

Installation instruction for MVA-20: 894 Professional CVS fully automated for CVS determinations

The «MVA-20» is a fully automated system for the determination of suppressor, brightener and leveler in plating solutions in small sample series.

- PC controlled operation.
- Manual operations:
 - Filling of the sample vials on the Sample Processor with suppressor standard solutions or leveler concentrate, plating bath samples and rinsing solution.
- Automatic addition of 4 solutions: VMS, brightener concentrate, suppressor concentrate and suppressor standard/leveler concentrate or plating bath sample.
- Automatic rinsing of the measuring vessel.
- Method change during the determination series is possible.
- Applications:
 - Analysis of suppressor concentration in plating baths with CVS.
 - Analysis of brightener concentration in plating baths with CVS.
 - Analysis of leveler concentration in plating baths with CVS.



Fig. 1: MVA-20

Content

1. Instruments and accessories.....	2
2. System setup.....	2
2.1. Electrical connections	2
2.2. Tubing connections for rinsing and draining of the measuring vessel	3
2.3. Tubing connections for automatic dosing of standard solutions and auxiliary solutions.....	4
3. viva «Configuration».....	6
3.1. Devices – 894 Professional CVS	6
3.2. Sensors/Electrodes.....	6
3.3. Dosing units	6
3.4. Solutions	7
3.5. Devices – 919 IC Autosampler plus for CVS	7
4. viva «Method»	8
4.1. Method run.....	8
4.2. Evaluation	10
5. Operation.....	11
5.1. Suppressor determination series	11
5.2. Brightener determination series	12
5.3. Leveler determination series	13
6. Remarks	14
6.1. Single additive setup.....	14
6.2. Combination of applications.....	14
6.3. Measuring vessel	14
6.4. Storing dosing units	14
6.5. Storing electrodes	15
6.6. Waste container	15

1. Instruments and accessories

Quantity	Article number	
1	2.894.1210	894 Professional CVS semiautomated
2	2.800.0010	800 Dosino
1	2.843.0240	843 Membrane Pump Station for Professional CVS Systems
1	2.919.0120	919 IC Autosampler plus for CVS
1	6.2141.300	Remote cable
1	6.5339.0X0	CVS electrode kit
1	6.5339.500	Equipment with 2 dosing units for VA/ CVS
1	6.6065.21X	viva 2.1

2. System setup

2.1. Electrical connections

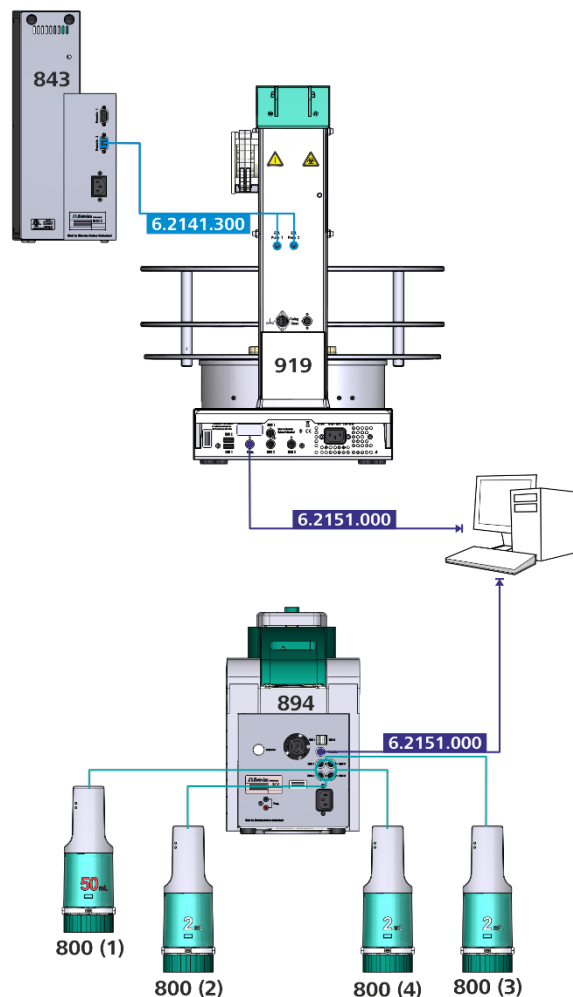
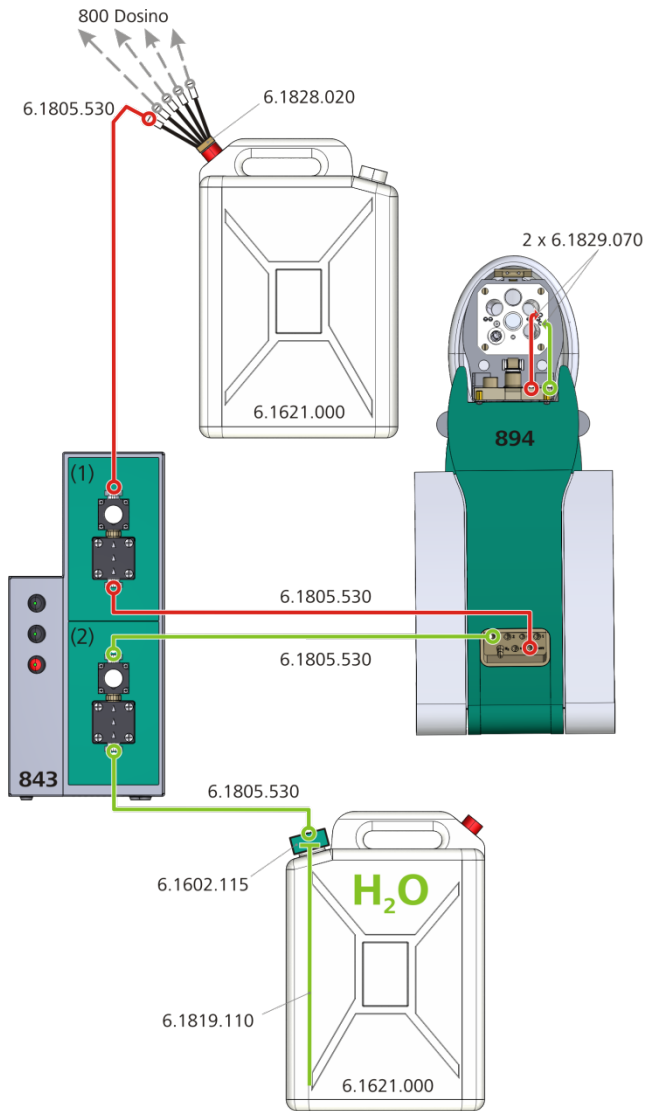


Fig. 2: Electrical connections

Please note!

- The cable 6.2141.300 has to be connected to «Remote 2» of the 843 Pump Station.
- 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 rinsing and draining of the measuring vessel



- Emptying tubes
- Rinsing tubes

Fig. 3: Tubing connections for rinsing and emptying of the measuring vessel

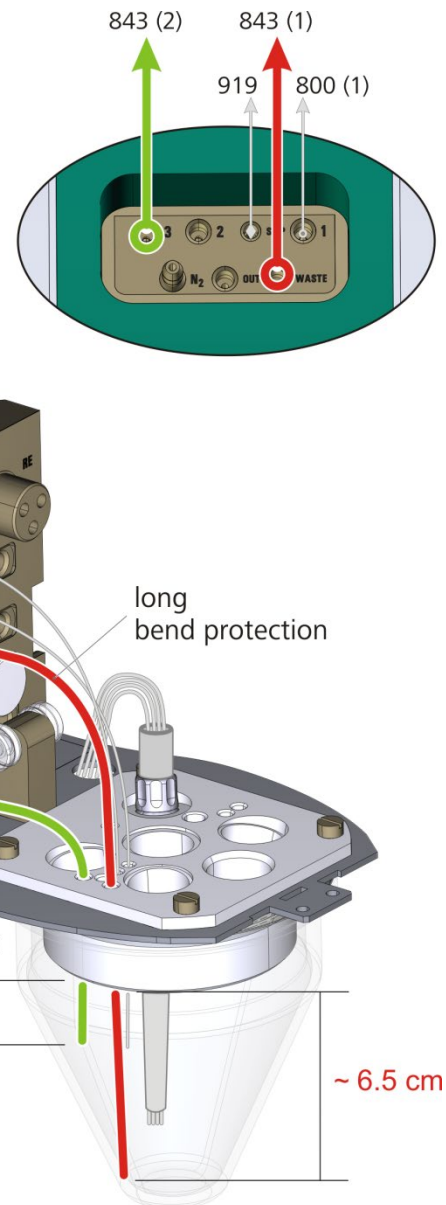


Fig. 4: Detailed view of the measuring head

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

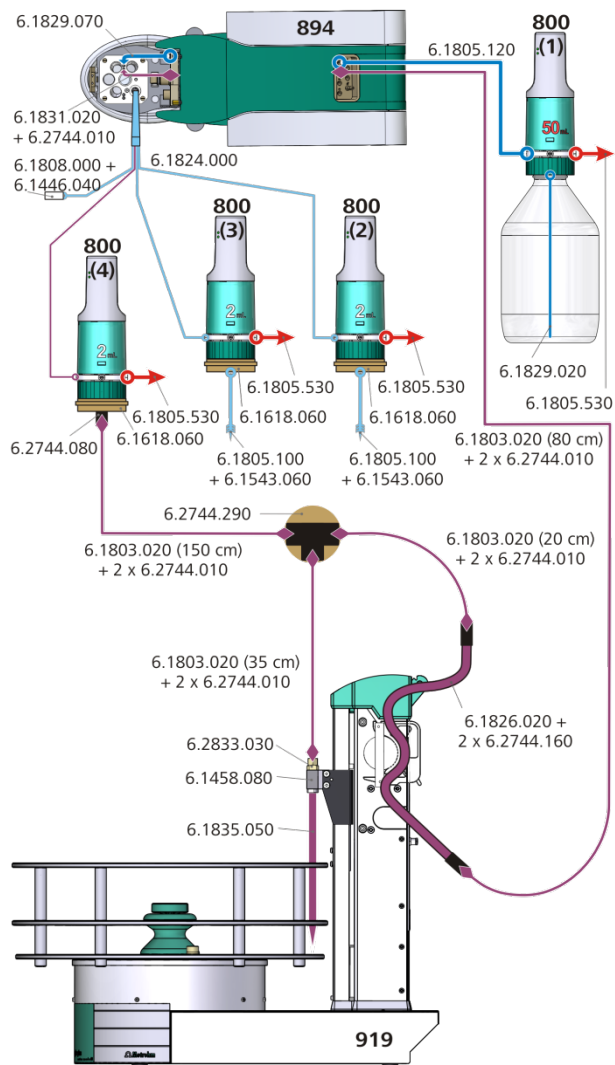


Fig. 5: Tubing connections for automatic dosing of standard solutions and auxiliary solutions

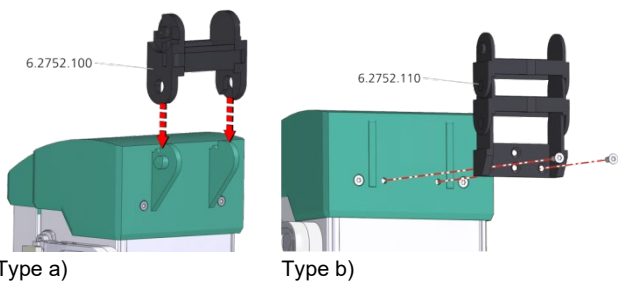


Fig. 6: Support for the T-connector for cover type a) 6.2752.100 and cover type b) 6.2752.110

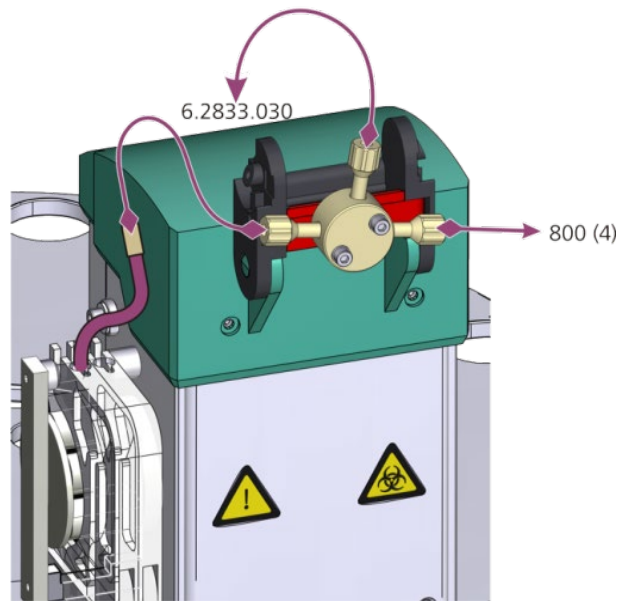


Fig. 7: Mounting of the T connector (6.2744.290) on the support type a)

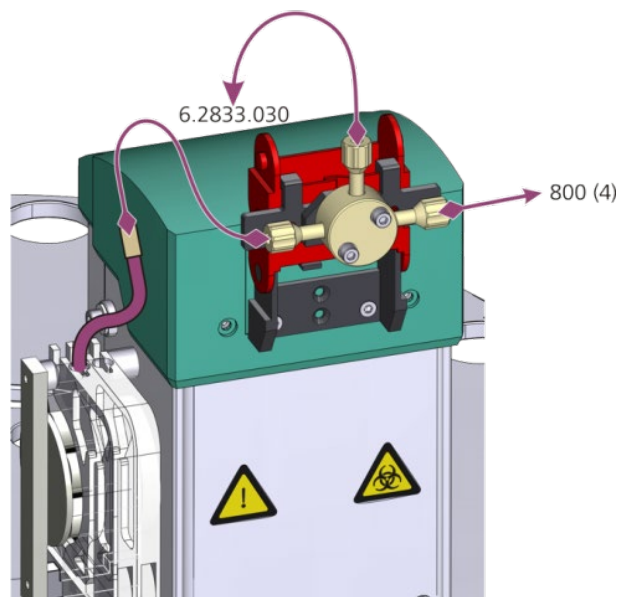


Fig. 8: Mounting of the T connector (6.2744.290) with adapter plate on the support type b)

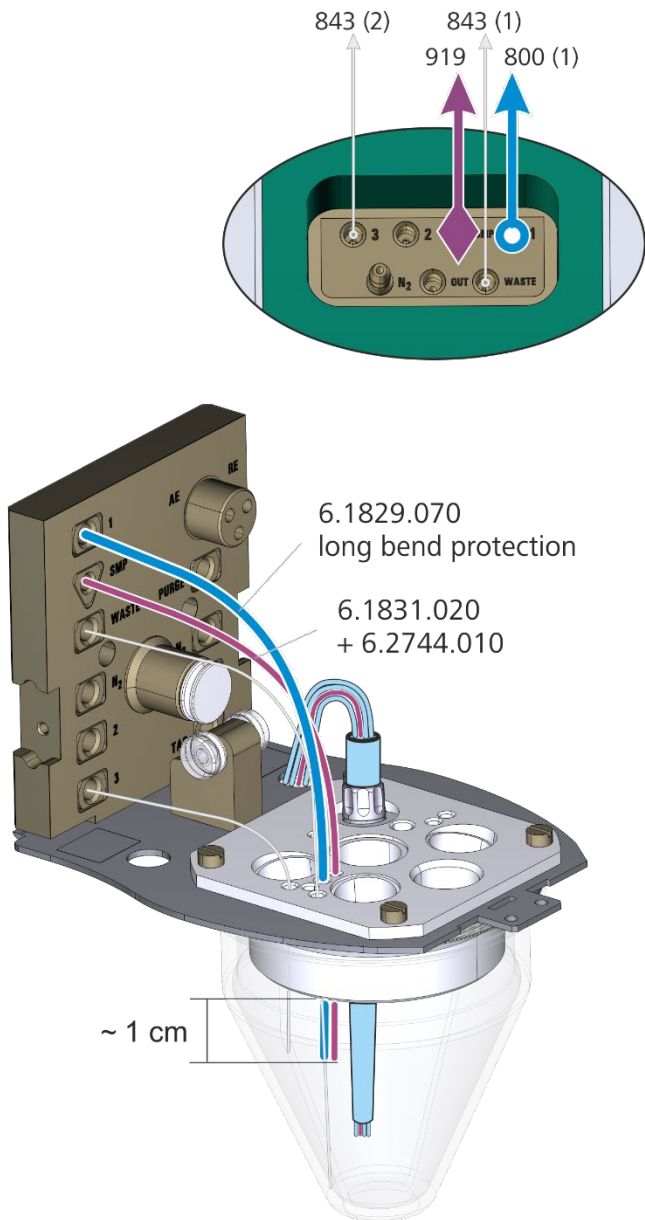


Fig. 9: Detailed view of the measuring head

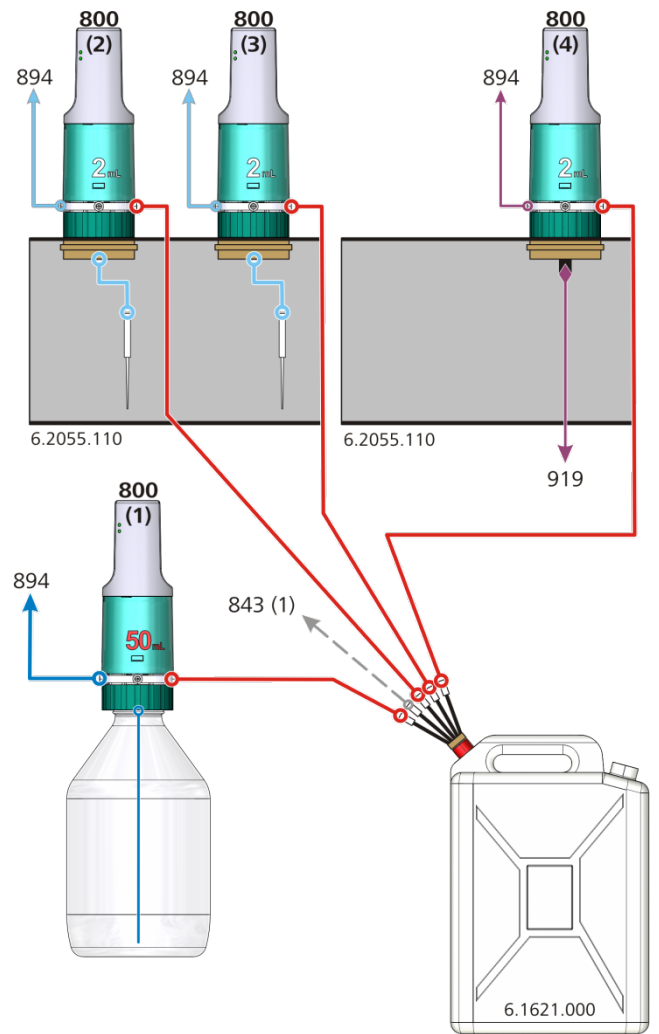
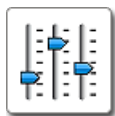


Fig. 10: Detailed view for the tubing connections of the dosing unit waste port

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 <i>Tutorial</i>

3.1. Devices – 894 Professional CVS

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
-------------	-------

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)

800 Dosino (1)	50 mL VMS
----------------	-----------

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	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) and 800 Dosino (3)

800 Dosino (2)	2 mL Brightener
800 Dosino (3)	2 mL Suppressor

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	55 cm	2 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic
--------------------	-----------

3.3.3. Dosing unit at 800 Dosino (4)

800 Dosino (4)	2 mL Standard or sample
----------------	-------------------------

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	4.0	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	200 cm	1 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic
--------------------	-----------

3.3.4. Dosing unit names

Please note that the dosing unit names in the example methods related to this Application Bulletin and the names in the **viva** method templates differ:

800105022EN example methods	viva method templates
50 mL VMS	894/D1 50mL VMS
2 mL Brightener	894/D2 2mL Brightener
2 mL Suppressor	894/D3 2mL Suppressor
2 mL Standard or sample	894/D4 2mL Std or sample

Therefore, the dosing unit names in your specific method may differ from the description in this Application Bulletin.

However, the dosing unit names can be chosen freely and independently of the instrument and MSB port, which they are connected to. Renaming is possible at any time.

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** example methods.

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».

3.5. Devices – 919 IC Autosampler plus for CVS

The «919 IC Autosampler plus for 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	919 IC Autosampler plus 1
-------------	---------------------------

For a step-by-step description, using the example of an 858 Professional Sample Processor, please see the *Tutorial* chapter «6.1.1 Configuring the instrument». The described procedure can be applied identically to a 919 IC Autosampler plus.

3.5.1. Tower

Tower parameters

Max. stroke path	133	mm
Min. beaker radius	off	
Lift rate	25	mm/s
Axial distance	189.0	mm

3.5.2. Rack

Rack name	6.2041.490
Shift rate	20 °/s

3.5.3. Rack data

Rack parameters

Beaker radius samples	off
Beaker sensor	off
Rack offset	0 °

Lift positions – Tower 1

Work position	User defined, see 3.5.4	mm
Rinse position	0	mm
Shift position	0	mm
Special position	0	mm

Lift positions – Tower 2

Work position	Not available
Rinse position	Not available
Shift position	Not available
Special position	Not available

Special beakers

Not used

3.5.4. Needle adjustment



The work position of the pipetting needle 6.1835.050 has to be adjusted in a way that the lower end of the needle is positioned max. 1 mm above the bottom of the sample vial. This is essential to guarantee a complete sample transfer from the sample vial on the rack of the 919 IC Autosampler plus into the measuring vessel of the 894 Professional CVS.

Note! For using the sample rack 6.2041.490 it is important to work with the transfer head 6.1458.080. Otherwise the needle does not point into the center of the vial.

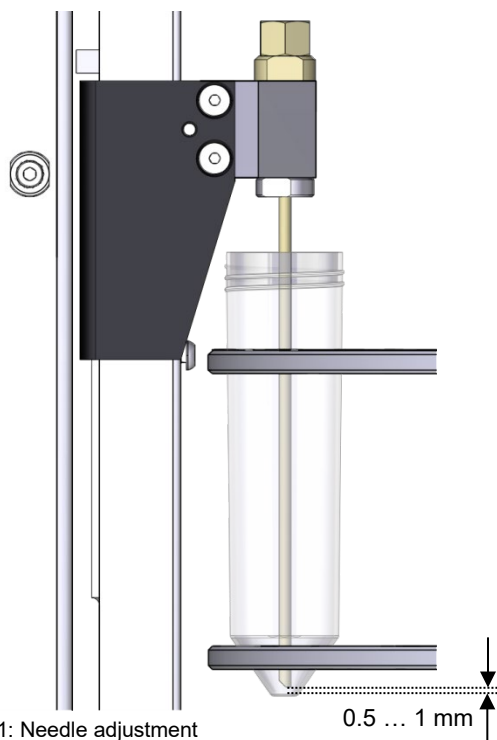


Fig. 11: Needle adjustment

Procedure to adjust the needle position in **viva**

1. Insert an empty sample vial to one of the sample positions on the rack (position 1 to 28).
2. Click on the «Manual» symbol.



3. Select Tower 1 (Sample changers – 919 IC Autosampler plus 1).
4. Open tab «Move».
5. Enter the position of the empty sample vial in the field «Target position».

Rack position

Current position: -----



Target position: [dropdown menu]

6. Click «Start» to move the needle to the chosen rack position.
7. Enter 125 mm in the field «Target position» in the section «Lift position».

Lift position

Current position: 0 mm

Target position: 125 mm

8. Click «Start» to lower the needle to the chosen target position. For the exact positioning of the needle as shown in «Fig. 11», use the arrow up and down buttons   to adjust the needle position stepwise.
9. Once the needle is properly adjusted select the tab «Assign position».
10. The new value can be seen in the section «Lift position – Current position».
11. Select the option «Work position for Tower» in the section «Lift position».

Lift position

Current position: 127 mm

Work position for: Tower

12. Click on «Assign» in the section «Lift position».
13. Leave the Manual control with a click on the «Close» button.

4. viva «Method»

4.1. Method run



The **viva** software includes three method templates for CVS analysis with an automated system.

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

Methods for fully automated leveler determination by RC are available in the internal area of the Metrohm website together with all methods files for application bulletin.

The templates already establish the basic sequences for the different applications, the use of 800 Dosinos for automatic dosing as well as the calculation of the result and the application of a sample changer and pumps to process a sample series. 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 «6.2 Methods for the automated determination».

The following commands have to be adapted:

4.1.1. Measuring commands

Such as

CVS
CVS

- 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:

ADD AUX	ADD STD
ADD VMS	ADD STD

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

Such as:

ADD SAMPLE DT
ADD SAMPLE DT

- 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.

4.1.3. Automation commands

Such as:

MOVE	LIFT	PUMP
MOVE to sample position	Needle → Work position	Peristaltic pump ON

- Assign the 919 IC Autosampler plus that should be used to run this command.

4.1.4. Transferring sample

This only applies for the brightener determination by MLAT and leveler determination by RC! To guarantee a complete sample transfer from the sample vial on the rack of the 919 IC Autosampler plus into the measuring vessel of the 894 Professional CVS the peristaltic pump time has to be adjusted in the **TRACK – PERISTALTIC PUMP** in the command **PUMP – PERISTALTIC PUMP ON**.

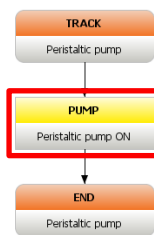


Fig. 12: Method snippet **TRACK – PERISTALTIC PUMP**

4.1.5. Rinsing measuring vessel

After each sample the measuring vessel needs to be rinsed with deionized water. The rinsing and draining times depend on the total volume used in the determination.

If the method templates are used, the rinsing and draining times are defined in the corresponding **PUMP** commands in the **TRACK – RINSE** and **TRACK – DRAIN**. The number of rinsing cycles is defined in the command **LOOP – LOOP RINSING** in the **TRACK – RINSING CYCLE**.

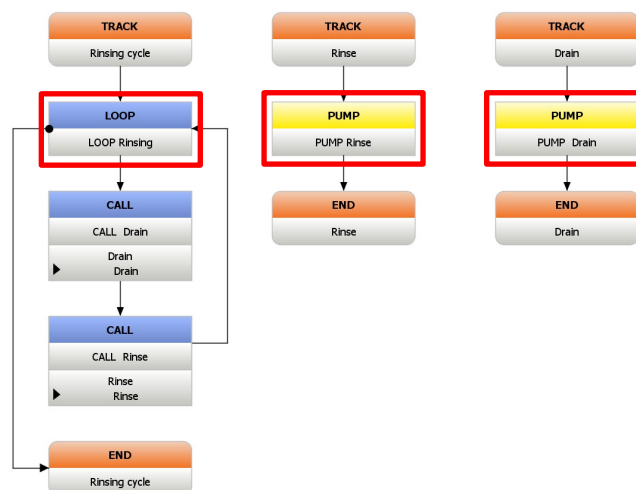


Fig. 13: Method snippet **TRACK – RINSING CYCLE**

Examples for rinsing and draining times:

Cell volume	50 mL	100 mL
Number of rinsing cycles	2	2
Draining time [s]	35	50
Rinsing time [s]	9	18

Please note! The device assigned to the commands **PUMP – PUMP RINSE** und **PUMP – PUMP DRAIN** need to be the 919 IC Autosampler plus, since the 843 Pump Station is connected to and controlled from the sample changer.

4.1.6. Rinsing transfer tubing

This only applies for the brightener determination by MLAT and leveler determination by RC! After each sample the transfer tubing from the 919 IC Autosampler plus to the measuring vessel of the 894 Professional CVS needs to be rinsed with deionized water. The rinsing solution is placed in a vial on the rack of the 919 IC Autosampler plus. The position of the rinsing solution relative to the sample position is defined in the **TRACK – GO TO RINSING POSITION** in the command **MOVE – MOVE RINSING POSITION**.

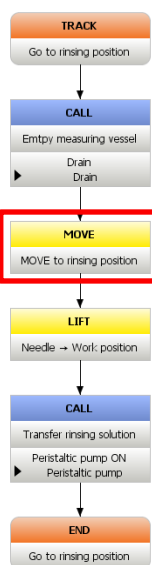


Fig. 14: Method snippet **TRACK – GO TO RINSING POSITION**

To change the relative position of the rinsing solution the formula editor has to be used on the parameter «Number» in the section «Target» in the command **MOVE – MOVE TO RINSING POSITION**.

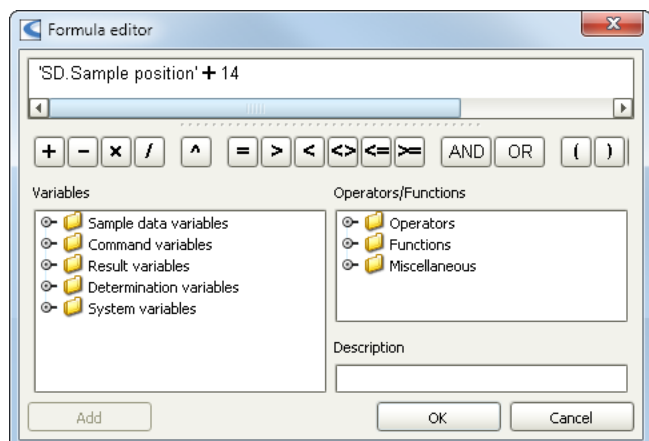


Fig. 15: Formula editor to change the rinsing position

The transfer time for the rinsing solution corresponds to the sample transfer time defined in the **TRACK – PERISTALTIC PUMP** in the command **PUMP – PERISTALTIC PUMP ON**.

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, MLAT or RC, 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.

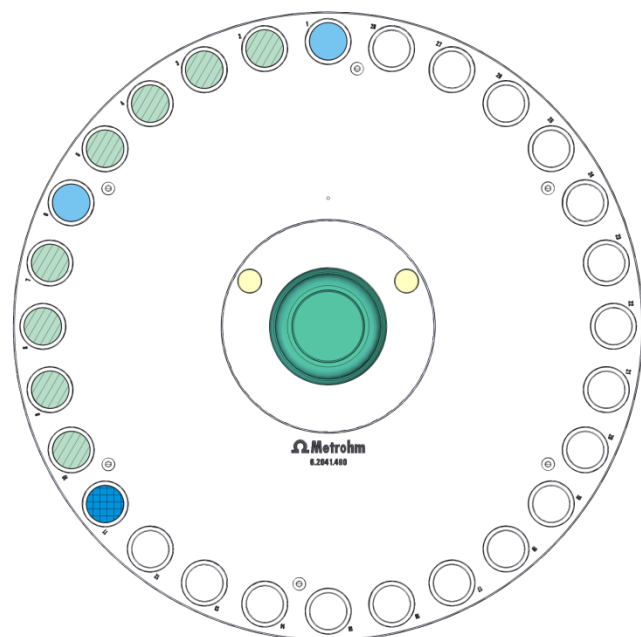
5. Operation

5.1. Suppressor determination series

5.1.1. Manual operation



- Dosing unit «50 mL VMS» has to be prepared with VMS.
- Suppressor standard solutions and plating bath samples are placed on position 1 to 27 of the sample rack using the sample vials for 50 mL (6.2747.010).
- On the position after the last sample a vial with deionized water is placed to rinse the dosing unit «2 mL Standard or sample» after the end of the suppressor sample series.



- Standard solution
- Sample
- Rinsing solution

Fig. 16: Example positions of solutions on the sample rack 6.2041.490 for suppressor determination

5.1.2. Workplace



- In the «Run» window on the tab «Determination series» create a sample table

	Method	ID1	ID2	ID3	Sample type	Sample position
▶ 1	Suppressor determination (CVS, DT), auto...	Standard solution	Calibration		Standard	1
2	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	2
3	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	3
4	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	4
5	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	5
6	Suppressor determination (CVS, DT), auto...	Standard solution	Calibration		Standard	6
7	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	7
8	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	8
9	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	9
10	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	10
*						

Fig. 17: Example sample table for suppressor determination

- To run a calibration with a standard solution select sample type **STANDARD**. For a determination the sample type **SAMPLE** has to be selected.
- No «Sample amount» needs to be defined in the sample table, 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 and determination by dilution titration is controlled by the 894 Professional CVS and **viva**.
 - a) The measuring vessel is emptied using the 843 Pump Station.
 - b) Dosing unit «2 mL Standard or sample» is automatically rinsed and prepared with suppressor standard or sample from the vial on the rack of the sample changer.
 - c) The measuring vessel is rinsed using the 843 Pump Station.
 - d) The dosing unit «50 mL VMS» automatically adds the VMS and dosing unit «2 mL Standard or sample» is used for the automatic addition of suppressor standard or plating bath sample.
 - e) At the end of each determination the measuring vessel is automatically emptied and rinsed using the 843 Pump Station.

The next sample starts again from a).

- Recalibration within a determination series is possible.
- At the end of a determination series the dosing unit «2 mL Standard or sample» is automatically prepared with rinsing solution.

5.2. Brightener determination series

5.2.1. Manual operation



- Dosing unit «50 mL VMS» has to be prepared with VMS.
- Dosing unit «2 mL Brightener» has to be prepared with brightener concentrate.
- Dosing unit «2 mL Suppressor» has to be prepared with suppressor concentrate.
- Plating bath samples are placed on position 1 to 14 of the sample rack using the sample vials for 50 mL (6.2747.010). The exact sample volume needed for the determination has to be pipetted into the vial.
- Rinsing solutions are placed on position 15 to 28 of the sample rack using the sample vials for 50 mL (6.2747.010). Usually the same volume of deionized water is used for rinsing like it was used for the sample. The rinsing solution has to be placed diagonally opposite the sample on the second half of the circle (Sample position + 14).

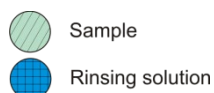
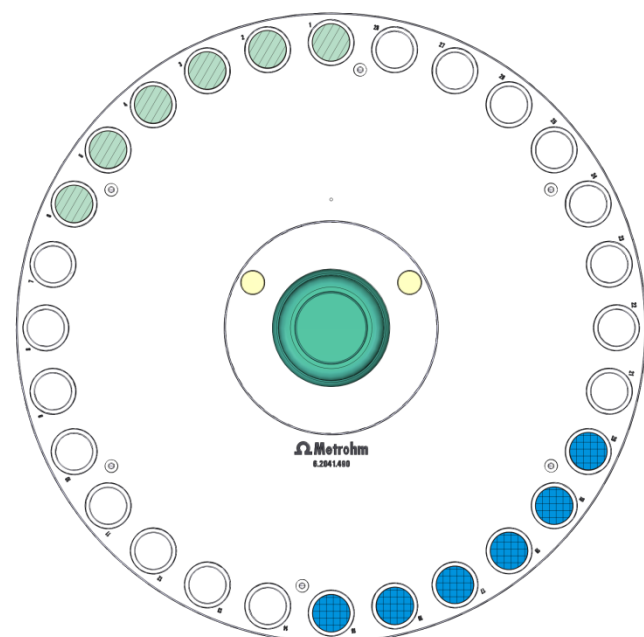


Fig. 18: Example positions of solutions on the sample rack 6.2041.490 for brightener determination

5.2.2. Workplace



- In the «Run» window on the tab «Determination series» create a sample table

	Method	ID1	ID2	ID3	Sample type	Sample position	Sample amount	Sample amount unit
▶ 1	Brightener determination with MLAT automatic	Sample	Determination		Sample	1	10	mL
2	Brightener determination with MLAT automatic	Sample	Determination		Sample	2	10	mL
3	Brightener determination with MLAT automatic	Sample	Determination		Sample	3	10	mL
4	Brightener determination with MLAT automatic	Sample	Determination		Sample	4	10	mL
5	Brightener determination with MLAT automatic	Sample	Determination		Sample	5	10	mL
6	Brightener determination with MLAT automatic	Sample	Determination		Sample	6	10	mL
**								

Fig. 19: Example sample table for brightener determination

- As sample type **SAMPLE** has to be selected.
- For «Sample amount» the volume pipetted into the vial has to be entered.

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**.
 - a) The measuring vessel is emptied using the 843 Pump Station.
 - b) The intercept solution is automatically prepared at the beginning of each determination by dosing VMS and suppressor concentrate from the respective Dosinos.
 - c) After the determination of the intercept value the plating bath sample is transferred from the sample rack to the measuring vessel by means of the built-in peristaltic pump of the 919 IC Autosampler plus. The sample is added on top of the intercept solution.
 - d) Standard addition is carried out automatically with brightener concentrate.
 - e) At the end of each determination the measuring vessel is emptied using the 843 Pump Station.
 - f) The transfer tubing from the sample changer to the measuring vessel is rinsed with the rinsing solution placed on the rack of the sample changer.
 - g) After the transfer tubing is rinsed the measuring vessel is automatically emptied and rinsed using the 843 Pump Station.

The next sample starts again from a).

5.3. Leveler determination series

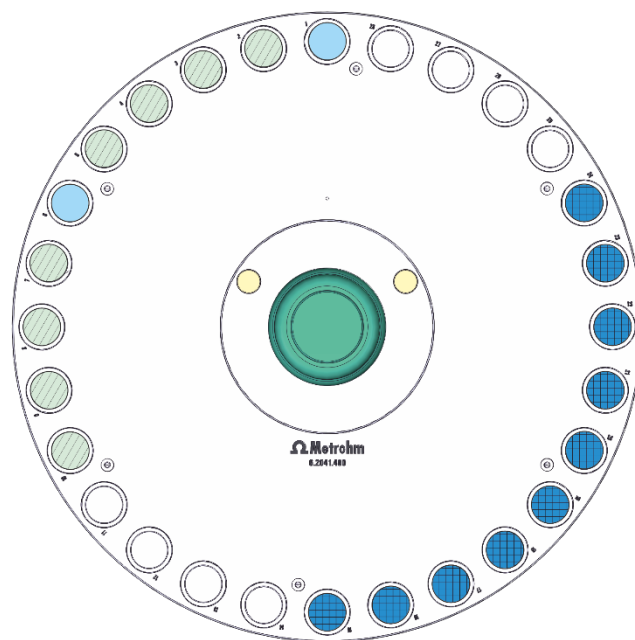
In the Metrohm Sales Area (protected part of the Metrohm website) two methods for fully automated determination of leveler with the 919 IC Autosampler plus are available for download. The difference between the two methods is the dilution of the sample.

MVA-20 Leveler determination method 1	The measuring vessel is emptied before the sample is transferred. No sample dilution.
MVA-20 Leveler determination method 2	The sample is directly added on the electrolyte solution. Sample is diluted.

5.3.1. Manual operation



- Dosing unit «50 mL VMS» has to be prepared with VMS.
- Dosing unit «2 mL Brightener» has to be prepared with brightener concentrate.
- Dosing unit «2 mL Suppressor» has to be prepared with suppressor concentrate.
- The leveler concentrate and plating bath samples are placed on position 1 to 14 of the sample rack using the sample vials for 50 mL (6.2747.010).
 - The exact volume of plating bath samples needed for the determination has to be pipetted accurately into the vial.
 - The volume of leveler concentrate has to be big enough to prepare the 2 mL dosing unit twice.
- Rinsing solutions are placed on position 15 to 28 of the sample rack using the sample vials for 50 mL (6.2747.010). Usually the same volume of deionized water is used for rinsing like it was used for the sample or the leveler concentrate. The rinsing solution has to be placed diagonally opposite the sample on the second half of the circle (Sample position + 14).



- Standard solution
- Sample
- Rinsing solution

Fig 1: Example positions of solutions on the sample rack 6.2041.490 for leveler determination

5.3.2. Workplace



- In the «Run» window on the tab «Determination series» create a sample table

	Method	ID1	ID2	ID3	Sample type	Sample position	Sample amount	Sample amount unit
▶ 1	Leveler determination (CV5, RC) ...	Leveler concentrate	Calibration	Standard	1	1.0	ml	
2	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	2	25	ml	
3	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	3	25	ml	
4	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	4	25	ml	
5	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	5	25	ml	
6	Leveler determination (CV5, RC) ...	Leveler concentrate	Calibration	Standard	6	1.0	ml	
7	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	7	25	ml	
8	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	8	25	ml	
9	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	9	25	ml	
10	Leveler determination (CV5, RC) ...	Sample	Determination	Sample	10	25	ml	
*								

Fig 2: Example sample table for leveler determination

- To run a calibration with a standard solution select sample type **STANDARD**. For a determination the sample type **SAMPLE** has to be selected.
- For the leveler calibration the value in the «Sample amount» does not matter. This value is only required for the sample determination. The addition volume for the standard is defined in the method command **ADD STD**.

5.3.3. Course of events

- The execution of calibration and determination by response curve is controlled by the 894 Professional CVS and **viva**.
- Calibration
 - a) The measuring vessel is emptied using the 843 Pump Station.
 - b) Dosing unit «2 mL Standard or sample» is automatically rinsed and prepared with leveler concentrate from the vial on the rack of the sample changer.
 - c) The measuring vessel is rinsed and emptied using the 843 Pump Station.
 - d) The electrolyte solution is automatically prepared in the measuring vessel at the beginning of the calibration by dosing VMS, suppressor concentrate and brightener concentrate from the respective dosing units.
 - e) After the determination of the electrolyte value the automatic addition of leveler concentrate is carried out by the dosing unit «2 mL Standard or sample».
 - f) At the end of the calibration the Dosing unit «2 mL Standard or sample» is automatically rinsed with deionized water from the respective rinsing vial on the rack of the sample changer.
 - g) The needle and the tubing between the needle and the T connector are automatically emptied by using the peristaltic pump on the sample changer.
 - h) As a final step the measuring vessel is automatically emptied and rinsed using the 843 Pump Station.
- Sample determination
 - a) The measuring vessel is emptied using the 843 Pump Station.
 - b) The electrolyte solution is automatically prepared in the measuring vessel at the beginning of the determination by dosing VMS, suppressor concentrate and brightener concentrate from the respective dosing units.
 - c) The electrolyte value is determined.
 - d) The measuring vessel is emptied using the 843 Pump Station (only RC method 1!).
 - e) The plating bath sample is transferred from the sample rack to the measuring vessel by means of the built-in peristaltic pump of the 919 IC Autosampler plus. Additional suppressor concentrate and brightener concentrate are added from the respective dosing units.
 - f) At the end of each determination the measuring vessel is emptied using the 843 Pump Station.

- g) The transfer tubing from the sample changer to the measuring vessel is rinsed with the rinsing solution placed on the rack of the sample changer.
- h) After the transfer tubing is rinsed the measuring vessel is automatically emptied and rinsed using the 843 Pump Station.
- i) The next sample starts again from a).

- Recalibration within a determination series is possible.

6. Remarks

6.1. Single additive setup

If the system is only used for suppressor or only for brightener determination the unused port at the T connector (6.2744.290) has to be closed with a threaded stopper (6.2744.060). If the system is only used for leveler determination all ports on the T connector are used.

6.2. Combination of applications

The determination of suppressor by dilution titration (DT), brightener by modified linear approximation technique (MLAT) and leveler by response curve (RC) can also be combined in one series.

6.3. Measuring vessel

Two measuring vessels are shipped with the electrode equipments for CVS, e.g. 6.5339.010.

Measuring vessel	Min. volume /mL	Max. volume /mL
6.1415.210	10	70
6.1415.250	30	150

The used measuring vessel must be suitable for the expected volumes of the application. At the minimum the electrodes have to immerse into the solution. At the maximum the measuring vessel must be sufficient to hold the total volume of the measuring solution.

For this purpose either the correct measuring vessel has to be chosen or the volumes of the application have to be adapted accordingly.

6.4. 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.

6.5. 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 (or KNO_3 solution in case KNO_3 is used as bridge electrolyte), so that the reference electrode immerses at least to the rim of the electrolyte vessel.

6.6. Waste container

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