

How to obtain an accurate pH measurement?

The measurement of the pH with a glass electrode depends on several items:

- The pH meter
- The electrode, its quality and condition
- The pH buffers used for the calibration
- The user's handlings ...

All these parameters will influence the accuracy. Only good products (reliable meter, electrode and solutions), a correct use, regular calibration and verification, a good maintenance, will help to keep the measurement error as low as possible.

The pH meter

A good qualitative meter is the smallest error introduced in the pH measurement system. The error of the device is to be seen as relative to the nearest calibration points. It depends on:

- the reproducibility at the calibration points,
- the measurement linearity between and outside the calibration points.

As example, a pH meter with an accuracy given as (0.2%+1 digit) and a resolution of 0.01 pH. It depends on the reproducibility at the calibration points (± 0.01 , 1 digit) and the linearity between and outside the calibration points (0.2%). When a calibration is done at pH 7.00 and pH 4.00, the device error at these same points is ± 0.01 pH. For a measurement at 5.50 pH, the device error is $((1.50 * 0.002) + 0.01) = 0.013$ pH.

The pH electrode

The construction, maintenance, lifetime and application will all influence the accuracy of the electrode, its reproducibility and linearity. Therefore can an electrode manufacturer only guarantee a pH error between 0.01 and 0.1 pH, depending on the electrode's model, for a new electrode!

The electrodes have a pH sensitive **glass membrane** that can be round, flat, large, small, pointed, The larger the surface contact of the pH membrane is, the better the electrode usually will be. Also are there different types of glass that can make a big difference for the required application. Always check whether using the correct electrode for your application [Application guide](#).

Another important part of the electrode is the reference electrode and its diaphragm. The pH measurement at the glass membrane is done against this reference electrode. There exists many different reference fluid contacts such as a frit junction, ceramic junction, sleeve junction, open junction, ... Also here can be told that the better the contact is, the better the measurement will be.

Poor maintenance or wrong use of the electrodes might lead to poisoning of the reference electrode, coating of the electrode's bulb, blocking/narrowing the measurement's surface, ... (see [pH Electrode Maintenance](#)).

Store the cleaned electrodes in the reference filling solution to keep the membrane in a optimum

condition

The pH buffers

It is advised to calibrate the meter with the electrode using buffers that cover or are near to the measurements to be performed and/or to be acquired. Use at least 2 buffers or more when measuring in a larger pH range.

Check the accuracy of the pH buffers to know the possible measurement errors. Measuring between 2 buffers, used for the calibration, with an accuracy of 0.02 pH will introduce a measurement error of 0.04 pH.

The user

Follow the [Good Measurement Practices](#) to make sure the calibration is done in the best conditions as possible. Don't rush the calibration to make sure all values are correctly registered by the meter.

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