pH measurement system

pH is measured every day and everywhere, but do you really know what is measured?

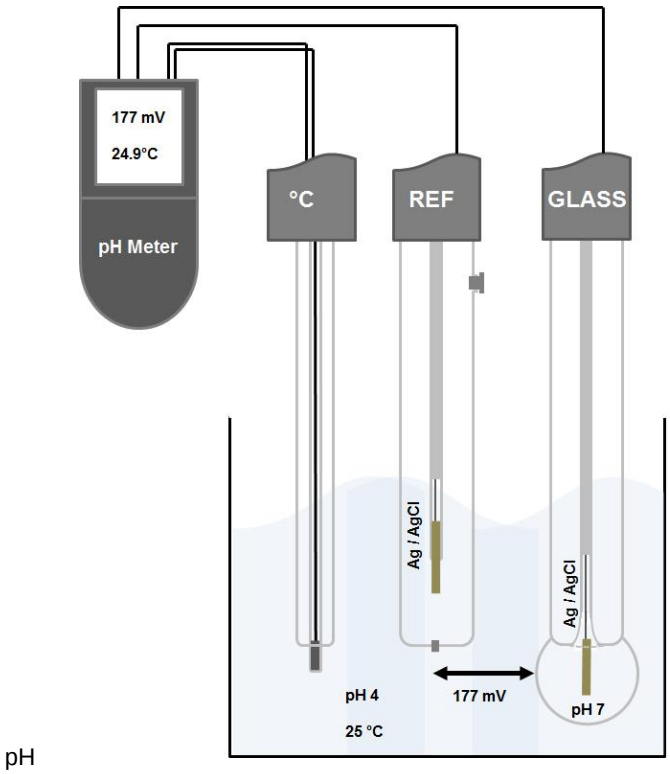
The combination of a glass and reference electrode develops a specific mV potential, which depends on the H+ concentration in the sample solution. The pH meter detects this mV potential and displays it. So we have a mV potential, but how do we get a pH value?

Because of the “real” behavior of the pH electrode parts, (not ideal or theoretical) the measurement chain must be calibrated with pH buffer solutions. The temperature variation of the pH of buffers is known. We know the pH value and measure the mV potential over the pH range we need. This curve can be analyzed and its slope and intercept (offset) can be calculated. The next measured mV potential of our sample can be converted into pH by (T = temperature):

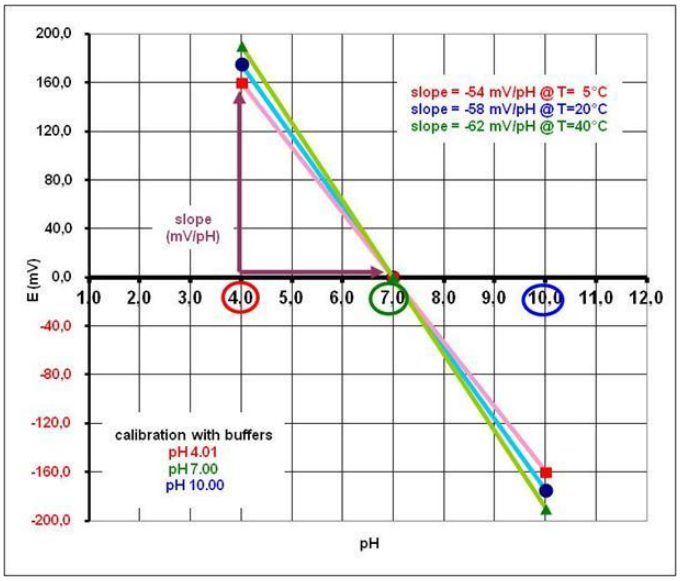
$$pH(T) = \frac{\text{offset}(T) - \text{measured potential}(T)}{\text{slope}(T)}$$

The table shows three pH buffers, the measured mV potential and the temperature 5°C, 20°C and 40°C. Slope and offset are calculated using a linear regression function. With the calibration data the pH meter converts each measured mV potential of your samples into the right pH value.

pH buffer	mV @20°C	mV @5°C	mV @40°C
4,010	175,0	160,0	190,0
7,000	0,0	0,0	0,0
10,012	-175,0	-160,0	-190,0
slope	-58,31	-53,32	-63,31
offset	408,6	373,6	443,6



measurement with 3 individual sensors
pH, reference, temperature



Temperature dependence
of the slope parameter

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TECHNICAL NOTE

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