Baxter

AK 98
DIALYSIS MACHINE
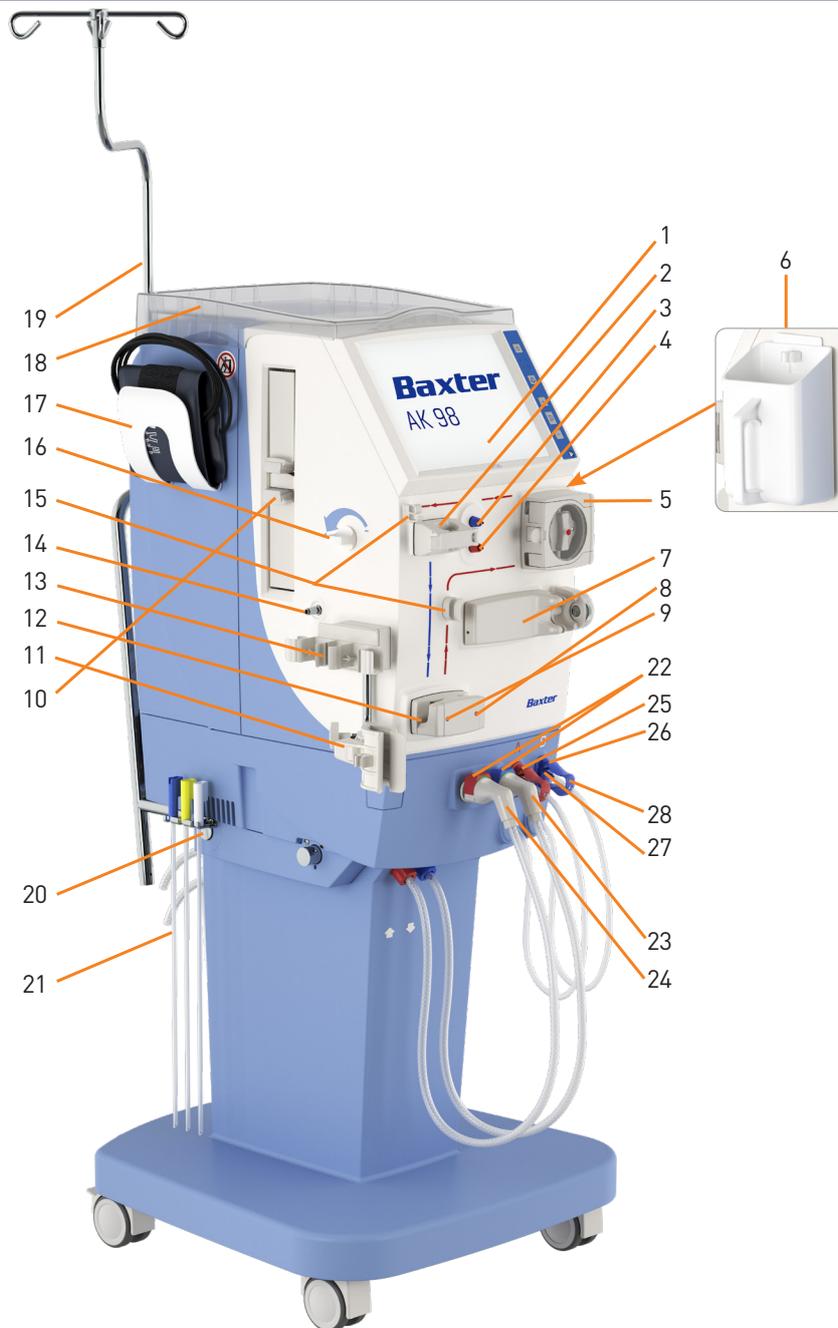
QUICK REFERENCE GUIDE

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Note: The contents of this training material are based on the **AK 98** Dialysis Machine Operator's Manual for software 3.xx (HC12839). Reviewing this material does not replace the training given to you by your healthcare provider, nor does it replace your responsibility to read and understand the full text of the Operator's Manual prior to operating the machine. If there are differences between the actions described here and the instructions contained in the Operator's Manual, then the information from the Operator's Manual takes precedence.
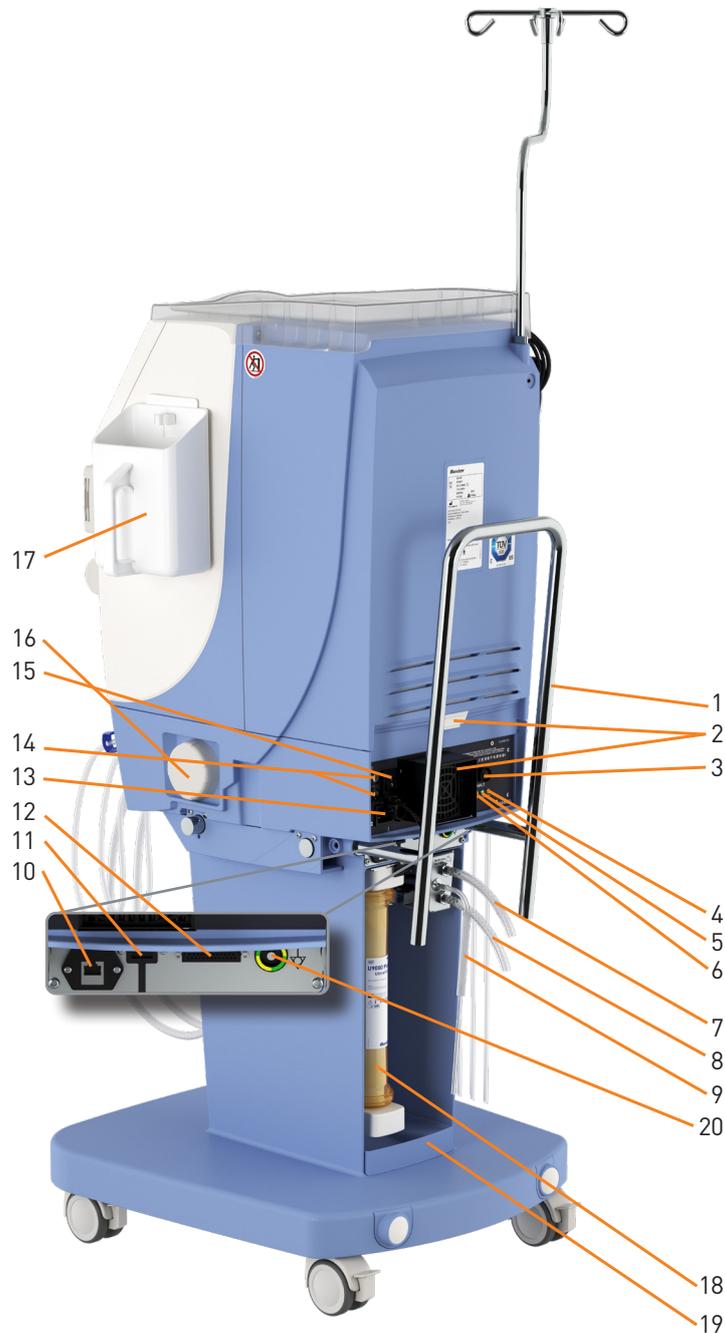
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12. External communication port
13. Mains connection
14. Fuses
15. Main switch

16. Blood leak detector
17. Priming bucket
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20. Potential equalisation connection

BUTTONS ON THE OPERATOR'S PANEL

1. On/Off button
2. Schedule indicator
3. Main switch indicator
4. Mute button
5. Blood pump up button
6. Blood pump button
7. Blood pump down button
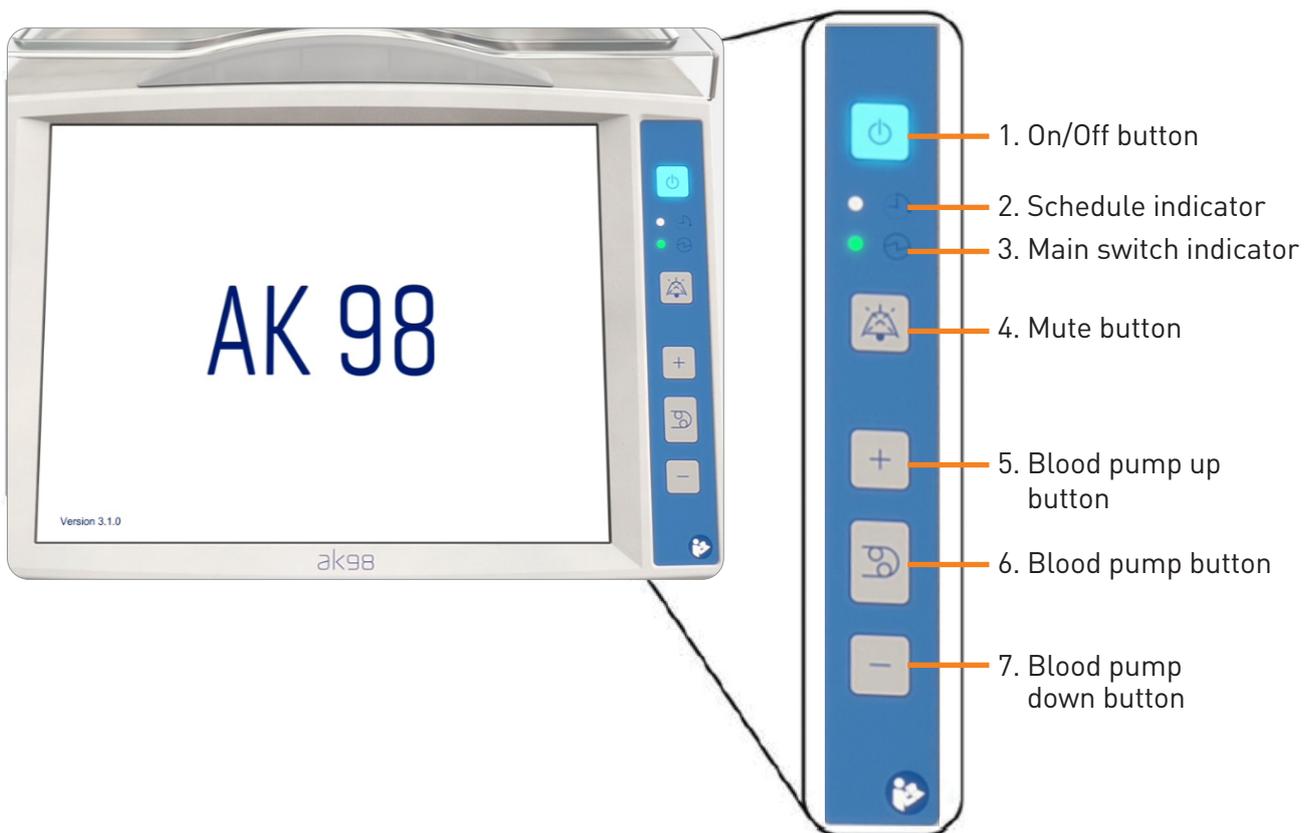
1. **On/Off button:** Press to turn the machine on or off. Press and hold for 3 seconds while a disinfection program is running for the machine to automatically turn off after the disinfection program is completed.

2. **Schedule indicator:** When lit blue, a rinse or disinfection program is scheduled to begin automatically.

3. **Main switch indicator:** When lit green, the machine is connected to main power supply and the main switch (behind the machine) is on.

4. **Mute button:** Press to mute alarm or attention sounds. Press and hold to turn alarm and attention sounds back on.

5. **Blood pump up button:** Press to increase blood pump speed.

6. **Blood pump button:** Press to start or stop the blood pump.

7. **Blood pump down button:** Press to reduce blood pump speed.
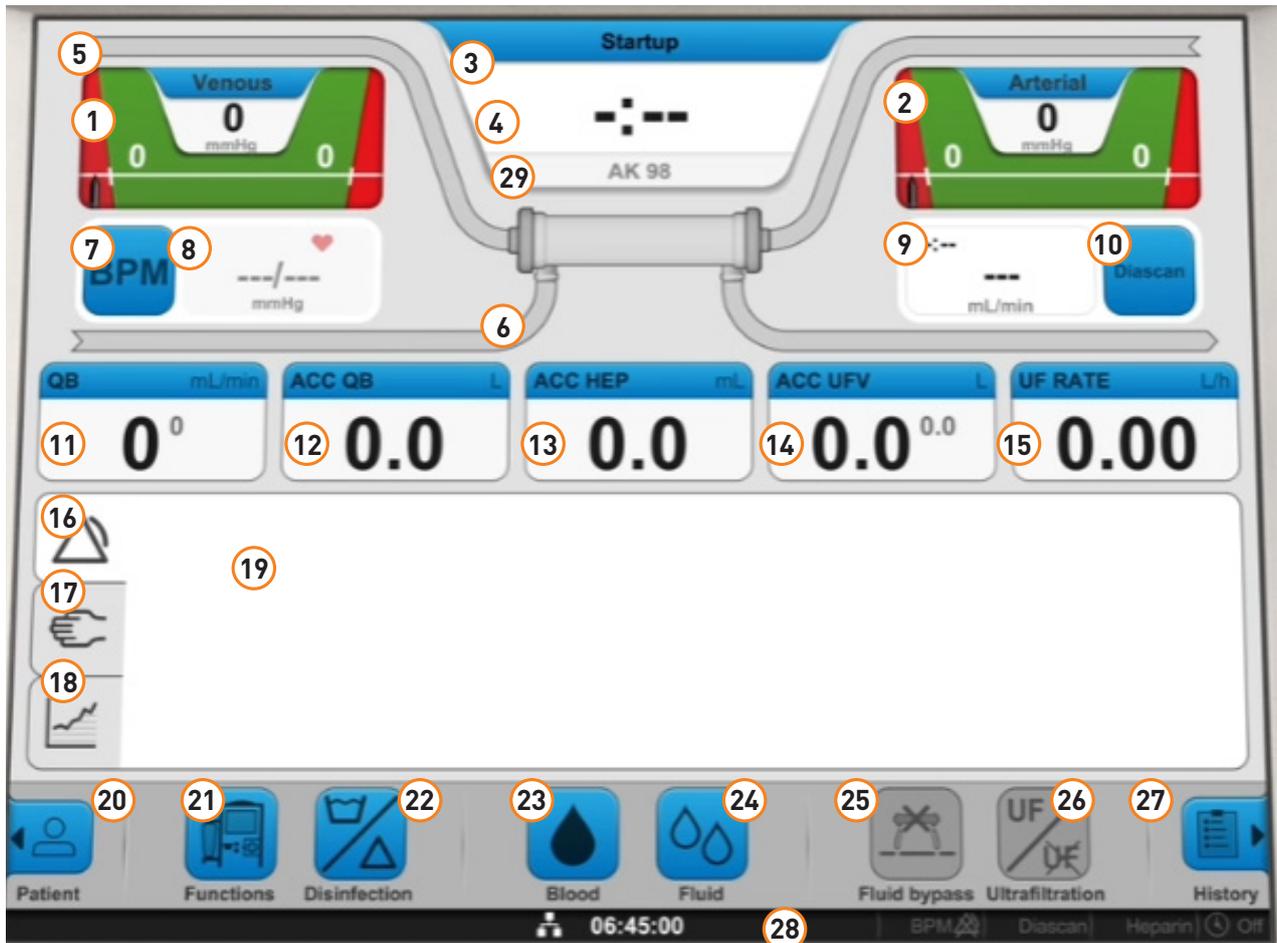
1. Venous pressure control
2. Arterial pressure control
3. Machine state indicator
4. Time indicator
5. Blood path
6. Fluid path
7. Blood pressure monitor (BPM) button
8. Blood pressure monitor (BPM) read out field
9. **Diascan** read out field
10. **Diascan** button
11. Blood flow rate
12. Total blood volume processed
13. Total heparin volume infused
14. Total UF volume removed
15. Ultrafiltration rate
16. Alarm tab

17. Information tab
18. Treatment graph tab
19. Information field
20. Patient page
21. Functions button
22. Disinfection button
23. Blood button
24. Fluid button
25. Fluid bypass button
26. Ultrafiltration (UF) button
27. Treatment history page
28. Status bar
29. Monitor identifier (Nickname)

💬 Note: Treatment overview fields (11-15) are configurable. Transmembrane pressure (TMP) is also available.

HOW TO USE

Operation Start Up

Pre-treatment Check

- The main power cable must be connected to the main power supply.
- The main switch must be turned on.
- The water supply must be connected to the inlet water and powered on.
- The outlet tube (drain) should be properly placed with an air gap between the dialysis machine and the drain.
- The dialysate lines should be connected to the dialysate ports.
- Acid concentrate, **BiCart** cartridge, dialyzer, bloodline, and saline must be ready for use.

1. Gently press the On/Off button to turn on the machine.

Functional Check

2. Before a treatment can be started the dialysis machine performs a functional check. Do NOT attach blood lines or open the blood pump door until the blood pump button is flashing.

3. Before connecting concentrates, wait for the machine prompt to connect concentrates.
4. Once prompted to connect concentrates, remove the red concentrate connector from the dialysate port.
5. Attach the white wand to the red concentrate connector. Place the wand in the acid concentrate container.

6. Select the concentrate combination to be used from the preset options on the screen.
   - **Note:** The user should ensure a current listing (brand and composition) of specified concentrates in the dialysis machine is the same as actually used during treatment, and that it is the same as is prescribed for the patient.
   - **Note:** Incorrect choice of dialysate concentrate may cause incorrect composition of the dialysate. Incorrect composition may lead to electrolytic imbalance in the patient's blood.

7. Press the release buttons to release the latches. Open the **BiCart** cartridge holder. Pull the upper latch out and up. Pull the lower latch down.
8. Remove the caps from the **BiCart** cartridge and attach it narrow end down.
9. While supporting the lower latch, press down the upper latch to secure the cartridge.

10. Attach the dialyzer in the holder. If necessary, squeeze the spring-clip to place the dialyzer in the holder. Move the dialyzer caps to the dialysate ports on the dialyzer to prevent saline loss. Follow the dialyzer's instructions for use.
11. Hang the saline bag on the IV pole.

HOW TO USE

Circuit Preparation and Line Connection - Attaching the Arterial Blood Line

1. Open the blood pump door. Press the center of the cover and pull the tab.
2. Place the blood pump segment into the blood pump. Do NOT push/thread the segment into the blood pump rotors. Ensure the arterial pressure transducer points down and the heparin line is at the top.
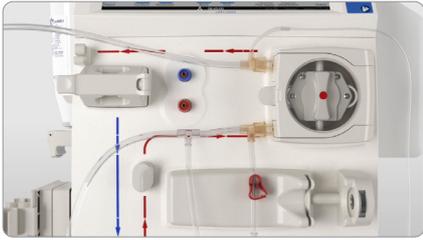
3. The blood pump segment collars must be outside of the pump housing.
4. Hold the segment in place and close the blood pump door.
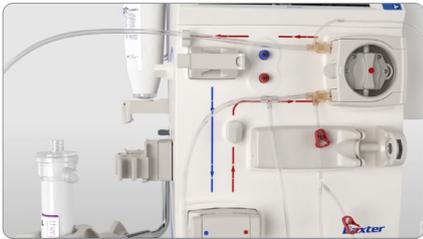
5. Follow the arterial guide arrows and gently press the blood line into the upper guide.
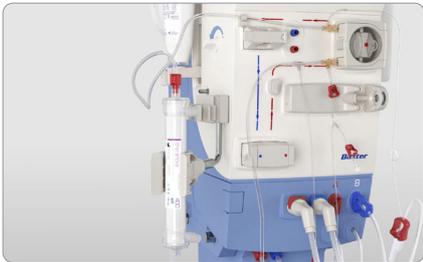
6. Remove the protective caps and attach the end of the arterial blood line to the dialyzer. Ensure the arterial blood line is securely attached to the dialyzer.

   💬 Note: Ensure the arterial blood line is not cross threaded and that it's firmly attached to the dialyzer to prevent patient blood loss.
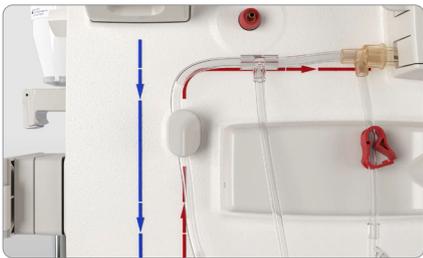
7. Route the line around the line guide.
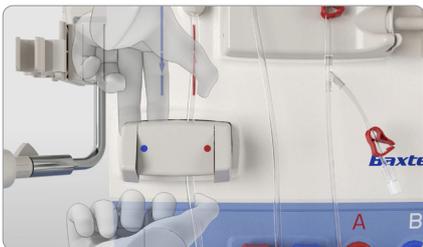
8. Insert the arterial blood line into the arterial clamp (marked with a red dot).
9. Gently pull the blood line down to secure in place.

   💬 Note: Ensure the blood line between the arterial clamp and blood pump is not too stretched.

HOW TO USE

Circuit Preparation and Line Connection - Attaching the Priming Solution

1. Attach the arterial blood line to one of the blood line holders in the prime bucket. Ensure the tip of the blood line does not touch the bottom of the bucket. Keep the arterial clamp open.

2. Clamp the infusion line and spike the saline bag. Ensure connection is secure.
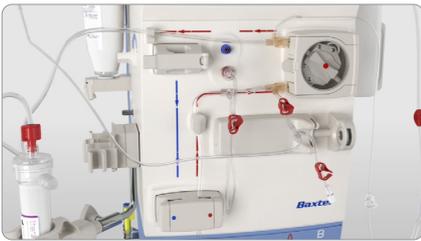
3. Attach the arterial pressure transducer protector to the red arterial pressure transducer connector. Turn to secure the connections - transducer line to transducer protector and transducer protector to transducer connector on the machine.

   💬 **Note:** Do NOT clamp the pressure transducer line.

HOW TO USE

WATCH VIDEO

1. Attach the venous blood line to one of the blood line holders in the prime bucket. Ensure the tip of the blood line does not touch the bottom of the bucket. Close the clamp on the venous patient line.
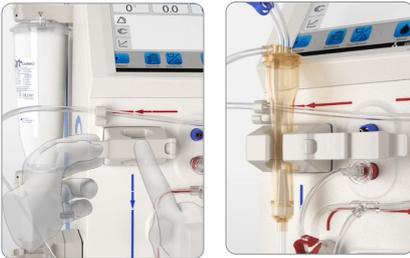
2. While firmly pressing the center of the cover, pull the tab towards you to open the air detector cover.

3. Pinch the venous drip chamber and place it in the air detector.

4. Adjust the position of the venous drip chamber such that the cone-shaped filter is below the air detector and that the chamber extends above the top of the air detector. While pressing the center of the cover, close the air detector cover.

5. Remove the protective caps and connect the end of the venous blood line to the dialyzer. Ensure the venous blood line is securely connected to the dialyzer.

   Note: Ensure the venous blood line is not cross threaded and that it's firmly attached to the dialyzer to prevent patient blood loss.
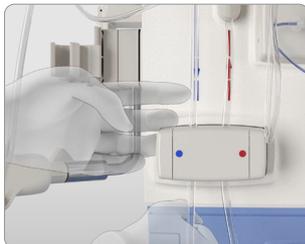
6. Place the blood line into the venous clamp (marked with a blue dot).

7. Gently pull the blood line down to secure in place.

8. Check carefully that the venous blood line is set correctly in the venous blood line (prime detector) clamp.

   Note: If venous blood line is not correctly placed in front of the prime detector, the supervision of alarms may not be activated.

9. Attach the venous pressure transducer protector to the blue venous pressure transducer connector. Turn to secure the connections - transducer line to transducer protector and transducer protector to transducer connector on the machine.

   Note: Do NOT clamp the pressure transducer line.

10. Close the blue clamp on the venous patient blood line secured in the prime bucket and close the blue medication administration port clamp at the top of the venous chamber.

11. Close the white clamp on the heparin administration line and ensure the white clamp on the infusion line is closed.

12. Close the red clamp on the arterial rinseback line.

Circuit Preparation and Line Connection – Attaching the Heparin Syringe

WATCH VIDEO
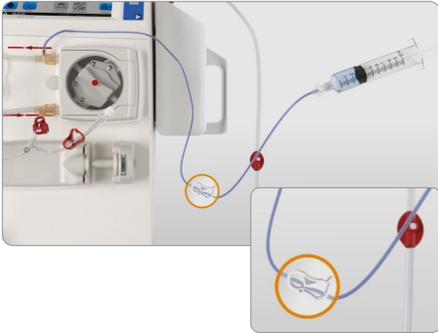
1. If heparin is to be used, attach the prepared syringe to the heparin line.

   📮 Note: If the heparin pump is not in use, ensure the heparin line is clamped.

2. Prime the heparin line with the solution up to the point where the arterial blood line starts. The luer lock must be properly attached.

   📮 Note: Ensure enough heparin has been withdrawn to account for the priming volume of 0.6 mL.

3. Close the clamp on the heparin line.

4. Press the end of the piston on the heparin pump and pull out the piston to extend it as much as possible.

   📮 Note: The locking wheel must be fully turned downwards before you can insert the syringe into the heparin pump.

   📮 Note: Check that the syringe size, syringe type and heparin type that you have specified in the dialysis machine are the same as you actually use during treatment. If not, the patient could be either over or under heparinized.
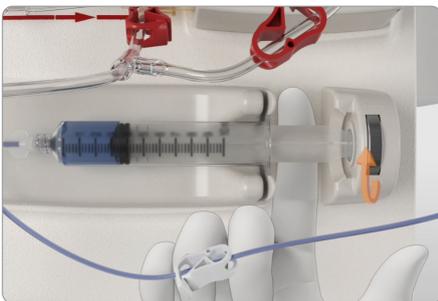
5. Insert the syringe into the pump. The plastic collar at the end of the syringe must fit in the grooves of the pump. When using a syringe with total volume less than 20 mL, a heparin pump adapter must be installed to accommodate the syringe.

6. Push the piston back to its original position and insert the plastic flat head of the plunger into the groove next to the locking wheel.

7. Turn the locking wheel upwards until you feel resistance.

8. Gently pull the plunger to ensure the syringe is properly attached. If properly attached, the syringe cannot be pulled out of the heparin pump.

HOW TO USE

WATCH VIDEO

1. Ensure the arterial blood line clamp is open.

2. Open the infusion line clamp(s).

3. Turn the dialyzer over so that the blue venous end is up. This helps remove the air from the dialyzer.

4. Manually prime the pre pump segment of the arterial blood line by gravity.

5. When the pre pump segment of the arterial blood line is primed and priming fluid has reached the prime bucket, close the arterial blood line clamp and open the venous blood line clamp.

6. Ensure there are no kinks in the blood lines.

7. Press the flashing blood pump button to start the blood pump and activate the post pump priming.

   Note: Actual priming volume is indicated on the screen.

8. Once a small volume of priming fluid has reached the venous chamber, adjust the level of priming fluid in the venous drip chamber with the adjustment knob. The level should be well above the air detector head.

9. To avoid unnecessary air detector alarms during set up, wait to activate the air detector until all air has been removed from the circuit.

   Note: The air detector is automatically activated when priming is completed or when Connect patient is selected.

10. When the blood pump stops, turn the dialyzer over so that the red end is up.

11. If not already done, attach the dialysate lines to the dialyzer. Connect the red dialysate line from the machine to the same side of the dialyzer as the arterial blood line. Connect the blue dialysate line from the machine to the same side of the dialyzer as the venous blood line.

    Note: To ensure proper function of the fluid path in the machine, ensure the dialysate lines are properly attached to the dialyzer. Red to red, and blue to blue, as indicated in photo.

12. Press the Fluid Bypass button to start the flow of dialysate into the dialyzer.
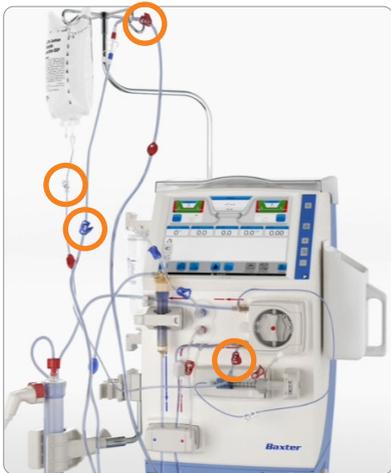
Recirculation

When priming is complete, the option for Recirculation will appear.

1. Press Recirculation.
2. Connect the patient ends of the bloodlines using a sterile recirculation connector. Ensure both patient bloodline clamps are open.
3. Ensure the clamps on the infusion line are open.
4. If your facility's policies and procedures allow, flip the dialyzer so the blue venous end is up to enhance air removal.
5. Start the blood pump.

    Note: Recirculation time depends on the preset value.

6. Adjust the level of saline in the venous drip chamber using the adjustment knob, as necessary. The level should be well above the air detector sensor head.

7. When recirculation is complete, depending on the preset value, the machine will enter concentrate standby mode.

HOW TO USE

Blood Pressure Monitor [BPM]

The blood pressure cuff is connected to the side of the machine.

Single Blood Pressure Measurement

Press the BPM readout field. The machine will start taking the measurement. The heart icon and BPM will start flashing while measurement is taken.

Note: If you press the BPM field twice, the measurement will stop.

Results

The measured value will appear in the BPM measurement output field.

How to Stop Measuring:

Press the BPM measurement output field to stop taking the measurement that is currently in progress.

Automatic Blood Pressure Measurement

1. Press the BPM button.
2. Select the Setup tab.
3. Press Auto mode.
4. Press the time interval.
5. Check the frequency of the blood pressure measurements, adjust if necessary. The frequency can be set between 5-60 minutes.
6. Press OK.
7. Activate automatic blood pressure measurements. The machine will start taking the measurement when activated.

   Note: The clock symbol appears by the BPM icon on the status bar when automatic blood pressure measurement is activated. The BPM icon and clock symbol flash when a blood pressure measurement is taken.

Measurement History

Blood pressure measurements will be recorded and saved in the log during treatment. Measurement data will be displayed in the History tab.

1. Press the BPM button.
2. Select the History tab.
3. Press History.

Manually Entering the Prescription

Set Treatment Time

1. Press the time indicator on the screen.
2. Press treatment time.
3. Set the desired treatment time and press OK.

Set Ultrafiltration Goal

4. Press the time indicator on the screen.
5. Press UF volume.
6. Enter the patient's ultrafiltration goal and press OK.
   Check the calculated/resulting UF rate.

Set Heparin Values

7. Press the Blood button.
8. Select the Heparin tab.
9. Press the settings one at a time, then set up the desired parameters, such as heparin bolus dose, heparin flow rate, stop time, etc. according to the prescription.
10. If a heparin bolus dose is needed at the start of treatment, press Heparin bolus dose and set a bolus dose (mL) appropriate for the patient.

> **Note:** Ensure to verify the prescribed heparin values. Incorrect heparin may increase risk of blood coagulation or bleeding.

HOW TO USE

Retrieving Patient Prescription

WATCH VIDEO
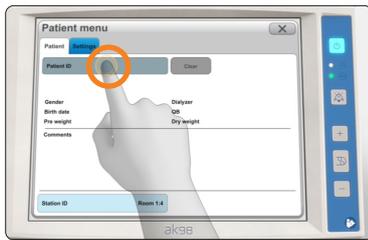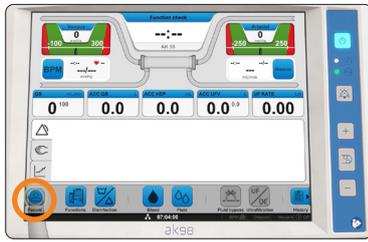
📩 **Note:** Applies only for bidirectional connectivity.

1. Press the Patient button.
2. Press the Patient ID bar.
3. Enter your patient's ID and press OK.
4. Carefully check the correct patient data has been retrieved, and then press Confirm to accept.
5. Review the prescription dialog box.

📄 Shows the prescription parameters which have come from the EHR/EMR. The other parameters are either your facility's settings, or the machine default values.

Any parameter can be changed if needed by pressing the blue bars.

📝 Shows the prescription parameters that have come from the EHR/EMR and have been changed.

6. Verify that all the required treatment parameters have been set correctly, and then press OK.

The Patient button is filled in and has a check mark. This confirms the machine is running with the patient prescription coming from the EHR/EMR.

📩 **Note:** The treatment parameters can also be entered manually in the Patient menu under the Settings tab.

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HOW TO USE

Connecting the Patient

1. Prior to stopping the blood pump following completion of recirculation, ensure:

   - Dialyzer is in treatment position (red arterial end up)

   - Machine is not in Concentrate Standby Mode (CSBM)

   - Dialysate path is green

   💬 Note: Blood pump must be stopped after recirculation for the Connect patient option to appear.

2. Ensure the venous line is correctly placed in the priming detector.

3. Press the Connect patient button on the screen to enter patient connection mode.
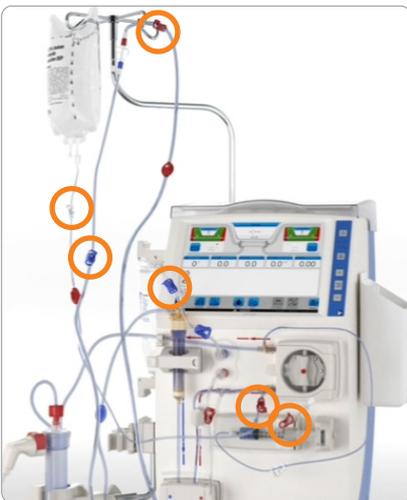
4. Clamp the infusion lines.

5. Clamp arterial and venous blood lines. Disconnect the arterial blood line from the recirculation connector.

6. Connect the arterial blood line to the arterial access (needle or catheter). Ensure the connection is tight and that there is no leakage.

7. Ensure there is no air in the venous blood line.

8. Connect the venous blood line to the venous access (needle or catheter). Ensure the connection is tight and that there is no leakage.

9. Unclamp the arterial and venous blood and access lines.

10. Ensure all relevant clamps are closed to prevent blood loss and the clamps on the blood lines and the patient access are open.
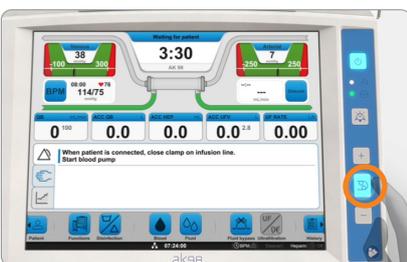
11. Press the flashing blood pump button to start the blood pump. The blood pump will start at the preset flow.

12. Once the blood passes through the dialyzer and blood is detected by the priming detector, the blood pump will stop automatically.

13. The color of the blood path will turn red on the screen.

   💬 Note: Check that the blood path of the flow diagram lights up. If it does not light up, check that the venous blood line is correctly placed in the priming detector. If the blood path does not light up, the machine considers the patient not connected and as a consequence the UF system is not controlling the patient ultrafiltration.

HOW TO USE

Starting the Treatment

1. Press the flashing blood pump button to restart the blood pump.
2. Adjust the blood flow rate using the +/- buttons above and below the blood pump button.

   Note: To adjust blood flow rate quickly, hold down the +/- buttons.

3. Press the flashing Ultrafiltration button to start ultrafiltration.
4. Initiate blood pressure and activate the auto mode and interval time (refer to page 14).

5. Check the arterial and venous pressures.

   Note: The alarm limits can be set manually by pressing the pressure controls followed by "Close alarm limits".

   Note: If the alarm limits are not set manually, the arterial and venous pressure alarm limits are automatically centralized around the actual values after the preset time.

6. Ensure the venous drip chamber is filled to the correct level and that the clamp of the (medication administration) short-line above the drip chamber is clamped and cap is secure.

Stopping the Treatment, Rinseback, and Disconnecting the Patient

1. When the treatment is completed and the time reaches 0:00, an attention (596 Treatment time expired) will appear.

   Note: To end the treatment early, press the time indicator and decrease the treatment time to 0:00.

2. Press the attention to confirm end of treatment.
3. Press the Rinse back button that appears in the Information field.
4. Press Confirm, then press OK. The blood pump stops.

WATCH VIDEO

Stopping the Treatment, Rinseback, and Disconnecting the Patient (cont.)
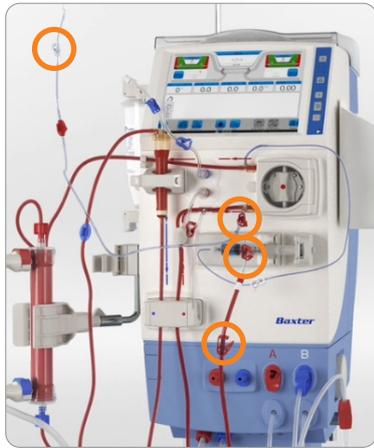
5. Close the clamp of the arterial blood line and the arterial access.

6. Disconnect the arterial blood line from the access.

7. Connect the arterial blood line to the rinseback line. Open the red clamps on the rinseback line, white clamp on the infusion line, and red clamp on the arterial blood line.

8. Ensure the red clamp on the infusion line closest to the blood pump is closed.

9. Press the blood pump button to start the blood pump.

   Note: Continue to monitor the venous needle and venous pressure during rinseback.

10. When the rinseback is completed, the blood pump stops.

    Note: The blood pump will stop upon reaching the preset rinseback volume, or when the priming detector stops detecting blood. The option to give additional rinseback volume will be available.

11. If not using the extra rinse back feature, press Disconnect patient.

12. Close the clamp on the venous blood line and the venous access. Disconnect the venous blood line from the access.

13. Ensure the patient is physically disconnected from the machine and press Confirm.

    Note: The air detector will be deactivated, and the patient must NOT be reconnected.

14. Remove the venous blood line from the priming detector.

WATCH VIDEO

Emptying the Dialyzer and BiCart Cartridge
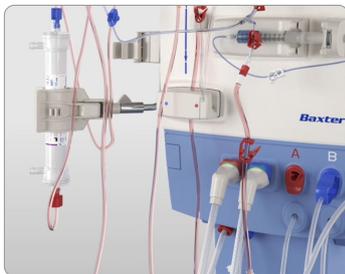
1. Rotate the dialyzer so that the blue connectors are up.

2. Remove the blue dialysate line from the dialyzer and connect to the blue dialysate port. The dialysate will drain from the dialyzer.

3. Once the dialyzer is empty, remove the red dialysate line from the dialyzer and connect to the red dialysate port.

   Note: The machine will not provide an alert when the dialyzer is empty, and it is not required to empty the dialyzer.
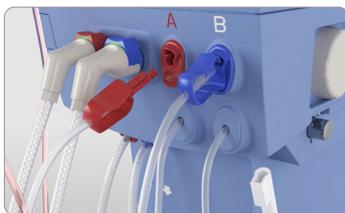
4. For the last treatment of the day: Follow the instructions on the screen and disconnect the concentrate connector from the concentrate supply and connect it to the concentrate port.

   Note: If descaling (between treatments) is indicated, concentrate supply must remain in acid concentrate to perform the descaling process.

5. Drain the **BiCart** cartridge by following the on-screen instructions.

6. When **BiCart** cartridge is drained, a message to 'remove **BiCart** cartridge and close latches' will appear. Pull the top of the **BiCart** cartridge holder latch outwards and lift it upwards to remove the **BiCart** cartridge.

7. Close the **BiCart** cartridge holder latches.

   Note: The "Drain **BiCart**" option will not appear on the screen if the steps above are not followed in order. Always reference the on-screen instructions to ensure the option will appear.

HOW TO USE

Disconnecting the Blood Line and Dialyzer
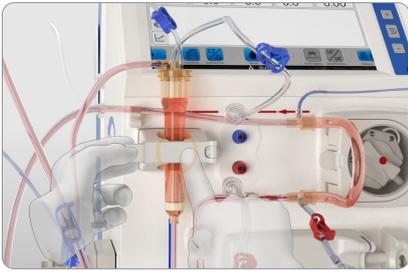
1. Press the center of the blood pump door and pull the tab to open the door.

2. Hold the arterial blood line just before the pump segment on the bottom. Pull the blood line outwards while rotating the blood pump counter-clockwise to remove the blood line.

3. Press the center of the air detector door and pull the tab to open the door. Pinch the venous drip chamber and pull it out.

4. Disconnect and remove the arterial and venous blood lines.

Descaling Between Treatments
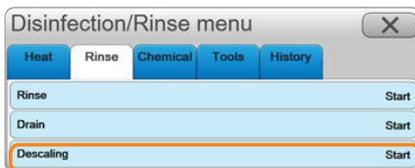
1. Press the "Disinfection" button.

2. Select the "Rinse" tab.

3. Press Descaling.

4. Press Confirm.

   Note: Descaling between treatments is to remove precipitated material from the machine.

   Note: When descaling between treatments, the red concentrate connector must remain connected to the acid concentrate to perform the descaling process.

Disinfection and Rinsing

Press the flashing "Disinfection" button to disinfect/rinse.

CleanCart cartridges, chemical substances, and/or heat disinfection can be used to disinfect.

Heat Disinfection with **CleanCart** Cartridges

CleanCart A and **CleanCart C** cartridges can be used with the **CleanCart** disinfection function.

   Note: Ensure that the bloodlines are removed from the machine and all connections are returned to their standby ports.

1. Select the "Disinfection" button.

2. Select the "Heat" tab.

3. Select the "Heat CleanCart" option and press Confirm.

   Note: After ~1 minute, the machine will display the message "**CleanCart** is not attached".

4. Open the **BiCart** cartridge holder. Fold the lower latch out and down, and fold the upper latch out and up, and pull out.

5. Attach the **CleanCart** cartridge, inserting the bottom first. Hold with one hand underneath the lower latch while closing the upper latch to secure the cartridge. The disinfection cycle will start.

HOW TO USE

Disinfection and Rinsing (cont.)

Chemical Disinfection

1. Select the "Chemical" tab from the Disinfection/Rinse menu.
2. Select the disinfectant.
3. Connect the blue concentrate connector to the yellow wand.
4. Place the wand inside the disinfectant solution.
5. When the machine has pulled in the appropriate amount of disinfectant solution, a message will be displayed and an alarm will sound. Disconnect the concentrate connector from the wand and connect it to the port on the machine.

   Note: After a chemical disinfection program, a test for chemical disinfect residual must be performed prior to connecting a patient to ensure that no residues exist. Residual chemicals can cause harm to a patient. Use an appropriate test method, with proven sensitivity for the chemical used.

WATCH VIDEO

Heat Disinfection

1. Select the "Heat" tab from the Disinfection/Rinse menu.
2. Select "Heat".
3. Press Confirm.

Integrated Heat Disinfection

The machine can perform a heat disinfection that is integrated with the central water system, which allows the water inlet tube to be included into the disinfection process.

During this integrated heat disinfection, the machine automatically switches on and receives hot water from the central water system. It can also be switched on manually, if required.

WATCH VIDEO

Heat Disinfection With Liquid Citric Acid

1. Ensure the disinfectant inlet tube from behind the machine is placed in the citric acid solution and that there is enough solution (~300 mL).
2. Select the "Heat" tab from the Disinfection/Rinse menu.
3. Select "Citric 20%" or "Short heat citric" and press Confirm.

   Note: Citric acid concentration is a preset.

   Note: Short heat citric is not a disinfection cycle and should be followed by a chemical disinfection program.

WATCH VIDEO

Six disinfection processes can be performed on the AK 98 System:

1. **Heat + CleanCart C Cartridge:** ~51 minutes to perform a decalcification, heat disinfection and drain the system.
2. **Full Heat Citric:** ~ 54 minutes to perform a decalcification, heat disinfection and drain the system.
3. **Short Heat Citric:** ~ 27 minutes to perform a decalcification and heat disinfection without draining the system.
4. **Heat + CleanCart A Cartridge:** ~51 minutes to perform a cleaning, heat disinfection and drain the system.
5. **Bleach:** ~ 50 minutes to perform a cleaning, chemical disinfection and drain the system. NOTE: Percentage of Hypochlorite is up to 10% settable in Presets.
6. **Heat:** ~ 40 minutes to perform a heat disinfection and drain the system.

Recommendation: Between treatments, run a descaling program. Each day, perform a heat with **CleanCart C** cartridge (or heat citric 20%) disinfection. Last day of the week, perform a heat with **CleanCart C** cartridge (or short heat citric 20%) followed by a heat with **CleanCart A** cartridge (or bleach) disinfection.

Example based on a clinic open 6 days a week:

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Full HC	Full HC	Full HC	Full HC	Full HC	Short HC & Bleach	Clinic Closed
Heat + **CleanCart C**	Heat + **CleanCart C**	Heat + **CleanCart C**	Heat + **CleanCart C**	Heat + **CleanCart C**	Heat + **CleanCart C** & Heat + **CleanCart A**	Clinic Closed

HOW TO USE

Changing the Dialyzer and Blood Lines During Treatment

If clotting occurs, you may have to change the blood line and dialyzer during treatment. If you must replace the dialyzer and blood line during treatment, all values and settings will be saved in the machine, and treatment will resume from where it left off.

💬 **Note:** It is not necessary to end the treatment and start again to replace the circuit. Once the procedure is complete, the treatment will continue from when it was stopped.

💬 **Note:** It is important to follow the instructions provided on the operator's panel in the sequence listed. Steps performed out of sequence may delay the option for priming and return to treatment mode. Once started, the new blood circuit procedure must be completed.

1. Press Functions.

2. Select New Blood Circuit and Confirm. The blood pump stops automatically.

3. Confirm New Blood Circuit with blood return when the blood pump stops. Disconnect patient will also be an option.

4. Prepare for rinse back using the rinse back line on the arterial blood line.

5. Select Rinse Back and Confirm. Follow the normal 'End the treatment' procedure to return the blood.

   - Connect the arterial blood line to the rinse back line

   - Start blood pump

   - Stop blood pump when rinse back is completed. The rinse back will automatically stop after the preset rinse back volume, if not stopped manually before.

6. Disconnect patient and select Confirm on the screen that patient is disconnected. The air detector will be deactivated.

7. Remove venous line from the priming detector.

8. Move dialysate lines to dialysate ports on the machine. Dialyzer will not be drained.

9. Remove/dismount the used dialyzer, bloodlines, and heparin syringe.

10. The message 'When ready to prime, start blood pump' appears. Follow the normal procedure to set up the machine.

11. When recirculation volume is achieved, prior to stopping the blood pump, ensure the dialyzer is in treatment position. Stop the blood pump and select Connect patient. Follow the normal procedure to connect the patient.

12. Increase blood flow and start UF. Treatment will continue from where it was stopped.

    💬 **Note:** If not possible to return blood to patient, select Disconnect Patient, Confirm, and follow on-screen instructions.

    💬 **Note:** If set, reactivate profiles and **Diascan** features.

Replacing the BiCart Cartridge During Treatment

**If you need to replace the BiCart** cartridge **with a new cartridge during treatment:**

1. Remove the used **BiCart** cartridge and close the **BiCart** holder for at least 2 seconds.

2. Reopen the holder and install the new **BiCart** cartridge. The machine will automatically prime the new **BiCart** cartridge.

TROUBLESHOOTING

Alarm Indication

There are two alarm levels: high priority alarms and medium priority alarms.

- **High Priority Alarm:** Flashing red light and repeating 5-tone sound. The light will continue to flash and audible tone will continue to sound until the cause of the alarm is resolved.

- **Medium Priority Alarm:** Flashing yellow light and repeating 3-tone sound. The light will continue to flash and audible tone will continue to sound until the cause of the alarm is resolved.
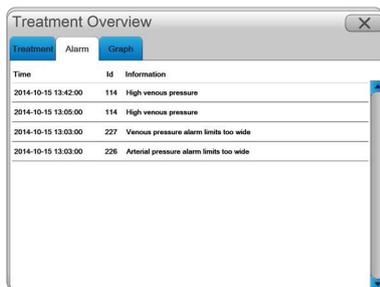
The time of the alarm will appear in the alarm history. Once the machine is powered down, the alarm list will be cleared. The alarm list will be maintained during a power outage as long as the backup battery allows. The last alarm that occurred will be displayed at the very top of the list. When the list is full, the oldest data will be cleared.

How to Check the Alarm List

1. Press the History button.
2. Select the Alarm tab.

WATCH VIDEO

How to Pause Treatment

It is possible to pause the treatment and disconnect the patient during treatment.
If the treatment is paused:

- Blood will circulate at a lower blood flow rate.
- Monitoring and alarms are still active, but the alarm windows for arterial and venous pressures are widened.
- The paused timer will appear on the screen and an alarm will sound every 15 minutes.
- Isolated UF, profiling, and **Diascan** functions are deactivated.
- Continuous heparin administration is deactivated, but you may still use bolus dose.
- Automatic BPM is deactivated, but you may still take BPM manually.
- When treatment resumes, the treatment continues and completes according to the initial settings.
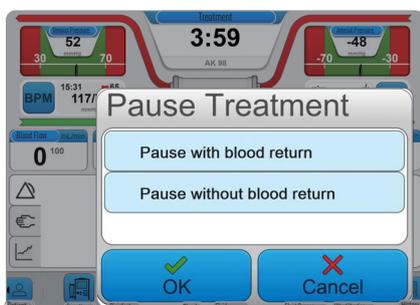
How to Pause Treatment

1. Press Functions.
2. Select Pause Treatment.
3. Confirm Pause treatment with blood return when the blood pump stops.
4. Prepare for rinse back using the rinse back line on the arterial blood line.
5. Start blood pump.
6. The blood pump will stop when the preset amount of saline has been delivered. Otherwise, stop the blood pump manually when ready for pause treatment.
7. Select Pause treatment.
8. Disconnect patient and connect blood lines for recirculation with sterile recirculation connector.
9. Start blood pump – the time in pause treatment is now being displayed on the screen.
10. Stop blood pump when ready to resume treatment.
11. Reconnect patient and confirm when patient is connected.
12. Start blood pump.
13. Increase blood flow.
14. Start Ultrafiltration and now the treatment will continue from where it was stopped.

    Note: It is possible to pause without blood return. Follow the on-screen instructions.
    Note: **Diascan** and profiling will be automatically restarted.

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TROUBLESHOOTING

What to Do During a Power Outage

Using the Machine During a Power Outage	• If the machine loses power, a backup battery will temporarily power the blood unit. All settings and actual values will be saved. • The blood pump and heparin pump will continue to operate using battery power, but dialysate preparation will stop. The machine will enter bypass mode and the dialysate line will appear gray. • The back-up battery will only last a limited time. 30 minutes can be expected from a fully loaded battery in good condition. • If the power outage is expected to last for more than a few minutes, consider discontinuing the treatment.
Continuing Treatment After a Power Outage	• When power is restored, the machine automatically resumes the treatment and asks the user to confirm the restart. • The treatment will resume from where it left off, and all settings and actual values will be saved. However, the user must double check all treatment settings.

Manual Rinseback

WATCH VIDEO

Manual Rinseback Process Note: During manual procedure to return blood to patient during a power failure, the operator shall take full responsibility for visually monitoring all safety parameters that cannot be monitored by the machine during a power failure (for example, air detection).	• If the blood pump cannot be started, the user may manually rinseback blood to the patient. • Since the machine's safety features are inactive while the machine is turned off, you must consider the risks that may occur during manual rinseback. 1. Close the arterial blood line and patient arterial access clamps. 2. Disconnect the arterial blood line from the patient. 3. Connect the arterial blood line to the rinseback line, and open the appropriate clamps on the arterial blood line, rinseback line, and infusion line. 4. Remove venous line from venous line clamp. 5. Open the blood pump door. 6. Rotate the blood pump counter-clockwise to return the blood. Ensure no air enters the patient. 7. Once rinseback is completed, clamp the venous blood line and patient venous access clamps. 8. Disconnect the venous blood line from the patient.

TROUBLESHOOTING

Changing a Wet Transducer

1. Don appropriate PPE as per facility policy.
2. Stop the blood pump.
3. Clamp transducer line.
4. Remove wet transducer protector from connector on machine and inspect the side connected to the machine for blood or priming solution strike-through.
5. Carefully inspect transducer connector on **AK 98** for fluid. If signs of fluid strike-through, machine should be pulled as per facility policy and an authorized service technician must replace the appropriate components in the machine.
6. Remove wet transducer protector from line and discard per facility policy.
7. Attach a 10 mL syringe to the transducer line and unclamp the line. To purge the transducer line of fluid, slowly inject 2-3 mL of air into the transducer line until the fluid is removed from 1/2 to 2/3 of the line and re-clamp the transducer line.

   💬 Note: Do NOT inject air too close, within approximately 4 inches, of the T junction on the transducer line.

   💬 Note: If changing the venous transducer protector, slowly inject 2 mL of air into the line to the venous chamber.

8. Attach new transducer protector to pressure transducer line. Ensure secure connection between transducer protector and line.
9. Attach transducer protector to **AK 98**, ensuring a secure connection between transducer protector and machine.
10. Unclamp the transducer line and resume previous blood flow setting.
11. Verify arterial / venous pressure monitoring.

💬 Note: The time the blood pump is stopped may contribute to additional clotting. It is important to check the bloodlines and dialyzer for clotting after the blood pump stops and therapy is restarted.

Code	Machine Screen Guidance	Resolution

100	**Air in Venous Drip Chamber**
	 Press Timer button, then turn the knob to increase drip chamber level.
	
		• If level has dropped or foam is present in the chamber, touch the clock symbol on the screen.
		 • Attempt to resolve by SLOWLY increasing the level in the venous chamber using the level adjustment knob, ensure that the blood pump is moving.
		   1. Press the timer button that appears on the alert tab to turn on the blood pump. At this point, the blood pump will rotate slowly at 50 mL/min and the speed cannot be changed.
		   2. Simultaneously rotate the chamber level adjustment knob counter-clockwise to raise the blood level.
		 • Be sure to watch for the message "Air no longer detected" and confirm on the screen if appropriate.
		 • May also require multiple attempts depending on the amount of air present.
		   💬 Note: May also indicate clotting in the venous chamber. Be sure to visually inspect the chamber for signs of clotting.
		
		  WATCH VIDEO

101	**Blood Detected in Dialysate Path** To start blood pump for 15 sec to rinse detector, press Timer button.	• Indicates that a blood leak may have occurred during treatment. • May occur immediately following priming of a new **BiCart** cartridge. • Follow your facility's specific policy when a blood leak alarm occurs during patient treatment.

TROUBLESHOOTING

Code	Machine Screen Guidance	Resolution
102	**Blood is Detected During Functional Check** Blood in priming detector. Functional check is stopped.	• Make sure that the patient is not connected to the blood lines. • Clean the priming detector lens with isopropyl alochol and allow to dry.
107	**Blood Pump is Stopped too Long**	• Prompts the user to restart the blood pump when it has not been restarted in 120-180 seconds, depending on preset value. • Manually start the blood pump using the blood pump button to the right of the screen. • If another alarm has caused the stoppage, resolve the primary alarm so the blood pump can start. • This may require going back to messaging under the flashing hand.
108	**Dialysate Path Obstruction** Too high blood circuit pressure. Check circuit, start blood pump.	• Press the Fluid bypass button. • If the alarm disappears, the obstruction is external (e.g., located in the blood lines, the dialysate lines or the dialyzer). Check for obstructions in the blood lines, the dialysate lines or the dialyzer and remove them if you find any. • If the alarm does not disappear, the obstruction is internal. Call an authorized technician.
109	**High Arterial Pressure**	• Stop the blood pump. The arterial and venous pressure alarm limits are automatically widened. • Consider needle dislodgement, check connection of arterial needle with arterial line. • Correct the cause of the alarm and restart the blood pump. Adjust blood flow rate per your procedure. • Check the transducer protector for potential strikethrough; if blood has contacted the protector membrane, replace with a sterile transducer protector if necessary. • Ensure there are no kinks or clamps closed on the blood tubing. 💬 Note: This may be a secondary alarm, resulting from a stop of the blood pump. WATCH VIDEO
114	**High Venous Pressure**	• Stop the blood pump. The arterial and venous pressure alarm limits are automatically widened. • Consider access complications, check that there are no kinks or clamps on the venous blood line between the needle and the drip chamber, and check the position of the venous needle. • Consider lowering the pump speed while the pump is stopped using the blood pump down button (-) to the right of the screen. • Correct the cause of the alarm and restart the blood pump. • Check the transducer protector for potential strikethrough; if blood has contacted the protector membrane, replace with a sterile transducer protector if necessary. • May also indicate clotting in the venous chamber.

TROUBLESHOOTING

Code	Machine Screen Guidance	Resolution
115	**Low Arterial Pressure**	• Stop the blood pump. The arterial and venous pressure alarm limits are automatically widened. • Check that the patient´s blood flow rate is the same as the blood flow rate set in the dialysis machine. • Check the patient´s blood pressure. • Check the position of the arterial needle. • Consider lowering the pump speed while the pump is stopped using the blood pump down button (-) to the right of the screen. • Correct the cause of the alarm and restart the blood pump. • May indicate a mechanical obstruction - access patency issues, kinks, or poor flow within vascular access related to the set pump speed. • Check the transducers for potential strikethrough.
120	**Low Venous Pressure** Check the venous needle position or catheter lumen.	• Stop the blood pump. The arterial and venous pressure alarm limits are automatically widened. • Check that the venous blood line is properly attached to the dialyzer. • Check that the venous needle is in proper position. • If this alarm occurs during functional check, restart the machine using the On/Off button and the machine will perform a new functional check. • Check that there are no clots before or in the dialyzer. • Adjust the blood flow rate and restart the blood pump. • Check the transducers for potential strikethrough. • Consider needle dislodgement, potential clotting before the dialyzer, or a wet transducer protector.
123	**Technical Error** The machine has been automatically restarted. To continue press Confirm.	• Press the Confirm key on the screen to continue treatment. • Proceed to the Functions key, Service, and then to the Error List tab at the top of the screen. Note the error code on the Error List (most recent at the top). • If this alarm occurs during functional check, restart the machine using the On/Off button and the machine will perform a new functional check. • If the alarm recurs, contact Technical Services and provide the full error code. **AK 98** is continuously supervising the computers used to run treatment. If the system identifies a problem, it will generate an automatic restart to restore a fully operational system. [QR code] WATCH VIDEO
124	**Technical Error** Contact technical service.	• If this alarm occurs during functional check, restart the machine using the On/Off button and the machine will perform a new functional check. • Ensure the dialysate line connector nuts are tight. • Ensure the dialysate connectors are properly seated on their dialysate ports. • Ensure there are no parts of the blood tubing strung on the machine before the blood pump button is flashing. • Verify that the acid concentrate connector and **BiCart** arms are free of build-up. • Power the machine on. If the alarm recurs, consider contacting Technical Services. • Proceed to the Functions key, Service, and then to the Error List tab at the top of the screen. Note the error code on the Error List (most recent at the top). 📣 Note: This is not possible during treatment. If the alarm occurs during a treatment, you may be able to complete a rinse back. Follow your procedures.
203	**Heparin Pump is Overloaded** Check heparin line for obstruction.	• May occur during machine start up if the heparin pump is too close to the housing; pull piston out to the right. • May be triggered by a closed clamp on the heparin infusion line or the heparin syringe is empty. • Consider setting the heparin flow rate to 0 mL if the syringe is empty. • If alarm recurs, consider removing the syringe from the pump and pulling the piston out to the right.

TROUBLESHOOTING

| Code	Machine Screen Guidance	Resolution
208	**Incorrect Dialysate Composition** Check set values and connected concentrates.	• Ensure the acid jug container is filled or that the wall connection is secure and that the right concentrate is connected to the machine. • Check for air in the concentrate line. Verify that the red concentrate connector is free from build-up and that the blue O-rings are intact. • If needed, remove **BiCart** cartridge and close the latches for at least 2 seconds. If clumping is present in the cartridge shake to eliminate. • Press the fluid key and go to the Cond tab. If the" Actual" conductivity number is not fluctuating after a few minutes, send the machine into a Rinse. Select Disinfect key, then select Rinse tab, then select Rinse. When completed – reconnect the concentrates and monitor the conductivity. • If air is present in the acid line, wait – the air may need to be cleared from the acid line by the machine. The machine will not airlock. 💬 Note: Pressure may build up in the **BiCart** cartridge. Lift the top latch to release the pressure, reattach.
211	**Conductivity Out of Limits** When the dialysate conductivity is outside the set alarm limit.	• Ensure the concentrate containers/**BiCart** cartridge are correctly connected, filled and not empty. • Ensure there is no kinking in the concentrate line and that wands are not sucking air. • Ensure the **BiCart** cartridge has primed if the cartridge was dry when added to the machine – if not, consider removing, shaking to eliminate clumping, and reattaching to the arms. • Check acid connector and **BiCart** arms for buildup and/or leaking. • Press fluid button and select Cond tab and see if the concentrate selected for the treatment is the same as the acid jug connected to the machine. • Wait until set conductivity is achieved. 💬 Note: When priming a **BiCart** cartridge during therapy, the **BiCart** arms must be closed for at least 2 seconds to initiate the priming process.
566	**Incorrect Conductivity** When the conductivity is not correct during a functional check.	
607	**Wrong Disinfectant** Check disinfectant. To continue press Confirm.	💬 Note: Always follow the manufacturer's instructions when reconstituting citric acid. • Ensure the correct type and concentration of disinfectant is connected to the machine – citric acid or bleach. • Verify that the citric acid wand is below the level of the fluid in the jug and that the jug is not empty. • If powder is found at the bottom of the citric acid jug, remove the wand and mix the jug. • Ensure **BiCart** holder arms are clean and closed fully. • Ensure acid and bicarbonate concentrate connnectors are clean and fully inserted in their ports. • Try using a different citric acid jug from a machine that did not alarm during heat citric disinfection. • Consider that crystallization of the citric acid wand may have occurred, and the line may have to be purged with RO water. • If unable to clear the alarm, perform a heat disinfection and contact Technical Services.
538 – 543	**Dialysate Line Sensor Test** Remove and attach the dialysate lines from the dialysate ports to restart the test.	• May occur if five disinfection programs have been run in a row, without running function checks in between. • Remove the dialysate lines from the dialysate ports on the machine and wait. • Ensure the lines are reseated properly. • Once reseated, the test will continue and message on screen will clear shortly.
571	**Leakage Test Failed** Check dialysate lines. To continue press Confirm.	• Appears when the dialysate lines are not properly attached to the dialysate ports. • Check the dialysate lines are properly attached to the dialysate ports. • Confirm the attention.

ADVANCED FUNCTIONS

- **Profiling**

  You can define the treatment parameter pattern through profiling. Ultrafiltration rate (UF rate), sodium (Na^+) concentration, and bicarbonate (HCO_3^-) concentration profiles can be used by the machine.

- **Profiling Settings/Activation**

  You may set up the profiling parameters immediately after the machine turns on and Function Check appears on the machine's status indicator. You may set up a model manually or select a preset model. You may set/adjust profiles for sodium (Na^+) concentration, bicarbonate (HCO_3^-) concentration, and UF rate for each model. The UF goal must be set up for treatment in order to use the ultrafiltration profile.
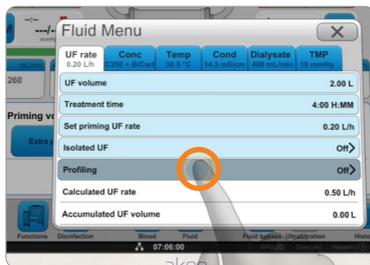
Ultrafiltration Profiling

1. Press the Fluid button.
2. Select the UF rate tab.
3. Press Profiling.
4. Press UF rate.
5. Press Mode.
6. Select the graph method (linear, step, or interval). If the profile is step or interval, select the number of steps or intervals according to the prescription.
7. Press OK.
8. Select the Start value for the UF rate. The Stop value for the UF rate will be automatically calculated in relation to the starting value.
9. Press Activate.
10. Change or set the profiles for Na^+ or HCO_3^-, if applicable.

   Note: You can create and use models by having an authorized technician preset the values for each profile.

WATCH VIDEO

- If UF goal or treatment time changes during active UF profiling, the profile parameters will change automatically.
- Always check the UF profile settings if UF goal or treatment time changes when a UF profile is activated.
- If the profile parameters have not changed and UF profiling reactivates, the UF profiling graph will change automatically according to the remaining UF goal and treatment time.
- Always check the UF profile settings after deactivating and reactivating a UF profile.
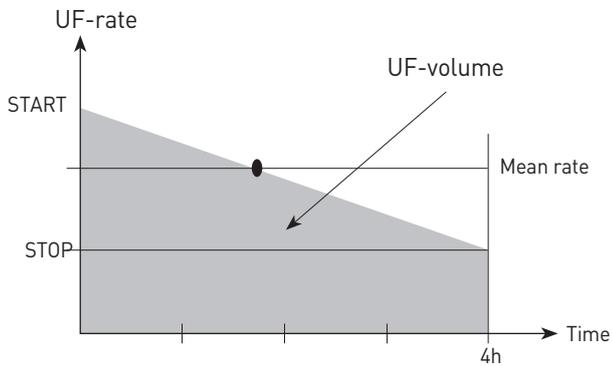
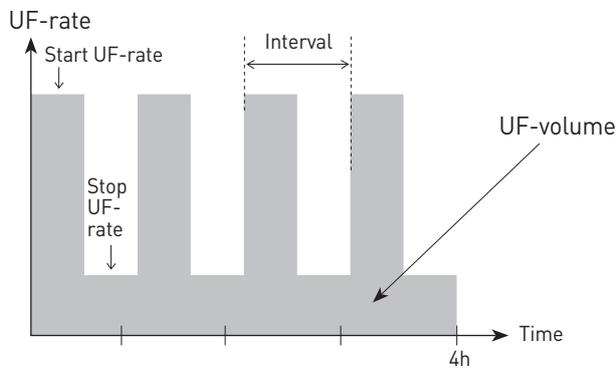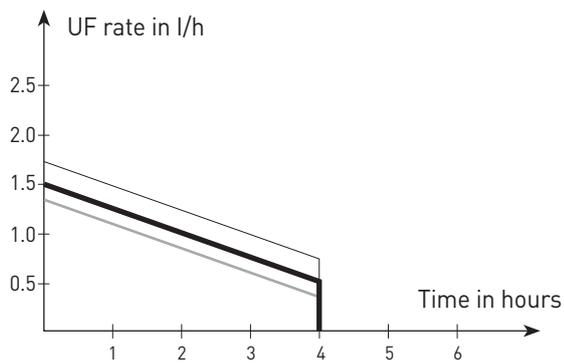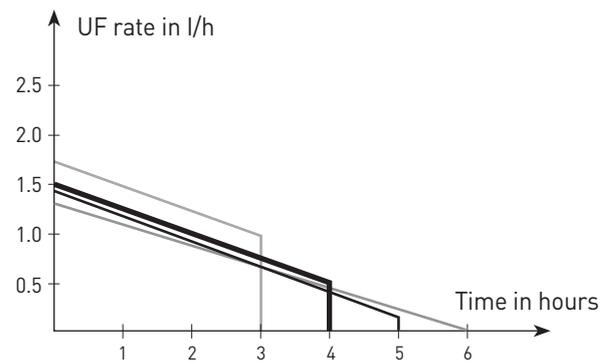**Decreasing linear mode for UF rate profiling**
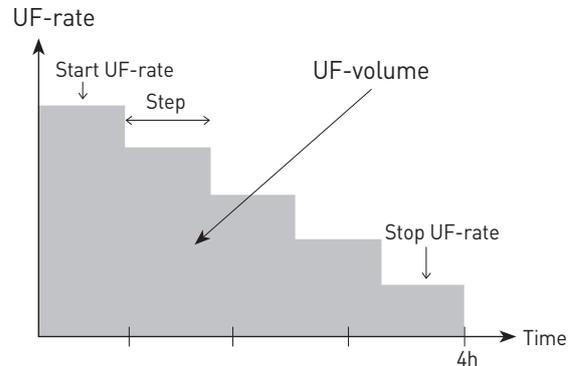
Decreasing step mode for UF rate profiling

Interval mode for UF rate profiling

UF rate in linear mode when UF goal is changed

UF rate in linear mode when treatment time is changed

ADVANCED FUNCTIONS

Profiling (cont.)

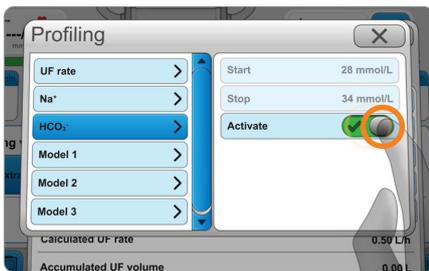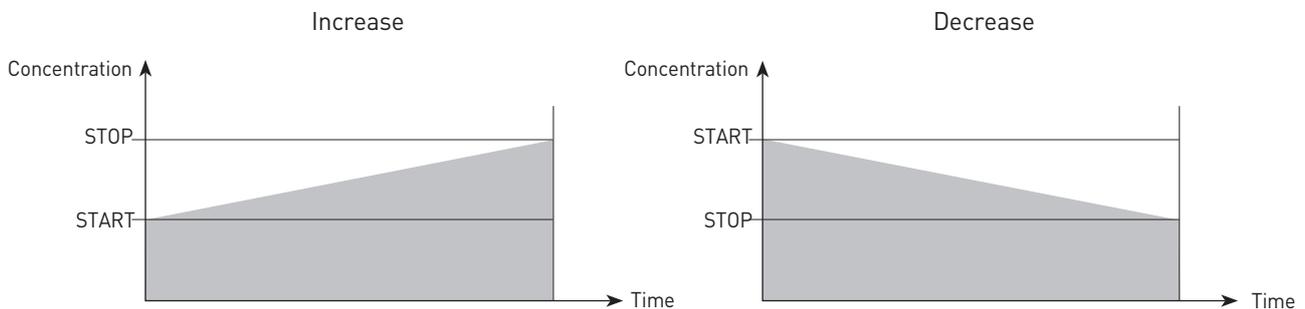### Sodium, Bicarbonate Profiling

1. Press the Fluid button.
2. Select the UF rate tab or Cond tab.

3. Press Profiling and press Sodium (Na^+) or Bicarbonate (HCO_3^-) to set up profiling.
4. Set up the Start and Stop values.
5. Press Activate.

   💬 Note: You can create and use models by having an authorized technician preset the values for each profile.

The sodium (Na^+) or bicarbonate (HCO_3^-) profiles may consist of increasing or decreasing concentrations in the dialysate.

Example of linear graphs for sodium and bicarbonate profiles

- If the treatment time changes during sodium and/or bicarbonate profiling, the profiling graph will not change.
- Therefore, even if the treatment time decreases, it will not reach the preset stop value.
- If sodium or bicarbonate profiling is deactivated during treatment, the machine will continue to run using the values from the point when profiling stopped, adjust per physician order.
- If profiling is reactivated without a change to the profiling parameters, the machine will continue to run from the point when profiling was deactivated.

ADVANCED FUNCTIONS

Diascan Monitoring System

- **Diascan** Function

  The **Diascan** function shows the estimated clearance value and calculates whether the set Kt/V target and minimum values can be reached at the end of treatment.

- **Diascan** Mechanism

  Since the molecular weights of urea and sodium are similar, the optional **Diascan** function enables non-invasive automatic monitoring of the sodium clearance rate, which is considered to be similar to the urea clearance rate.

- Kt/V Confirmation

  AK 98 can calculate the Kt/V as a single measurement or at intervals. To measure Kt/V, the urea distribution volume must be set. The distribution volume is the urea distribution volume (water in the body) in liters and is estimated for each patient based on the patient's dry weight. The user sets the distribution volume on the machine.

  Note: To get a reliable Kt/V value, enter the patient's distribution volume accurately into the machine. Because the **Diascan** measurement takes time, single measurements cannot be started with less than 30 minutes of treatment time remaining.

  Note: The **Diascan** function can be programmed via the presets to be activated automatically.

  Note: It is also possible to enter the patient parameters (Watson) after treatment has started so that the Kt/V calculation can be displayed.
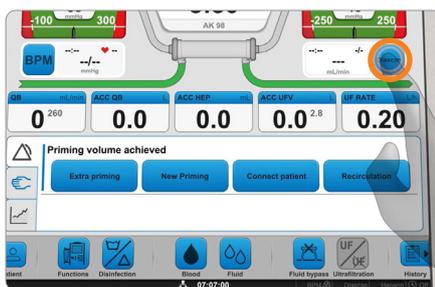
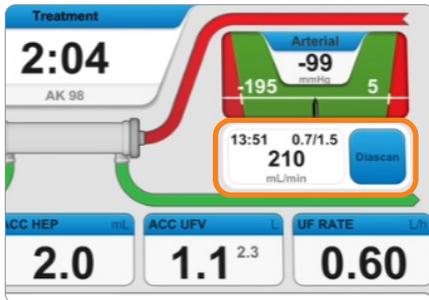|	
	1. Press the **Diascan** button.
	2. If you know the patient's distribution volume, press Distribution volume (manual) in the Setup tab and set the volume. If you need to calculate the patient's distribution volume, select the Watson tab and press Enter Parameters. 3. Enter the patient's information in the settings that appear on the screen. 4. Select the Setup tab and press Interval. **Note:** It is not necessary to activate the Alarm settings.
	5. Select between 30 or 60 minute intervals to activate the **Diascan** function. 6. Press Single to take a single measurement.

Diascan Monitoring System (cont.)

Results

The measurement results will appear in the clearance measurement output field.

① Time of Last Measurement

② Current/Estimated Kt/V at end of treatment

③ Last Measured Clearance Value

Check Measurement History

1. Press the **Diascan** button.
2. Select the History tab and press History.

ADVANCED FUNCTIONS

WATCH VIDEO

Isolated UF (Ultrafiltration)

During isolated UF, diffusion does not occur. Because the dialysate bypasses the dialyzer, the machine only performs ultrafiltration. During isolated UF, because the dialysate bypasses the dialyzer, the blood cannot maintain its temperature in the same way it does during diffusion. Since the UF rate is usually high during isolated UF, a high blood flow rate, within acceptable limits for the patient, is recommended to prevent clotting in the dialyzer and blood line. If dialysis (diffusion) is ordered after the isolated UF phase, when isolated UF is completed, the machine will automatically switch to the diffusion phase. Follow your protocol / prescription order.

1. Press the Fluid button.
2. Set the treatment time and ultrafiltration goal for dialysis (diffusion step).

3. Press Isolated UF.
4. Press the Isolated UF volume button, and set the ultrafiltration goal for the isolated UF step.
5. Press the Isolated UF Time button, and set the time for the Isolated UF step.

   💬 Note: The values are added to the set diffusion values or, if the other preset is used, the values will be taken from the set time and UF goal values.

6. Press Activate.
7. Verify accuracy of total treatment time (time + Isolated UF time) and total UF goal (UF volume + Isolated UF volume). Make adjustments, as needed.

How to add a second and subsequent phase of isolated UF

- Second and subsequent isolated UF phases may be activated at any point during treatment.
- The time and UF goal for the new phase must be added to the previous isolated UF time and UF goal to create a cumulative amount. For example, if the first phase was set to 30 minutes and 0.5 L, and the second phase to be set with the same values, the settings need to be 60 minutes and 1L, which is a total of two phases together.
- The values set for the second and subsequent phases must be greater than the accumulated isolated time and UF goal.

Isolated UF Deactivation

- Press the Fluid button. Press Isolated UF, and deactivate isolated UF.
- To stop UF before the set isolated UF goals are met, deactivate Isolated UF and change the time and volume to values that have already been achieved (i.e., Isolated UF Accumulated Values).
- If only isolated UF is being performed, the remaining treatment time must also be set to zero to get the "Treatment time expired" message.
- If "Value out of range. The value can't be higher than X.XX L" appears, first set the Total UF and then the Isolated UF goal.

   💬 Note: The dialysate flow will not stop, as **AK 98** needs dialysate to measure ultrafiltration. It is not possible nor advisable to decrease dialysate flow rate or set it to zero.

OTHER FUNCTIONS

Concentrate Standby Mode (CSBM)

AK 98 can be placed into concentrate standby mode. In concentrate standby mode, the concentrate is no longer used, and water consumption can be reduced. Concentrate standby mode can be activated when the functional check is done and the flow diagram turns green. When concentrate standby mode is active, a message will appear in the information field. The bypass path of the flow diagram will turn orange. After 1 hour in concentrate standby mode, the machine will automatically start preparing dialysate again. If blood is detected, concentrate standby mode cannot be activated. Concentrate standby mode can be activated manually, or preset to activate automatically. Recirculation and concentrate standby mode cannot occur simultaneously.

How to Activate / Reactivate Concentrate Standby Mode Manually

1. Press the Fluid button.

   Note: The machine can be preset to automatically activate concentrate standby mode.

2. Select the Dialysate tab.
3. Activate concentrate standby mode.
4. If reactivating, repeat every hour as needed and allowed by your procedure.

How to Exit Concentrate Standby Mode

1. Select the Information tab.
2. Press Confirm the message.

   Note: Do not stop the blood pump to Connect patient until the dialysate line is green.

Service Menu

You may explore and adjust some machine settings, and check the error list.

1. Press the Functions button.

2. Press Service to open the menu.

There are 4 functions offered: Set time, Daylight Savings time, Screen brightness, and Volume.

- **Set Time:** Select Set Time, open the keypad, and adjust the time of the system clock.
- **Daylight Savings Time:** Press Activate to activate daylight savings time. When activated, the clock will advance by 1 hour (used in the summer months). When deactivated, the standard time will be shown on the clock (used in the winter months).
- **Screen Brightness:** Move the slider to adjust the screen's brightness.
- **Volume:** Move the slider to adjust the speaker volume.

  💬 **Note:** The Set Time and Daylight Savings Time can only be utilized when the machine is not in treatment mode.
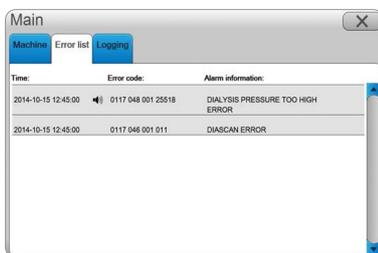
Error List

- **Time:** Shows the time when the error occurred.
- **Error Code:** The error code can identify the software or hardware component that caused the error.
- **Alarm (Error) Information:** Error messages that are displayed on the Error list tab. The most recent errors are shown at the top in black font. The list will be retained even if you turn off the machine or after a power outage.
  1. Press the Functions button.
  2. Press Service.
  3. Select the Error list tab.


Logging Tab

- You can select the parameters that will be logged. This function is used by the authorized service technician to check the condition and status of hardware or software components.
- This can also be used to check the charge level of the battery.

OTHER FUNCTIONS

Automatic Restart

What is the automatic restart?

The automatic restart is a recovery process of the **AK 98** program that usually completes in less than 1 minute. During this process, the screen turns off for ~10 seconds, the blood pump is stopped, and the **AK 98** machine is in a patient-safe state.
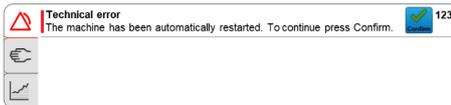
After the automatic restart is completed, a notification is provided:

- If the restart happens during functional check, priming, or treatment:
  - The alarm "123 Technical error - The machine has been automatically restarted" is displayed, with red light and alarm sound

- If the restart happens during disinfection:
  - The attention "586 Restarted after power failure" is displayed, with yellow light

  📋 Note: The automatic restart is logged in the error list as "HEARTBEAT ERROR - MACHINE RESTARTED".

- The automatic restart may happen rarely and randomly, and it is important to report to clinical staff.

- If the automatic restart occurs more than 3 times within a 30-day period, the **AK 98** machine will not allow treatment and the alarm "124 Technical error" will be displayed, with red light and alarm sound.

Why may the automatic restart happen?

The **AK 98** program includes an internal safety process, called a "Heartbeat", to ensure there is healthy communication between the different electronic sub-systems inside the machine; whenever a malfunction is suspected, the **AK 98** system triggers an automatic restart.

📋 Note: The term "Heartbeat" refers exclusively to a technical process intended to check correct functioning of internal electronics and is NOT related to any heart-related clinical parameter of the patient.

How to manage the automatic restart during treatment?

1. Wait for the process to complete – do NOT press the Halt button on the back of the machine.

2. After the automatic restart is complete, press the Confirm button and check treatment parameters. The blood pump will restart automatically, and the **AK 98** machine will continue the treatment from where it was interrupted.

3. If the alarm "124 Technical error" is displayed, discontinue the treatment, and return the blood, following your procedure.

Ultrafiltration (UF) Rate Limits

If the UF rate goes down to zero during treatment, due to alarm conditions, the machine will try to compensate for the time loss within the remaining time. A high UF rate limit is automatically calculated and set as 120% of the calculated UF rate. This limit is the allowable UF rate during treatment with the given remaining UF goal and treatment time.

The UF rate will go down to zero when:
- the UF is manually stopped
- the self-check is done every 30 minutes (UF taration)
- the blood pump is stopped
- the dialysate is in bypass
- the UF goal is achieved

📋 Note: All actual values displayed are for a given moment in time and may therefore fluctuate.

OTHER FUNCTIONS

## Blood Pressure Measurement (BPM) Alarm Limit Setting

If allowed, you may set upper and lower limits for alarms for the pulse, systolic, diastolic, and mean blood pressure. An alarm will occur when the value is outside the set alarm limits.

1. Press the BPM button.
2. Select the Alarm tab.
3. Press Set Limits.
4. After selecting the alarm limit that you wish to set, enter the alarm limit value.
5. Press OK.
6. Repeat Steps 4 and 5 for all alarm limits that you wish to set. Close the limit setup menu.
7. Press the Alarm Limit Activate button for the alarm limit to activate the new settings.

   Note: All treatment parameters and alarm limits are reset to the default values when the machine is restarted and a new treatment is started.

Actual Blood Flow
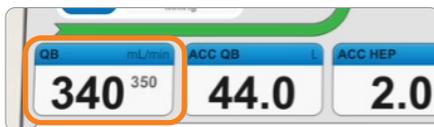
The actual blood flow, also referred to as the compensated blood flow, is calculated from the blood pump rotations and the pump segment diameter and compensated with the pre-pump arterial pressure.

The actual blood flow is shown in large bold text in the QB treatment overview field, while the set blood flow rate is shown in small gray text.

HELPFUL TIPS

Air Detector Activation

To avoid unnecessary air detector alarms during set up, wait to activate the air detector until all air has been removed from the circuit.

💬 **Note:** Once the air detector test is done, the air detector will be automatically activated either when priming volume is achieved or when Connect patient is selected after recirculation.

The "Flashing" Attention Hand
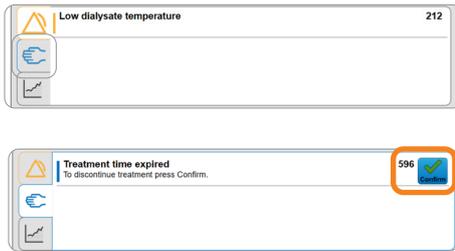
- Alarms have higher priority than attention messages on the screen.
- If an alarm occurs and cannot be resolved and you choose to return the blood to the patient, the "Confirm treatment time expired" message will appear after you set the treatment time to zero.
- The flashing attention hand will appear. Press the flashing attention hand and follow the on-screen prompts.

  💬 **Note:** It may be necessary to repeat this sequence to complete the treatment discontinuation procedure.

Conductivity Actual and Calculated - C/P Values
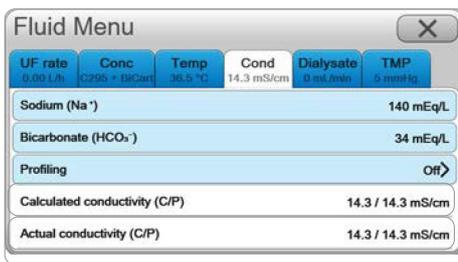
- The actual value is the current value seen on the operator's panel.
- The calculated value is based on the type of concentrate selected and the set values for sodium and bicarbonate.

  💬 **Note:** If the values are not within an acceptable range, the dialysate will bypass the dialyzer. Follow your procedure for allowable limits.

Heparin Delivery
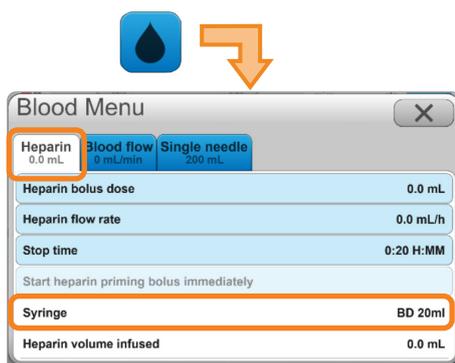
Tips to support accurate heparin delivery:

- Ensure the syringe used matches the brand and size programmed into the **AK 98** presets, or the heparin delivery may not be accurate.
- Confirm that heparin line is fully primed.

  💬 **Note:** Prime volume is 0.6mL.

- To view the syringe brand and size, go to Blood Menu and select Heparin.
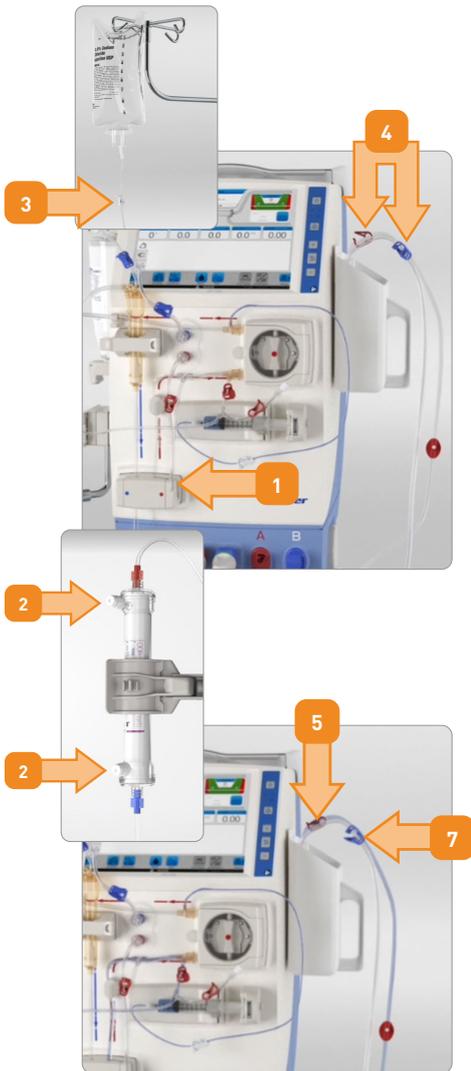
Restart Using the On/Off Button

- If restarting using the On/Off button located on the operator's panel, to the right of the screen, ensure the dialysate lines are properly connected to the color-coded standby ports on the machine before restarting the **AK 98**. This will avoid unnecessary error messages.

HELPFUL TIPS

Saline Loss

The arterial patient line is primed by gravity and is not counted in the preset prime volume.

Example: If the priming volume is set to 300 ml, the remaining saline volume in a 1-liter saline bag after the complete prime procedure would be less than 700 ml.

Tips to minimize saline loss during set up:

1. Verify the venous line is properly inserted in the venous clamp.
2. Ensure the caps are secured on the dialyzer dialysate ports.
3. Clamp the infusion line before spiking the saline bag.
4. Ensure the arterial bloodline clamp is open and venous clamp is closed when gravity priming of arterial line.
5. Clamp the arterial line as soon as saline has reached the prime bucket (some air may still be present).
6. Ensure priming via the blood pump occurs as soon as the arterial line is primed.
7. Unclamp the blue venous clamp before starting the blood pump.
8. Raise the venous chamber level during the initial prime cycle.
9. When Prime volume has been achieved, connect arterial and venous lines for recirculation before selecting the Recirculation option.

## Surface Cleaning and Disinfection

The exterior surfaces should be cleaned after treatment, using wipes moistened with ethanol (70%), isopropanol (60%), or sodium hypochlorite (1%).

Note: Highly saturated wipes may cause fluid to drip along sensitive components of the blood panel, like the priming detector highlighted on the picture. Residual detergent and/or film remaining on the priming detector may result in incorrect detection of blood, which could result in unnecessary alarms and interfere with the priming process.

- After cleaning the external surface of the machine and the allotted contact time has passed, ensure the venous line priming detector lens is wiped with an isopropanol alcohol pad to remove any residual cleaning agent.

HEMODIALYSIS BASICS

How Hemodialysis Works
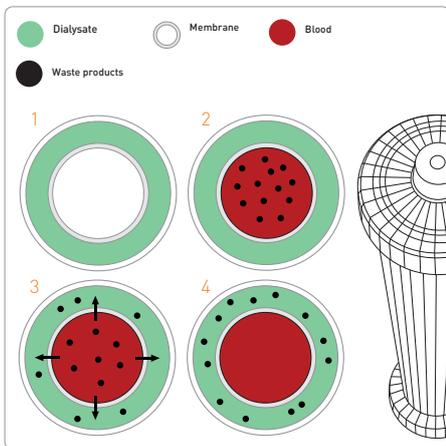
In hemodialysis, the cleaning of the blood takes place outside the body in an "artificial kidney", called a dialyzer. Blood is pumped via disposable circuit to the dialyzer and back again, a process monitored and controlled by a dialysis machine.

During the treatment blood flows on one side of a semi-permeable membrane within the dialyzer. The dialysis machine mixes a fluid known as dialysate and passes it through the dialyzer on the other side of the membrane.

Waste products and excess fluid pass across the membrane from the blood into the dialysate fluid. The cleaned blood is returned to the body and the waste products and fluid are removed from the system.

As the dialysate is free from waste products, a concentration difference is created across the membrane. This makes the waste products move by diffusion from the blood, through the membrane and into the dialysate. When the treatment starts, besides waste products, the patient's blood also contains excess fluid. To remove the fluid, a pressure gradient is applied across the membrane in the dialyzer. This forces water to leave the blood and enter the dialysate by the process of ultrafiltration. The amount of fluid ultrafiltered during the entire treatment session should correspond to the excess volume.

The Dialyzer
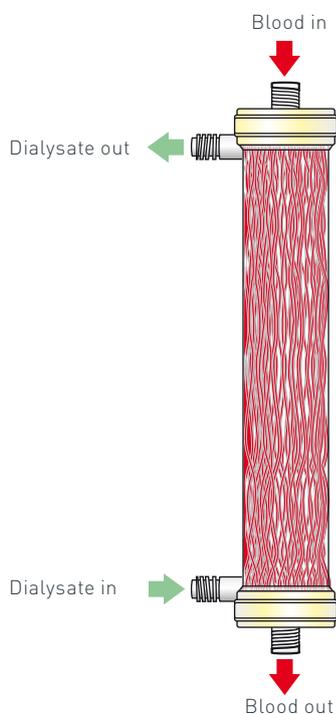
This is a small plastic cylinder which attaches to the disposable circuit.

A dialyzer contains many fibers of a semi-permeable membrane.

This membrane is a thin film containing thousands of microscopic holes (pores). The pores allow water and waste products to pass through them but keep the blood cells and proteins within the blood.

Fluid is removed from the blood by ultrafiltration driven by a pressure gradient, TMP (transmembrane pressure), across the membrane.

Dialysate passes continuously through the dialyzer on the other side of the membrane.

All dialyzers have four external ports, two that allow blood to enter and exit the dialyzer and two that allow dialysate to enter and exit the dialyzer.

The dialysate flows through the dialyzer in the opposite direction to the blood, also known as counter-current.
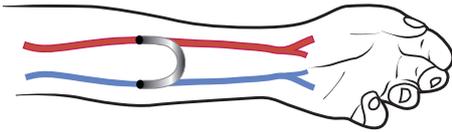
HEMODIALYSIS BASICS

Blood Access Types
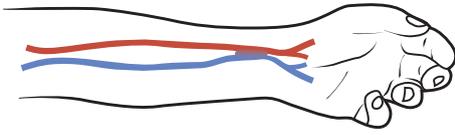
AV-fistula

This is the recommended type of access. The artery (red) has been connected to a superficial vein (blue), and after a maturation period the vein has become arterialized with thicker walls and larger diameter.

Graft

The connection between artery and vein is made through a tube made either of an artificial material, or from part of one of the patient's blood vessels.
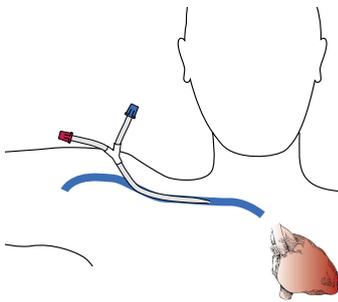
Catheter

Usually inserted into a vein in the neck or shoulder.

Typically, hemodialysis patients are administered heparin to reduce potential clotting during treatment.

💬 **Note:** The time the blood pump is stopped during treatment should be minimized to reduce the risk of clotting.

Different Components of the Hemodialysis System

A dialysis machine is needed to perform hemodialysis.

If the dialyzer is the kidney, the machine could be said to correspond to the rest of the body, providing the kidney with blood and controlling the whole process.
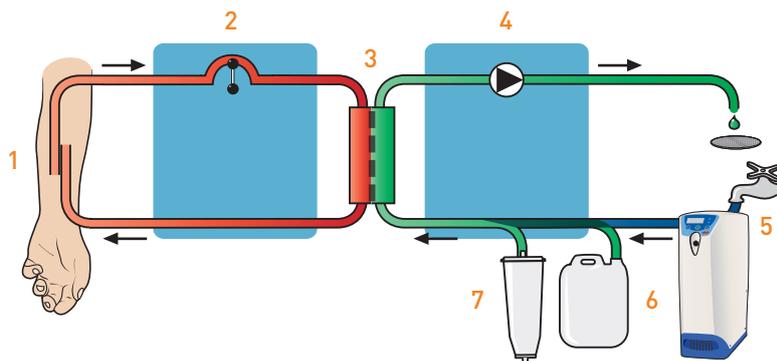
1. **The access:** the means by which blood is removed and returned to the body.
2. **The blood monitor:** pumps blood through a disposable circuit at a continuous, controlled speed from the access, through the dialyzer and back to the access.
3. **The dialyzer:** is connected within the disposable circuit. This is where waste products and excess fluid are removed from the blood.
4. **The fluid circuit:** prepares and pumps the dialysate through the dialyzer and out to drain.
5. **The reverse osmosis unit:** provides a continuous flow of pure or ultrapure water to the dialysis machine during treatment and disinfection.
6. **A-concentrate:** contains electrolytes, including sodium, potassium, calcium, magnesium chloride and acetic acid.
7. **B-concentrate:** contains the buffer bicarbonate and sodium.
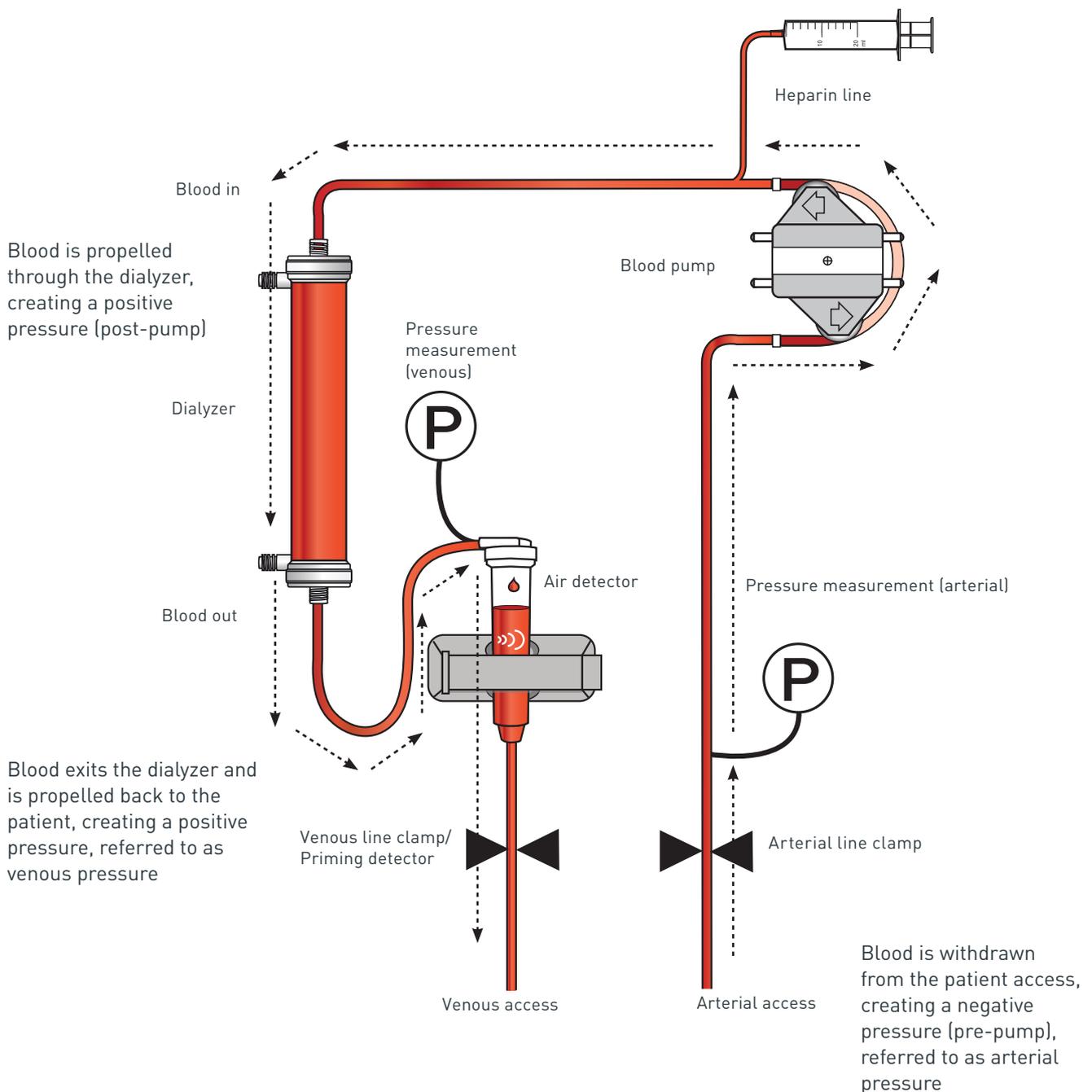
HEMODIALYSIS BASICS

The Blood Monitor

The blood monitor controls and supervises the entire blood circuit.

The purpose of the blood monitor is to pass blood from the access through the arterial blood line to the dialyzer, after which it is returned to the patient via the venous blood line. This is done at a continuous flow and controlled speed.

The blood pump is placed before the dialyzer.

Safety features built into the system monitor the pressure of the blood flow coming out of and returning to the access.

An air detector is incorporated into the blood circuit in order to prevent possible air being returned to the patient.

Heparin line

Blood in

Blood is propelled through the dialyzer, creating a positive pressure (post-pump)

Blood pump

Pressure measurement (venous)

Dialyzer

Air detector

Pressure measurement (arterial)

Blood out

Blood exits the dialyzer and is propelled back to the patient, creating a positive pressure, referred to as venous pressure

Venous line clamp/ Priming detector

Arterial line clamp

Venous access

Arterial access

Blood is withdrawn from the patient access, creating a negative pressure (pre-pump), referred to as arterial pressure

HEMODIALYSIS BASICS

The Fluid Monitor

The purpose of the fluid monitor is to prepare dialysate and continuously pass it through the dialyzer and out to drain.

Pure or ultrapure water is taken into the machine and mixed with acid and bicarbonate concentrates.

The fluid is monitored to ensure the concentration of electrolytes is correct. It is then warmed to body temperature and passed via the dialysate lines to the dialyzer.

The amount of fluid removed in the dialyzer is measured and controlled and the waste fluid is passed to the drain.

The functions of the fluid unit are:

1. To produce dialysate in the correct concentration and at the right temperature
2. To pass the fluid through the dialyzer at a continuous controlled flow
3. To monitor and control fluid removal
4. To monitor the dialysate for problems

Blood in

Dialysate out

Waste products

Excess fluid

Electrolytes

Bicarbonate

Dialysate in

Blood out
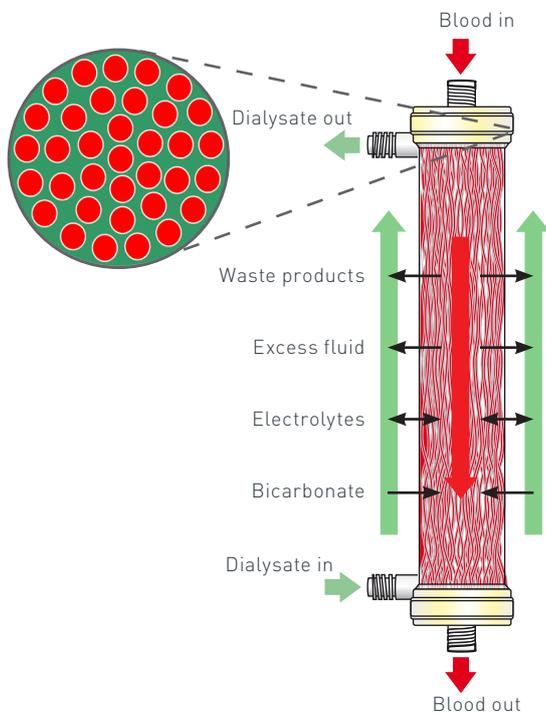
The Dialysate

As well as removing waste products and fluid from the blood, the dialysate corrects the imbalance of various electrolytes within the body.

This is achieved by adding these electrolytes to the dialysate. The fluid monitor mixes water with concentrates taken from one or two canisters or cartridges. By varying the concentration of electrolytes in the concentrate, the imbalance can be corrected (A and B concentrates).

Some solutes will move from the blood into the dialysate whilst others will move in the opposite direction.

HEMODIALYSIS BASICS

The Water Supply

Note: Image is representative of facilities that use a portable RO system.

The water used for dialysis must be of a high quality since the water is used to prepare dialysate.

A hemodialysis patient is exposed to several hundred liters of dialysate per week, which is separated from the blood only by a thin membrane.

The incoming water is therefore purified before it is used by the dialysis machine in a reverse osmosis (RO) and deionization units. This device uses a semipermeable membrane that allows the passage of water but removes most other contaminants.

Pretreatment of the water may be required before it enters the RO unit.

- A water softener to remove water hardness, including calcium and magnesium ions
- A carbon filter to remove chlorine and chloramines
- A sediment filter to remove particulate matter

The water should be analyzed on a regular basis, both from a chemical and microbiological standpoint, to ensure that it complies with relevant standards for dialysis water.

Efficiency of Hemodialysis

How do we know that the prescription and the treatment are adequate?

To accomplish a satisfactory dialysis treatment, four things have to be achieved:

1. Adequate removal of excess fluid
2. Adequate removal of unwanted solutes i.e., waste products
3. Correct electrolyte (salt) imbalances
4. Restore buffer (bicarbonate) balance

   Note: The time the blood pump is stopped as well as the time the dialysate is bypassed will reduce the effective treatment time.

Removal of excess fluid

Accurate weight and assessment of fluid balance must be performed prior to initiating a treatment.

The fluid volume to be removed, the UF goal, is calculated from the weight gain since the last treatment, to which is added the volume of the fluids used during the session as well as any additional infusions.

The target weight is called dry weight. This is the lowest tolerated post dialysis weight (achieved via gradual change in post dialysis weight) at which there are minimal signs or symptoms of hypovolemia or hypervolemia.

When the UF goal is set, the machine can calculate the required UF rate by considering the treatment time, normally between 3 and 4 hours for conventional HD.

Efficiency of Hemodialysis (cont.)

Solute removal

The removal of solutes is directly impacted by the prescribed blood flow (QB).

One common waste is urea, which results from the breakdown of protein.

The simplest way to follow the urea removal is to analyze and compare the blood urea concentrations before (pre) and after (post) dialysis.

The results of the pre and post blood tests can be entered into one of two main calculations to establish efficient delivery of therapy.

These calculations are

• Urea reduction ratio (URR)

• Urea kinetic modeling (Kt/V)

The URR measures the level of urea in the blood before and after a treatment. The difference between the two levels is shown as a percent.

The Kt/V is calculated by multiplying the amount of waste removed by the treatment time. The result is divided by the estimated volume of water in the body.

• The K stands for clearance of urea

• The t stands for treatment time

• The V stands for the volume of the body water

> 💬 Note: The **AK 98** dialysis machine has a feature integrated that can provide information on the efficiency of the treatment. The **Diascan** monitoring system can be used for theoretical clearance measurement (K) and (Kt/V).

> 💬 Note: Clearance describes the cleansing capacity of a dialyzer with consideration to the blood flow and dialysate flow rates.
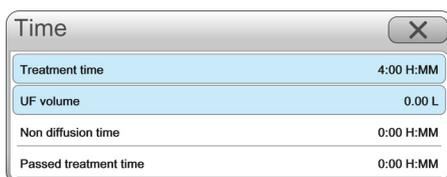
Time	✕
Treatment time	4:00 H:MM
UF volume	0.00 L
Non diffusion time	0:00 H:MM
Passed treatment time	0:00 H:MM

Several factors facilitate the efficiency of a dialysis treatment. Those parameters can also be checked on the **AK 98** dialysis machine.

The non-diffusion time:

This is the time during the treatment when no dialysis has occurred when the blood pump is stopped or when the dialysate is bypassed. This may be due to:

• An alarm that has put the dialysate in bypass (e.g., a conductivity alarm)

• An alarm that has stopped the blood pump (e.g., an arterial pressure alarm)

ACC QB L
9.0

The Accumulated Blood Volume (ACC QB) is:

Blood flow (ml/minute) x Time (minutes)

• To achieve an efficient solute removal the blood flow rate, QB, should be maintained per provider order, as dialysis access will allow.

• The length of the treatment is prescribed by a physician to achieve efficient solute and fluid removal appropriate for the individual patient.

• A stopped blood pump or reduced blood flow will also reduce the accumulated blood volume processed.

Notes

RESOURCES

Scan or click QR code to view
AK 98 resources and training videos.

renalcareus.baxter.com/ak98#resources

CONTACT US

For current product listing,
visit **ecatalog.vantive.com** or contact
your local Baxter sales representative
at **1-888-736-2543**.

For Technical Support,
call **1-800-525-2623 Option #2** or
email **COtechsupport@baxter.com**.

For Renal Clinical Helpline,
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US-RC4-220021 (v2.0) 03/2024