

# Fully automated dilution workstation for pesticides working standard mixtures



Axel Semrau®

Rothmeier, S.<sup>1</sup>, Nestola, M.<sup>2</sup>, Hentschel, A.<sup>1</sup>, Fischer, F.<sup>1</sup>, Becker, E.<sup>1</sup>, Kirchhoff, E.<sup>1</sup>

<sup>1</sup>Institut Kirchhoff Berlin GmbH, Oudenarder Straße 16, 13347 Berlin/D

<sup>2</sup>Axel Semrau GmbH & Co. KG, Stefansbecke 42, 45549 Sprockhövel



The manual preparation and management of stock standard solution and working standard mixtures particular for pesticide analysis consumes a lot of working time and manpower, also the volume-controlled dosage often does not suffice and is error-prone. Axel-Semrau® and Institut Kirchhoff Berlin GmbH developed based on the CHRONECT Robotic XYZ robots from CTC Analytics AG a fully automated dilution workstation which is able to produce working standard mixtures from stock solutions under gravimetric control. The dilution workstation is controlled by CHRONOS and is linked with a SQL database to manage all reference standards and standard solutions.

## SANTE [1] requirements

F1: Reference standards of analytes should be of known purity and must be assigned with a **unique identification code** and recorded in a way that ensures full traceability (including source of supply, batch number, date of receipt and place of storage)

They should be stored at **low temperature, preferably in a freezer, under exclusion of light and moisture**, i.e. under conditions that minimise the rate of degradation.

F2: When preparing stock standards (solutions, dispersions or gaseous dilutions) of reference standards (analytes and internal standards) documentation should be such as to ensure **full traceability**. The date of preparation, the identity and mass (or volume, for highly volatile analytes) of the reference standard and the identity and volume of the solvent (or other diluents) must be recorded.

F4: Stock standards must be labelled indelibly, allocated an expiry date and **stored at low temperature** in the dark in containers that prevent any loss of solvent and entry of water. After equilibration at room temperature, homogeneity of the solutions **must be assured**.

F6: Vial Septa are particularly prone to evaporation losses (in addition to being a potential source of contamination) and should be **replaced as soon as practicable after piercing**, if solutions are to be retained.

## Dilution workstation

Art	Konz	Lösemittel	Charge	Herstelldatum	MHD
Stamm	1 mg/ml	Cyclohexan	SZBD238KV	07.06.2017	07.06.2018
Standard	10 mg/l	Cyclohexan	SZBD238KV	07.06.2017	07.06.2018
Standard	10 mg/l	Cyclohexan	SZBD238KV	07.06.2017	07.06.2018
Stamm	1,0678 mg/ml	Acetonitril	SZBD238KV	21.11.2017	21.11.2018

Fig.1: Overview about all stock and working standards from Database



Unique identification code for each standard controlled by barcode reader

PSM-Nr	Wirkstoff	Konz	Endkonz	Charge
1	Aldrin (HHDN)	1,02 mg/ml	1,02 µg/ml	SZBD333XV
2	DDE, o,p-	1,056 mg/ml	1,056 µg/ml	6236200
3	Hexachlorbenzol (F)	1,087 mg/ml	1,087 µg/ml	BCBS3897V
4	Parathion-methyl	1,078 mg/ml	1,078 µg/ml	SZBF194XV
5	Bromophos-methyl	1,029 mg/ml	1,029 µg/ml	SZBD333XV
6	Methidathion	1,01 mg/ml	1,01 µg/ml	SZBD234XV
7	Dimethoat	1,036 mg/ml	1,036 µg/ml	779155
8	Chlorpyrifos-methyl (F)	1,018 mg/ml	1,018 µg/ml	30227
9	Chlorpyrifos (F)	1,077 mg/ml	1,077 µg/ml	SZBD343XV
10	Vinlozolin	1,031 mg/ml	1,032 µg/ml	41016
12	Diethyltoluamid (DEET)	1,033 mg/ml	3,099 µg/ml	771907
13	Aldicarb	1,036 mg/ml	1,036 µg/ml	BCBS6930V
14	Aldicarb-sulfoxid	1,027 mg/ml	1,027 µg/ml	31016
15	Atrazin (F)	1,018 mg/ml	1,019 µg/ml	SZBD158XV
16	Bendiocarb	1,029 mg/ml	1,029 µg/ml	40122
17	Bentazon	1,006 mg/ml	1,006 µg/ml	SZBD337XV

Fig.2: Working standard mixture created by database, automatically prepared, gravimetrically corrected concentrations for each mixture in the database

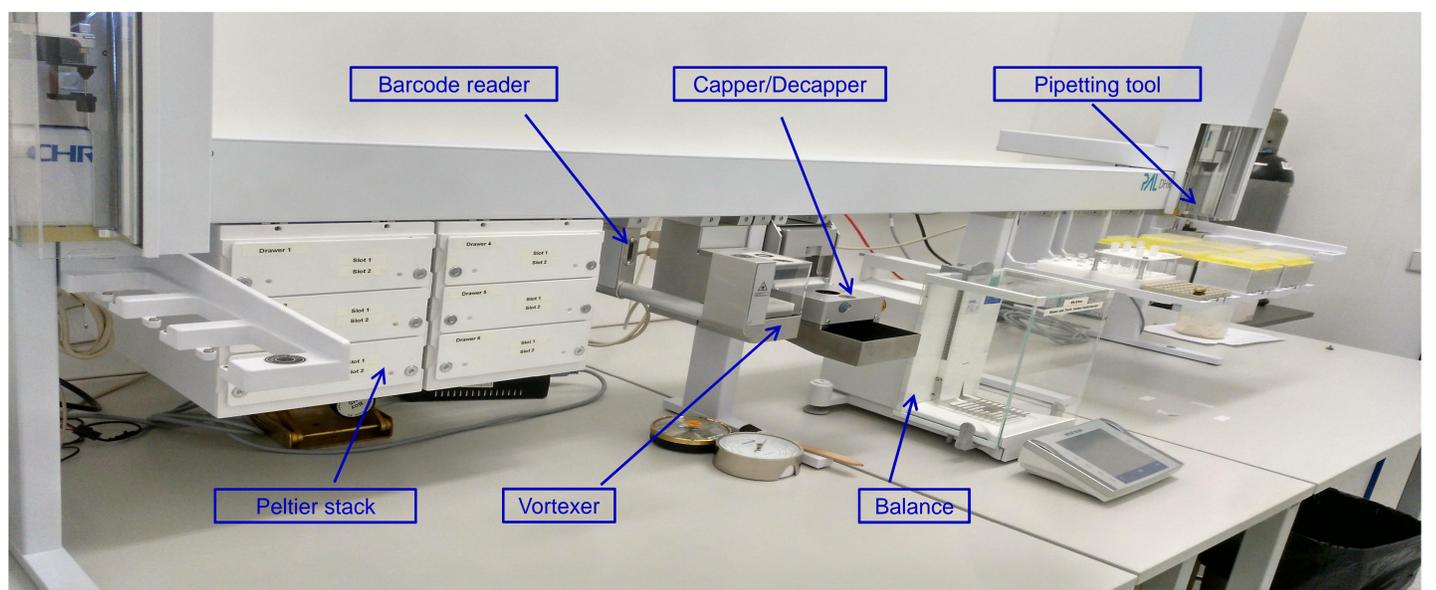


Fig.3: PAL3 System



Peltier stack module: 12 racks with 54 positions: conditions between 4°C and 40°C



Vortex Mixer Module tool → **remixing**



Capping and decapping tool → **no replacement of septum after piercing necessary**



Pipetting tool for using disposable pipette tips → **no risk of carryover**

This procedure complies with the requirements of SANTE [1], all relevant information like date of expiry, batch, purity and final analyte concentration (gravimetrically controlled) are easily accessible for each stock standard solution and working standard solution mixtures. A standard mixture solution with 400 analytes could be mixed automated within 24 hours. A laboratory assistant would spend 3-4 working days (including documentation).