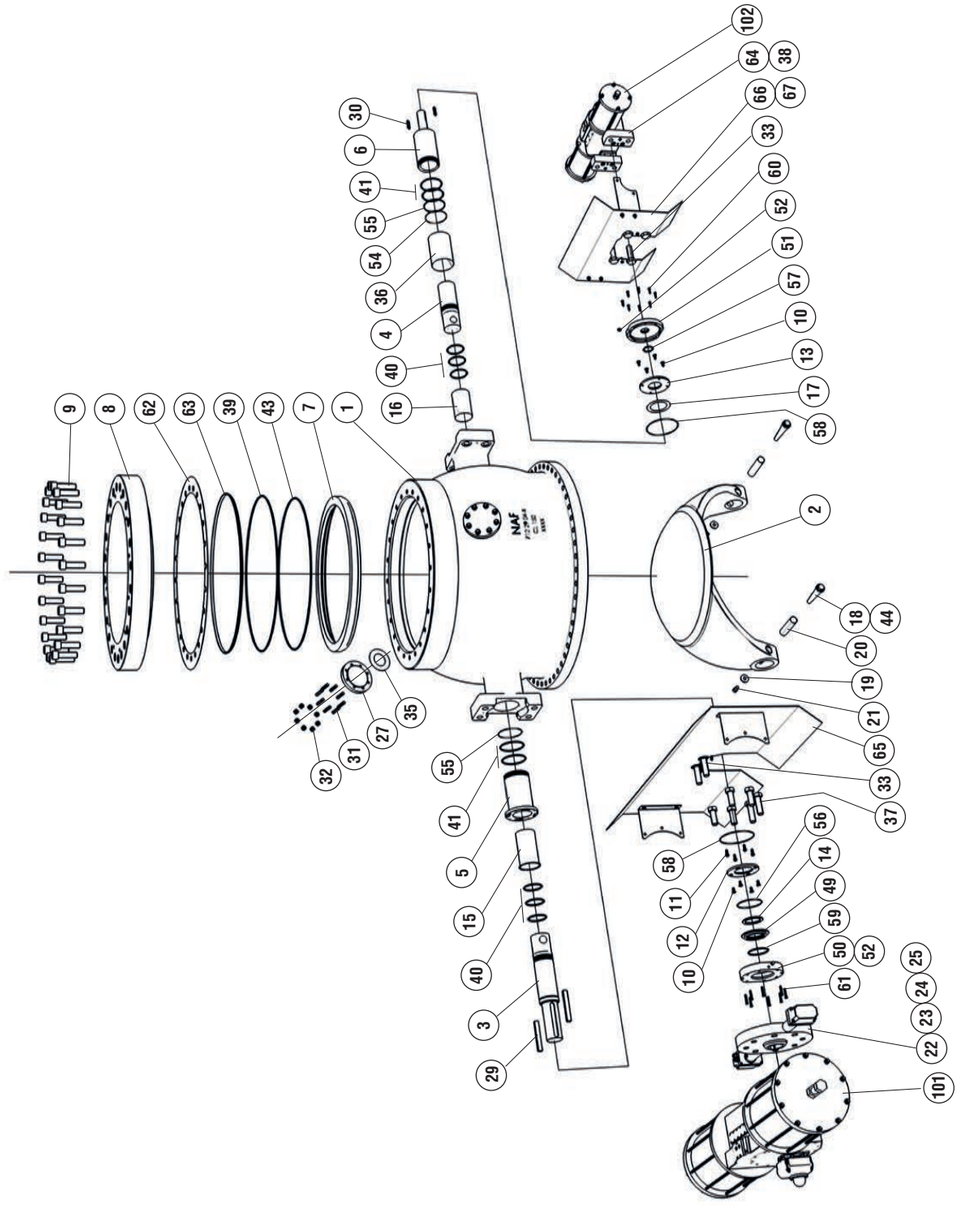


Figure 22: Exploded view with item/part numbering

Item	Qty	Part	Kit A Clamp ring seal kit	Kit A Clamp ring seal kit	Kit C Seat & Segment kit
1	1	Body			
2	1	Ball Sector			X
3	1	Stem, upper			
4	1	Stem, lower			
5	1	Eccenter, upper			
6	1	Eccenter, lower			
7	1	Seat ring			X
8	1	Clamp ring			
9	[1]	Screw			
10	8	Screw			
11	4	Screw			
12	1	Cover, upper			
13	1	Cover, lower			
14	2	Locking segment			
15	1	Bushing, stem upper		X	
16	1	Bushing, stem lower		X	
17	1	Bearing washer		X	
18	2	Pin plunger			
19	2	Washer			
20	2	Pin sleeve			
21	2	Screw			
22	1	Jammer Plate			
23	1	Jammer hub			
24.1	1	Jammer cylinder with limit switches			
24.2	1	Jammer cylinder with limit switches			
25	2	Piston assembly			
27	2	Lid			
29	2	Key			
30	2	Key			
31	16	Stud			
32	16	Nut			
33	8	Screw			
35	2	Gasket			
36	1	Bearing, Lower Eccenter		X	
37	4	Screw			

Item	Qty	Part	Kit A Clamp ring seal kit	Kit B Seal kit complete	Kit C Seat & Segment kit
38	[1]	Screw			
39	1	O-ring	X	X	
40	6	O-ring		X	
41	4	O-ring		X	
43	1	O-ring	X	X	
44	2	Thread insert			
49	1	Cover ring, upper			
50	1	Outside cover, upper			
51	1	Outside cover, lower			
52	2	Plug			
54	1	Support ring			
55	2	O-ring		X	
56	1	O-ring		X	
57	1	O-ring		X	
58	2	O-ring		X	
59	1	O-ring		X	
60	8	Screw			
61	8	Screw			
62	[2]	Gasket	X[2]	X[2]	
63	1	Seal Ring	X	X	
64	[1]	Distance block			
65	1	Heat shield, upper			
66	1	Heat shield, lower			
67	5	Screw			
101	1	Turnex actuator incl. limit switches for opening/closing			
102	1	Turnex actuator incl. limit switches for the lifting/ lowering of the ball sector			

Figure 22: Exploded view with item/part numbering

1) Quantity depending on size of the valve.
2) Quantity is either 0 or 1 dependning on version of valve.

8 Ordering of spare parts

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 7.
- Quantity required.

Ordering example:

NAF-No: 8683XXX
Spare part kit: B
Quantity: 1 pc.

9 Maintenance

Read all safety related information in section 2.1 and 2.2 before start of maintenance.

The valve should only be maintained by qualified personnel.

Ensure the digester is free from pressure.

Always use suitable and safe lifting equipment when lifting heavy parts.

For part numbers, refer to Figure 22 and table 2. We recommend that the only maintenance work done by the the user is replacement of the seal between body and clamp ring and behind the seat, using Kit A. These seals can normally be replaced on site without removing the valve from the digester. Please see section 9.1.

For a total overhaul, we recommend the work to be done by a experienced service center, having necessary knowledge of safe handling of big valves as well as being trained of overhauling the NAF ProCap. For replacement of all seals, the service center should use Kit B. If there is a need to replace the segment and seat, use Kit C in combination with Kit B.

9.1 DISASSEMBLING THE VALVE FOR REPLACEMENT OF CLAMP RING SEALS AND SEAT SEAL

Lock the control (i.e. Local Control Box) in order to prevent unintended stroking of the valve during maintenance.

1. Make sure that spare part kit A is available.
2. Pressurize the small actuator (102) so it lowers the segment (2), thus off-loading the seat ring (7). Make sure that the supply air is connected during the maintenance, preventing the actuator to lift the ball sector until step 13.
3. Remove any water mirror or other device from the top of the ProCap valve.
4. Apply a lubricating penetrant spray on each screw (9) on the clamp ring (8). Let it sit for a short time. Untighten all the screws (9). If the screws are stuck, gentle heating may be applied.
5. Attach at least two M20 lifting eye bolts to the clamp ring (8), equally distributed over the clamp ring and carefully lift the clamp ring from the valve body (1). If it is stuck, gentle heating may be applied.
6. Remove seal ring (63) and o-ring (39) and lift up and remove the seat ring (7) together with o-ring (43). Make sure not to drop anything into the digester.
7. Clean the seating area of the body (1), clamp ring (8) and the seat ring (7).
8. Gently lower the seat ring (7) into the valve body (1). Center the seat ring visually.
9. While the clamp ring (8) is still hanging, fit a new seal ring (63) onto the clamp ring (8) so the sharp end will face the valve body (1) when assembled. Also fit o-rings (39, 43) on the clamp ring (8) using silicon grease to keep them to the clamp ring (8) during mounting.
10. Gently lower the clamp ring assembly into the valve body (1). It will finally rest on the seal ring (63). Remove lifting equipment and the eye lifting bolts.
11. Lubricate the contact surfaces and threads of the screws (9) with suitable anti-seizing grease and tighten them manually.
12. Tighten the screws (9) alternately in several stages and finally tighten according to the torque as below in Table 3.

DN	Size	Screw Thread	Torque Nm
500/700	20/28	M20	364
600/800	24/32	M30	1240
750/950	30/38	M30	1240

Table 3: Clamping ring screw thread and corresponding torque.

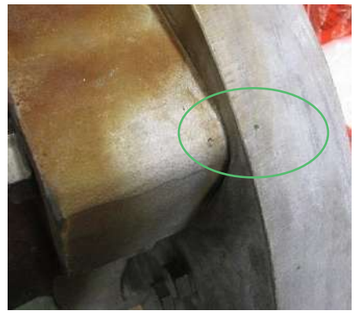
13. Lift the segment (2) towards the seat ring (7) by pressurizing the small actuator (102).
14. Stroke the small actuator (102) 2-3 times to let the seat ring (7) center itself.
15. Put the water mirror, or any other removed equipment, back onto the valve.

9.2 DISASSEMBLING THE VALVE FOR INSPECTION AND REPLACEMENT OF BALL SECTOR, SEAT AND STEM PACKING

For part numbers, refer to Figure 22 and table 2. Read Section 4, Lifting and Handling, before the valve is removed from the digester.

Note: The instruction below is to be used when disassembling the NAF ProCap. If the instructions deviate from the ProCap that is to be disassembled or if you are uncertain on how to proceed, please contact NAF for further instructions.

1. Mark the two stems (3,4), ball sector (2) and jammer plate (22) so that each component orientation can be identified for reassembly.

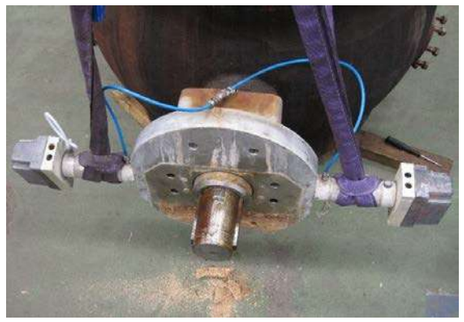


2. Place a distance to the floor to enable the ball sector (2) to be moved freely (as well as avoiding damaging it). Place the valve upside-down on the floor/distance, making sure the clamp ring (8) doesn't get damaged.

3. Pressurize the small actuator (102). This enables movement of the ball sector (2). Remove the four bolts (33) situated on the back side of the small actuator mounting bracket and remove the small actuator from the stem.

4. Remove the four bolts (33) situated on the back side of the jammer plate (22) and remove the big actuator (101) from the stem (3) using suitable slings to balance the weight.

5. Mount slings on the jammer cylinders (24) but only lift loosely to avoid dropping the jammer plate (do not pull upwards as this will damage the jammer cylinders). Remove the four bolts (33) situated on the back side of the big actuator (101) mounting bracket.



6. Pressurize the jammer cylinders to unlock the jammers, thus allowing the jammer plate to be removed from the stem. Remove the jammer plate from the stem.
7. Add an eye bolt and a round sling to the ball sector so that it may be opened the “wrong” way.

8. Remove bolt and washer from the expansion pins on each side of the ball sector.

9. Rotate the ball sector 90°. Place a small piece of wood (or similar item that does not damage the ball sector) to let the ball sector rest on. Keep the lifting device for safety.

10. Screw the expansion pin removal unit in place in the expansion pins. Make sure that it is screwed down all the way to avoid damage to the unit.
11. Place the removal rod in the grove of the expansion pin removal unit on one side of the ball sector and hit the removal rod with a sledge hammer to remove the expansion pin. Repeat on the other side. The two pieces, as seen below, shall be removed from each side.

12. Remove the wooden stop and lower the ball sector to “closed” position.
13. Clean and grease the big stem. Remove the jammer hub by pulling it outwards.

14. Remove the keys from both stems.
15. Remove the screws from the gas cover on the big stem and then remove gas cover (not seen in pictures above).
16. Remove the cover from the big stem.
17. Remove the locking segments from the big stem by applying force in the gap between them.

18. Remove the screws from the gas cover on the small stem and then remove gas cover.
19. Unscrew the screws on the eccentric hub on the big stem.
20. Unscrew the cover on the eccentric hub on the small stem.
21. Apply the distance plates between the ball sector and the body on each side, this to prevent force to be applied on the ball sector in the next step.
22. Apply force on both stems by using a two-way jack and distances. NOTE! It is critical that minimal force is applied on the ball sector as this can cause damage and possible leaking issues.

23. After one side has come loose, remove it completely with the jack. The big stem bushing can also be removed by using the threaded holes and distance plates to slowly remove it from the body.

24. Install the actuator cover plate. This enables force to be applied on the other stem. Do not attempt to use any other equipment as this might cause damage to the ball sector.
25. Put a round sling (one short and one long) around each expansion pins and reinstall the expansion pins loosely. Connect lifting devices to each round sling. The short one is to be connected to a chain block.

26. Start to lift the ball sector gently. This is to be done in iterations by:
    a. Lift the ball sector 2 – 3 cm
    b. Lower the chain block side but do not touch the seat ring

    After some iterations, the ball sector is carried by the long round string only. Disconnect the chain block.

27. Before lifting the ball sector out of the valve body, place a piece of cardboard, blanket or other protective material between the ball sector and the valve body. Lift out the ball sector out of the valve body gently.

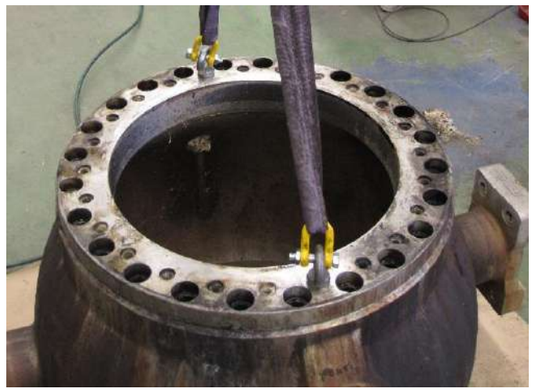
28. Place the ball sector on a covered pallet.

29. Hang a sling around each stem of the valve body, preferably using a crane or a forklift for a controlled simultaneous lift. Slowly lift the ProCap some 30 cm for the floor.
30. Attach an eye bolt to the top flange on the opposite side of the way the valve is to be turned. Attach a round sling and attach this to a lifting device.

31. In a controlled manner, start to raise the upper flange thus turning the valve. Control the forklift levels upward/downwards for a controlled rotation. When the valve is fully turned, lower it onto a protected and clean surface.

32. Apply a rust penetrant spray on each bolt on the clamp ring. Let it sit for a short time. Remove the bolts using a suitable (power) tool. If the bolts are stuck, gentle heating may be applied.

33. Attach two eye bolts to the top flange. Attach round slings and attach these to a lifting device. Start lifting to remove the clamp ring. If it is stuck, gentle heating may be applied. Do not use blunt force to remove the clamp ring as this may damage the clamp/seat ring.



34. Carefully remove the seat ring. If stuck, please contact NAF for further instructions.

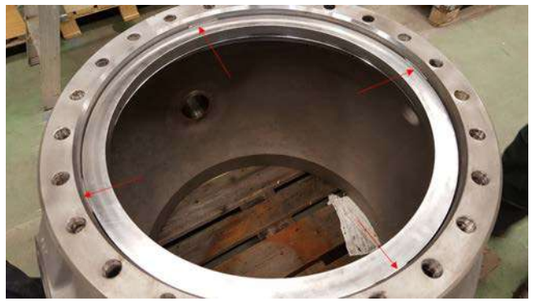
9.3 RE-ASSEMBLY OF THE NAF PROCAP

For part numbers, refer to Figure 18. Read Section 4, Lifting and Handling, before the valve is put back onto the digester.

The instruction below is to be used when re-assembling the NAF ProCap. If the instructions deviate from the ProCap that is to be assembled, or if you are uncertain on how to proceed, please contact ANDRITZ NAF for further instructions.

NOTE: Before re-assembling the valve, make sure all functional sealing surfaces have been cleaned.

35. Mount the seat ring into the valve body and center the seat ring by placing pieces of sheet metal in the radial gap between the seat ring and the valve body.



36. Mount the clamp ring but only four bolts need to be used i.e. use every sixth hole. This is done to center and hold the ring in place. The final position of the ring will be set later in the assembly process.
37. Hang a round sling around each stem of the valve body, preferably using a forklift for a controlled simultaneous lift. Slowly lift the ProCap some 30 cm for the floor. Turn the valve in a controlled manner. When the valve is fully turned, lower it onto some wood blocks to lift the valve at least 3 cm from the floor.

38. Grease the seat ring using a Barrierta L 55/3 grease or similar. Distribute the grease evenly.

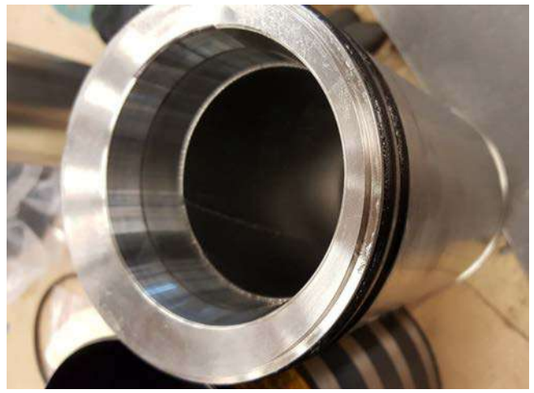
39. Put a round sling (one short and one long) around each expansion pins and install the expansion pins loosely. Connect lifting devices to each round sling. The short one is to be connected to a chain block. Raise the ball sector and let it hang vertically.

40. Identify by the markings on the ball sector/stem (made during disassembly) which orientation the ball sector should have in the valve body.
41. When inserting the ball sector into of the valve body, place a piece of cardboard, blanket or other protective material between the ball sector and the valve body. Start to lower the ball sector into the valve body gently.

42. The ball sector shall be tilted up once in the valve body when close to the seat ring. This is to be done in iterations by:
    a. Raise the chain block side but do not touch the seat ring
    b. Lower the ball sector 2 – 3 cm

    After some iterations, the ball sector is in a horizontal position. With great care, lower the ball sector onto the seat ring. Disconnect the chain block and the expansion pins.

43. Add O-rings and the Metaloplast bushing using the clamp tool on the small stem eccenter. Add the support ring. Add the O-ring onto the support ring. Grease the upper part of the eccenter once that O-ring is in place.



44. Add the O-ring to the small eccenter stem neck and spray silicone into the small eccenter stem neck.
45. Insert the small eccenter stem into the valve body. This is done by pushing it through the clamp tool and into the body. It is of great importance that the O-ring in the support ring is not folded. This need to be controlled from the inside of the valve body, preferably using a flash light.

46. "Glue" the Metaloplast bushing in place on the small eccenter lid using grease and screw the lid onto the small eccenter stem.

47. Add the O-rings to the big stem and big eccenter. Add the Metaloplast bushing to the eccenter. Mark the end position of the stem with a marker, this to avoid that the O-rings of the stem follow the Metaloplast bushing when the stem is put in place.

48. Insert the big stem into the eccenter and insert the stem package into the valve body. Once in place, put paste on the bolts and attach the eccenter with these.
49. Add grease in the locking segment grove and add the locking segments. Attach the locking segment lid.
50. On the small stem, grease the O-ring in the eccenter lid. Inspect that there are no sharp edges in the key slots (gently remove any). Put the eccenter lid in place. Add paste to the bolts and attach the lid. Add the keys.

51. Turn the small stem into the correct position.
52. From within the valve, insert the small stem into the eccenter together with a feeler gauge (approx. 0.20 mm) to vent the stem cavity. Determine the correct depth of the feeler gauge prior to inserting the stem to assure good venting.
53. Use a two-way jack and distance to push the stem into place. If venting is successful, the stem stays in position. If not, stem will “pop out”. Retry the procedure.

54. When the small stem is in place, put the expansion pins in place on both stems and tighten.

55. To get the small eccenter to raise/lower the ball sector properly, the small stem should “be tight” at some 350 dgs (where 360 dgs is 12 o’clock). This is to be adjusted with big eccenter (by first removing the lid). By adjusting the big eccenter to the XX makes the small eccenter to turn more towards 360 dgs while the opposite will make it tight earlier. Test the small eccenter and iterate the process until satisfying results are achieved.

56. Tighten the bolts around the big and small stem/ eccenter.
57. Replace the locking segment lid. Grease the O-ring in the gas lid on the big stem.
58. Grease the big stem and add the keys. Grease the back of the jammer hub and attach in on the big stem.
59. Mount round slings on the jammer cylinders on the jammer plate. Pressurize the jammer cylinders into “open” position.
60. Move the jammer plate into the correct position i.e. the jammer cylinders can lock into the jammer hub.

61. Remove the air and make sure that the jammers are in position by releasing the air. Double check that the jammers are locked into the jammer hub. This is critical as the valve is to be turned and the ball sector need to be locked in position.
62. Hang a round sling around each stem of the valve body, preferably using a forklift for a controlled simultaneous lift. Slowly lift the ProCap some 30 cm for the floor.
63. Attach an eye bolt to the top flange on the opposite side of the way the valve is to be turned. Attach a round sling and attach this to a lifting device.
64. In a controlled manner, start to raise the upper flange thus turning the valve. Control the forklift levels upward/downwards for a controlled rotation. When the valve is fully turned, lower it onto a protected and clean surface. NOTE! The valve weight distribution is towards the ball sector side why tilting the valve with lifting device is critical to prevent the valve from uncontrolled rotation.

65. Place a distance to the floor to enable the ball sector to be moved freely (as well as avoiding damaging it). Set down the valve on the floor/ distance.
66. Mount the big actuator.
67. Remove air tubing from one of the jammer cylinders and remove this cylinder. Remove the limit switch boxes from both the cylinders.
68. Turn the small eccenter counter-clockwise to lower the ball sector.
69. Pressurize the big actuator to perform action “close”.
70. Verify that the jammer plate and jammer hub are aligned, this by controlling that there are edges in the “hole” between the plate/hub in the removed cylinder position. Adjust the stop bolt on the closing side of the big actuator if needed.
71. Reinstall the jammer cylinder and air supply. Test the jammer cylinders correct position by pressure/ depressurize the jammer cylinders and checking that they go into locking position.
72. Carefully pressurize the big actuator to perform action “open”. Observe that the ball sector does not strike floor when performing this action!
73. Remove air tubing from one of the jammer cylinders and remove this cylinder. Fully pressurize the big actuator to reach fully open position.
74. Verify that the jammer plate and jammer hub are aligned, this by controlling that there are edges in the “hole” between the plate/hub in the removed cylinder position. Adjust the stop bolt on the opening side of the big actuator if needed.
75. Tighten the jammer cylinders and reinstall the limit switch boxes to both the jammer cylinders.
76. Unlock the jammer cylinders by pressurizing the to “open” and pressurize the big actuator to perform action “close”.
77. Mount the small actuator on the small stem.
78. Perform action “lower the ball sector” on the small actuator.
79. Attach two eye bolts to the top flange. Attach round slings and attach these to a lifting device. Start lifting to remove the clamp ring.

80. When the clamp ring is removed, remove distance in the area between the seat ring and the valve body.
81. Add the seal ring to the clamp ring.
82. Grease the O-rings and add them to the clamp ring.
83. Carefully place the graphite seal ring to the valve body.
84. Carefully lower the clamp ring down to its correct position. Make sure that the O-rings are in position and be careful with the graphite seal ring.
85. Add the clamp ring bolts, label them 1 – 24 and tighten them in a criss-cross tightening procedure. Repeat this 3- 4 times.
86. Configure the small actuator so that it performs in the range 20 – 40 dgs (which is the weakest area of operation).
87. Use 2.5 – 3 bar of air and pressurize the small actuator to close. Tighten the stop bolt on the closing side of the small actuator.
88. Use 2.5 – 3 bar of air and pressurize the small actuator to open. Use a feeler gauge of 0.20 mm and adjust the actuator so that the feeler gauge moves freely approx. 180 dgs of the ball sector. Adjust the stop bolt on the opening side of the small actuator if needed.

89. Tighten the stop screws on the opening side of the small actuator.
90. Perform action “raise the ball sector” on the small actuator.
91. The valve is now assembled. Add any auxiliary equipment and test the valve with water.

10 Returns and Disposal

10.1 RETURNS

The product/system shall be emptied, cleaned, and preserved before returning the equipment to the manufacturer. The manufacturer will only open the returned equipment if the contamination declaration is present.

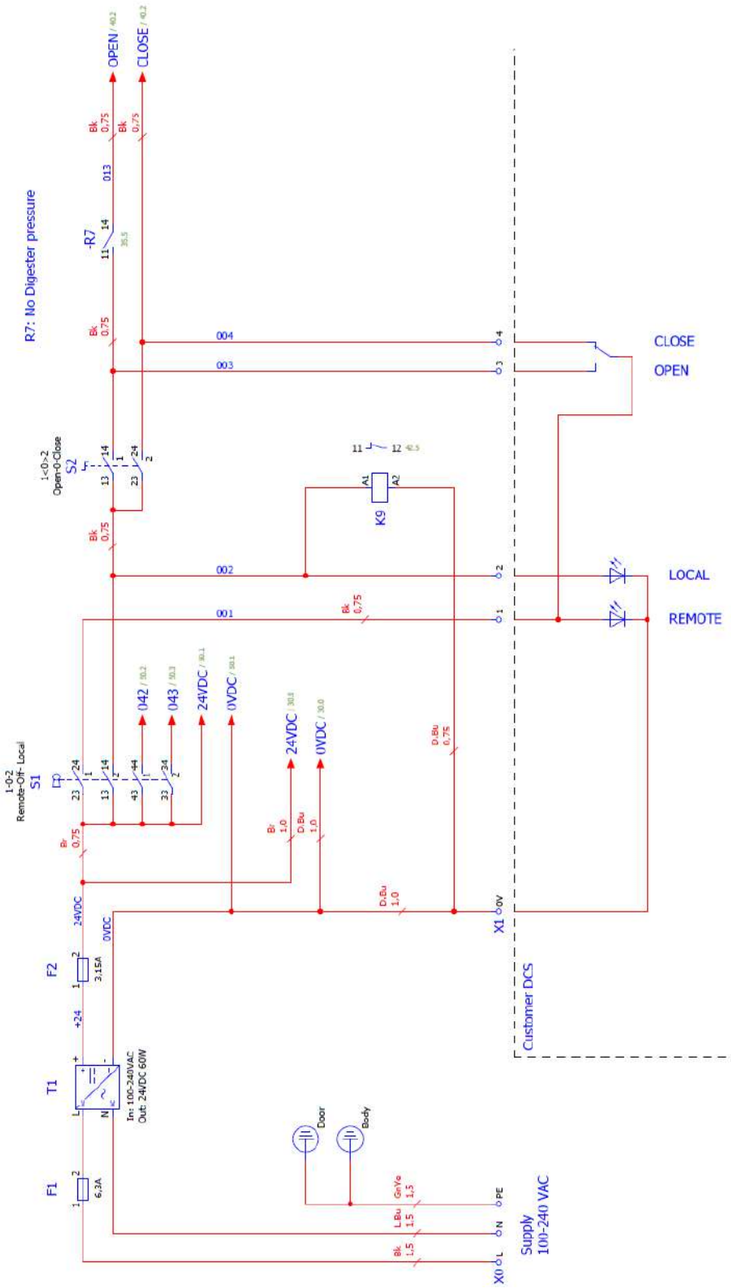
(**Note:** the terms and conditions associated with returning a product/system shall be addressed within the purchasing agreement or contract, and not part of the User Instruction.)

10.2 DISPOSAL AND RECYCLING

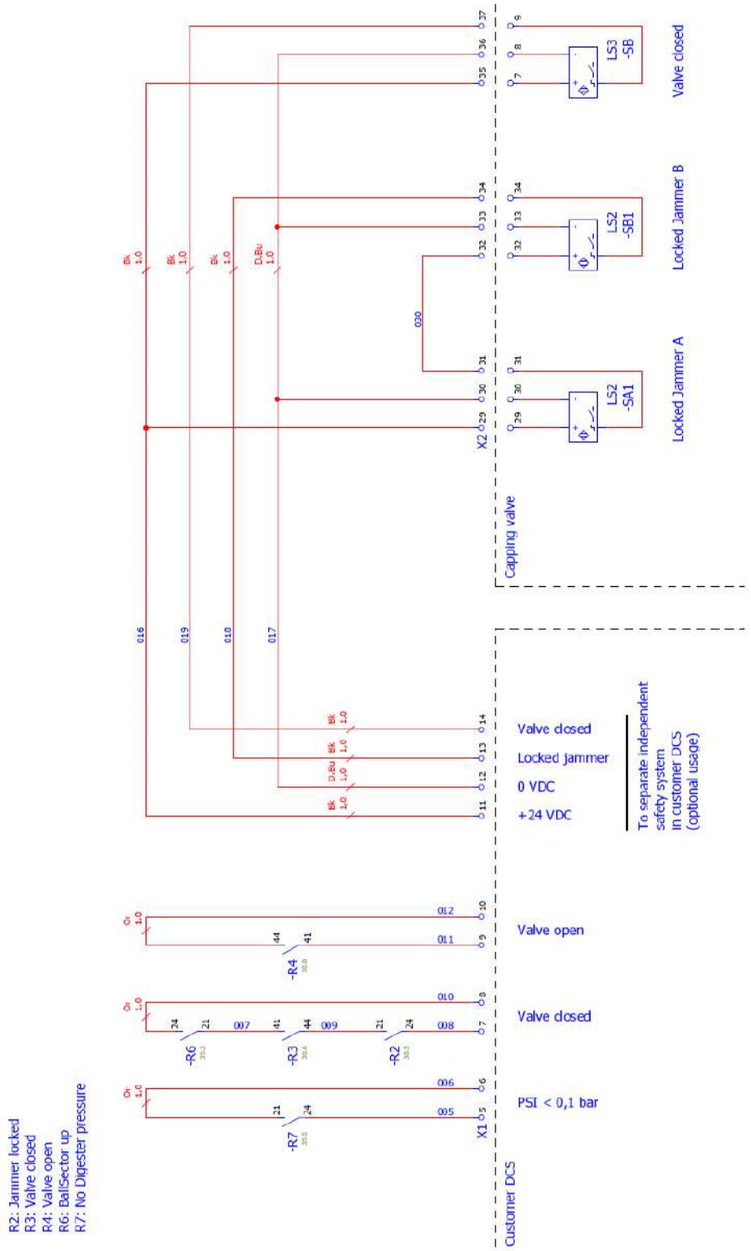
At the end of the equipment service life, the relevant materials and parts should be recycled or disposed of using local environmental regulation methods. If the product contains substances which are harmful to the environment, then the removal or disposal of the equipment must be in accordance with local/regional regulations. This includes any liquid and/or gas in the “seal system” or utility.

Refer to Safety Data Sheets and make sure that hazardous substances or toxic fluids are disposed of safely and that the correct personal protective equipment is used. All activities involving hazardous substances or toxic fluids must be in compliance with published safety standards.

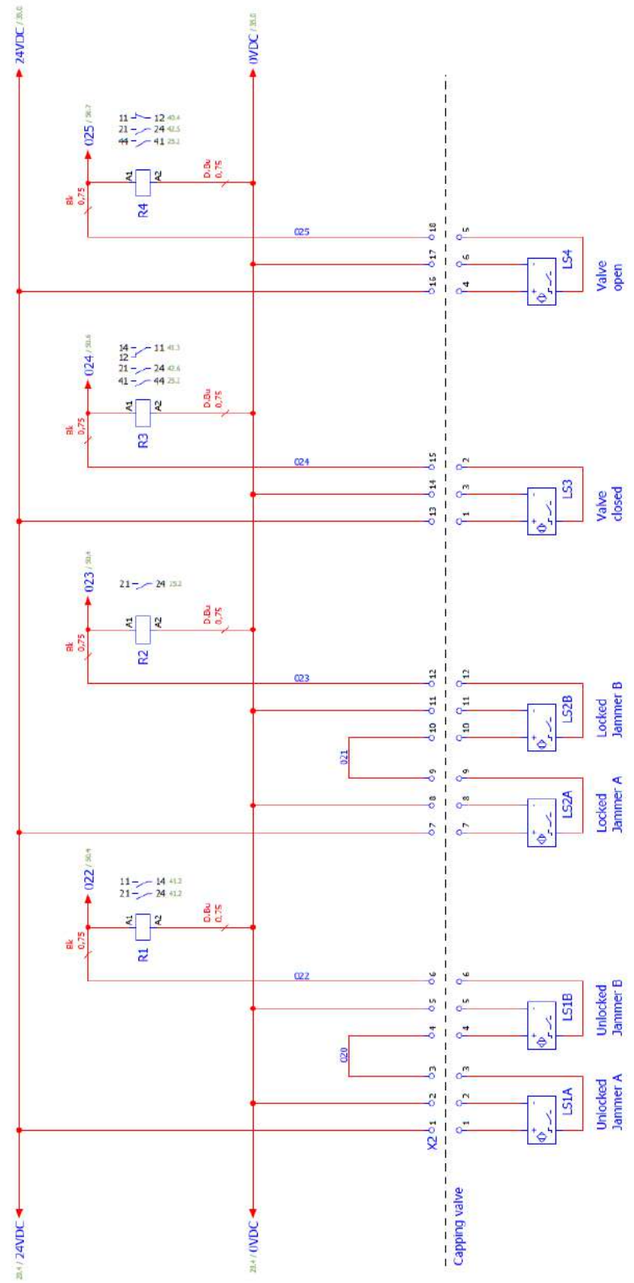
Annex A: Electric wiring of the Local Control Box. Drawing 33414591, part 1: Terminal X0 and X1: Power supply and remote control



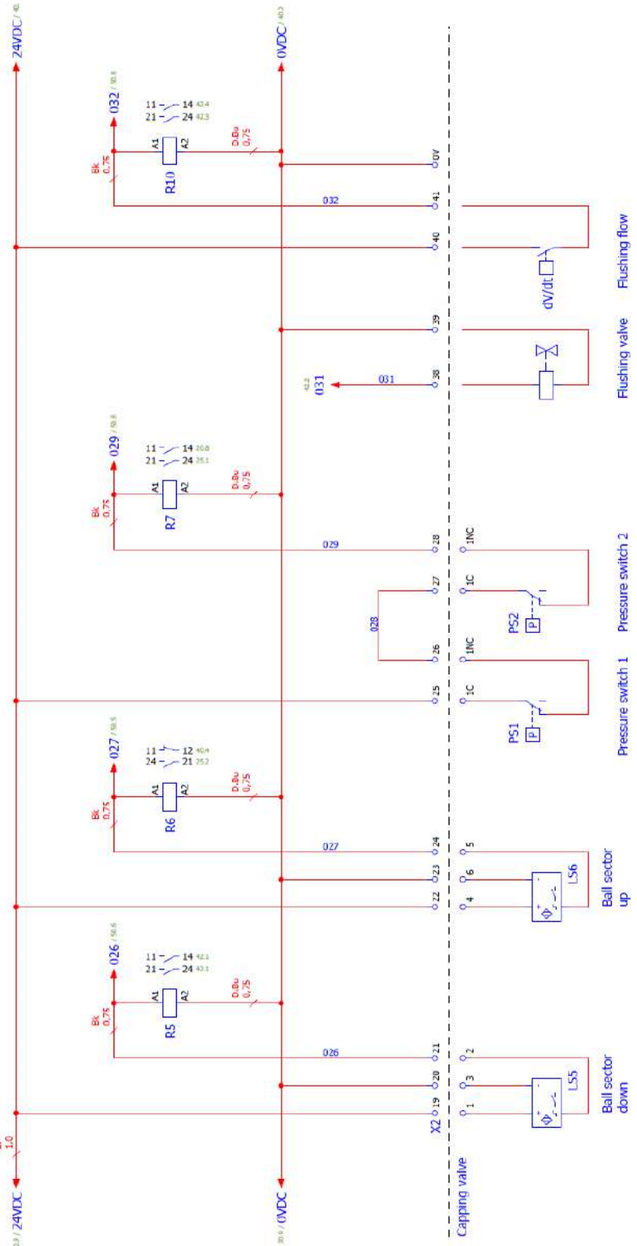
Annex B: Electric wiring of the Local Control Box Drawing 33414591, part 2: Terminal X1 and X2: Signals back to DCS plus Independent Safety System including extra limit switches for jammers and closed valve.



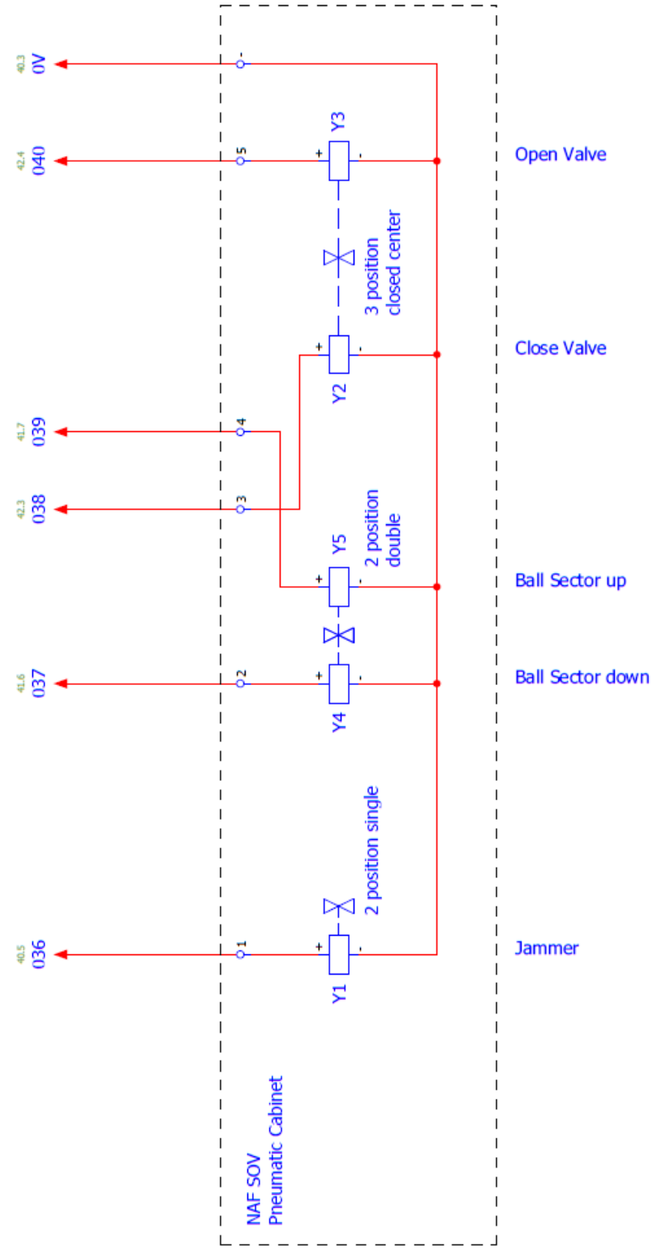
Annex C: Electric wiring of the Local Control Box. Drawing 33414591, part 3: Terminal X2: Inductive limit switches for jammers and valve position.



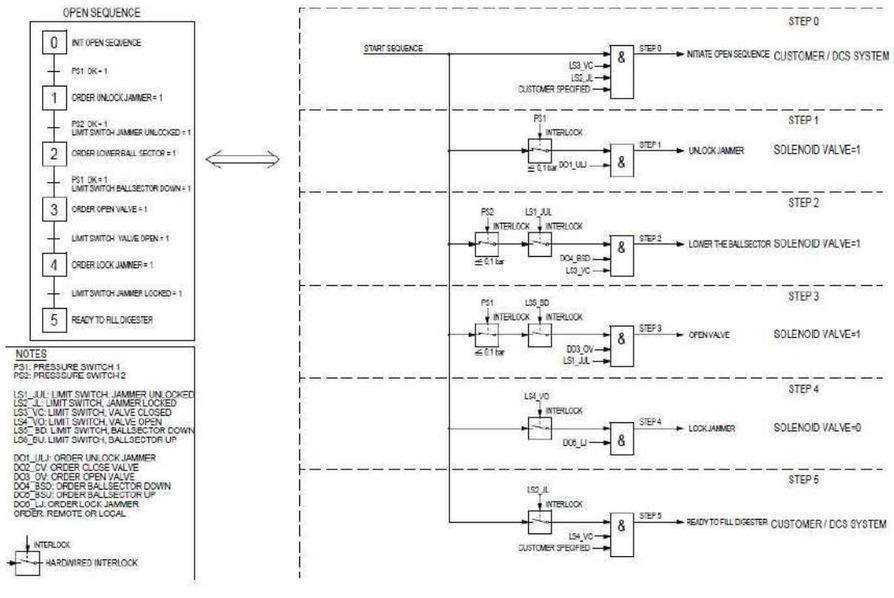
Annex D: Electric wiring of the Local Control Box. Drawing 33414591, part 4: Terminal X2: Inductive limit switches for ball sector up/down, pressure switches and flushing valve and flushing flow switch.

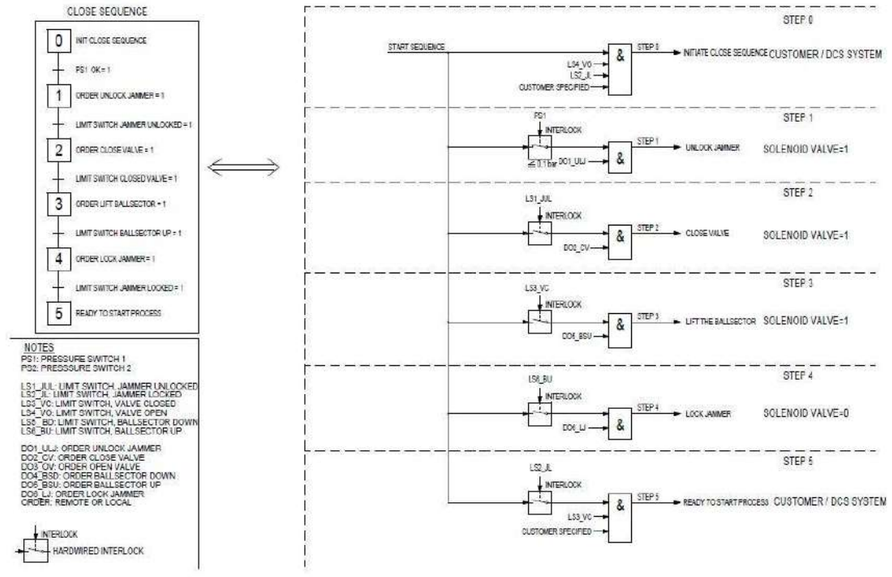


Annex E: Electric wiring of the Local Control Box. Drawing 33414591, part 5: Terminal X3: Solenoid valves.



Annex F: Logic sequence for Open & Close sequence for ProCap. (Please note that this is only provided as an example. We always recommend to use the Local Control Box for a well proven and safe control sequence, which also controls a flushing sequence).





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