

Application Bulletin 800105023EN

Installation instruction for MVA-21/MVA-23: 894 Professional CVS or 884 Professional VA fully automated for CVS determinations

The «MVA-21/MVA-23» is a fully automated system for the determination of suppressor, brightener and leveler in plating solutions.

- 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-21/MVA-23

The only difference between the systems MVA-21 and MVA-23 is that in case of the MVA-21 the 894 Professional CVS is used, whereas the MVA-23 is delivered with the 884 Professional VA. The rest of the equipment is identical for both systems.

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1. Instruments and accessories

In the following only the MVA-23 is described. For the MVA-21 the instructions are nearly identical. There are only minor differences, which are described in chapter 6.8.

Quantity	Article number	
1	2.884.1210	884 Professional VA semiautomated for CVS
2	2.800.0020	800 Dosino
1	2.843.0240	Membrane Pump Station for Professional CVS Systems
1	2.858.0110	858 Professional CVS Sample Processor
1	6.2141.300	Remote cable
1	6.5339.0x0	CVS Electrodes kit
1	6.5339.500	Equipment with 2 dosing units for VA/CSV
1	6.6065.21X	viva 2.1

2. System setup

2.1. Electrical connections

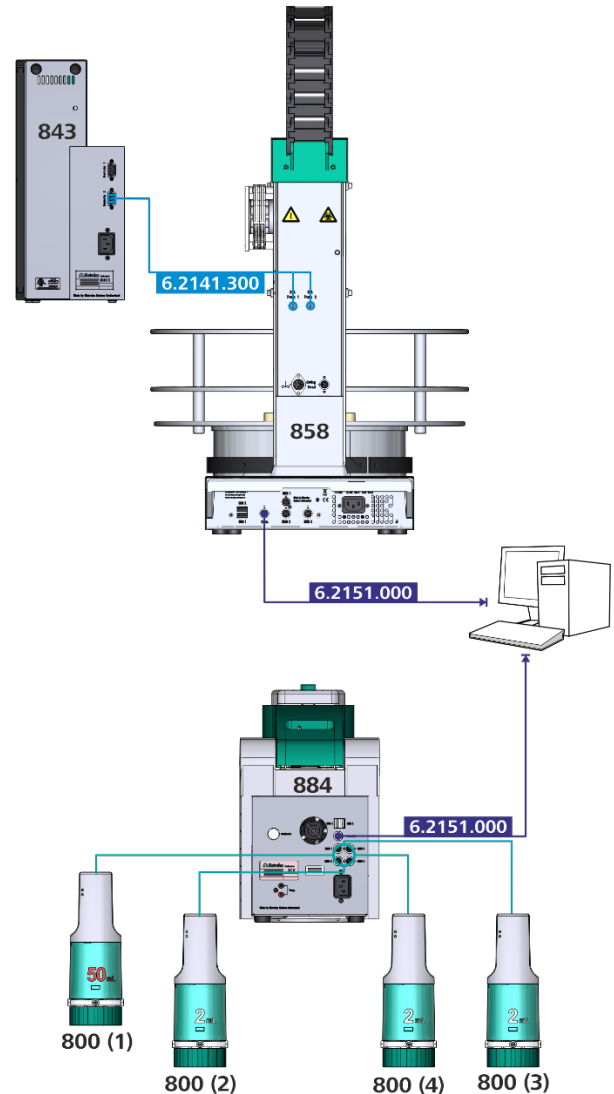


Fig 2: Electrical connections

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

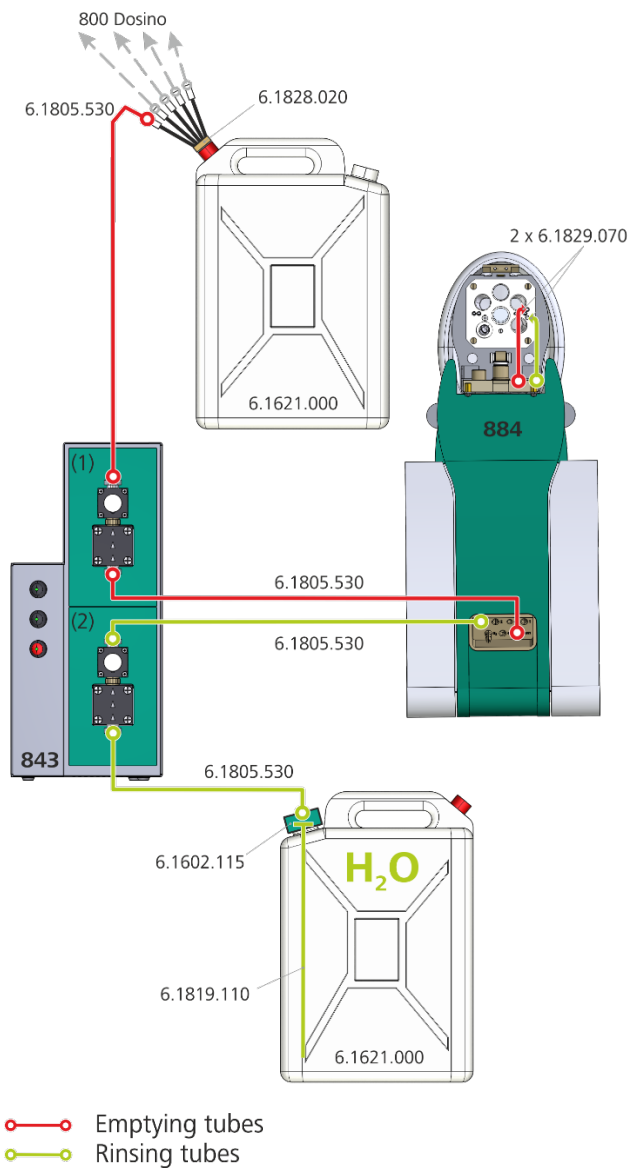


Fig 3: Tubing connections for rinsing and emptying of the measuring vessel

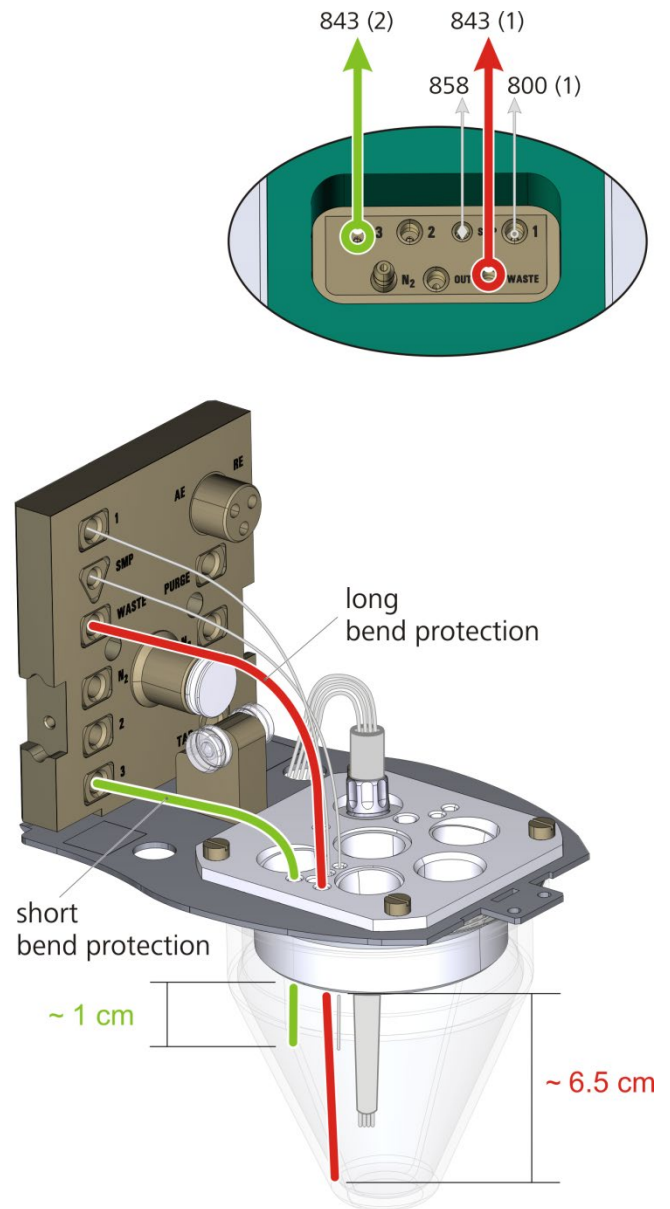


Fig 4: Detailed view of the measuring head

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

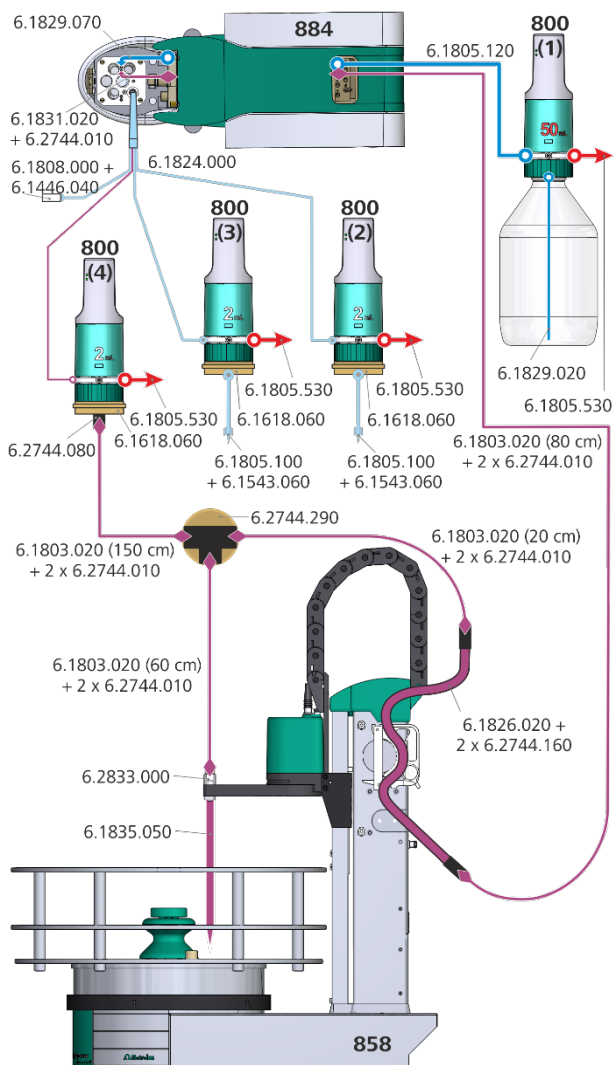


Fig 5: Tubing connections for automatic dosing of standard solutions and auxiliary solutions

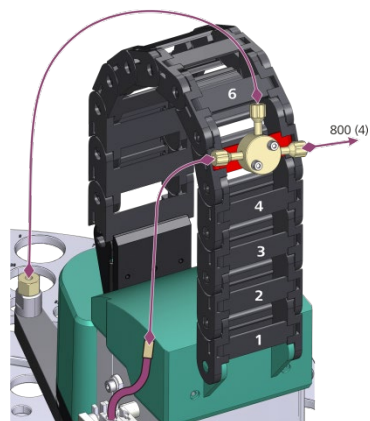


Fig 6: Mounting of the T connector (6.2744.290) on the guide chain.

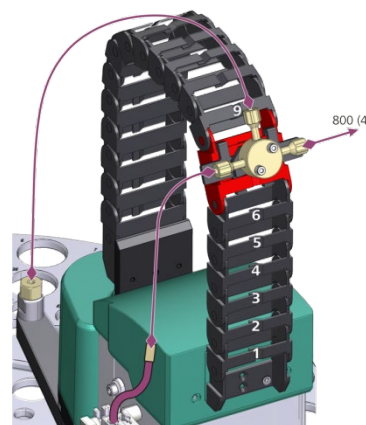


Fig 7: Mounting of the T connector (6.2744.290) with adapter plate on alternative type of the guide chain.

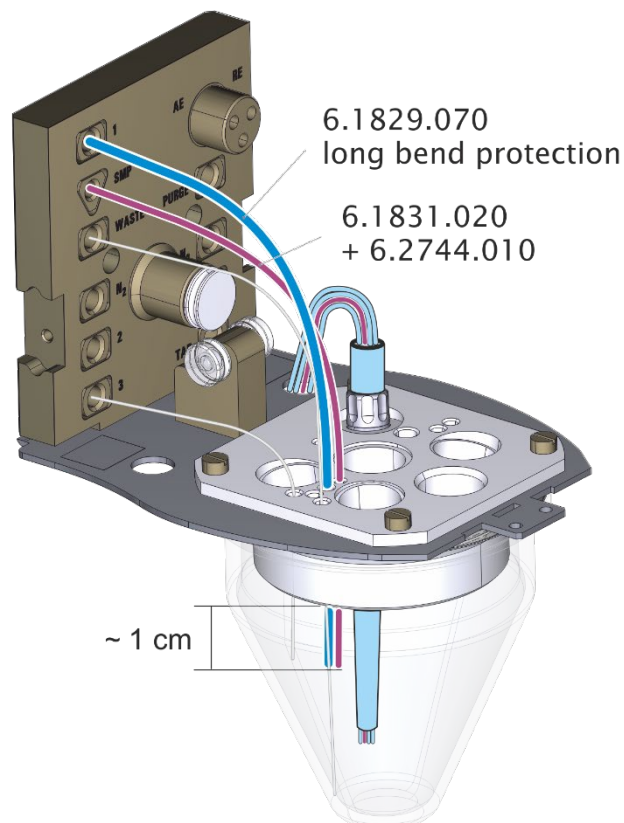
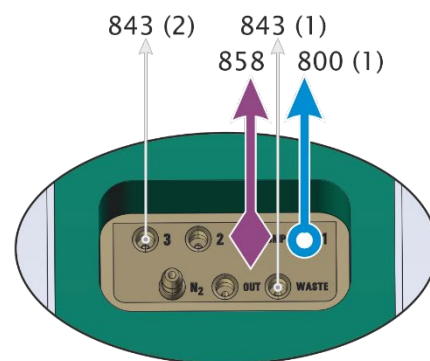


Fig 8: Detailed view of the measuring head

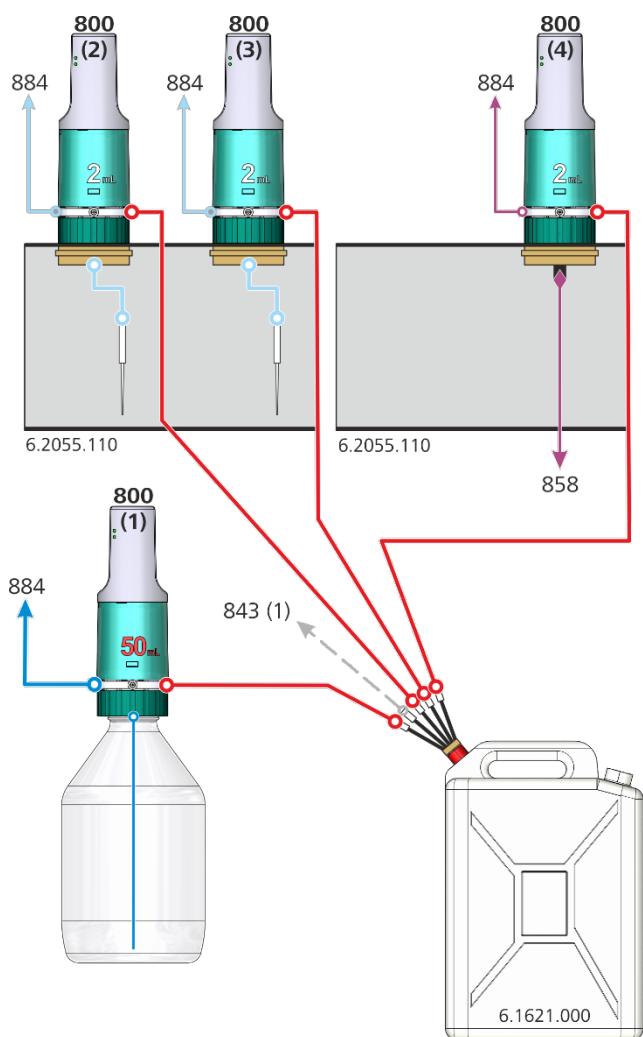
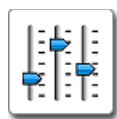


Fig 9: Detailed view for the tubing connections of the dosing unit waste port

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 *Tutorial*

3.1. Devices – 884 Professional VA

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». The following three electrodes have to be present if the measuring command in the method is used as specified in the **viva** method templates for CVS.

Sensor name	Sensor type
Auxiliary electrode	Auxiliary electrode
RDE	RDE/SSE
Reference electrode	Reference electrode

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 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

Tube 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
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3.3.3. Dosing unit at 800 Dosino (4)

800 Dosino (4)	2 mL Standard or sample
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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	4.0	mL/min
Dosing rate Special port	maximum	mL/min

Tube 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	230 cm	1 mm
Special port	Port 4	0 cm	2 mm

Valve disk

Rotating direction	automatic
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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:

AB 402 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
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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 be dosed automatically 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 – 858 Professional Sample Processor for CVS

The «858 Professional Sample Processor 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	858 Professional Sample Processor 1
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For a step-by-step description please see the *Tutorial* chapter «6.1.1 Configuring the instrument».

3.5.1. Tower

Tower parameters

Max. stroke path	130	mm
Min. beaker radius	off	
Lift rate	25	mm/s
Axial distance	166.0	mm

Swing head

Swing position	0	mm
Rinse position	0	mm

External position	Not used
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3.5.2. Rack

Rack name	6.2041.450	
Shift rate	20	°/s

3.5.3. Rack data

Rack parameters

Beaker radius samples	off
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Beaker sensor	off
---------------	-----

Rack offset	0	°
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Lift positions – Tower 1

Work position	User defined	mm
---------------	--------------	----

Rinse position	0	mm
----------------	---	----

Shift position	0	mm
----------------	---	----

Special position	0	mm
------------------	---	----

Lift positions – Tower 2

Work position	Not available
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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 sample transfer 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 858 Professional Sample Processor into the measuring vessel of the 884 Professional VA.

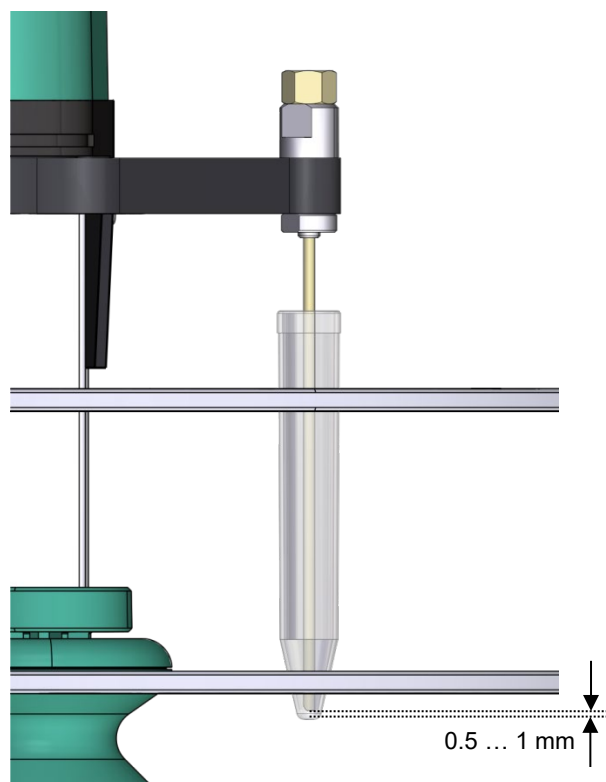


Fig 10: Needle adjustment

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

1. Insert an empty sample vial to the desired sample position on the rack (position 57 to 112).
2. Click on the Manual symbol.



3. Select Tower 1 (Sample changers – 858 Professional Sample Processor).
4. Open tab «Move».
5. Enter the position of the empty sample vial in the field «Target position».

Rack position	
Current position	-----
Target position	<input type="text" value=""/>

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	<input type="text" value="0"/> mm
Target position	<input type="text" value="125"/> mm

8. Click Start to lower the needle to the chosen target position. To adjust the needle like shown above, use the arrow up and down buttons to lower the needle 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».



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 and methods 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, 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



- Assign the 884 Professional VA 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.

4.1.3. Automation commands

Such as:



- Assign the 858 Professional Sample Processor 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 858 Professional Sample Processor into the measuring vessel of the 884 Professional VA the peristaltic pump time has to be adjusted in the **TRACK – PERISTALTIC PUMP** in the command **PUMP – PERISTALTIC PUMP ON**.

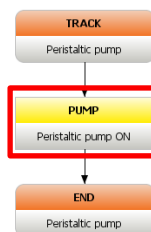


Fig 11: Method snippet **TRACK – PERISTALTIC PUMP**

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**.

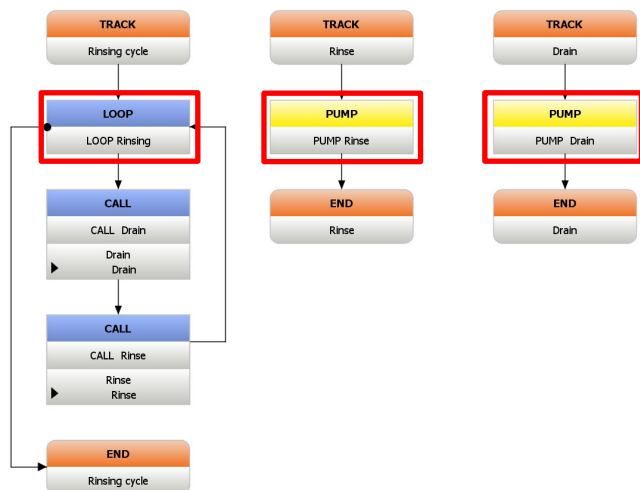


Fig 12: Method snippet **TRACK – RINSING CYCLE**

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 858 Professional Sample Processor, 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 858 Professional Sample Processor to the measuring vessel of the 884 Professional VA needs to be rinsed with deionized water. The rinsing solution is placed in a vial on the rack of the 858 Professional Sample Processor. 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 TO RINSING POSITION**.

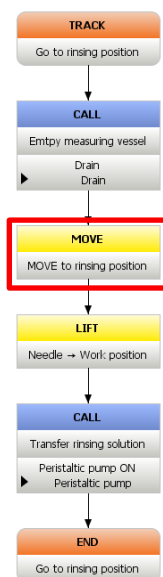


Fig 13: Method snippet **TRACK – GO TO RINSING POSITION**

The position of the rinsing solution is defined as «sample position + 28». This means the outer circle on the rack 6.2041.450 is used for the sample and the inner circle for the rinsing solution.

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.

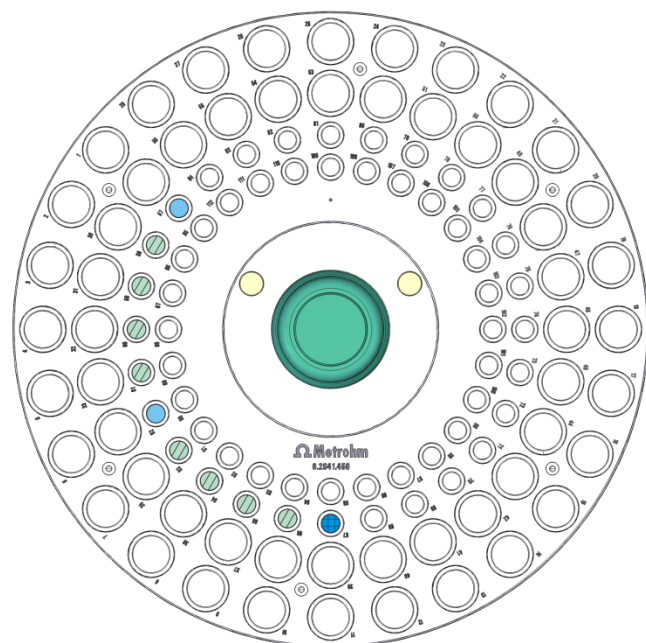
5. Operation

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 57 to 111 of the sample rack using the sample vials for 11 mL (6.2743.057).
- 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 14: Example positions of solutions on the sample rack 6.2041.450 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	57
2	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	58
3	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	59
4	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	60
5	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	61
6	Suppressor determination (CVS, DT), auto...	Standard solution	Calibration		Standard	62
7	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	63
8	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	64
9	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	65
10	Suppressor determination (CVS, DT), auto...	Sample	Determination		Sample	66
*						

Fig 15: 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 884 Professional VA 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) VMS is automatically dosed from the dosing unit «50 mL VMS» and the automatic addition of suppressor standard or plating bath sample is carried out by the dosing unit «2 mL Standard or 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 28 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 29 to 56 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 on the inner circle on the neighboring position of the sample (Sample position + 28).

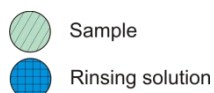
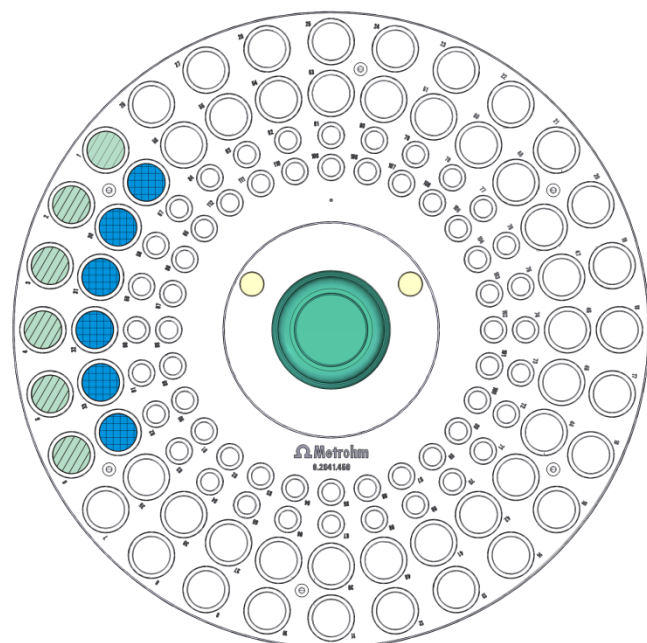


Fig 16: Example positions of solutions on the sample rack 6.2041.450

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 17: Example sample table

- 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 884 Professional VA 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 dosing units.
 - 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 858 Professional Sample Processor. 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

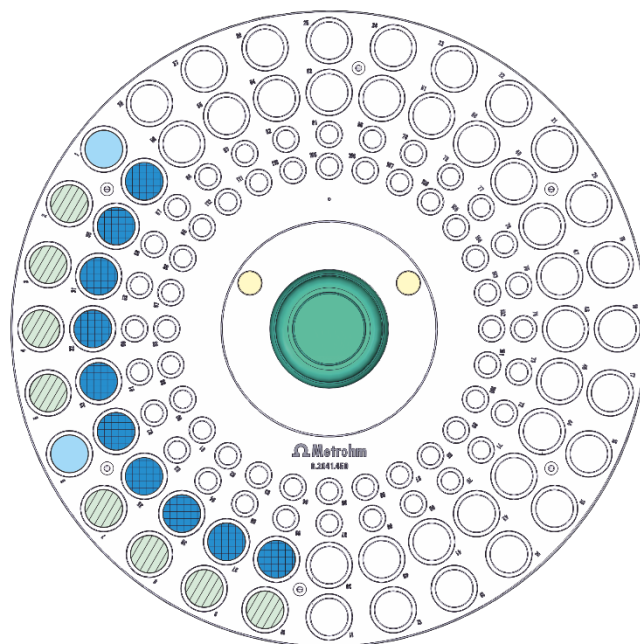
In the Metrohm Sales Area (protected part of the Metrohm website) two methods for fully automated determination of leveler with the 858 Professional Sample Processor are available for download. The difference between the two methods is the dilution of the sample.

MVA-23 Leveler determination method 1	The measuring vessel is emptied before the sample is transferred. No sample dilution.
MVA-23 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.
 - Leveler concentrate and plating bath samples are placed on position 1 to 28 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 the volume has to be big enough to prepare the 2 mL dosing unit twice.
- Rinsing solutions are placed on position 29 to 56 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 on the inner circle on the neighboring position of the sample or leveler concentrate (Sample position + 28).



- Standard solution
- Sample
- Rinsing solution

Fig 18: Example positions of solutions on the sample rack 6.2041.450 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 19: 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 884 Professional VA 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 858 Professional Sample Processor. 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 this must not be done since 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. The volume of the measuring solution must be within these limits to ensure that the electrodes are immersed sufficiently.

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

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. Sample vials

For MLAT and RC determinations with less than 10 mL sample solution it is recommended to use the 11 mL vials instead of the 50 mL vials.

6.5. Storing dosing units

When the dosing units are not used (during the night, over the weekend) the dosing cylinder has to be rinsed with

deionized 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 deionized water is sufficient to prevent a blockage.

6.6. 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.

6.7. 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.

6.8. Using the 894 Professional CVS

If the 894 Professional CVS is used instead of the 884 Professional VA there are only minor changes in the setup description which have to be considered.

- 894 Professional CVS semiautomated (2.894.1210) is used instead of 884 Professional VA semiautomated (2.884.1210).
- The 894 has to be assigned to the measuring commands.
- Minimum software requirement: **viva** 1.1. However, it is recommended to update **viva** to the latest version.