

Application Bulletin 425/1 e

Installation instruction for 884 Professional VA semiautomated MME: 884 Professional VA with the Multi-Mode Electrode pro and 800 Dosinos for automatic dosing

The «884 Professional VA semiautomated MME» is a system for semiautomatic voltammetric determinations with the Multi-Mode Electrode pro.

- PC controlled operation.
- Automatic addition of 2 solutions: standard solution and electrolyte.
- Example applications:
 - Cd, Pb and Cu in water samples
 - Pb in electroless Ni baths
 - 4-Carboxybenzaldehyde (4-CBA) in terephthalic acid



Fig. 1: 884 Professional VA semiautomated

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1. Instruments and accessories

Quantity	Article number	
1	2.884.1110	884 Professional VA semiautomated MME
1	6.5339.030	VA electrode kit 884 MME
1	6.6065.20X	viva 2.0

2. System setup

2.1. Electrical connections

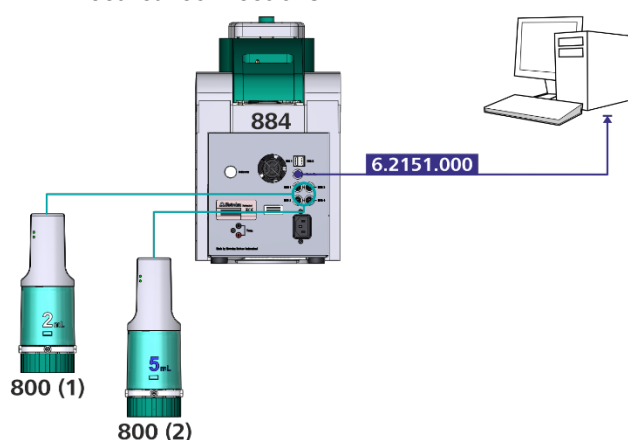


Fig. 2: Electrical connections 884 Professional VA semiautomated

Please note that 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 with two dosing units

The equipment delivered with the 884 Professional VA semiautomated for MME (2.884.1110) contains two dosing units. As an example one can be used for standard addition and the other one for electrolyte. However, the setup is arranged according to the following scheme.

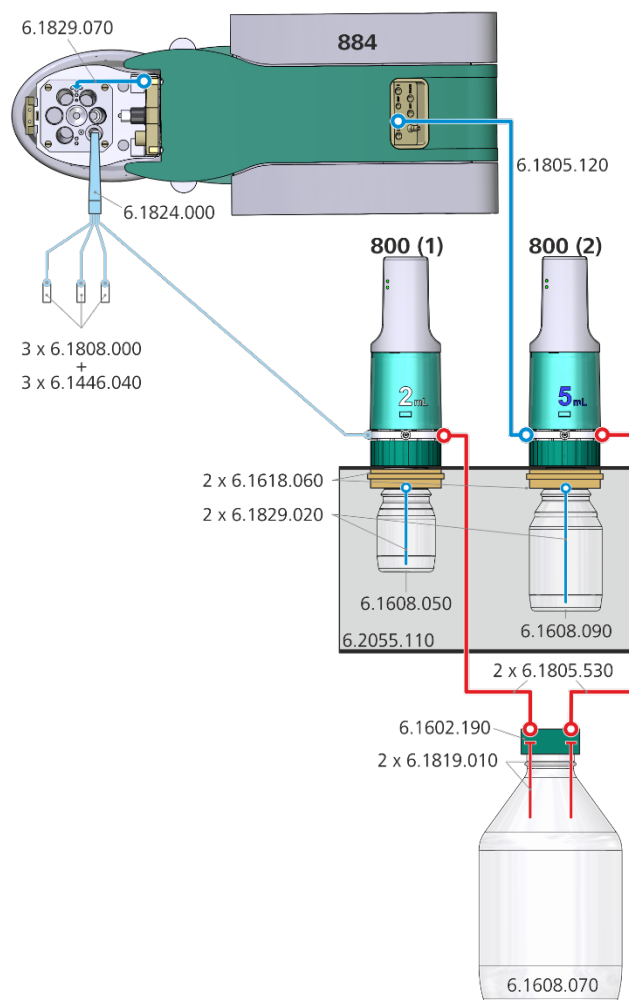


Fig. 3: Tubing connections for automatic dosing of standard and electrolyte with two dosing units

The aspiration tubes (6.1829.020) for the dosing units have to be cut to the appropriate length. With aid of the capillary cutter (6.2621.080) the aspiration tube should be cut approximately 2 mm above the bottom of the glass bottle. Approximate values are given in the following table:

Glass bottle	Approx. tubing length
6.1608.050 (100 mL)	12 cm
6.1608.090 (250 mL)	15 cm

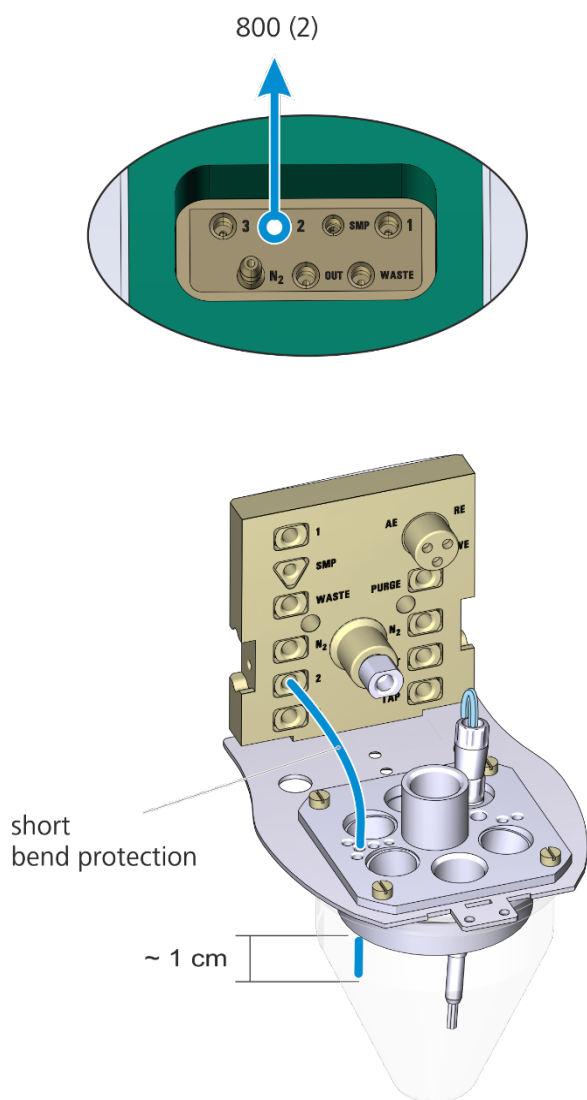


Fig. 4: Detailed view of the measuring head

Important:

- It is recommended to use port 2 of the 884 Professional VA for the addition of the electrolyte if the instrument is used for both, trace analysis and CVS, because port 1 is usually used for VMS in CVS applications. In this case port 1 should remain to be dedicated to VMS and port 2 for electrolyte to avoid cross-contamination.
- The electrolyte tubing should be put through the central one of the four equally sized holes on the left side (see Fig. 4) to minimize overlapping with further installed tubes (automatic rinsing, additional solutions).
- The four-way micro dosing tip (6.1824.000) is guided through the opening on the right side (see Fig. 5).

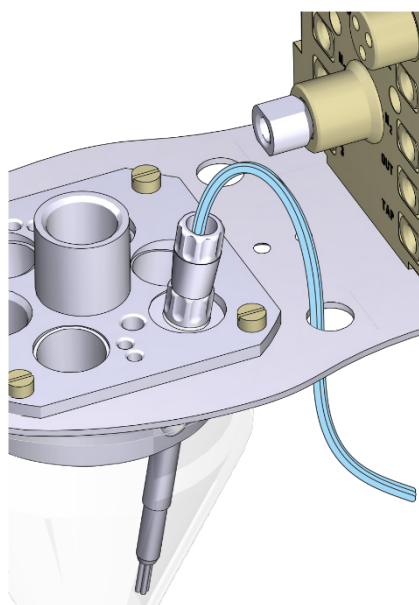


Fig. 5: Installation of the four-way micro dosing tip

2.3. Tubing connections with four dosing units

The 884 Professional VA semiautomated MME can be extended by two dosing units using the following equipment:

Quantity	Article number	
1	6.5339.500	Equipment with two 2 mL dosing units, a bottle holder and two 100 mL glass bottles
2	2.800.0020	800 Dosino with cable 65 cm

The tubing connections for the extended system are shown in the following scheme:

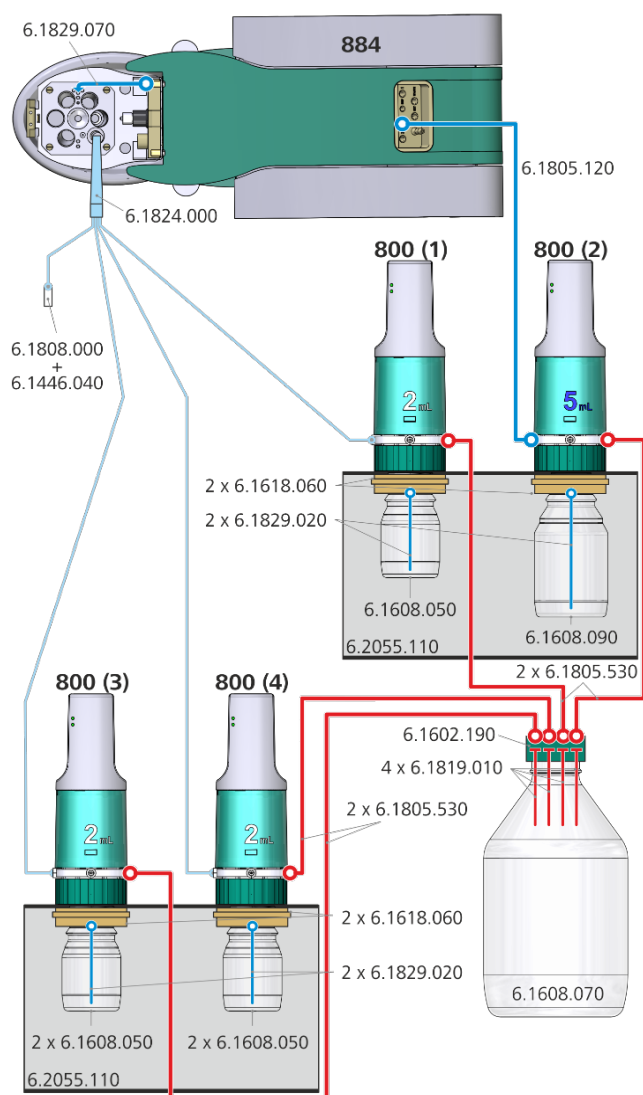
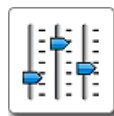


Fig. 6: Tubing connections for automatic dosing with four dosing units

The tubings on the 884 Professional VA and the measuring head and the 800 Dosinos are installed as described in the preceding chapters.

3. viva «Configuration»



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

8.103.8033XX

viva Tutorial Trace Analysis

In the following chapters it will be referred to as *Tutorial*

3.1. Devices

The 884 Professional VA 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

884_1

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». These default electrodes are used in the voltammetric commands in the **viva** method templates.

Sensor name	Sensor type
Auxiliary electrode	Auxiliary electrode
Reference electrode	Reference electrode
MME	MME
RDE	RDE/SSE
scTRACE Gold	scTRACE Gold

3.3. Dosing units

An 807 Dosing Unit attached to an 800 Dosino, which is connected to the 884 Professional VA, 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 2 mL at 800 Dosino (1)

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

Name	2 mL Standard
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Parameters for preparation

Dosing port Prep/Empty	Dosing port 2	
Dosing rate Dosing port 1	2.0	mL/min
Dosing rate Dosing port 2	maximum	mL/min
Dosing rate Fill port	maximum	mL/min
Dosing rate Special port	maximum	mL/min

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	12 cm*	2 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic
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* to be measured

3.3.2. Dosing unit 5 mL at 800 Dosino (2)

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

Name	5 mL Electrolyte
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Parameters for preparation

Dosing port Prep/Empty	Dosing port 2	
Dosing rate Dosing port 1	maximum	mL/min
Dosing rate Dosing port 2	maximum	mL/min
Dosing rate Fill port	maximum	mL/min
Dosing rate Special port	maximum	mL/min

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	15 cm*	2 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic
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* to be measured

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
Standard	2 mL Standard
Electrolyte	5 mL Electrolyte

Solution type for «Standard» has to be «Standard solution», for «Electrolyte» «Auxiliary solution» is used.

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

3.5. Additional solutions and dosing units

If additional solutions are used they have to be defined in the **viva** «Configuration» as described in chapter «3.4 Solutions». The names can be given arbitrarily. However, care has to be taken to choose the correct solution type. If it is a standard solution (used for calibration) the solution type has to be «Standard solution». For all other solutions «Auxiliary solution» is chosen.

If the addition of the solutions should be done automatically by an 800 Dosino the dosing unit has to be configured as well. Therefore the steps described in chapter «3.3 Dosing units» of this document have to be carried out. It is important to enter the correct tubing dimensions in order not to damage the 800 Dosino and to ensure that after preparing the dosing unit all tubings are filled completely with the respective solution. Furthermore the solution has to be linked to the respective dosing unit in the **viva** «Configuration». The solution can now be used in a method with automatic dosing.

4. viva «Method»



The **viva** software includes one method template for trace analysis with a semiautomated system.

- ASV determination (DP, standard addition) semiautomated

This template already establishes 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 detailed description of the method template please see the *Tutorial* chapter «5.2 ASV determination semiautomated with standard addition».

The following commands have to be adapted:

4.1. Method run

4.1.1. Voltammetric commands

Such as:

DP	ELECTRODE TEST
DP	Electrode test

- Select the 884 Professional VA instrument, the electrodes and, in case of sensor type MME, the operation mode 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 (e.g. Application Bulletin, Application Note, etc.).
- For the voltammetric command **ELECTRODE TEST** only the 884 Professional VA and the working electrode have to be chosen. No measurement parameters can be changed except for the stirring rate.

4.1.2. Dosing commands

Such as:

ADD STD	ADD AUX
Add standard	Add electrolyte

- Select the solution name from the drop-down list to ensure the spelling exactly matches the entry in the configuration. In the **ADD STD** command only solutions with solution type «Standard» are listed.
- Define the volume of solution that should be dosed when these commands are carried out.

Such as:

LQH	LQH
Fill DU Standard	Fill DU Electrolyte

- On the tab «General/Hardware» select the name of the dosing unit which should be filled after the determination has finished.

4.2. Evaluation

Settings regarding evaluation and documentation of the determination are located in the «Evaluation» part of the method. The template includes all necessary settings to determine cadmium and lead. These settings have to be adapted to the particular application. For modification of substances please refer to the *Tutorial* chapter «4.2.3.2 Modify substances». Below is an overview where important parameters in the **viva** evaluation part can be found:

4.2.1. Substances

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

4.2.2. Standards

In the «Standards» part the analyte concentrations in the standard solutions are defined.

Important:

Independent from modifications on the substances click on **Edit** ▼ (or right mouse click on the standards table) and select «Apply from ADD STD». This is in order to ensure that the spelling of the standard solution in the table exactly matches the solution name in the **ADD STD** command. In case of inconsistent spelling, no calibration curve can be calculated.

Also define the concentrations of the standards according to the standard solutions used in your particular application.

4.2.3. Calibration

In the «Calibration» part the calibration method, such as «Standard addition» or «External calibration», is defined as well as the regression type.

4.2.4. Results

In the «Results» part on the tab «Results» the substances are listed for which the concentration is automatically calculated and displayed.

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

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

5. Operation

The operation of the system is shown at the example of a semiautomated ASV determination with the calibration method «standard addition».

5.1. Manual operation



- Dosing unit «2 mL Standard» has to be prepared with the standard solution.
- Dosing unit «5 mL Electrolyte» has to be prepared with the supporting electrolyte.
- The correct «Sample amount» has to be pipetted into the measuring vessel when requested.

5.2. Workplace



- In the «Run» window on the tab «Single determination» load the method created in chapter 4.
- Select sample type «Sample» to run a determination.
- Define the volume of sample used for the determination under «Sample amount».

5.3. Course of events

- The execution of the determination by standard addition is controlled by the 884 Professional VA and **viva**.
- At the beginning of the determination a window will pop up prompting to add the sample into the measuring vessel. The exact sample volume has to be pipetted manually through the pipetting opening of the 884 Professional VA.
- The electrolyte is automatically dosed from the dosing unit «5 mL Electrolyte».
- An electrode test is carried out to check, whether the electrodes are connected correctly and whether they are operational.
- If the electrode test was successful the solution is degassed for 5 minutes.
- The sample is measured. Standard addition is carried out automatically with standard solution dosed from the dosing unit «2 mL Standard».

- When the determination has finished the dosing units are automatically filled.

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 ultrapure water. For this purpose the «Prepare» function in the **viva** «Manual control» can be used.

6.2. Storing electrodes

When the electrodes are not used (during the night, over the weekend) all electrodes can be stored in ultrapure water. If they are not used for a longer period of time the reference electrode should be stored in $c(\text{KCl}) = 3 \text{ mol/L}$ (in case KCl is used as the bridge electrolyte). The working and auxiliary electrodes should be stored dry.

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.