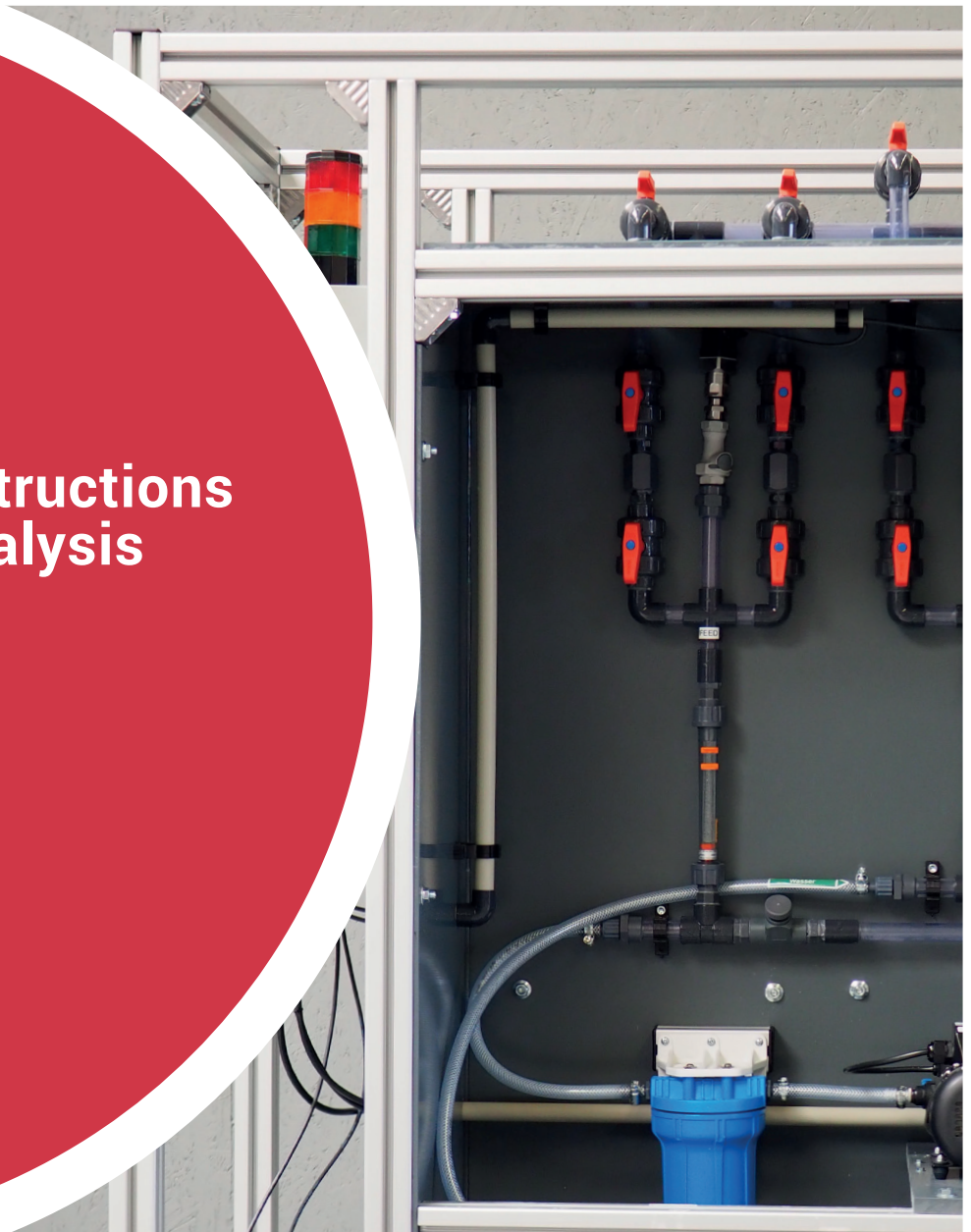


Installation instructions for diffusion dialysis system

Typ: PP2-DB
Status: 07/2019



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1 INTRODUCTION:

The installation instructions contains the most important information and notifications for the use of the pilot system. Keep the installation instructions safely so that they are accessible for all users and so that they are available to any new owner of the product. The **German installation instructions** can be found in the internet at: www.spiraltecgbmh.com/de/download. The **English installation instructions** can be found in the internet at: www.spiraltecgbmh.com/en/downloads-en.

1.1 Plant-specific data sheet:

A **system-specific data sheet** with information for the product is enclosed with every product. These instructions must be observed. In addition, there are **product-specific data sheets** and **general safety instructions** and attention must be paid to these. If individual data sheets are no longer available, you can find them on the Internet at: www.spiraltecgbmh.com/en/downloads-en

1.2 Terminology:

The terms ‚system‘ or ‚pilot system‘ used in these instructions always refer to the Series PP2-DB diffusion dialysis system made by Spiraltec GmbH. The term ‚spiral membrane module‘ used in these instructions always refers to a Series WD-AR10 spiral membrane module.

1.3 Presentation:

The following presentation styles are used in these instructions:

DANGER!



Warns of immediate danger!
Disregard results in death or severe injuries.

WARNING!



Warns of a potentially dangerous situation.
Disregard can result in serious death or injuries.

CAUTION!



Warns of a potential hazard.
Disregard can result in moderate or minor injuries.

NOTE:

(Warns of property damage).

REFERS TO INFORMATION IN THESE INSTALLATION INSTRUCTIONS OR IN OTHER DOCUMENTATION.

- Indicates a general explanation.
- > Indicates an instruction for avoiding a hazard, which you must observe.



WARNING!

Important information for safety. Read through the installation instructions carefully. First and foremost, observe the „Proper intended use“ and „Basic safety instructions“ chapters.

The installation instructions must be read and understood.

2. PROPER INTENDED USE:

Unintended use of pilot system PP2-DB can cause hazards to arise for people, systems in the surrounding area and for the environment.

- The system is designed to separate metal salts from free acids from process baths.
- > For this application, pay attention to the data and to the conditions for operation and service named in the *contract documents, system-specific data sheet* and the *product-specific data sheet*.
- > Prerequisites for the safe and problem-free operation of the system include professional transport, storage and installation as well as diligent operation and maintenance.
- > Only operate the system for its intended use.

3. BASIC SAFETY INSTRUCTIONS:

These safety instructions do not take into account

- Coincidental or random eventualities that could arise during the installation, operation or maintenance of the product.
- Location-specific safety provisions where the operating company is responsible for their compliance, also in respect of installation personnel.



DANGER!

Risk of injury caused by high pressure in the system.

- > Before working on the system, shut off the pressure and drain the pipework.



DANGER!

Intoxication, chemical burns, contamination due to media escape.

- > Check the product for leaks before commissioning.
- > With hazardous media, ensure that corresponding protective measures are implemented and wear personal protective equipment in accordance with the requirements of the media.
- > Before loosening lines, ensure that the medium has been flushed out of the whole system.

General hazard situations:

The following must be observed to avoid injuries:

- > The system must not be operated unsupervised.
- > Installation work shall be performed only by authorised specialist personnel with suitable tools.
- > After an interruption in the diffusion dialysis processes, a controlled re-start of the system must be assured.
- > Comply with general good engineering practise when operating the product.

The following must be observed to avoid damage to the product:

- > Protect the product from UV radiation and frost.
- > Do not bring the system or spiral membrane modules into contact with organic substances.
- > Do not subject the system to any shocks.
- > Always keep the interior of the spiral membrane modules moist after filling.
- > Do not exceed the maximum operating pressure.
- > Avoid pressure being applied on a single side.
- > Do not exceed the maximum operating temperature.
- > Do not carry out any external alterations to the system.
- > Do not subject the system or storage container to mechanical loads (e.g. do not use it as a step).
- > Only media listed in chapter 5.3 shall be fed into the media connections.
Use of unlisted media is the sole responsibility of the user.
- > Avoid mixing up the media connections.

4. GENERAL INFORMATION:

4.1 Contact address:

Spiraltec GmbH

Heinzenberger Weg 34
74343 Sachsenheim
Germany

Technical support: +49 7147 9670 204
E-Mail: info@spiraltecgmbh.de
www.spiraltecgmbh.com

4.2 Warranty:

Prerequisite for the warranty is the intended use of the product and compliance with the specified operating conditions (see Section 2, intended use).

Any other form of use, or any more extensive form of use, does not constitute intended use. No liability can be assumed for any damage resulting from this or from improper use.

Structural changes to the system:

- > No alterations or conversion work can be carried out on the system without the consent of Spiraltec GmbH.
- > The only way to assure the function and resistance to stresses and strains on the system is through the use of spare parts that are sourced from Spiraltec GmbH.
- > Without exception, our General terms & conditions of sale and delivery apply. These are available as a download at this address: www.spiraltecgmbh.com/en/downloads_en. These are available to the operating company by no later than the date of signing of the contract. Warranty and liability claims for personal injury and material damage shall be rejected if they can be traced to one or more of the following causes, e.g.:
 - Non-intended use of the system or of system components.
 - Improper installation, commissioning, operating and maintenance of the system.
 - Operation of the system while safety equipment is defective or while safety and protection fixtures are not fitted properly or are not functional.
 - Failure to observe the valid rules of engineering and/or notifications in the installation instructions in relation to transport, storage, installation, commissioning, operating and maintenance of the system.
 - Structural modifications at own initiative to the controller, the system or to system components.
 - Modifications to operating parameters made at own initiative.
 - Deficient monitoring of system components that are subject to wear, or that require regular maintenance.

- Use of operating media other than those intended.
- Disaster scenarios resulting from the influence of foreign bodies and force majeure.
- Operation of the system by qualified and/or untrained personnel.

4.3 Information on the Internet:

Installation instructions, system-specific data sheets and *product-specific data sheets* can be found on the Internet at: www.spiraltecgbh.com/en/downloads-en

5. TECHNICAL DATA:

5.1 System data:

| | |
|---|---|
| Flow: | 15 - 30 l/h (depending on the flow limiters, the composition of the media and the operating pressure) |
| Minimum pre-pressure: | 1,0 bar (overpressure) |
| Maximum pressure: | 2,5 bar (overpressure) |
| Recommended operating pressure: | 1,8 - 2,2 bar (over pressure before the flow limiters) |
| Pressure loss: | Equivalent to operating pressure |
| Operating temperature: | 5 °C - 30 °C |
| Weight when system is empty: | Approx. 150 kg (incl. empty modules) |
| Fill volume: | Approx. 20 L per channel (without storage container) |
| Storage container: | Max. 75 L per container |
| Switch cabinet number: | 600-400-XXXX-XXX |
| Power supply: | L1/N/PE AC 230 V; 50 Hz |
| Connection: | CEE connector 1-16: L+N+PE |
| Line length: | Approx. 3 m |
| Min. supply line: | 3 x 1,5 mm ² |
| Full-load / short-circuit current: | 16 A / 10 kA |
| Control voltage: | DC 24 V |

For further system data, please refer to the *system-specific data sheet*.

5.2 Operating conditions:

NOTE:

- > The operating conditions (flow rates, operating pressures) are dependent on the respective application and the flow limiters selected! The optimum combination should be determined during initial tests with the pilot system.
- > The limit values for operating pressure and operating temperature shall not be exceeded.
- > Ambient temperature not higher than operating temperature, always frost-free.

Please refer to the *system-specific datasheet* for further information on the conditions for operation and service.

5.3 Suitable media:

If using media that are not cited on the *product-specific datasheet*, please consult with a representative of Spiraltec GmbH beforehand.
In the event of unlisted media being used without prior consultation, the responsibility lies with the operator and the warranty for the product is voided!

5.4 Forbidden media:

- Nitric acid
- Hydrochloric acid
- Hydrofluoric acid
- Organic liquids (e.g. solvents)
- Alkalis
- Oxidation agents (e.g. H₂O₂)
- Liquids with particles > 10 µm

Other media may be on the *product-specific data sheet*.

6. INSTALLATION AND COMMISSIONING:



Danger!

Intoxication, chemical burns, contamination due to media escape.

- > Check the product for leaks before commissioning.
- > With hazardous media, ensure that corresponding protective measures are implemented and wear personal protective equipment in accordance with the requirements of the media.
- > Before loosening lines, ensure that the medium has been flushed out of the whole system.



Danger!

Danger of injury caused by high pressure in the system and in the spiral membrane modules.

- > Before working on the system or spiral membrane modules, relieve the pressure and empty the lines.

Risk of injury due to improper operation.

Improper operation can lead to injuries as well as damage to the system and its surroundings.



- > Before commissioning, it is necessary to guarantee that the operating personnel are familiar with the content of the installation instructions and that they understand these fully.
- > The safety instructions and the proper intended use must be observed.
- > Only appropriately trained personnel are permitted to commission the system.



Warning!

Risk of injury with improper installation.

- > Installation work shall be performed only by authorised specialist personnel with suitable tools.

Danger of injury through switching the system on unintentionally and uncontrolled re-start.

- > Secure the system from unintentional actuation.
- > After the installation, ensure that the re-start is carried out in a controlled manner.

6.1 Before installation:

- > Check the system for external mechanical damage.
- > Remove packaging and transport attachments if fitted.

6.2 Preparatory measures for initial commissioning of the system:

Installation of the storage containers is restricted to trained personnel. Installation by untrained personnel is prohibited.

Before initial commissioning, the following work must be completed:

1. Connecting up the storage containers:

- a. Unscrew, remove and store the 8 cover caps from the side of the system.
- b. Container 1 DI water:
Container connection 1. Out DI water with system connection 1. In DI water.
Container connection 1. Overflow DI water with system connection 1. Overflow DI water.
- c. Container 2 Feed:
Container connection 2. Out FEED with system connection 2. In FEED
Container connection 2. Overflow FEED with system connection 2. Overflow FEED.
Container connections 3. Airing with system connections, Airing (2x).
- d. Container 1.1 Diffusate:
Container connection 1.1 In Diffusate with system connection 1.1 Out Diffusate.
- e. Container 2.2 Dialysate:
Container connection 2.2 In Dialysate with system connection 2.2 Out Dialysate.

2. Connection of system to the power supply:

- a. The main switch must be in its Off position!
If the main switch is not in its Off position, move it into the Off position.
- b. Insert power connector into a suitable socket!
If an extension cable is needed (min. IP54), provide spray protection for the connection!
Avoid any trip hazard associated with the cable!

3. Filling the storage containers:

Check the storage containers for foreign bodies and contamination before filling them. If necessary, remove foreign bodies and clean the storage containers. When filling the storage containers, always ensure that no fill level monitoring system is installed. For this reason, the fill level must be monitored and checked manually.

NO organic substances (e.g. solvents, oils, etc.) and NO particles > 10 microns are permitted to enter pilot system PP2-DB. The operator must provide suitable pre-filtering upstream before entry in the corresponding storage containers.

- a. Container 1, DI water, fill with DI water (max. fill volume 75 litres).
- b. Container 2, Feed fill with the solution that is to be prepared (max. fill volume 75 litres).
- c. Check position of all ball cocks (see Figs. 1 & 2).

The following ball cocks must be opened

Pump side (see Fig. 1; page 10):
V1.1; V1.2; V1.3; V1.4; V2.1; V2.2; V2.3; V2.4
Spiral module side (see Fig. 2; page 10):
points
V1.5; V1.6; V2.5; V2.6

The following ball cocks must be closed

Pump side (see Fig. 2; page 10):
V3.1; V3.2; V3.3; V3.4
all blue cocks at the sample extraction

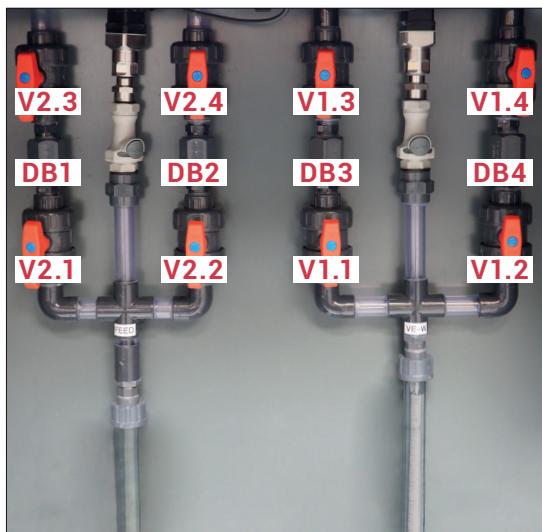


Figure 1: Position of the ball cocks on the pump side

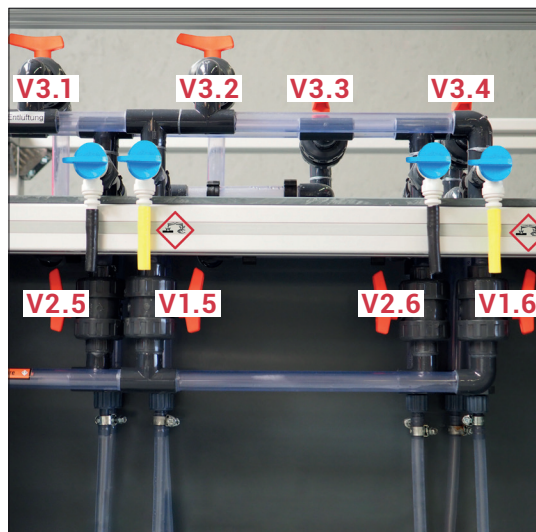


Figure 2: Position of ball cocks on the spiral membrane module side

1. Initial fill of the spiral membrane modules:

- a. Check the fill levels of the storage containers (topping up if required).
- b. Switch on the system (see Section 6.4 „1. Start the system“).
- c. Wait until the spiral membrane modules are filled. This can take up to 40 minutes (depending on the flow limiters used). The spiral membrane modules are filled as soon as liquid levels rise at outlets 1.1 Diffusate and 2.2 Dialysate.

2. Bleeding the hose lines before the spiral membrane modules:

In succession, open vent cocks V3.1 to V3.4 and close them again after approx. 10 seconds (see Fig. 3 and Fig. 4).

Please note: During operation, always ensure that the vent cocks are closed!

3. Setting the flow rates:

- a. Remove cover from the pump side (waf 13).
- b. Read off the existing flow rates on the respective rotameter (see Fig. 5).
- c. The existing operating pressures are displayed on the switch cabinet screen (see Fig. 6).
- d. The flow rate for DI water is set at needle valve NV1 (see Fig. 5).
Ensure that the operating pressure remains between 1.1 bar and 2.2 bar.
- e. The flow rate for the feed is set at needle valve NV2 (see Fig. 5).
Ensure that the operating pressure remains between 1.1 bar and 2.2 bar.
- f. After setting the flow rates, reinstall the cover at the pump side.
- g. The system is now operating.

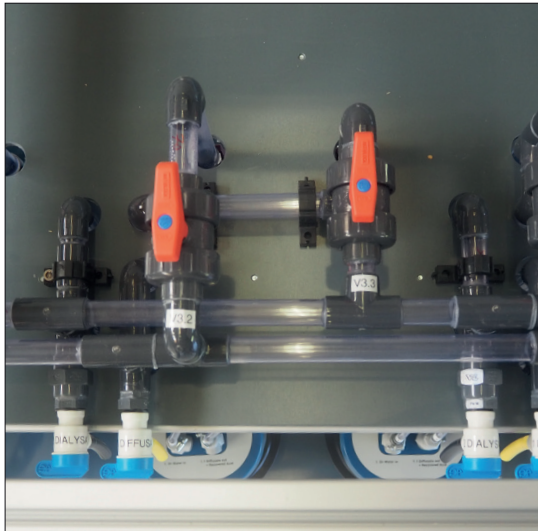


Figure 3: Open ventilation

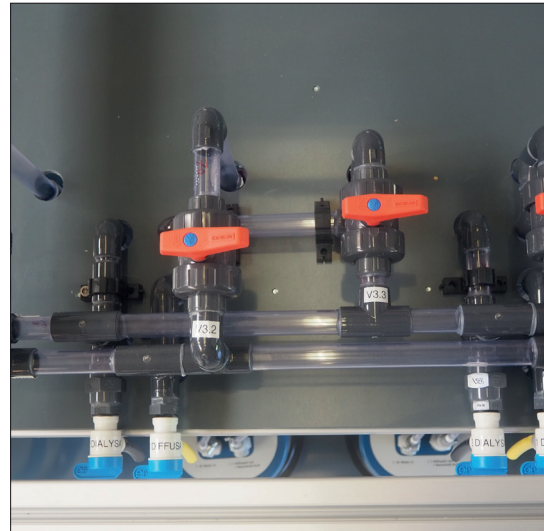


Figure 3: Closed ventilation

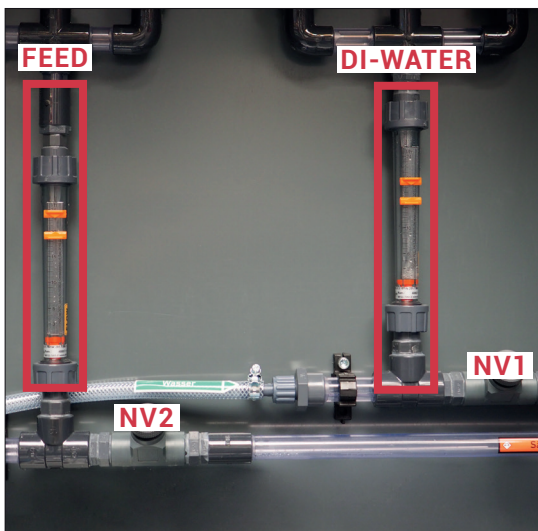


Figure 5: Rotameter on the pump side

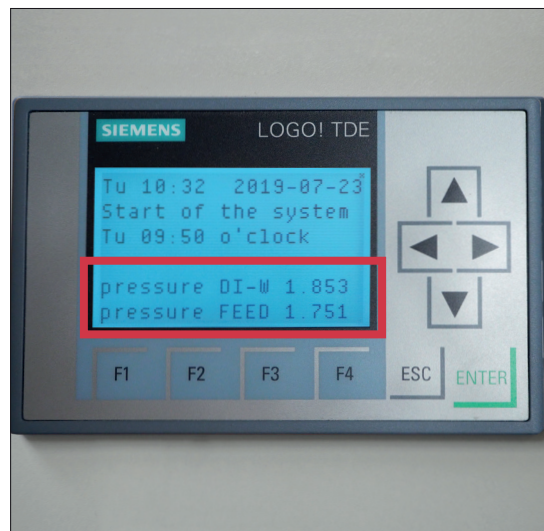


Figure 6: Display on switch cabinet

6.4 Commissioning the system:

1. Starting the system:

- a. Actuate the main switch on the left side of the switch cabinet, turning it to ON. This starts up the electronics, the system is booted and the homepage appears on screen. Follow the instructions on the display.
- b. Actuating button F1 starts the pumps, and the green indicator lamp lights up. The display now shows the operating pressures for DI water and feed (see Fig. 6). Ensure that operating pressures never rise above 2.2 bar and do not drop below 1.0 bar.
- c. The system is now in operation.

Please note: The fill levels of containers 1 DI water, 2 Feed, 1.1 Diffusate and 2.2 Dialysate are not monitored. For this reason, the system must always be supervised during operation.

2. Take a sample (diffusate and dialysate):

- a. Hold a suitable sample extraction container under the blue cock (see Fig. 7).
- b. Open the blue sample cock.
- c. Close the red ball cock located below it. It takes approx. 10 - 15 seconds before fluid starts to flow out.
- d. Draw off the required volume of sample.
- e. Open the red ball cock.
- f. Close the blue sample cock again.

Notices:

Wear personal protective equipment (PPE) when taking samples.

To ensure that the samples taken provide substantive results, they must be extracted once the system has reached its stationary operating point. This occurs approximately 90 minutes after the pumps start up.

The performance capability of each spiral membrane module can be established separately by taking samples at the 4 blue cocks (see Fig. 7). For every spiral membrane module, separate samples of diffusate and dialysate can be taken. If the spiral membrane module is intact and the system is stationary, the metal salt content in the diffusate should be < 5%.

The performance capability is dependent on the volumetric flow rates set and is subject to fluctuations. If the metal salt content of the diffusate rises significantly, the corresponding spiral membrane module needs to be replaced.

3. Powering down the system:

- a. Pressing button F2 stops the pumps and the green indicator lamp goes out. The system is now shut down.
- b. Control voltage to the system is switched off by turning the main switch into the Off position.



Figure 7: One of the sampling cocks

7. MAINTENANCE/SERVICE:

7.1 The following checks must be carried out on a regular basis:

Every time the system starts up:

- Check the system for leaks. Small leaks at the hose clips can be remedied directly by tightening the hose clips.

Weekly checks:

- Check the cap screw connections on the ball cocks for leaks and tighten them down if necessary.
- Check the performance of the spiral membrane modules by analysing the diffusate and dialysate.
- Check all hoses for embrittlement and cracking, and replace them if necessary.

Filter:

- Replace the active carbon filter by no longer than 450 operating hours. Higher load levels or particles in the feed reduce the service life of the filter substantially. The filter must be replaced immediately whenever the feed pump starts to pulsate (switching on and off continuously).
- Depending on the contamination level of the DI water, the particle filter must be replaced when needed. The filter must be replaced immediately whenever the DI water pump starts to pulsate (switching on and off continuously).

Storage containers:

- The storage containers must be replaced every 5 years (see adhesive label on the container).

Hoses:

- The fabric hoses and PVC hoses must be replaced annually or when required. For safety reasons, whenever any damage is detected on a hose, all hoses must be replaced.

Service contract:

- If a service contract has been concluded with Spiraltec GmbH, employees of Spiraltec GmbH will come to replace the containers and hoses. The materials involved in this work will be invoiced.

Spare parts list:

- The spare parts required can be obtained from Spiraltec GmbH by quoting the following item numbers (prices on request):

| Item number | Designation | Unit |
|-------------|---|----------|
| 11000045 | Active carbon filter cartridge (for acid) | 1 Unit |
| 11000037 | Cartridge filter (for VE water) | 1 Unit |
| 11000172 | PVC hose (transparent) | 5 Metres |
| 11000050 | PVC fabric hose | 5 Metres |
| 11000181 | Ring wrench for filter housing | 1 Unit |
| 11000074 | Storage container, 75 L | 1 Unit |
| 32000001 | Flow limiter 12 l/hr | 1 Unit |
| 32000002 | Flow limiter 15 l/hr | 1 Unit |
| 32000003 | Flow limiter 18 l/hr | 1 Unit |
| 32000004 | Spare filter kit with wrench | 1 Unit |

7.2 Replacing the flow limiters:

As standard equipment, the system is equipped with four flow limiters that limit the flow rate to 9 l/hr per channel (referenced to water). To be flexible and to be able to run tests to adapt the system to the needs of the process, these flow limiters can be interchanged. Flow limiters rated for the following flow rates are available: 12 l/hr, 15 l/hr and 18 l/hr (details referenced to water).

**Please note: Acid can escape during the work described below.
Appropriate protective equipment must be worn!**

1. Removal of a flow limiter:

- a. Stop the system by pressing the F2 key.
- b. Turn the main switch on the left side of the switch cabinet to OFF.
- c. Secure the system to prevent it from being switched on accidentally (Log out / Tag out).
- d. Use appropriate protective clothing and provide an acid-resistant collection vessel.
- e. Dismantle the protective plate at the pump side.
- f. Unlock both ball cocks that are located above and below the flow limiter (see Fig. 8).
- g. Place a collection vessel under the relevant flow limiter.
- h. Carefully and slowly unfasten the caps on the ball cocks at the flow limiter end.

Please note: Liquid can escape.

- i. Slowly remove the flow limiter between the two ball cocks (see Fig. 9).

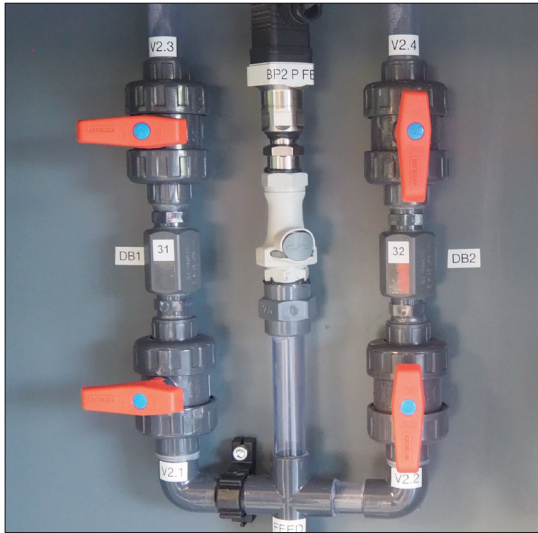


Figure 8: Closed ball cocks

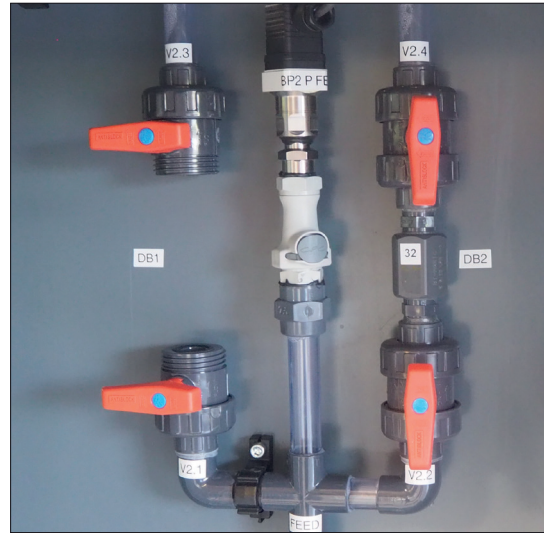


Figure 9: Removed flow limiter

2. Installing a flow limiter:

- a. Check the sealing surfaces on the ball cocks and the flow limiter for signs of soiling or particles. If applicable, remove them.
 - b. Slowly slide the flow limiter between the two ball cocks.
- Pay attention to the direction of flow limiter (arrow on the flow limiter)!**
- c. Screw the flow limiter down tightly on the ball cocks using the cap screws.
 - d. Slowly open the two closed ball cocks.
 - e. Remove the collection vessel from the system and dispose of the liquid it contains in an appropriate manner.
 - f. Secure the protective plate at the pump side.
 - g. Turn the main switch on the left side of the switch cabinet to ON.
 - h. Switch on the system by pressing the F1 key.
 - i. Check the replaced flow limiter for signs of leakage.

If you detect any escaping liquid after replacement of the flow limiter, carry out steps a to e as described in „1. Removal of a flow limiter“.

Retighten the cap screws. If this measure does not deliver the desired success, check the seals and replace them if necessary.

7.3 Filter replacement:

Before replacing the filters, ensure that the main switch on the left side of the switch cabinet is in the OFF position. Then secure the system to prevent it from being switched back on accidentally (Log out / Tag out). When replacing filters, always wear appropriate protective equipment. Before opening the filter housings, close the ball cocks V1.1; V1.2; V2.1; V2.2 as well as needle valves NV1 and NV2 (see Fig. 5; page 11).

Replacement of particle filters:

Turn filter housing 1 by hand to open it (see Fig. 10): be careful - DI water can emerge. Collect this using a suitable aid. Remove the filter cartridge and lift it out of the system together with the sump. Dispose of the remaining DI water and filter cartridge properly. Reinstall new filter cartridges together with the sump and tighten it down by hand.

Replacement of active carbon filters:

Please note: Acid!

Lower the feed above the lower drain cock on the filter housing 2 into a suitable receptacle. Unfasten the filter housing with a wrench (see Fig. 11). Wait until the remaining acid has drained off. Then close the drain cock, completely screw down the housing and lift it out carefully.

Dispose of remaining acid and the active carbon filter properly. Install a new active carbon filter in the housing, screw in by hand, then tighten down with a wrench. Open the ball cocks V1.1; V1.2; V2.1; V2.2 (see Fig. 1; page 10) as well as needle valves NV1 and NV2.

After starting up the system, examine the filter housings for signs of leakage and retighten them wherever necessary. Now the flow rates need to be reset. The description for this can be found in Section 6.4 Commissioning the system under „3. Setting the flow rates“.



Figure 10: Filter housing in the system



Figure 11: Key for filter housing 2



Figure 12: Active carbon filter



Figure 13: Particle filter

7.4 Replacing the spiral membrane modules:

1. Remove the cover from the spiral membrane module side (see Fig. 14; page 18) (waf 13).
2. Unfasten screw (waf 13) on bracket (see Fig. 15; page 18) and open the retaining bracket.
3. Disconnect the used spiral membrane module by unfastening the quick-release couplings (see Fig. 16; page 18) and remove them.
4. Unscrew and remove the quick-release couplings on the spiral membrane module. Dispose of the old spiral membrane module properly, paying attention to legislative provisions!
5. Remove the screw caps from the new spiral membrane module and install the quick-release couplings (max. torque 3.5 Nm).
6. Install a new spiral membrane module in the bracket and close the retaining bracket with a screw (waf 13).
7. Connect up the spiral membrane module with the quick-release couplings and ensure that the numbering matches up (see Fig. 17; page 18)!
8. Reinstall the cover at the spiral membrane module side.

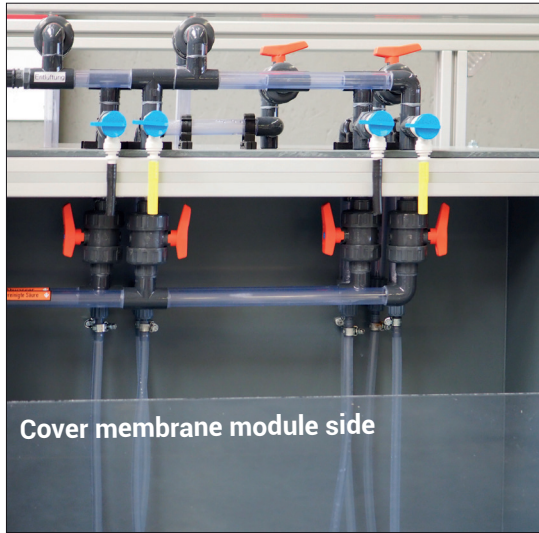


Figure 14: Membrane module side



Figure 15: Membrane module side without cover



Figure 16: Membrane module not connected



Figure 17: Connected membrane module

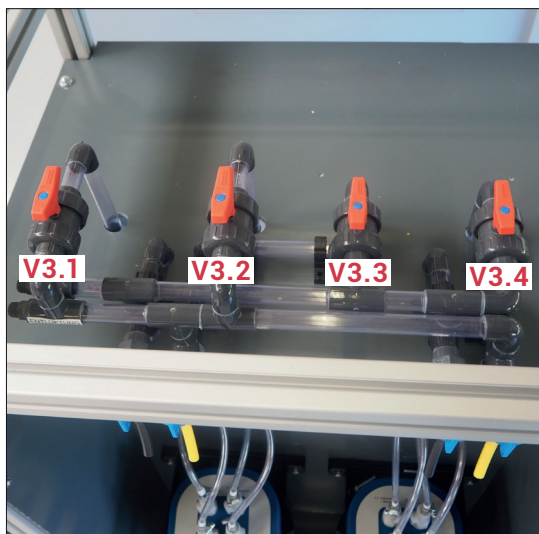


Figure 18: Opened venting



Figure 19: Connections with cover

8. REMOVAL:



Danger!

Intoxication, chemical burns, contamination due to media escape.

- > With hazardous media, ensure that corresponding protective measures are implemented and wear personal protective equipment in accordance with the requirements of the media.
- > Before loosening lines, ensure that the medium has been flushed out of the whole system.

Danger of injury through high pressure in the system/product.

- > Before working on the system or the spiral membrane module, shut off the pressure and empty the lines.

Risk of injury with improper removal.

- > Only appropriately trained personnel are permitted to remove the product.

1. Flush the system, set up as described in Section 9.2, with DI water for a minimum of 120 minutes.
2. Drain the system as completely as possible. For this, open the vent cocks V3.1 - V3.4.
Please note: Despite this, acid residue may still remain in the system (see Fig. 18).
3. Remove the hoses on the quick-release couplings from the containers.
4. Unfasten the cap screw connections on the system and drain residue from the hoses. Place a suitable collection vessel under the connections because liquid is still emerging.
5. Open and drain the two filter housings as described in Section 7.2.
6. Drain the containers and dispose of the liquids properly.
7. Seal all open pipes on the system with the cover caps that were supplied with the system (see Fig. 19).
8. The system can now be packaged and stored and/or transported (see Section 10). Please ensure that the ambient temperature is at least 5°C. When recommissioning the system, proceed as described in Section 6.

9. SHUTDOWN/STORAGE:



Danger!

Intoxication, chemical burns, contamination due to media escape.

- > With hazardous media, ensure that corresponding protective measures are implemented and wear personal protective equipment in accordance with the requirements of the media.
- > Before loosening lines, ensure that the medium has been flushed out of the whole system.

Danger of injury through high pressure in the system/product.

- > Before working on the system or the spiral membrane modules, shut off the pressure and empty the lines.

Risk of injury with improper removal.

- > Only appropriately trained personnel are permitted to remove the product.

Used spiral membrane modules must be kept damp at all times. To prevent bacterial growth during extended periods of downtime or storage, the spiral membrane modules must be flushed with diluted salt-free acid (e.g. diffusate). We therefore recommend preserving the spiral membrane modules inside the system. If you remove the spiral membrane modules from the system, only place them into storage: **Upright with their connections facing upwards!**

9.1 Short-term storage:

Shut-downs up to 48 hours in length:

- > No measures necessary. Storage containers must always remain connected to prevent any pressure from building up.

Shut-downs between 48 hours and 7 days in length:

- > Flush the entire system for 120 minutes with diluted salt-free acid:
 1. Drain storage containers 1 (DI water) and 2 (Feed).
 2. Fill storage containers 1 (DI water) and 2 (Feed) with diluted, salt-free acid.
 3. Start up the system.
 4. Dispose of any 'splash water' that may occur properly and in accordance with the provisions of environmental legislation.
- > Storage containers must always remain connected to prevent any pressure from building up.

9.2 Long-term storage:

Shut-downs between 7 days and 6 months in length:

- > Flush the entire system for 120 minutes with diluted, salt-free acid:
 1. Drain storage containers 1 (DI water) and 2 (Feed).
 2. Fill storage containers 1 (DI water) and 2 (Feed) with diluted, salt-free acid.
 3. Start up the system.
 4. Dispose of any 'splash water' that may occur properly and in accordance with the provisions of environmental legislation.
- > Then flush the entire system for 120 minutes with DI water:
 1. Drain storage containers 1 (DI water) and 2 (Feed).
 2. Fill storage container 1 (DI water) and storage container 2 (Feed) with DI water.
 3. Start up the system.
 4. Dispose of any 'splash water' that may occur properly and in accordance with the provisions of environmental legislation.
- > Remove the spiral membrane modules and drain them by standing them on end with the help of the quick-release couplings provided (see Fig. 20; page 22).
- > Fill approx. 500 ml of diluted, salt-free acid into the drained spiral membrane module (into each channel).
- > Reinstall the spiral membrane modules in the system.
- > Dismantle the storage containers as described in Section 8 Disassembly.
- > Store the system and containers at a storage temperature of 5 °C – 30 °C.

Shut-downs longer than 6 months:

- > Every 6 months flush the entire system once again for 90 minutes with diluted, salt-free acid.
- > Procedure as described in Section 9.2.

10. PACKAGING AND TRANSPORT:

Note:

Damage while in transit:

- > Insufficiently protected systems can be damaged while in transit.
- > Ensure that the permissible storage temperatures are not infringed.
- > Storage temperature 5 °C - 30 °C.

Environmental damage caused by system components contaminated by media:

- > Dispose of system and packaging in an environmentally friendly manner.
- > **Observe applicable disposal regulations, transport provisions and environmental regulations.**

11. RETURNING A PILOT SYSTEM:

In the event of a pilot system PP2-DB-01 being returned, please first contact a representative of Spiraltec GmbH.

Flush out the system and storage containers as described in Section 8 disassembly.

Return the system and storage containers to Spiraltec GmbH, simply first rinsing them out, draining them and packaging them well. Please provide information with a description of the application (media used etc.) in writing.

- > **Observe applicable disposal regulations, transport provisions and environmental regulations.**

12. ACCESSORIES:

The following accessories can be obtained from Spiraltec GmbH:

Flow limiter with the following flow rates: 9 l/hr; 12 l/hr; 15 l/hr; 18 l/hr

Contact a representative of Spiraltec GmbH for this.

13. TECHNICAL MALFUNCTIONS THAT MAY OCCUR:



Figure 20: Example of a fault message

Malfunctions:

Malfunctions are shown on the display located on the front of the switch cabinet. In addition, the yellow indicator lamp flashes and the red indicator lamp lights up. The system shuts down every time there is a malfunction. After remedying the malfunction, the error message can be acknowledged by pressing the Enter key, and the system can be restarted using the F1 key (see Fig. 21).

Leakage:

If liquid escapes at one or both spiral membrane modules or at a different location on the system, and if the system has not gone into fault mode, switch off the system, first taking personal safety precautions. Try to prevent the escaped liquid from spreading by catching and collecting it.

Please note: Use appropriate protective equipment and acid-resistant containers.

If liquid escapes from a hose connection, this can be remedied by tightening the pipe clip gently. Always ensure that the plastic screw connection is not damaged.

Power failure:

In the event of a power failure, proceed as follows:

Power failure (< 30 minutes)

- Start the system by actuating the F1 key.

Power failure (> 30 minutes)

- Proceed as described in Section 6.4.

13.1 List of fault messages

Error message on display:

Possible cause:

Possible workaround:

| | | |
|--|--|---|
| Operating pressure too high! System has been stopped! | <ul style="list-style-type: none">- Max. operating pressure exceeded | <ul style="list-style-type: none">- Open needle valve further |
| Operating pressure too low! System has been stopped! | <ul style="list-style-type: none">- Particle filter clogged- Activated carbon filter clogged- Empty storage containers- Pump defective- Undershooting of the min. operating pressure- Leakage on the system | <ul style="list-style-type: none">- Change particle filter- Change activated carbon filter- Filling the storage containers- Replace pump- Continue to close needle valve- Repair leakage |
| Leakage on the system detected! Please check! | <ul style="list-style-type: none">- Membrane module leaking- Hose line leaking/broken- Piping leaky | <ul style="list-style-type: none">- Replace membrane module- Retighten hose clamp- Retighten cap screw fitting- Retighten filter housing- Close the drain cocks on the filter- Replace hose line |

13.2 Cleaning the flow limiters:

In rare cases, whenever larger particles are present in the liquids, this can block the flow limiters. This becomes apparent by the operating pressure in the system rising too high, or by a decline in the flow rate. If the actions described in the section covering „Exceeding the operating pressure“ fail to deliver the desired outcome, you should clean the relevant flow limiter.

As described in Section 7.2, remove the relevant flow limiter.

Check the direction of flow in the flow limiter. This is indicated by an arrow on the side of the component. With the help of a spray bottle, spray a powerful jet of DI water against the direction of flow in the flow limiter (see Figs. 22 and 23).

If this sprayed jet emerges again powerfully at the inlet end of the flow limiter, it is not blocked and can be reinstalled in the system, as described in Section 7.2.



Figure 21: Flow direction



Figure 22: Flow limiter during flushing with deionised water



**AFTER EVERY MALFUNCTION,
CONTACT YOUR APPOINTED ADVISOR.
CONTACT DETAILS BELOW**

Spiraltec GmbH
Heinzenberger Weg 34
74343 Sachsenheim
Germany

Technical support: +49 7147 9670 204
E-Mail: info@spiraltecgmbh.de

www.spiraltecgmbh.com

14. EG-KONFORMITÄTSERKLÄRUNG

Spiraltec GmbH
Heinzenberger Weg 34
74343 Sachsenheim



Sicherheit von Maschinen in der EU

EG-Konformitätserklärung

im Sinne der EG-Richtlinie Maschinen 2006/42/EG, Anhang II A

Hiermit erklären wir, dass die Diffusionsdialyseanlagen zur Abtrennung der Metallsalze von freien Säuren aus Prozessbädern

Typ: **Diffusionsdialyseanlage PP2-DB**

Hersteller: Spiraltec GmbH, Heinzenberger Weg 34, 74343 Sachsenheim

folgenden einschlägigen Bestimmungen entspricht:

- EG-Richtlinie Maschinen in der Fassung von 2006/42/EG, EU-Abl. L 157/24 vom 09.06.2006
- Niederspannungsrichtlinie, Die Schutzziele der Niederspannungsrichtlinie 2014/35/EU, EU-Abl. L 96/357 vom 29.03.2014 wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie 2006/42/EG eingehalten
- EMV-Richtlinie 2014/30/EU, EU-Abl. L 96/79 vom 29.03.2014

Angewendete harmonisierte Normen, insbesondere:

- DIN EN ISO 12100:2010, Ausgabe 2011-03, Sicherheit von Maschinen: Grundbegriffe, allgemeine Gestaltungsleitsätze
- EN ISO 13857, 06/2008 Sicherheit von Maschinen: Sicherheitsabstände gegen das Erreichen von Gefahrenstellen mit den oberen und unteren Gliedmaßen
- EN 60204-1 06/2007 Sicherheit von Maschinen: Elektrische Ausrüstung von Maschinen; Teil 1: Allgemeine Anforderungen

Angewendete nationale technische Spezifikationen und Erkenntnishilfen insbesondere:

- VDE 0100-100, -200, -410, -510
- DGUV Vorschrift 3, Elektrische Anlagen und Betriebsmittel

Dokumentationsbevollmächtigter: Herr Frank Moser (Anschrift wie Hersteller)

Sachsenheim, den 05.12.2018

Unterschrift

A handwritten signature in black ink, appearing to read "H. Härter".

Holger P. Härter
Geschäftsführung

15. OWN NOTIFICATIONS:

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-
-
-
-
-
-
-
-
-



