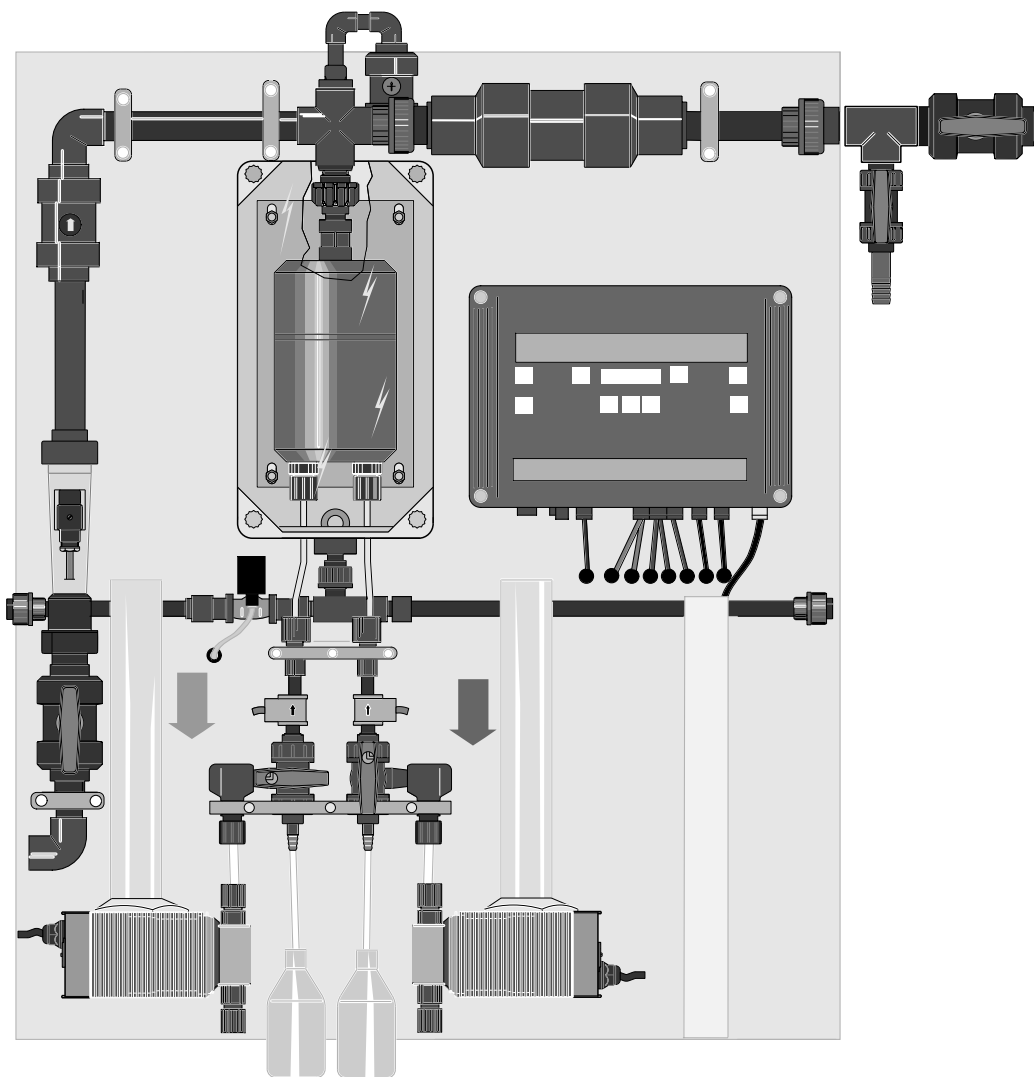


Repair Instructions

ProMinent Chlorine Dioxide Systems

Bello Zon® Replace CDVa reactor with CDVb



IMPORTANT

The repair manual is valid only when used in conjunction with the appropriate operating manual and/or CDVa and CDKa operating instructions manual!

NOTE

The repair manual contains instructions for replacing the reactor with the spare reactor, the subsequent tightness check and for recommissioning the chlorine dioxide system.

Publishing Details:

Repair Instructions ProMinent Chlorine Dioxide Systems

Bello Zon® Replace CDVa reactor with CDVb

© ProMinent Dosiertechnik GmbH, 2003

ProMinent Dosiertechnik GmbH

Im Schuhmachergewann 5-11

69123 Heidelberg

Germany

info@prominent.de

www.prominent.de

Subject to revision

Printed in the F.R. Germany

1	Transport, Handling and Storage	4
2	Description of Design and Function	4
2.1	Design	4
3	Information about Decommissioning the Chlorine Dioxide System	5
3.1.	Decommissioning the Chlorine Dioxide System	5
3.1.1	Safety Requirements / Safety Instructions	5
3.1.2	Decommissioning	6
3.1.2.2	Required Materials	6
3.1.3	Flushing	6
3.1.3.1	System without Flushing Assembly	6
3.1.3.2	System with Flushing Assembly	6
4	Replacing The Reactor	7
4.1	Safety Requirements / Safety Instructions	7
4.2	Required Materials	7
4.3	Chemical Requirements	8
4.4	Expansion of the Existing Reactor	8
4.5	Detoxication of Reactor Contents	7
4.6	Installation of new Reactor	8
4.7	Disposal of Spent Parts	9
5	Recommissioning	9
6	Technical Details	9
7	What to do in an Emergency	10

1 Transportation, Handling and Storage

The Bello Zon® 0.4 l CDVb reactors are wrapped in a cardboard surrounding package which is designed either as a sealed disposable wrapper, or is transported together with other parts.

Observe the following ambient conditions for storage of the reactors (e.g. danger of frost, UV protection):

- admissible storage temperature : TS = -10 °C to +40 °C
- admissible transport temperature : TS = -10 °C to +40 °C
- do not expose reactors to direct sunlight
- prior to storage and/or transportation, ensure that the reactor is empty

2 Description of Design and Function

2.1 Design

The spare assembly comprises a CDVb/CDKb series reactor, the reactor intake valves, reactor outlet adapter and discharge valve parts.

The assembly is supplied by PM Heidelberg ready for installation into the Bello Zon® chlorine dioxide generating system.

The reactors are available in the following sizes :

Spare assembly	Part number	For system type
Spare 0.2 l reactor set.	TN 1023234	CDVa 7
Spare 0.4 l reactor set.	TN 1021935	CDVa 35-120

The procedure for replacing the reactor and discharge valve parts and the actual construction is shown in drawing 81_01-401_00_18-04.

3 Information about Decommissioning the Chlorine Dioxide System

3.1 Decommissioning the chlorine dioxide system

3.1.1 Safety requirements / safety instructions



IMPORTANT

Observe the following regulations:

- a) Accident prevention regulations GUV 8.15 and/or VGB 65



WARNING

- Ensure the operating or installation room is well ventilated while replacing the reactor.
- Any leaked chemicals must be safely removed e.g. presence of water supply and floor drain.



IMPORTANT

- A user manual and/or operating instructions manual must be made available before commencing operation.
 - § 12 (1-5) describes the personal safety equipment that must be provided for operators.
- b) Observe the ordinance on hazardous operating substances (Arb-StoffV), version issued 11th February 1982 BGBl. / p.145.

Additional safety instructions:



WARNING

- Before all maintenance operations (when replacing parts etc.) flush the Bello Zon[®] system with water until it and above all the reactor no longer contain any chemicals.
In the worst case, the undiluted ClO₂ solution can be subjected to underpressure in the reactor e.g. due to a leak in a line downstream. The reactor may then explode.
- Empty all contents of the reactor before opening the cabinet.
Press the “Extract” button. (water for extraction must be flowing)
- Keep full and empty chemical containers closed.
- Switch off the chlorine dioxide system throughout maintenance operations.
- Depressurise the discharge valve parts before disassembly.
- Open the ball check valve at the reactor outlet/bypass
- Never mix the contents of the component containers.
 - ▶ This will cause a large quantity of toxic explosive ClO₂ gas to form.
- Never pour the contents of the ventilation bottles into the component containers.
 - ▶ This will cause a large quantity of toxic explosive ClO₂ gas to form.
- Never place both suction lances into the same bucket together or one after another.
 - ▶ This will cause a large quantity of toxic explosive ClO₂ gas to form.
- Do not adjust vent taps as chemicals could be drawn to these outlets.
 - ▶ Corrosive chemicals could then leak out.



CAUTION

- Even if the bypass line is at atmospheric pressure the area between the reactor intake valves and the discharge valve will be at a pressure of approx. 1.5 bar.
Depressurise this area by slowly unscrewing the compression spring centre.

NOTE

- The compression springs and the valve lifters of the discharge valve can be removed easily after unscrewing the compression spring centre, when the Bello Zon® system and the bypass line are at atmospheric pressure. It is then almost impossible for liquid to escape and run through the system.

3.1.2 Decommissioning

To replace the reactor you need to decommission the Bello Zon® system. First, flush the entire system with water.

If fitted, use the flushing assembly bypass line.



If no flushing assembly is fitted, flush the system using an adapter on the discharge valve (upper cross piece outlet).

3.1.2.2 Required materials


1 Adapter for cross piece with approx. 3 m hose
(systems with cross piece and no flushing valve)


3.1.3 Flushing

3.1.3.1 System without flushing assembly

- Depressurise bypass by opening the bypass ball check valve. Do not dismantle any parts prior to this.
- Press the “START/STOP” button .
- Slowly unscrew the compression spring centre (1).
- It is easy to remove the spring (2) and the valve lifter (3) of the discharge valve after unscrewing the compression spring centre (1) (see 1st step according to drawing).
- Screw adapter into cross piece.
- Connect a hose to the adapter.
- Insert the hose into a tank containing neutralising solution - the hose must be immersed below the liquid level.
- Remove each suction lance from the chemical tanks and place each one in a separate bucket filled with clean water.
- Close the stopcock upstream and downstream from the Bello Zon® system.
- Open the configuration menu on the control display (only possible using access code “1000”).
- In the “Start ” menu set the start up parameters to a minimum of 60 minutes.
- Press the “Startup” button  and set both metering pump stroke lengths to 100%.
- Run the Bello Zon® system until the pump’s liquid ends, reactor and lines up to the flushing assembly are completely filled with water (during disassembly this will prevent chlorine dioxide solution from flowing out of the reactor).
- Disconnect the system from the mains power supply.

3.1.3.2 System with flushing assembly

- In systems with purge valves the compression spring centre (1), compression spring (2) and the valve lifter (3) are only dismantled after rinsing!
- Switch off the system using the “START/STOP” button .
- Connect a hose to the purge valve of the flushing assembly.
- Insert the hose into a tank containing neutralising solution - the hose must be immersed below the liquid level.
- Depressurise the bypass if possible.
- Close the stopcock upstream from the Bello Zon® system and downstream from the flushing assembly.

- Open the purge valve.
- Place each suction lance in a separate bucket filled with clean water.
- Press the “Startup” button  and set both metering pump stroke lengths to 100%.
- Run the Bello Zon® system until the pump’s liquid ends, the reactor and lines up to the flushing assembly are completely filled with water (during disassembly this will prevent chlorine dioxide solution from flowing out of the reactor).
- Disconnect the system from the mains power supply.

4 Replacing the Reactor

(only to be carried out by service technicians)

4.1 Safety requirements / safety instructions

Personal protective equipment:

- Facial protection
- Rubber or plastic boots
- Protective gauntlets (ClO₂- proof design)
- Protective apron
- Respirator - full mask
- 1 spare filter per respirator



WARNING

- **Wear suitable protective equipment for ClO₂ gas, ClO₂ solution, hydrochloric acid, sodium chlorite and caustic soda (protective goggles, rubber gauntlets, gas mask, rubber apron, ...)!**
- **In the event of contact with one of these chemicals, rinse immediately with plenty of cold water, consult a doctor if necessary!**
- **Observe national and local directives!**
- **The disassembly of an unrinsed reactor is risky, because air can get into the solution as it drains out, which can quickly produce explosive ClO₂ gas. This measure is therefore acceptable only in an emergency and also only if the reactor volume does not exceed 3 litres.**
- **Only recommission the system and bypass line under pressure if the compression spring centre is tightly screwed into the stop.**



CAUTION

- **If a reactor cabinet is present: before dismantling the intake valves on the bottom of the reactor, press the “Suction” button, to extract the remaining ClO₂ gas from the reactor cabinet !**

NOTE

- **Always add alkaline flushing water to the neutralisation tank for neutralisation!**
- **Only ProMinent service technicians should carry out repairs to the Bello Zon® system!**

4.2 Materials required

approx. 3m water hose
1 open tank for neutralising
1 bottle caustic soda 50%, 1 litre (C, irritant)
1 bottle hydrogen peroxide 30%, 1 litre (Xi, irritant)
1 pH meter (ideally pH paper, but is bleached by ClO₂)
Potable water (see table)

4.3 Chemicals required

- For neutralising and detoxifying reactor contents, approx. 70 ml caustic soda 50% and 20 ml hydrogen peroxide 30% (Perhydrol) per litre, is required.

This requires use of the following individual components:

System type	Tank	Water	Caustic soda	Hydrogen peroxide*	Reactor contents with tower packing
CDV 15....120	20 l	5 l	27 ml	8 ml	0.2/0.4 l
CDV 220...600	80 l	20 l	130 ml	37 ml	1.8 l

* instead of hydrogen peroxide 30% (H₂O₂) you can use a dessert spoonful of sodium perborate, Na-BO₂·H₂O_{2,3} H₂O

4.4 Disassembly of spent reactors

- Before screwing on the union nuts (429) and (5), switch on the suction to continuous operation
- Disassemble the 4 hexagonal nuts (10) (see step 2).
- Screw both union nuts (429) onto the reactor intake valves (see step 2).
- Detach the union nut (5) from the discharge valve (see step 2).
- Lift the reactor (6) out of the reactor housing and, using the appropriate protective equipment, lower it into the tank (fill this with as much water as is necessary to completely cover the reactor) and rapidly place both **outdoors** or at an exit. There you should unscrew the reactor intake valve under water and lift the reactor up and down to transfer the contents into the tank.

4.5 Detoxifying reactor contents

- First add caustic soda and then hydrogen peroxide to the tank contents, until the solution is colourless.
- Let the reactor empty out over the tank and if necessary, rinse again **with water**.
- When the reactor is completely empty, the contents must be diluted 10:1 in the neutralisation tank.
- Whilst stirring, add the quantity of caustic soda required for neutralising (protective equipment!).
- Then add the calculated quantity of hydrogen peroxide (overdose is uncritical) whilst stirring. If the yellow-green solution does not colour **immediately**, check the pH value: **it must be more than 8** and can be corrected if necessary by adding more caustic soda.



CAUTION

Add the alkaline flushing water to the neutralisation tank for neutralisation!

- Unscrew the discharge valve holder (6) with ball seat disc (7), O ring (9) and valve ball (8) from the crosspiece (see step 3).

4.6 Installing a new reactor

- Carefully remove the protective cap, so that no components fall on the floor.
- Screw the union nut (325) for the adapter onto the spare assembly.
- Screw the discharge valve holder (324) with ball seat disc (367), O ring (840) and valve ball (454) onto the crosspiece (see step 5).
- Insert the valve lifter (3) from above into the crosspiece. Assemble the compression spring (2) and the compression spring centre (1) (see step 6)!
- Check whether the adapter (325) is screwed right up to the reactor.

- O ring (862) in discharge valve holder (324) (see step 7).
- Assemble the new reactor (200) in the reactor housing and tighten the 4 hexagonal nuts(10) (see step 7).
- Push the reactor (200) upwards and lightly screw the union nut for the adapter (325) onto the discharge valve holder (324), then tighten (see step 7).
- Lightly screw the union nut (429) onto the valve body (344), then tighten.
- If hoses (11) are too long, adjust to the required length.
- Pull the union nut and clamping ring over the line, then push the hose end, extended as required, **right over** the nozzle, stretch the mouth of the hose if necessary.
- The clamping action is now achieved by tightening the nut whilst pressing against the hose.
- You will obtain a tight hose connection if you briefly pull the line connected to the reactor and then firmly twist the union nut again.



WARNING

Do not mix up the connections!



IMPORTANT

You should use only the appropriate hoses, pinch rings and hose sockets, otherwise durability and tightness of the connection is not guaranteed!

4.7 Disposal of spent parts



WARNING

First rinse the reactor thoroughly with water. Otherwise chlorine dioxide (ClO₂) could be left in the reactor!



IMPORTANT

Observe regulations applying to your own working area!

5 Recommissioning

Recommissioning the system after work has finished.
Check the system for leaks!
Check safety features are functioning.

Recommissioning takes place in accordance with the associated operating instructions manual.
You should follow all safety requirements/safety instructions detailed here.

6 Technical Data

In accordance with the relevant user manual/operating instructions manual.

7 What to do in an emergency

- ▶ If you have come into contact with the acid:
see leaflet "HCl"
- ▶ If you have come into contact with the chlorite:
see leaflet "NaClO₂"
- ▶ If you have come into contact with the ClO₂ solution or with ClO₂ gas:
see leaflet "ClO₂"
- ▶ If orange-yellow ClO₂ gas is leaking out:
empty the room immediately and disconnect the power supply (e.g. emergency stop switch)!
Put on full protective gear and suppress the gas by spraying with water! Also see leaflet
"Characteristics of chlorine dioxide and notes ..."
- ▶ If orange-yellow ClO₂-solution is leaking out:
empty the room immediately and disconnect the power supply (e.g. emergency stop switch)!
Put on full protective gear and pour sodium thiosulphate solution onto the ClO₂ solution, then
dilute with plenty of water and rinse down the drain. Also see leaflet "Characteristics of
chlorine dioxide and notes ..."
- ▶ The Bello Zon[®] system has been charged with concentrated chemicals and metering pumps
have already pumped them to the reactor:
empty the room immediately and disconnect the power supply (e.g. emergency stop switch)!
Call the Fire Service and notify them of the risk of explosion due to concentrated ClO₂ gas!
(ClO₂ gas can still explode after a few hours!) Also see leaflet "Characteristics of chlorine
dioxide and notes..."
- ▶ The Bello Zon[®] system has been charged with concentrated chemicals and metering pumps
have not yet begun to pump:
Switch the Bello Zon[®] system immediately to "Metering OFF" (Start/Stop button)! Place each
suction lance in a separate bucket filled with water and fill the chemical drum with dilute
chemicals. Dispose of concentrated chemicals appropriately. Also see leaflet "Characteristics
of chlorine dioxide and notes ..."

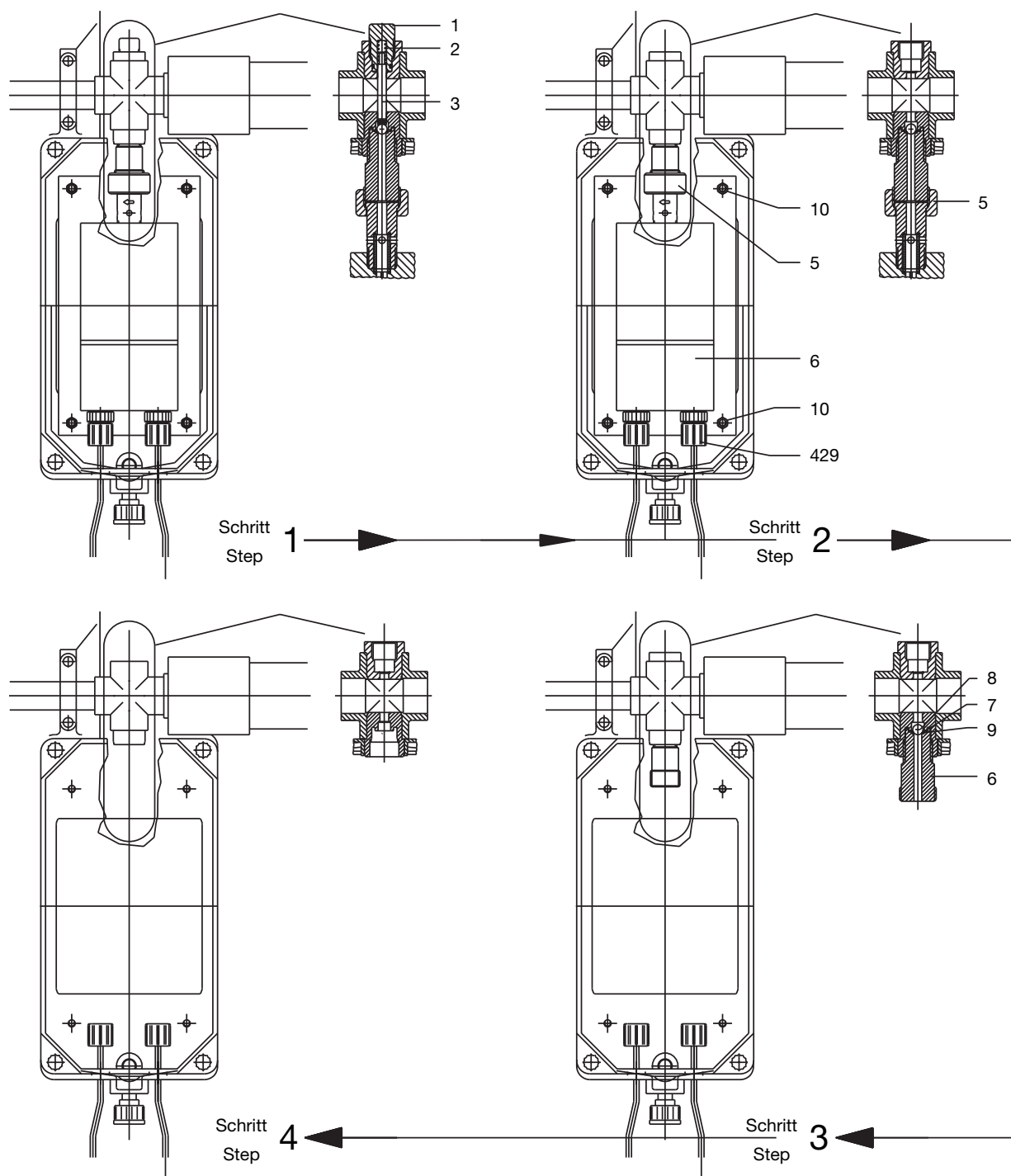
Appendix

List of documentation drawings:

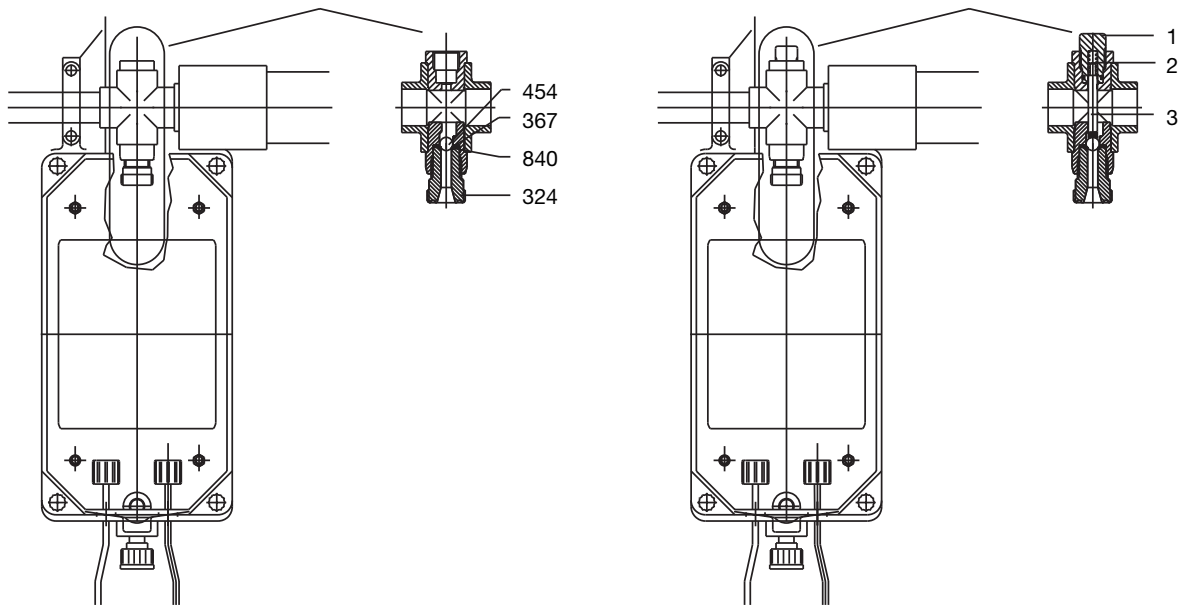
Replace reactor 0.4l CDVa 81_01-401_00_18-04 Sheet 1+2

Ausbau des alten Reaktors

Disassembling of the old reaktor

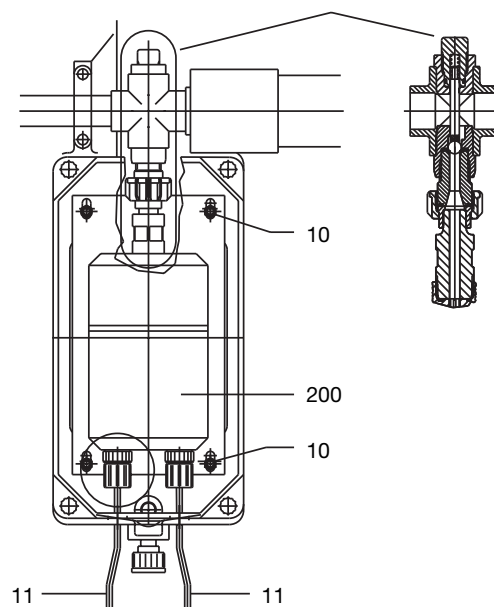


Ausbau des alten Reaktors Disassembling of the old reaktor



Schritt
Step 5

Schritt
Step 6



Schritt
Step 7