

Conductivity Calibration and Temperature Coefficients

Are you calibrating your machines accurately?

You've properly calibrated your dialysis meter and then calibrate a dialysis machine using the meter. This means that the machine will be accurately calibrated, right? Not necessarily.

The Temperature Coefficient

A solution's conductivity will change according to temperature. With increasing temperatures, the measured solution's conductivity will increase, too. To achieve meaningful measurement results, the conductivity value displayed on your meter is compensated to 25°C. In other words, the display is always converted to a solution temperature of 25°C. The temperature coefficient which the displayed value is compensated with is expressed as %/°C. Unfortunately however, different solutions also have different temperature coefficients. To achieve an exact display, the meter will have to be adjusted to the temperature coefficient of the current solution. The average temperature coefficient for dialysates is 2.07 %/°C. Unfortunately, most meters (except the models made by IBP Medical) do not have adjustable temperature coefficients.

For naturally occurring solutions, a value of 1.97 %/°C is frequently used. Many measuring devices not specially tailored to dialysis will use this value. The calculations below show the drastic effects of an incorrect temperature coefficient.

Example calculation for an incorrect temperature coefficient, using a dialysate with a temperature coefficient of 2.07 %/°C:

Conductivity of Solution	Temperature of Solution	Coefficient of Instrument	Display of Instrument	Difference in Values
14 ms/cm	37 °C	2.07 %/°C	14.00 ms/cm	0.00 %
14 ms/cm	37 °C	1.97 %/°C	14.17 ms/cm	1.21%

Temperature coefficients used by most major hemodialysis machine manufacturers include:

Baxter	2.20%/°C
B.Braun	2.10%/°C
Fresenius	2.10%/°C
Gambro AK Series	1,80%/°C
Gambro Phoenix	2.07%/°C
Hospal	2.07%/°C
Nikkiso	
Bicarb. Cond.	2.20%/°C
Total Cond.	2.05%/°C

These are merely examples and we recommend that you doublecheck this data with documentation from your machine's manufacturer.

Possible Errors

As indicated above, the error is 1.21% due to the improper temperature coefficient. In combination with other factors such as meter accuracy, improper reference solutions accuracy and usage your "calibrated" dialysis machine may be out of calibration by several percent. Is this acceptable?

Ask your nephrologist if he or she can accept a deviation of up to 3% in sodium. I would assume that most nephrologists would never tolerate this. Thus, our calculation example illustrates that the user must set the temperature coefficient correctly in order to ensure accurate conductivity.

Which temperature coefficient you should use?

If you have machines from one manufacturer, use the temperature coefficient that the dialysis machine uses for compensation. This information may be obtained from your manufacturer or the documentation that came with your dialysis machine.

If you have different types of dialysis machines in your unit the most practical solution is to use a temperature coefficient of 2.07 %/°C for all machines. This avoids confusion with different readings of conductivity on different machines.

The HDM97 and HDM99 from IBP Medical are the only dialysis meters offering a user-selectable temperature coefficient for the highest possible accuracy in machine calibrations.