

CHRONECT Workstation MultiMix



Product Information

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Introduction

The preparation of mixes and standards in analytical laboratories is a time-consuming task. It is not only important to ensure correct preparation, but also to meet the high requirements for documentation. A lot of data has to be entered and managed manually for individual substances. This is time-consuming and error-prone. The CHRONECT Workstation MultiMix uses software that has been developed for these needs and enables gapless documentation. In combination with the appropriate hardware modules, calibration standards can be created completely automatically.

Explanation of terms

In this context there are different terms. The following definitions are valid for this document:

- Reference substances: Solids, which are to be obtained from the manufacturer
- Stock solution: solution of the reference substances with known concentration
- Aliquot of the stock solution: smaller filling quantity of the stock solution for further processing
- Working mix: diluted mixture of different stock solutions used for the preparation of calibration standards

Working method

This workstation was originally developed for pesticide analytics and meets the requirements for the production of calibration standards according to the SANTE document 12682/2019. However, these requirements can also be used for other substance groups.

The SANTE document sets four criteria:

- Reference substances and stock solutions should be stored in a cool place, preferably in a freezer, excluding light and humidity.
- The documentation created during production should ensure full traceability of all steps.
- The standards should be permanently marked and mixed again after heating to room temperature.
- If septa are punctured during standard production, they should be replaced as soon as possible.

In order to meet these requirements, the CHRONECT Workstation MultiMix contains various modules.

- An aliquot of the stock solutions is stored in a Peltier-cooled drawer system, which is flushed with nitrogen to exclude moisture (Fig. 1). By regularly closing the drawers, the standards are stored in the dark.



Figure 1: Cooled drawer system.

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- Traceability is ensured by the use of 2D barcodes and a software package (Fig. 2). The barcode reader was developed by Axel Semrau and is fully integrated into the system. The software creates suitable labels for the stock solutions, which are printed on solvent-resistant foil by means of a barcode printer. Before each dosage, the barcode is used to check the correctness of the stock solution.
- To prevent the septa from being punctured, the vial is opened with a DeCapper before dosing and closed again after collection (Fig. 4).



Figure 2: 2D barcode reader.

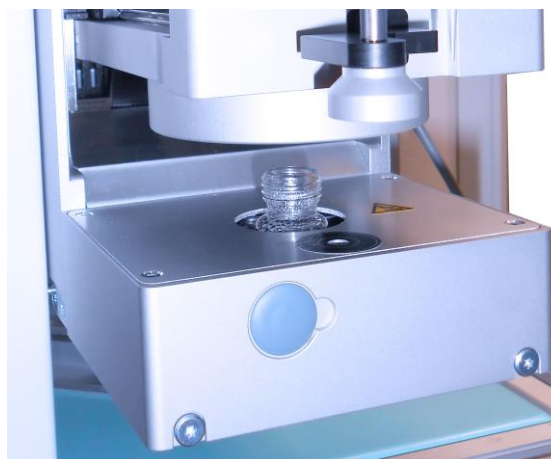


Figure 4: DeCapper.

- Re-mixing after heating to room temperature is achieved by using a vortex mixer (Fig. 3).



Figure 3: Vortex mixer.

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MultiMix Software

The core of the supplied software is a substance catalog management, which ensures the integrity of the data through clear, complete documentation. A password-secured SQL database supports the user with the administration and maintenance of all important data. Each substance is assigned a reference. This consists of information such as:

- CAS name
- Supplier
- Delivery date
- Price
- Solvent
- Opening date
- Date of production
- Expiration date
- Weighing-in

When creating the mix, a message also appears if a certain substance has run off and whether this is relevant for further processing or not. The weighing results generated during standard production are transferred online to the database (Fig. 5). This eliminates transmission, spelling and calculation errors.

Existing data from the laboratory's database can be imported from Excel. For pesticide analysis, the software includes an extensive pesticide database, eliminating tedious input routines. The system can be expanded to include other analytes at any time. This does not refer exclusively to pesticides, but to all fields of application in which mixes have to be generated.

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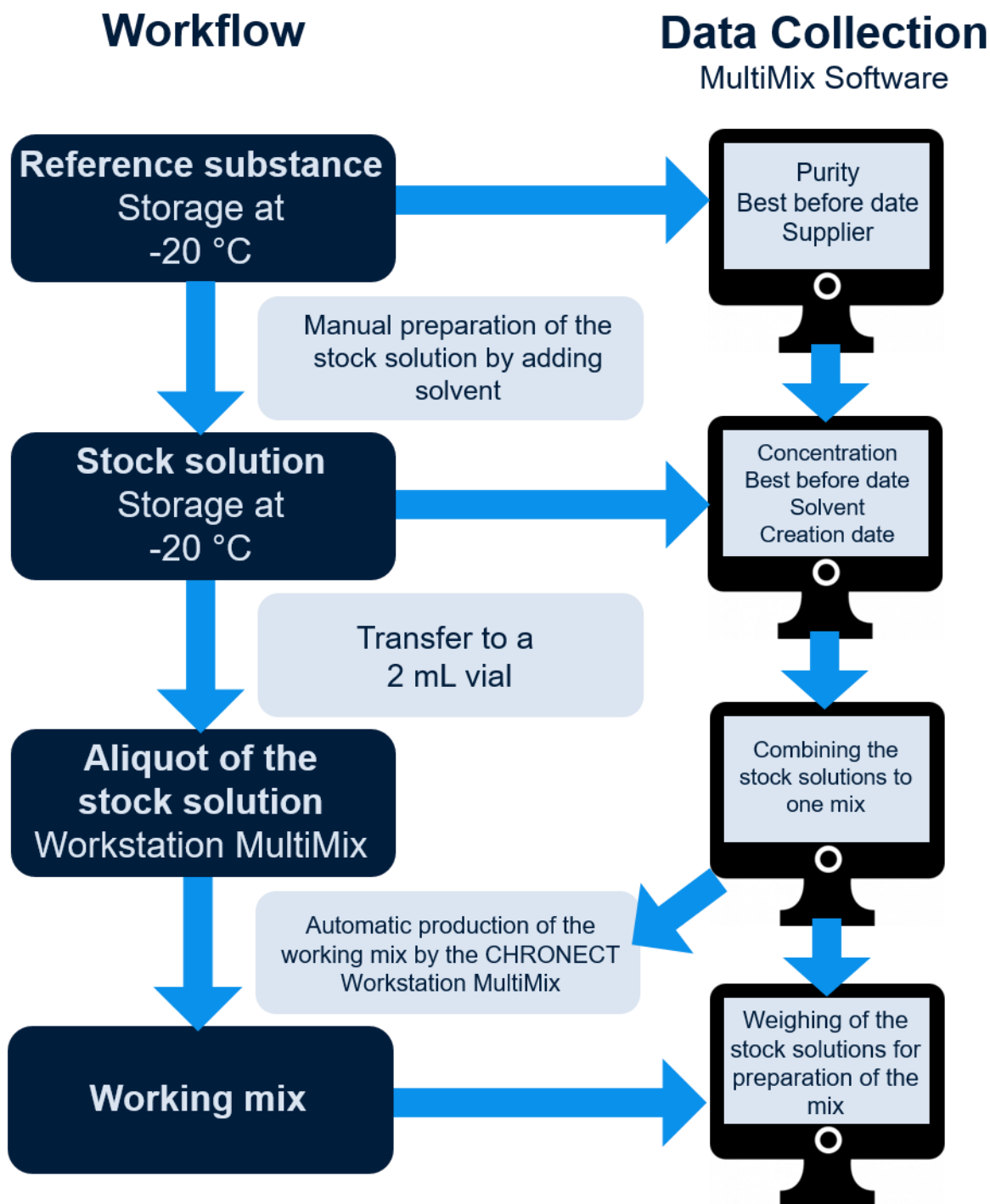


Figure 5: Workflow and data acquisition by the CHRONECT MultiMix software using the example of the production of a calibration standard for pesticide analysis.

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Carryover

A further requirement for a system for the preparation of calibration standards that works with highly concentrated standards is the prevention of carryover. In order to exclude any carryover, the CHRONECT Workstation MultiMix uses disposable pipette tips for dosing the stock solutions. These pipette tips are calibrated for the particular solvent used to achieve the target concentration of the analyte as accurately as possible. This calibration is carried out during installation and can be automated at any time by means of a supplied workflow in the control software.



Figure 6: Pipette tips for the liquid handling of stock solutions.

Gravimetric control

In order to complete the traceability and to ensure the highest possible precision of the created working mixes, each liquid dosage is gravimetrically controlled in the CHRONECT Workstation MultiMix. For this purpose, the system includes a scale with a five-digit display. The weighing results obtained are written directly into the database, thus ensuring complete documentation and the accuracy of the concentration of the analyte in the working mix.

The actual concentrations obtained can be exported to calibration files for GC-MS or LC-MS data systems.



Figure 7: Balance for gravimetric control of the dosed volumes.

Duration

Depending on the composition, a mix can consist of 500 individual substances, for example, and can take 5 minutes of preparation time to enter the data into the software. The mix is then created fully automatically overnight. The time required is about 20 hours. A corresponding manual process takes about 32 working hours on average. For an 8 hour day this corresponds to 4 working days.

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Summary

The CHRONECT Workstation MultiMix offers every laboratory the possibility to produce individual working mixes and to manage information about individual substances or mixes reliably and without great effort. Due to the fully automatic process, independent of working hours, a strong reduction of the preparation time compared to manual processes is achieved. The approach of

volumetric dosing and gravimetric precision dosing ensures the correctness of the determined concentrations at any time. For pesticide analysis, the workstation meets all the regulatory requirements specified by SANTE.

Integrated monitoring ensures the correctness and reliability of the results within the framework of error prevention strategies.

Technical data

Specifications	Values
Number of stock solutions in the system	648 1.6 mL vials
Drawer system temperature	4 °C – 40 °C, nitrogen flushed
Number of volumetric flasks for mixes	8 á 10 mL
Number of pipette tips	576
Supported solvents	5
Barcode reader	rotating, supports 1D and 2D barcodes
Barcode printer	included in delivery, including solvent-resistant labels
Software equipment	SQL-Server, database application for the administration of analytes, reference materials, stock solutions, mixtures, CHRONOS automation platform for robot control extended with SQL integration
Balance	220 g maximum load, readability 0.01 mg
DeCapper	Supports different vial types

The CHRONECT Workstation
MultiMix is a development by
Axel Semrau.

Subject to technical changes

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