Metrohm

Application Bulletin 401/2 e

Installation instructions for 894 Professional CVS semiautomated: 894 Professional CVS with 800 Dosinos for automatic dosing

The «894 Professional CVS semiautomated» is a system for the semiautomatic determination of suppressor in plating solutions. With the additional accessory kit «Equipment with 2 Dosing Units for VA/CVS» also brightener can be determined.

- PC controlled operation.
- Automatic addition of 2 solutions: VMS, suppressor standard or plating bath sample.
- With «Equipment with 2 Dosing Units for VA/CVS» automatic addition of 4 solutions: VMS, brightener concentrate, suppressor concentrate and suppressor standard or plating bath sample.
- Applications:
    - Analysis of suppressor concentration in plating baths with CVS.
    - Analysis of brightener concentration in plating baths with CVS.

Fig. 1: 894 Professional CVS semiautomated with optional equipment with 2 Dosing Units for VA/CVS

The description in this Application Bulletin can also be used for the 884 Professional VA semiautomated for CVS (2.884.1210). The difference is only the measuring instrument, which is an 884 Professional VA instead of the 894 Professional CVS. The system setup is identical. Only the instrument assignment in the method has to be adapted accordingly.

Content

1. Instruments and accessories

Quantity	Article number	
1	2.894.1210*	894 Professional CVS semiautomated
1	6.5339.0X0	CVS electrode kit
1	6.6065.21X	**viva** 2.1
Optional:		
2	2.800.0010	800 Dosino
1	6.5339.500	Equipment with 2 Dosing Units for VA/CVS

* or 2.884.1210 – 884 Professional VA semiautomated for CVS

2. System setup

2.1. Electrical connections

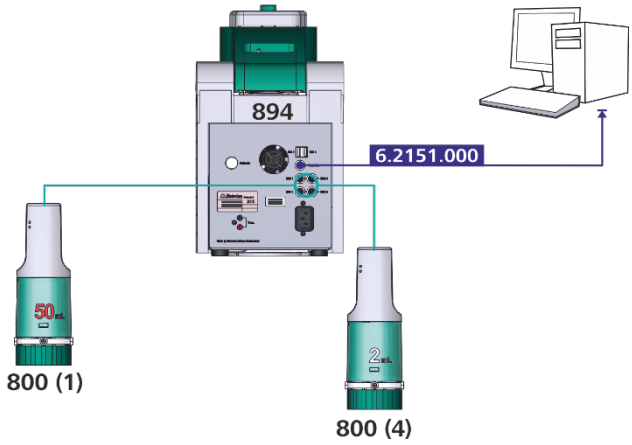


Fig. 2: Electrical connections 894 Professional CVS semiautomated

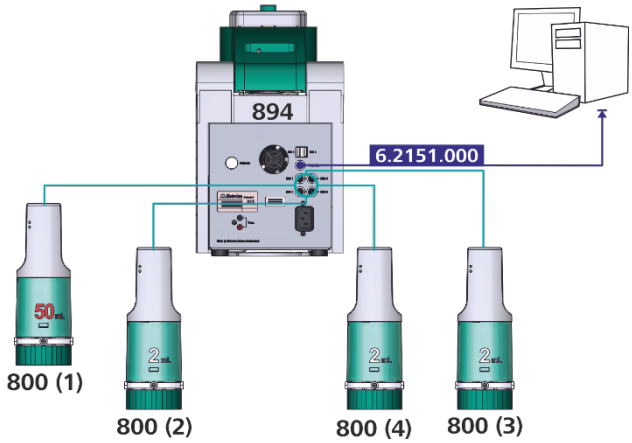


Fig. 3: Electrical connections 894 Professional CVS semiautomated with optional equipment with 2 Dosing Units for VA/CVS

Please note!

- The 800 Dosinos can be connected to any of the MSB ports. The indicated number is only used to distinguish the dosing units in this document.

2.2. Tubing connections for automatic dosing of standard solutions and auxiliary solutions

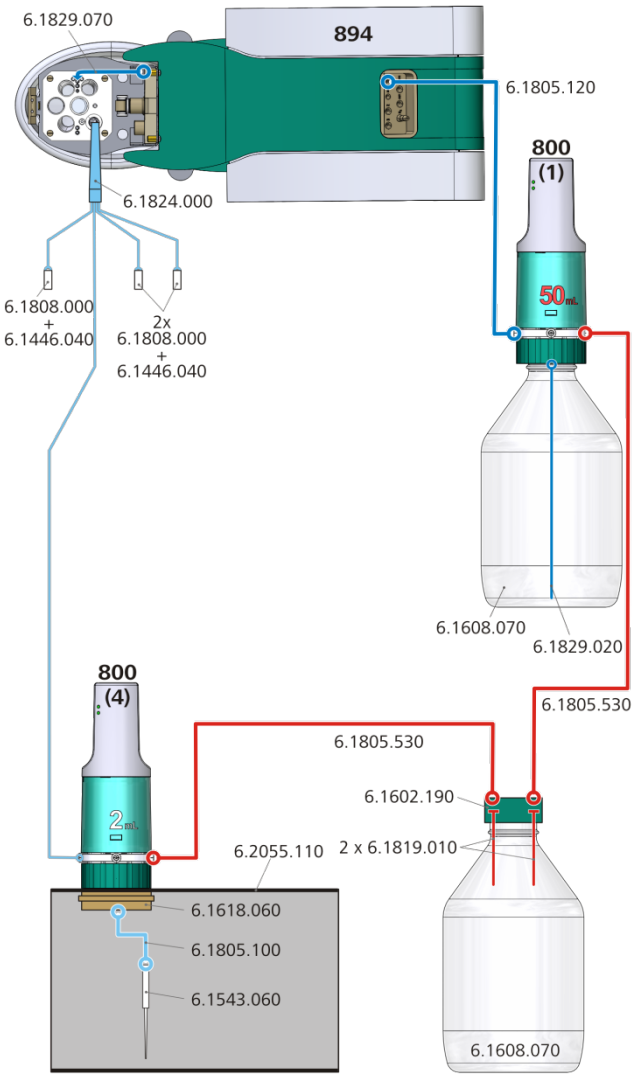


Fig. 4: Tubing connections for automatic dosing of VMS and suppressor standard or plating bath sample

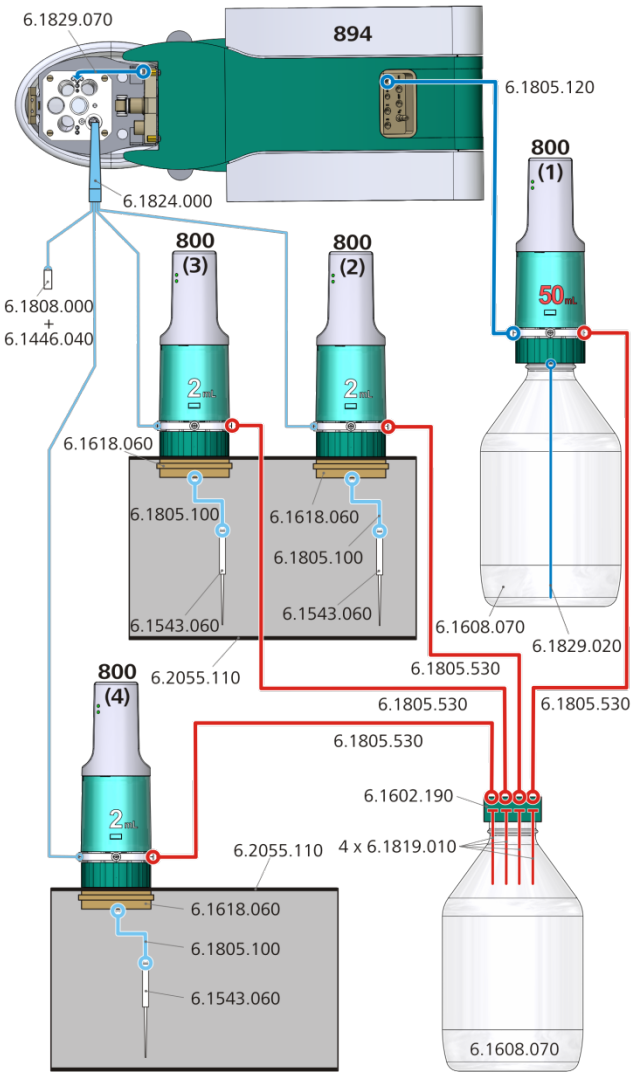


Fig. 5: Tubing connections for automatic dosing of VMS, suppressor concentrate, brightener concentrate and suppressor standard or plating bath sample

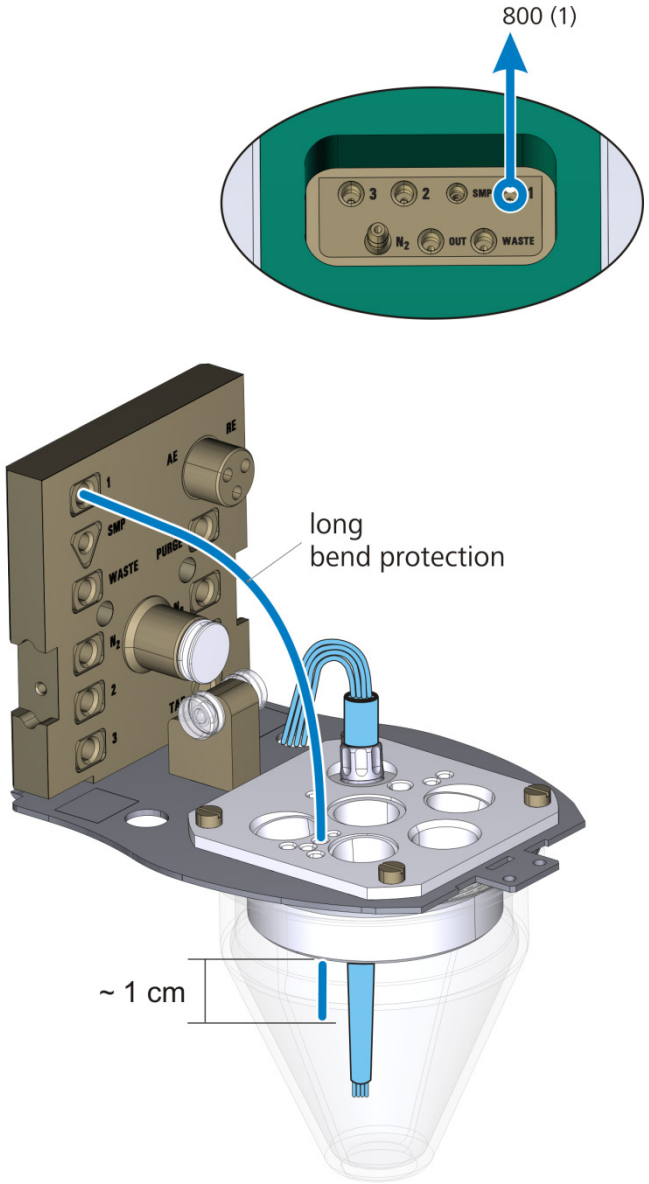
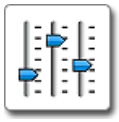


Fig. 6: Detailed view of the measuring head

3. viva «Configuration»



In addition to this Application Bulletin, it is recommended to have the following document available.

8.103.8010xx	**viva** Tutorial CVS
	In the following chapters it will be referred to as *Tutorial*

3.1. Devices

The 894 Professional CVS is automatically recognized by the **viva** software. When an instrument is connected for the first time it needs to be entered in the **viva** «Configuration». The corresponding dialog will pop up automatically.

Device name*	894_1

* as used in the example method

For a step-by-step description please see the *Tutorial* chapter «4.1.1 Configuring the instrument».

3.2. Sensors/Electrodes

With the software a set of electrodes is preinstalled in the **viva** «Configuration». The following three electrodes have to be present if the measuring command in the method is used as specified in the **viva** method templates.

Sensor name	***Sensor type***
Auxiliary electrode	Auxiliary electrode
RDE	RDE
Reference electrode	Reference electrode

3.3. Dosing units

An 807 Dosing Unit attached to an 800 Dosino, which is connected to the 894 Professional CVS, is automatically recognized by the **viva** software. When the Dosing Unit is connected for the first time it needs to be entered in the **viva** «Configuration». The corresponding dialog will pop up automatically. For a step by step description please see the *Tutorial* chapter «5.1.3 Configuring dosing units».

3.3.1. Dosing unit at 800 Dosino (1)

Dosing Unit name as used in the **viva** method templates.

800 Dosino (1)	50 mL VMS

Parameters for preparation

Dosing port Prep/empty	Dosing port 2

Dosing rate port 1	Maximum	mL/L
Dosing rate port 2	Maximum	mL/L
Dosing rate Fill port	Maximum	mL/L
Dosing rate special port	Maximum	mL/L

Tubing parameters

	Port	Length	Diameter
Dosing port 1	Port 1	138 cm	2 mm
Dosing port 2	Port 3	0 cm	2 mm
Fill port	Port 2	25 cm	2 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic

3.3.2. Dosing unit at 800 Dosino (2), 800 Dosino (3) and 800 Dosino (4)

Dosing Unit name as used in the **viva** method templates.

800 Dosino (2)	2 mL Brightener
800 Dosino (3)	2 mL Suppressor
800 Dosino (4)	2 mL Standard or sample

Parameters for preparation

Dosing port Prep/empty	Dosing port 2	
Dosing rate port 1	**2.0**	mL/L
Dosing rate port 2	Maximum	mL/L
Dosing rate Fill port	Maximum	mL/L
Dosing rate special port	Maximum	mL/L

Tubing parameters

	Port	Length	Diameter
Dosing port 1	Port 1	80 cm	0.3 mm
Dosing port 2	Port 3	0 cm	2 mm
Fill port	Port 2	55 cm	2 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic

3.4. Solutions

Solutions that should automatically be dosed have to be defined in the **viva** «Configuration» and need to be assigned to the Dosing Unit which is used for the dosing.

The following table shows the solution names and assigned Dosing Units as used in the **viva** method templates.

Solution name	***Dosing Unit***
VMS	50 mL VMS
Brightener concentrate	2 mL Brightener
Suppressor concentrate	2 mL Suppressor
Standard or sample	2 mL Standard or sample

SOLUTION TYPE for «VMS» and «Suppressor concentrate» has to be **AUXILIARY SOLUTION**, for «Brightener concentrate» and «Standard or sample» it is **STANDARD SOLUTION**.

For a step-by-step description please see the *Tutorial* chapter «5.1.4 Define solutions».

4. viva «Method»

The **viva** software includes several method templates for CVS analysis with a semiautomated system. Some examples are:

- Brightener determination (CVS, MLAT), semiautomated
- Conditioning (Cu VMS), semiautomated
- Suppressor determination (CVS, DT), semiautomated

The templates already establish the basic sequences for the different applications and the use of 800 Dosinos for automatic dosing as well as the calculation of the result. However certain commands and settings have to be adapted to the used hardware and the requirements of the specific application.

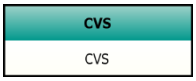
For a step-by-step description please see the *Tutorial* chapter «5.2 Methods for the semiautomated determination».

The following commands have to be adapted:

4.1. Method run

4.1.1. Measuring commands

Such as



- Assign the 894 Professional CVS instrument to be used on the tab «General/Hardware».
- Adapt the measuring parameters on the tabs «Pre-treatment», «Sweep», «Post-treatment» and «Potentiostat» according to the requirements of the application. These parameters can be found in separate application documentation.

4.1.2. Dosing commands

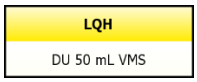
Such as:

- Define the volume of solution that should be dosed when this command is due.

Such as:

- Define the volume of solution that should be dosed when this command is due.
- Assign the Dosing Unit that should be used to run this command.

Such as:



- Assign the Dosing Unit that should be used to run this command.

4.2. Evaluation

Settings regarding evaluation and documentation of the determination are located in the «Evaluation» part of the method. The templates already include all necessary settings to determine brightener or suppressor concentration in an acid copper bath. If modifications however should be necessary, here is where important parameters are found:

4.2.1. Substances

In the «Substances» part settings for peak recognition and baseline parameters are defined.

4.2.2. Standards

In the «Standards» part the concentration of the used standard solution is defined.

4.2.3. Calibration

In the «Calibration» part the calibration method, such as DT or MLAT, is defined as well as the regression type.

4.2.4. Results

In the «Results» part on the tab «Results» the substance is selected for which the concentration should be calculated and displayed.

On the tab «Database» the database is defined where determinations should be stored. By default **viva** database is used.

On the tab «Report» a report template for an automatic printout can be defined. By default no printout is defined.

5. Operation

5.1. Suppressor determination

5.1.1. Manual operation

- Dosing Unit «50 mL VMS» connected to Dosino 1 has to be prepared with VMS.
- Dosing Unit «2 mL Standard or sample» connected to Dosino 4 has to be prepared with suppressor standard solution if a calibration is recorded or with plating bath sample for the determination.

5.1.2. Workplace

- Select sample type **STANDARD** to run a calibration in the «Run» window of the «Workplace». For a determination sample type **SAMPLE** has to be selected.
- No «Sample amount» needs to be defined in the «Run» window on the «Workplace», since addition volumes for the standard and the sample are defined in the method commands **ADD STD** and **ADD SAMPLE DT**.

5.1.3. Course of events

- The execution of calibration or determination by dilution titration is controlled by the 894 Professional CVS and **viva**.
- Dosino 1 automatically doses the VMS and Dosino 4 is used for the automatic addition of suppressor standard or plating bath sample.

5.2. Brightener determination

5.2.1. Manual operation

- Dosing Unit «50 mL VMS» connected to Dosino 1 has to be prepared with VMS.
- Dosing Unit «2 mL Brightener» connected to Dosino 2 has to be prepared with brightener concentrate.
- Dosing Unit «2 mL Suppressor» connected to Dosino 3 has to be prepared with suppressor concentrate.
- The correct «Sample amount» has to be pipetted into the measuring vessel when requested.

5.2.2. Workplace

- Select sample type **SAMPLE** in the «Run» window of the «Workplace» to run a determination.
- Define the volume of sample used for the determination under «Sample amount» in the «Run» window of the «Workplace».

5.2.3. Course of events

- The execution of the determination by modified linear approximation technique is controlled by the 894 Professional CVS and **viva**.
- The intercept solution is automatically prepared at the beginning of each determination, by dosing VMS from Dosino 1 and suppressor concentrate from Dosino 3.
- After the determination of the intercept value, a window will pop up prompting to add the sample on top of the intercept solution. The exact sample volume has to be pipetted manually through the pipetting opening of the 894 Professional CVS.
- Standard addition is carried out automatically with brightener concentrate from Dosino 2.

6. Remarks

6.1. Storing dosing units

When the dosing units are not used (during the night, over the weekend) the dosing cylinder has to be rinsed with water. Otherwise, elemental copper can be formed or additives can precipitate between the valve disk and the distributor disk or in the tubings. A blockage can damage the 800 Dosino. Emptying the cylinder and filling it with water is sufficient to prevent a blockage.

6.2. Storing electrodes

When the electrodes are not used (during the night, over the weekend) the electrodes should be thoroughly rinsed. Working and auxiliary electrode can either be stored in deionized water or dry. The reference electrode should be stored separately in a vial filled with deionized water (KCl solution, in case KCl is used as bridge electrolyte), so that the reference electrode immerses at least to the rim of the electrolyte vessel.

6.3. Waste bottle

The waste bottle must not be closed completely. For pressure balancing in the waste bottle, keep at least one opening unsealed. Overpressure would lead to a malfunction of the 800 Dosinos.