SARTORIUS

Application Highlight

Preparation of standards, also called reference samples, of known concentrations is a common routine procedure in analytical laboratories. Internal or external standards with very low concentrations are used in these laboratories for highly sensitive quantitative analytical methods to exactly determine the concentration of chemical components in samples using highly sensitive quantitative analytical procedures.

Standard Preparation

External standards are separate samples used for comparison to test samples, whereas internal standards are added to the samples to be analyzed. However, all standards have a defined concentration of one or several known component(s). The concentration of these standards must be as accurate as possible to prevent subsequent errors in determining unknown concentrations in samples.

Also the preparation of standards is routine work in analytical laboratories two problems can occur when standards are manually prepared from soluble solids:

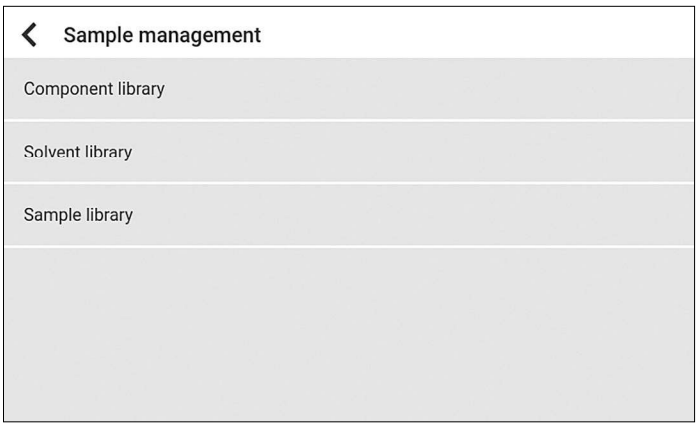
1. The required weight of the soluble component(s) is calculated based on the desired final component(s) concentration and the final solution volume. The decisive problem is the weighing process of the solid component(s). Normally, high-resolution laboratory balances with an accuracy of several decimal places are used to measure the exact weight and it is almost impossible to reach the target weight exactly to the last digit during weighing in a component. Most often the measured component weight exceeds the target weight because users don't want to weigh in less than required but don't hit exactly the target weight. Especially when preparing mixed standards it is not possible to remove excessive material from the vessel without impairing the component(s) final concentration(s).

2. If the component weight does not precisely equal the calculated weight, the volume of solvent has to be adjusted to reach the desired final concentration. Recalculation of the required solvent volume is time consuming and is a possible source of error as many factors must be considered. Depending on the type of concentration specified, various parameters need to be taken into account, such as the desired concentration, purity of the substance, amount actually weighed and possibly even the molecular weight. For inexperienced users, recalculation of the component weight is usually takes considerable time, whereas experienced users commonly find this a boring task so inadvertent errors can easily creep in.

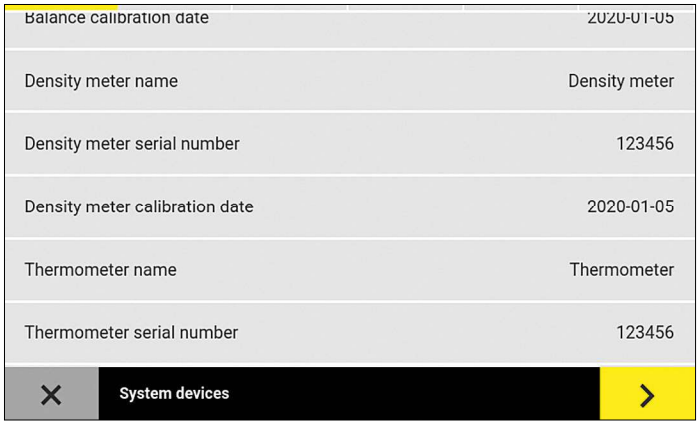
The Cubis® MCA software Standard preparation (QAPP001) is designed to eliminate the described problems.
The system guides the user automatically throughout the entire process of preparing standards, and the application software automatically takes care of all calculations in the background. There is no need to reach the target weight exactly as the software automatically calculates the required solvent volume based on the gravimetrically measured component(s) weight(s). After the user applied the solvent the added weight is gravimetrically checked and using this value the verified concentration(s) and the verified volume of the standard prepared is calculated.

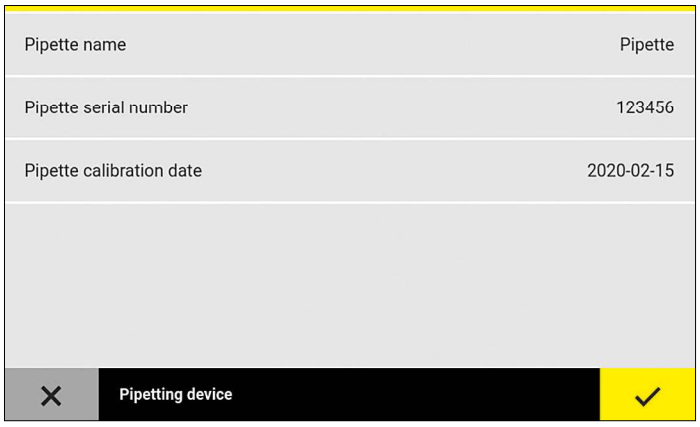
The Standard preparation application works with database to save components, solvents and samples. Components are defined by name, molecular weight and purity and solvents by name and density. For 58 frequently used solvents names and density values at standard room temperature are preset in the database and can be selected by users for defining samples.

Each sample consists of one solvent and at least one component and up to 20 components can be selected for each sample for the preparation of mixed standards.

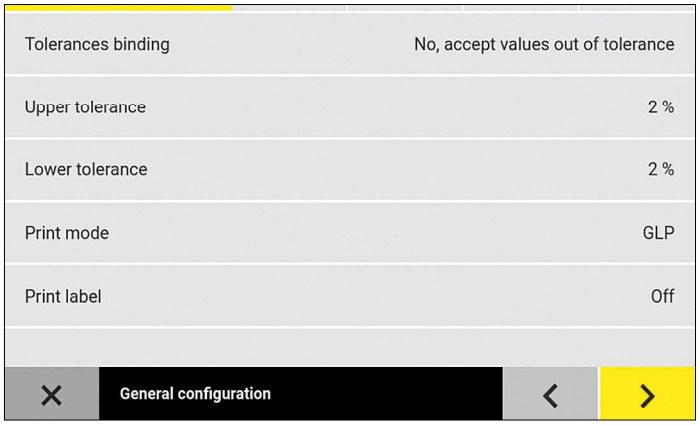


In addition to solvents, components and samples information for used system devices like the balance, thermometer, density meter, printer and pipette are saved to the database. Data for the balance, thermometer, density meter and printer is entered in the task management by a user with the right to edit tasks and pipette data is entered by the user during the task start. With the print mode GLP is activated set data for system devices is printed to reports for documentation.

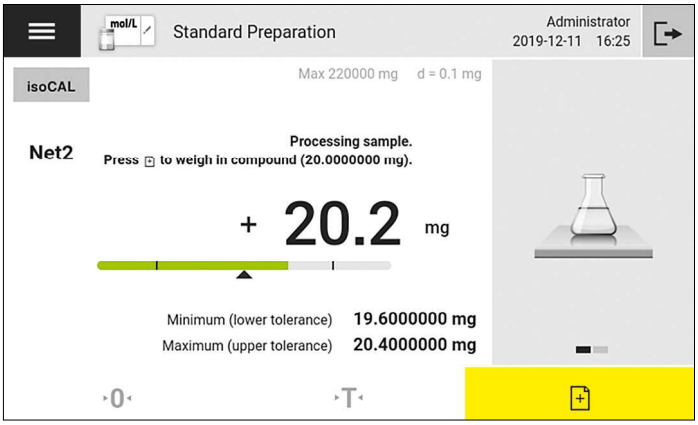




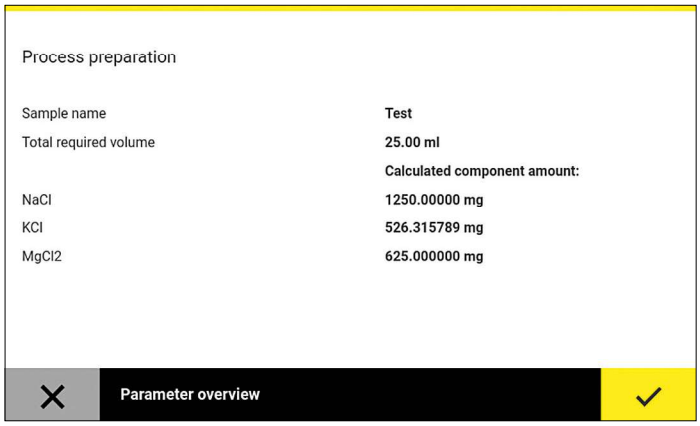
Additionally during the task setup the permissible sample and solvent weight tolerance and the mode for samples out of tolerance can be defined. If the sample weight is below or above the set tolerance the user either a) cannot take over the weight value, or b) must enter the set password to take over the weight value or c) can acquire any value even if the weight is out of tolerance. It is under control of the lab manager creating the task to select what the user is allowed to do with samples out of tolerance. As print mode GLP print inclusive all data or standard with measurement data and calculates results only can be selected and the label print can be set on or off.



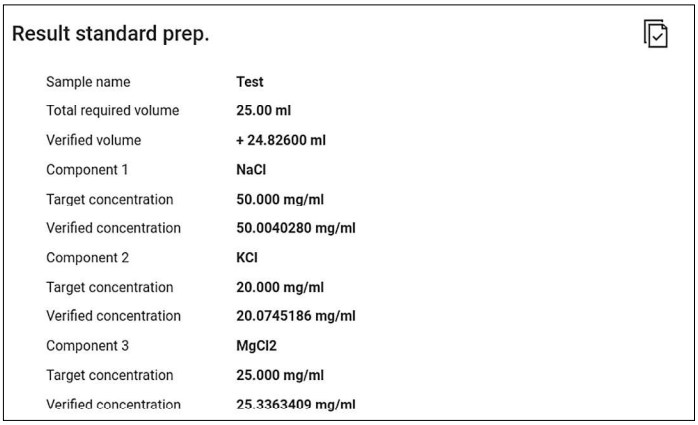
During the weighing process for each component the target weight and a tolerance bar are displayed. If the measured weight is within the permissible tolerances the tolerance bar is shown in green, for weight values out of tolerances it is shown in red. By the color code the user gets an immediate visual feedback if the measured weight value is within the tolerances or not. Depending upon the task settings for out of tolerance values the user either is allowed to accept the value and continue with the process, or can accept the value by entering the password set in the task management or cannot accept the value and the process is stopped.



During sample processing the user is guided through the complete process. The user enters the desired target component(s) concentration(s), selects the concentration unit and the required sample volume and the software application automatically calculates the required amount of component(s) and displays the values to the user. Using this comprehensive overview the user can check if sufficient amount of component(s) and solvent is available to prepare the desired standard solution.



Based upon the measured component(s) weight(s) the software calculates the required solvent volume. For mixed standard the calculated mean value is used. As for the components the software displays a tolerance bar with target weight and permissible tolerances. When the user adds the solvent the balance gravimetrically measures the solvent weight and the software application using the solvents density calculates applied solvent volume and the verified component(s) concentration(s) in the prepared sample. Results are printed either as comprehensive short report or as GLP report listing additionally the system devices used for sample processing. In addition, labels can be printed to label the used vessel.



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Status: 05 | 2020