

# How temperature affects measurement results

## Problem

The air and sample temperature can affect the analysis result. Results may come out too high or too low.

## Solution

Observe the notes in the user instructions. Use a thermostat if required to achieve the correct temperature.

## Benefits

Sticking to the correct temperature as precisely as possible improves the accuracy of your measurement results!

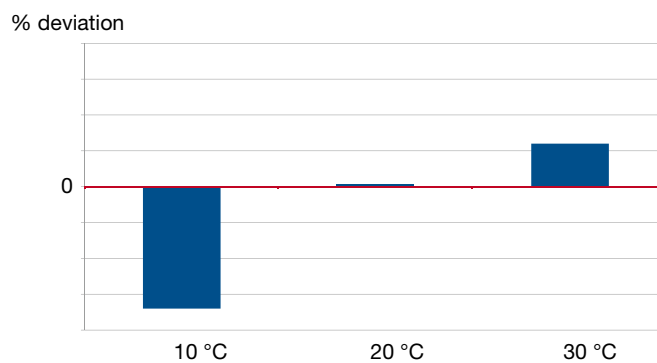
## Background

Laboratory equipment that is used to measure volumes, such as pipettes or volumetric flasks, is calibrated to a temperature of 20 °C. This means that any solution that you want to measure must be as close to this temperature as possible. Any sample that has just been removed from cold receiving waters must be brought up to temperature before being pipetted. The same applies to hot electroplating baths. All Hach® cuvette tests are also calibrated at 20 °C.

The temperature affects not only the volume but also the speed of the chemical reaction. In some cases, lower temperatures produce results that are too low; higher temperatures, in contrast, may produce results that are too high. The solution in the cuvette should therefore ideally be at 20 °C when it is measured in the photometer.

Digestion is carried out beforehand for some parameters. Before a COD cuvette, for example, is placed in the photometer for analysis, it should be cooled to room temperature. But what is "room temperature"? Room temperature is commonly defined as the temperature range 15–25 °C. Depending on the region and time of year, the temperatures in some companies may actually fall outside this temperature range. The sample must be brought to the correct temperature in these situations to achieve accurate results.

## Typical effect of temperature when determining ammonium using the salicylate method



Temperature of reagents, sample and/or environment

10 °C: fresh from the refrigerator

20 °C: optimum

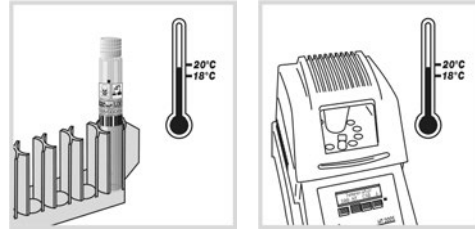
30 °C: summer heat in measuring rooms without air conditioning

**How do I get the correct results?**

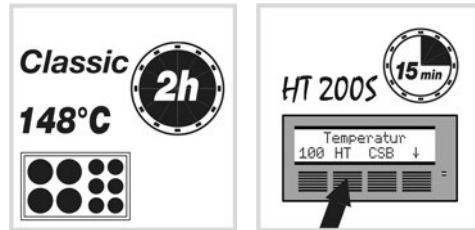
For parameters that do not require digestion (e. g. ammonium or nitrate), both the water sample and the reagents for the cuvette test must be at room temperature. For example, you should not use reagents and samples taken straight from the refrigerator (too cold = results may be too low) or any that have just been exposed to heat or direct sunlight (too warm = results may be too high).

With COD, the cuvette should be shaken after digestion in the thermostat (2 h at 148 °C or 15 min at 170 °C in the HT200S) while it is still hot, in order to accelerate the formation of precipitation and to prevent any streaks from forming due to water vapour condensation. Then allow the cuvettes to cool down to room temperature and do not analyse them too soon (i. e. too warm = results may be too high) in the photometer. This also applies to other parameters after digestion, e. g. for total P.

You should ideally temper all cuvettes using a water bath or a thermostat that is set to 20°C (e. g. the Hach LT20 thermostat). In the HT200S high-temperature thermostat, the built-in blower automatically cools the cuvettes down.



*Directions regarding handling and temperatures are found in every package of reagents.*



*Using the HT200S high-temperature thermostat cuts the digestion time to 15 minutes!*



*LT20 thermostat for tempering 13 mm cuvettes to 20 °C*



*LT200 thermostat for classic digestion at 100 or 148 °C*



*HT200S thermostat for reduced digestion time at temperatures of up to 170 °C*



We can provide a regular inspection service for your thermostats. Please contact us.