884 Professional VA



Universal system solution for voltammetry and CVS

Metrohm

884 Professional VA and **viva** – flexible, convenient, and secure!

The 884 Professional VA in combination with **viva** software is currently the most modern and most flexible analysis system for voltammetry and polarography.

More flexibility

The 884 Professional VA is outstanding for its unique flexibility. Due to its modular design, the system can be expanded at any time with additional components such as dosing devices, pumps, and sample changers. This flexibility is supported by the **viva** PC software. **viva** gives users unlimited freedom to program their own application-oriented methods. Commonly used methods are already available as templates to facilitate familiarization with the system. Access to all method parameters is a matter of course.

More convenience

Another key benefit of **viva** is the integrated database. In addition to automatic data acquisition and evaluation, **viva** also enables convenient management of the measuring results.

More security

User administration with freely definable access rights as well as automatic backup functions ensure a high level of data security. Even better: to ensure that the solutions, and electrodes are checked at regular intervals, they can be monitored with the GLP (Good Laboratory Practice) functions.

The most important applications

- Determination of transition metals using polarography or stripping voltammetry
- Speciation analysis
- Determination of organic additives (brighteners, levelers, suppressors) in electroplating baths using CVS







The most important benefits at a glance

884 Professional VA

- Compact, space saving design
- Maximum flexibility due to easily exchangeable measuring head
- Trace analysis and CVS in one instrument
- Customized measuring system with versatile automation options
- Guaranteed accuracy and trueness due to the integrated calibrator

viva

- Maximum flexibility due to individualized, task-focused method programming
- Intelligent user support based on logical decisions, e.g. proportional standard addition, measuring with or without preconcentration
- Reliable and reproducible calculations of the results
- Data security and traceability of the measurement results
- Database with numerous functions for convenient viewing and assessment of measurement results

Application 1 – Trace analysis

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Analysis of heavy metals using voltammetry

Voltammetry is outstanding for its combination of low detection limits and low sensitivity to interferences arising from high concentrations of dissolved solids. Moreover, it is a quite affordable technologoy and operating costs are low – especially in comparison with spectroscopic methods such ICP-MS.

Total concentration and speciation

Spectroscopic methods can determine only the total metal concentration. In contrast, voltammetry can also be used to differentiate between different oxidation states of metal ions or between free and bound metal ions. This allows statements to be made on the biological availability and on the toxicity of heavy metals, e.g., in environmental research.

High ion concentrations? Not a problem with VA!

Samples with high ion concentrations are not a problem for voltammetry. Hence, voltammetry is ideal for the analysis of:

- Seawater, salts, pure chemicals
- Electroplating baths

Typical limits of detection		
Antimony	Sb^{III}/Sb^{V}	200 ppt
Arsenic	As^{III}/As^{V}	100 ppt
Bismuth	Bi	500 ppt
Lead	Pb	50 ppt
Cadmium	Cd	50 ppt
Chromium	Cr^{III}/Cr^{VI}	25 ppt
Cobalt	Co	50 ppt
Iron	Fe^{II}/Fe^{III}	50 ppt
Copper	Cu	50 ppt
Molybdenum	Mo	50 ppt
Nickel	Ni	50 ppt
Platinum	Pt	0.1 ppt
Rhodium	Rh	0.1 ppt
Mercury	Hg	100 ppt
Selenium	Se^{IV}/Se^{VI}	300 ppt
Thallium	Tl	50 ppt
Uranium	U	25 ppt
Tungsten	W	200 ppt
Zinc	Zn	50 ppt





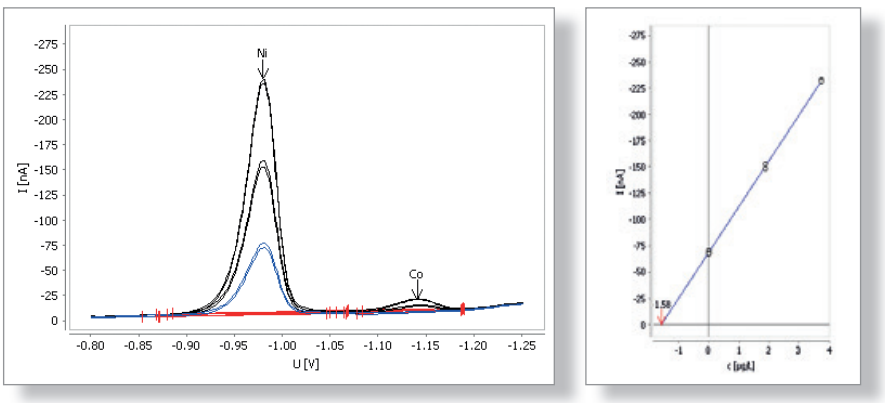
Determination of organics, anions, and elements

Voltammetry is not just limited to metal determination. It may also be used to determine a wide variety of organic compounds by polarography. Voltammetry thus permits a simple determination of impurities in organic synthesis, e.g., 4-carboxybenzaldehyde in terephthalic acid or free styrene in polystyrene. Active pharmaceutical ingredients, e.g., thiomersal in storage solutions for contact lenses, can be quantified by polarography.

Certain special anions can also be determined by voltammetry. Of particular interest is the analysis of environmentally relevant species such as cyanide, sulfide, nitrite, and nitrate. The polarographic determination of elemental sulfur in gasoline is an application that is particularly used in vehicle construction and in petrochemistry.

Typical applications

- Metal ions, e.g., Cd, Pb, Ni, Co, Fe, As in water samples
- Additives and impurities in electroplating baths and in electrolytic metal refining
- Corrosion indicators (Cu, Fe, etc.) in boiler feed water
- Ultratrace determination of metal species (Fe(II), Fe(III), Cr(III), Cr(VI), Cd, Pb, Co, etc.) in seawater
- Fe(II) in iron sucrose injection solutions
- Iodide and iodate in sodium chloride solutions and glacial acetic acid

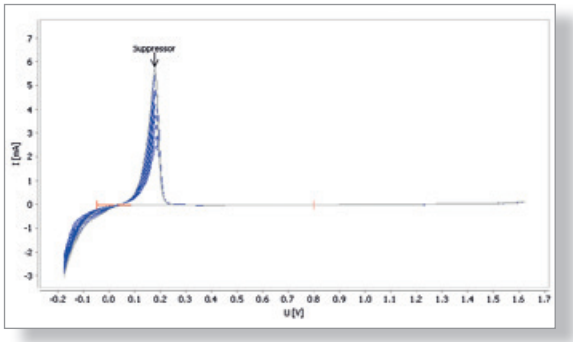


Typical voltammogram nickel (1.7 µg/L) and cobalt (n/a) in seawater

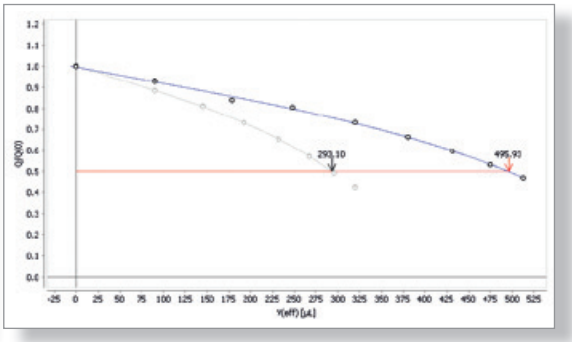
Application 2 – Determination of organic additives with CVS

«Cyclic Voltammetric Stripping» (CVS) and «Cyclic Pulse Voltammetric Stripping» (CPVS) are important methods used in the electroplating industry for the determination of organic additives in electroplating baths. This method plays a crucial role in production control for many types of technical coatings, particularly in the manufacturing of printed circuit boards and semiconductors. Quantitative determination of the additives takes place indirectly via their influence on the plating of the principal component of the electroplating bath. Since the measurement is based on an electrode reaction that corresponds to the production process, the activity of the additives and thus their efficiency in the electroplating process is measured. Due to the different effects of the additives in the electroplating process, different measuring and calibration techniques are available for the analysis.

Dilution Titration (DT)
The well-established Dilution Titration (DT) technique can be used to determine the concentration of the suppressor component. Using the innovative smartDT, the execution of this determination is now even faster and more efficient than before.



Typical voltammogram

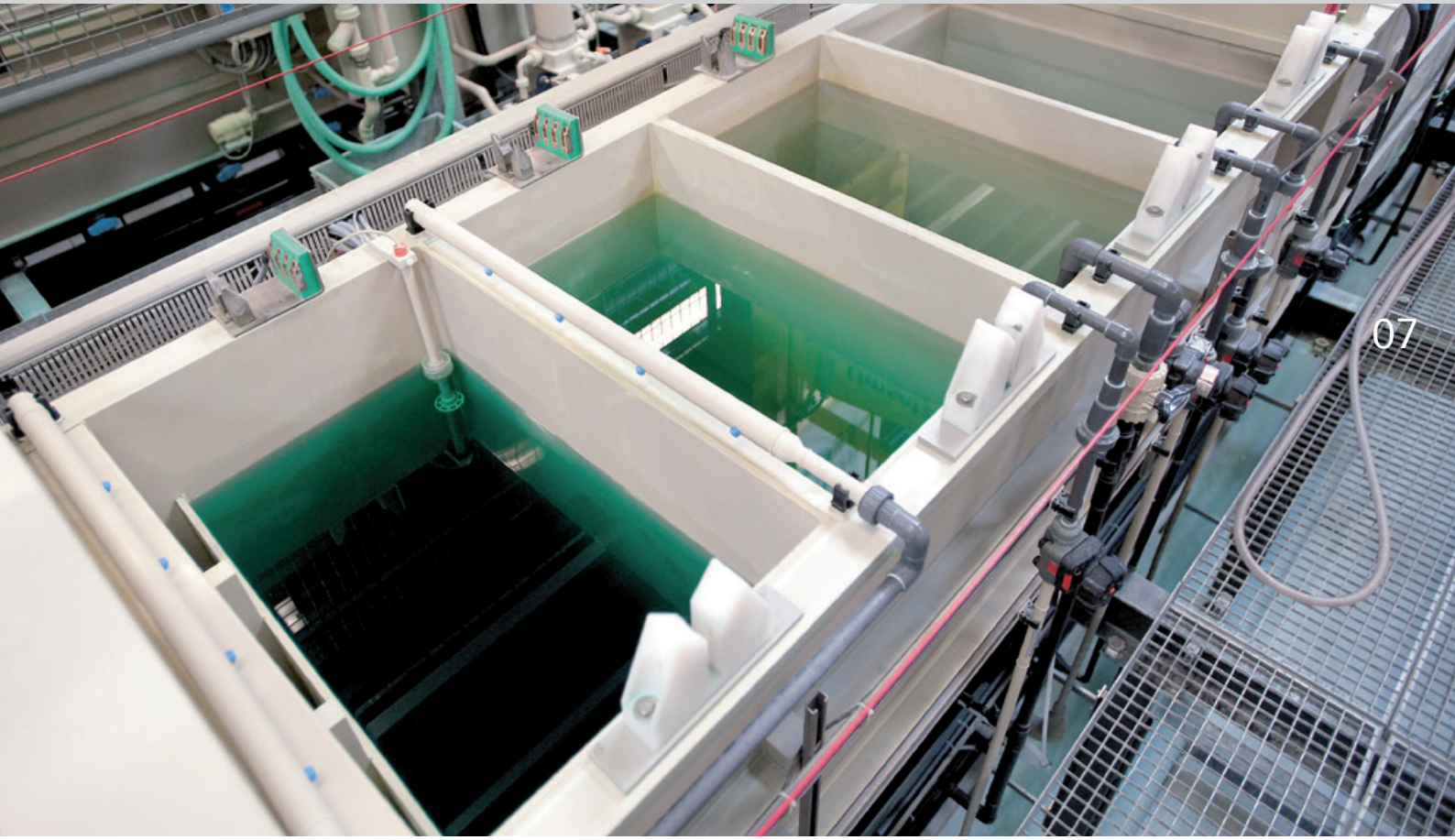


Calibration curve and determination with smartDT



(Modified) Linear Approximation Technique (M)LAT
MLAT or LAT is the calibration technique of choice when it comes to brightener determination. A wide array of electroplating baths can be analyzed by using either CVS or CPVS measurement techniques (for pulse-plating procedures or electrolytes containing iron).

Response Curve (RC)
The Response Curve is used for the determination of levelers, which are increasingly popular as a third additive component in modern electroplating baths.



Save time and money with the 884 Professional VA

In order to reduce cost of ownership per determination, it is possible with the 894 Professional VA to reduce the amount of reagents needed significantly* in comparison with other systems. Furthermore, the duration of the analysis can also be reduced. This increases sample throughput and helps keeping cost of ownership low.

The most important applications

- Suppressor determination with DT (Dilution Titration)
- Brightener determination with MLAT (Modified Linear Approximation Technique)
- Brightener determination with LAT (Linear Approximation Technique)
- Leveler determination with RC (Response Curve)
- Chronopotentiometric measurement (CP)

*Up to 70% of the quantity normally used

The 884 Professional VA in detail

The basic configuration of the 884 Professional VA consists of the instrument, the separately available electrode kit for the respective application, and the matching measuring head. This already makes a full-fledged analysis system. An integrated calibrator and the newly designed potentiostat that is extremely accurate in all measuring ranges provide for superior accuracy and sensitivity of measurements.





Fast method change due to detachable measuring head

The new detachable measuring head means that the measuring system can be refitted for a different application in a matter of seconds. All the electrodes and tubing connections can be replaced quickly and simply.



Wide selection of sensors

There is a versatile selection of suitable electrodes available for the different applications.



Superior reliability of measurements due to integrated calibrator

The 884 Professional VA has an integrated, certified calibrator. It is used to readjust the potentiostat before each measurement. Even in the case of fluctuating ambient conditions (temperature, humidity, etc.), this ensures that the measurement is always accurate and reliable.



High performance on a small footprint

With its footprint of only 18.8 cm × 45.2 cm, the 884 Professional VA takes up very little space on the laboratory bench. The modular design provides the highest convenience and maximum flexibility to suit your requirements.



Powerful communication

4 MSB connectors permit the operation of several 800 Dosino-type dosing devices. The 884 Professional VA is connected to the computer via USB. An integrated USB hub provides connections for additional PC peripheral devices, e.g., printers or barcode readers.

Metrohm VA systems – flexible automation

Flexible and modular
Due to the modular concept, a manually operated 884 Professional VA can be easily upgraded to a fully automated analysis system. The 884 Professional VA grows with the requirements of your laboratory.

884 Professional VA manual
Even the manual version of the 884 Professional VA enables reliable analysis. The solutions necessary for the determination are added manually. Of course, all the available calibration and current measuring techniques are supported without limitation.

884 Professional VA semiautomated
Routine analysis is much more user-friendly when the solutions are added automatically. The 884 Professional VA semiautomated is recommended for routine determination of trace metals or organic additives in individual samples. Determinations can be carried out easily with minimum intervention by laboratory personnel. All auxiliary solutions and, if necessary, the sample are added automatically with an 800 Dosino.

The basic version includes two 800 Dosinos for two auxiliary solutions. An optional accessory kit allows simple expansion to four or more dosing devices. The optional 843 Pump Station can be used to rinse the measuring vessel automatically after each determination. This enhances both user convenience and measuring accuracy because the need for user intervention is reduced to a minimum.

MVA-22 884 Professional VA automated for VA
The MVA-22 884 Professional VA automated is a fully automated system with a sample changer for the voltammetric determination of heavy metals in routine laboratory work. If an MVA-22 is used, the samples are automatically transferred by a 919 IC Autosampler plus for VA using the integrated peristaltic pump. Up to 28 samples can be determined in a series.

MVA-23 884 Professional VA automated for CVS
The MVA-23 884 Professional VA automated for CVS is the fully automated solution for CVS determinations. Using an 858 Professional CVS Sample Processor, up to 56 samples for a suppressor determination or up to 28 samples for a brightener determination can be analyzed for their additive content. An unlimited combination of different calibration techniques is also possible. Depending on the chosen method, the sample is transferred with an 800 Dosino or a peristaltic pump that is integrated in the sample changer. The possibility of recalibrating methods during a sample series guarantees the highest accuracy.



System modules

Manual

884 Professional VA
Measuring head
Electrode kit
viva

The 884 Professional VA is the core component of the voltammetry system. When combined with the appropriate measuring head for rotating disk electrodes, for screen printed electrodes (SPE), or for the Multi-Mode Electrode pro, the corresponding electrode kit and the **viva** software, it is a fully functioning manual measurement system.

Semiautomated

Kit with the first 2 Dosinos
Expansion kit with 2 Dosinos

Dosinos are used for the convenient, automated addition of solutions. Corresponding kits containing the necessary accessories make it easy to set up the connections.

Rinsing equipment

The rinsing equipment is used to empty and rinse the measuring vessel automatically after each measurement.

Automated

919 IC Autosampler plus
858 Professional Sample Processor

Sample changers enable automatic processing of sample series. The 919 IC Autosampler plus is suitable for small sample series, whereas the 858 Professional Sample Processor with its robotic arm is used for larger-sized series.

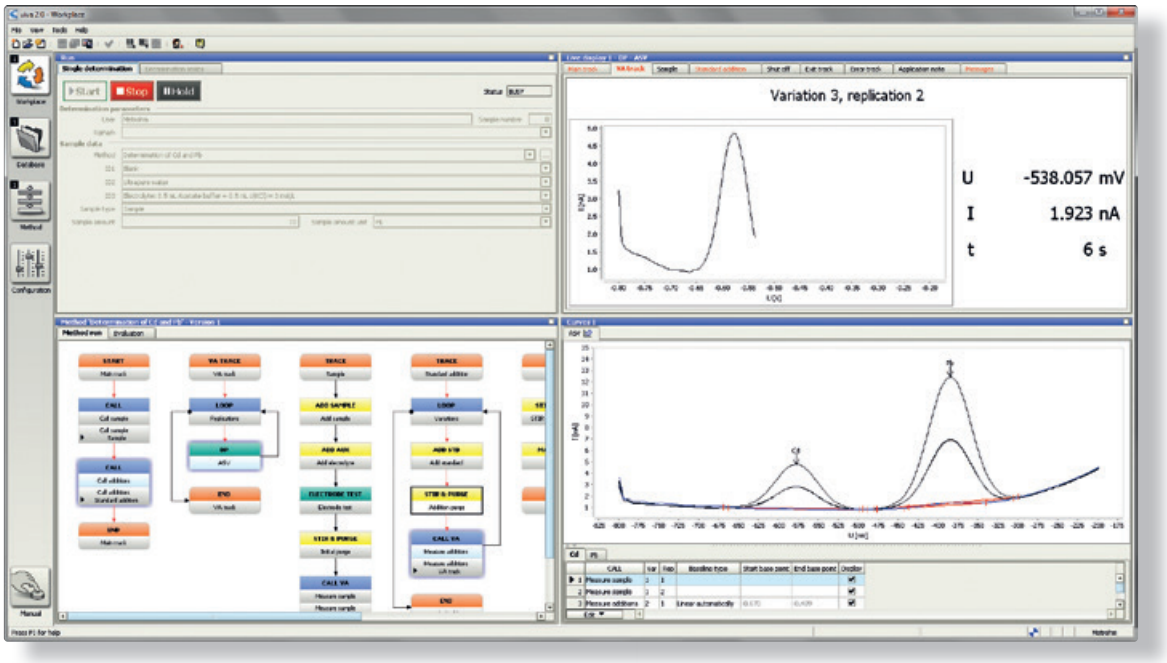


viva – the new Metrohm software for voltammetry

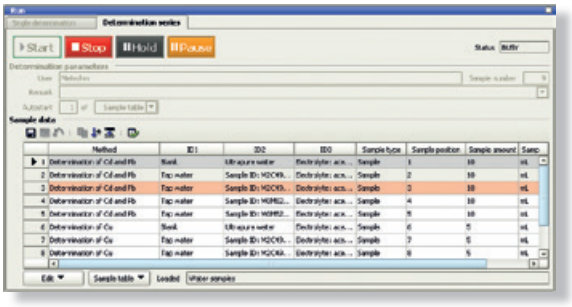
viva is the most powerful software for VA and CVS determinations. Easy to use and highly flexible, **viva** enables individual and task-focused method programming for voltammetry and CVS.



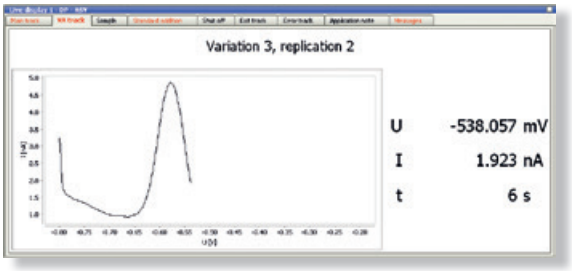
The userfriendliness of the software is evident in the «Workplace» of the user interface. All of the information required for the determination is presented here. It goes without saying that the «Workplace» can be individually configured so that only the data relevant to the user is displayed.



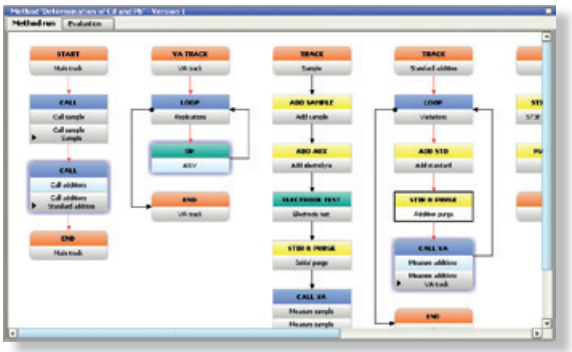
The «Run» window is the «cockpit» of **viva** software, from here to the user controls all measurements. The appropriate method, any sample identification data, and the sample quantities, among other things, are defined here. With just a few mouse clicks, a sample table for executing a determination series can be compiled and then saved to any available storage medium for later use.



Animated graphics and text information in the «Live display» window provide the user with an overview of the progress of the current measurement. The voltammogram in progress, the remaining measuring time, and the status of any pumps or Dosinos are additional real-time information available to the user there.

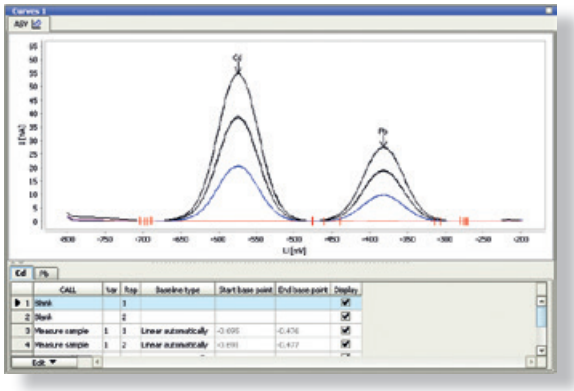


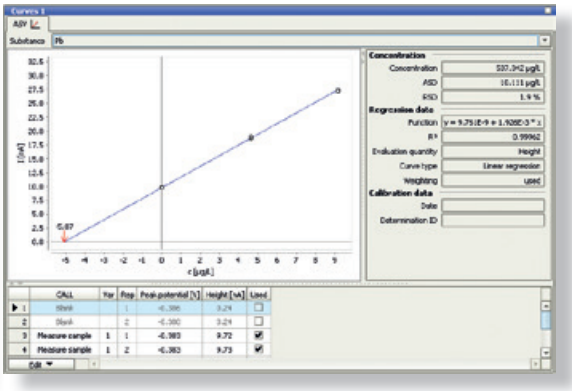
The method used and the associated evaluation parameters are logically structured and clearly displayed in the «Method» window. The current command is highlighted in color during a measurement.



Curves

The measured voltammograms are superimposed on each other in the curve window. The associated calibration curve and the measurement results can be displayed by simply switching between the two.

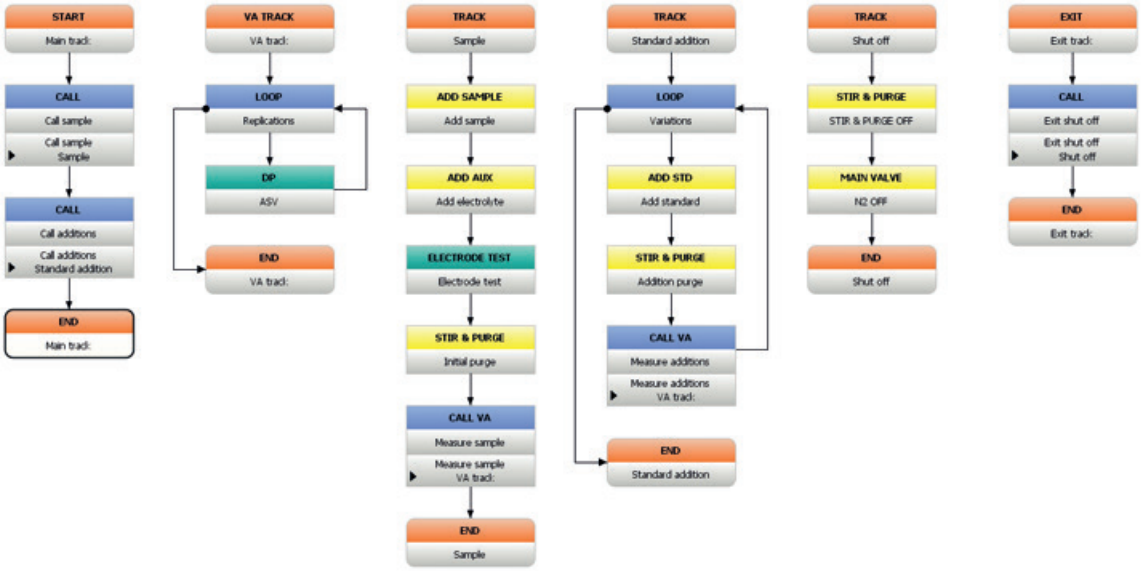




viva – smart features for superior usability

viva is the first and only voltammetry software that enables individual, task-focused method programming.

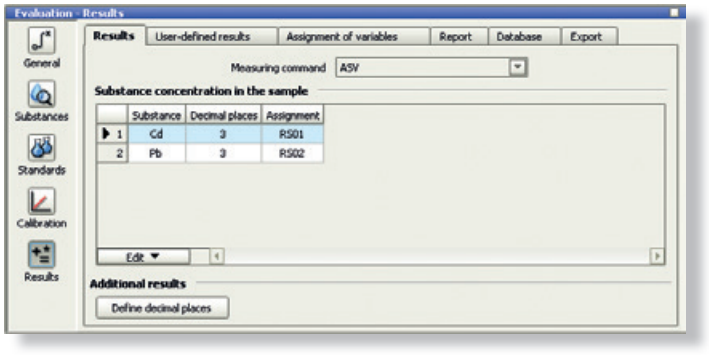
viva does not force the user to follow rigid, predefined measuring sequences. Instead, methods can be programmed step by step adding command by command and following the logic of the application at hand – it is that simple! It is even possible to have commands executed simultaneously!



Commonly used method runs are already available as templates to facilitate familiarization with the system. These can be adapted and expanded as required.

viva supports the user with numerous smart assist functions. The optimum standard addition volumes, for example, can be calculated automatically by **viva** for each determination.

With **viva**, users no longer have to think about calculating results – that is all done automatically. Volumes, too are automatically calculated according to the settings of the method. and even the appropriate prefix for the units of the result (µg/L, mg/L, etc.) are determined automatically by **viva**.

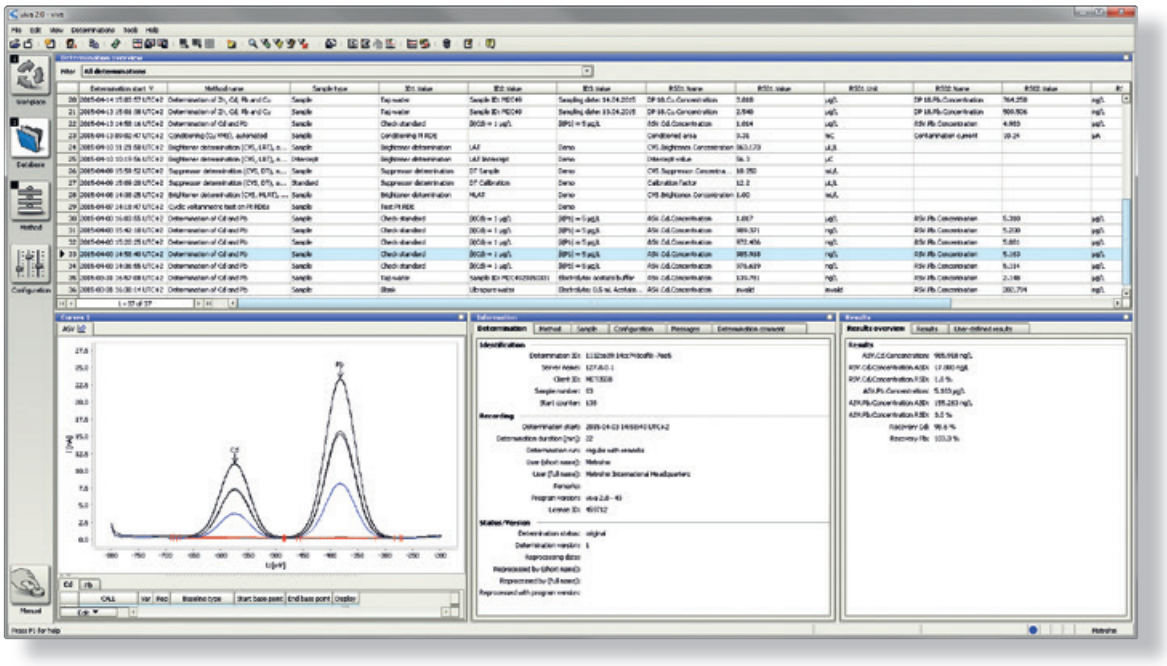


viva – user-friendly data management and maximum security

All determinations are stored in the **viva** database.



The determinations can be viewed in the «Database» program part, along with all of the parameters for the determination, the method, and the instrument.



The determination overview can be configured according to preference. This means that it is easy to keep track of all measurement results. In the «Curve» and «Information» subwindows, the respective measurement curve, calibration curve, and other information on the parameters for the determination, the method, and the instrument can be displayed for the selected determination. Easy-to-operate sort, search, and filter functions simplify data retrieval.

Central data management

There is no difference between the **viva** client-server version and local installations in terms of operation and range of functions. However, in the client-server-version, all of the methods and determinations are saved centrally on the **viva** server. The benefit of this is that the data can be viewed and edited further from any PC that has a **viva** client installed on it, whether in the laboratory or in the office. All measured data is thus available throughout the company.

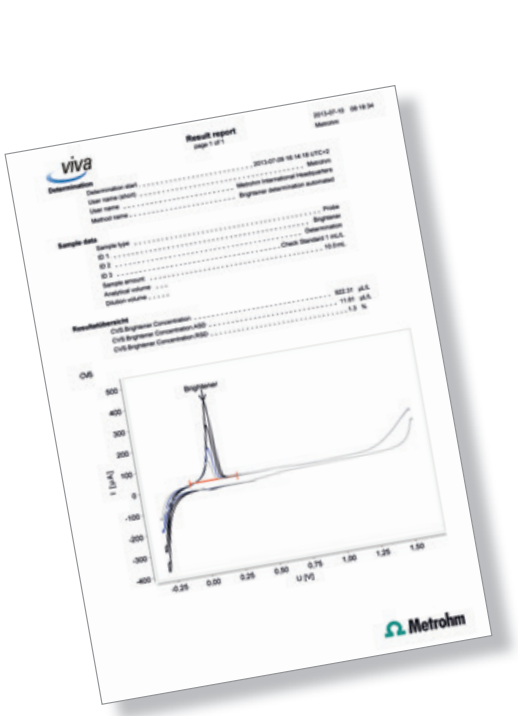
Reprocessing a determination



Does the voltammogram show unknown peaks? Has the concentration of the standard solutions being used changed? No problem with **viva**, as determinations already carried out can be recalculated at any time. Retroactive recalibration with a newly measured standard solution is also possible. Of course, the original data is not lost and all versions of the determination can be archived.

Report generation

The report generator offers a full range of options for designing the analysis report, whether it be an individual report with all relevant sample and method information or a tabular overview report containing all of the results of a measurement sequence. **viva** offers a range of different report templates that can easily be adapted to meet the respective requirements. This means a customized report can be created very fast.



Individual report containing all the relevant specifications for the determination



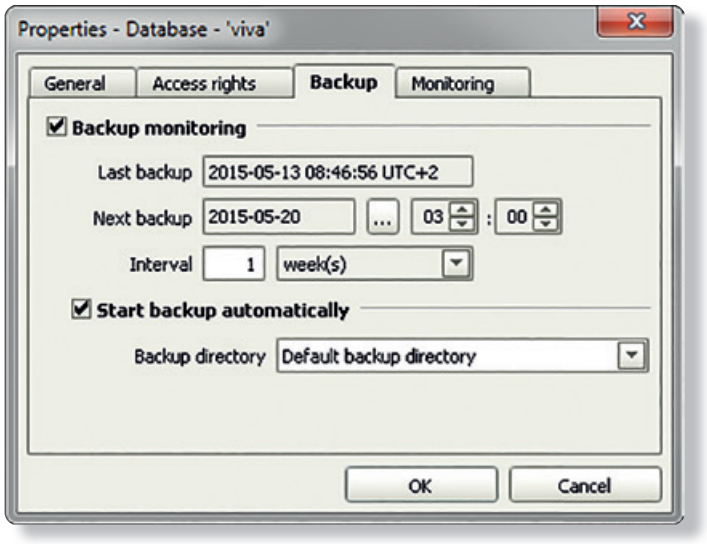
Tabulated report (with or without curve) in portrait or landscape format provides a better overview for large measurement series

Simple user administrationt

Data security and traceability of the results are becoming ever more important. Access permissions for each user can be defined in **viva** in accordance with in-house security guidelines. Unauthorized access to program parts and data is prevented by password protection. Unnecessary program parts can thus be hidden, making operation even easier.

Data security

viva also performs data backups. The entire database and all methods are backed up at freely defined intervals. Lost data can thus be quickly restored.



GLP – Good Laboratory Practice

With **viva**, the regular maintenance intervals of the complete analysis system, can be monitored automatically and in compliance with GLP. If the defined working life is exceeded, this automatically triggers the appropriate measures (e.g., automatically generated e-mail, stopping the determination). Thanks to this «integrated quality assurance», expired solutions, unchecked electrodes, or unserviced dosing units are a thing of the past.



Technical specifications

884 Professional VA		
Voltammetric measuring station with integrated potentiostats and galvanostats		
Dimensions	with measuring head and drip pan	
	Width	188 mm
	Height	322 mm
	Depth	452 mm
Weight without accessories		7.4 kg
Potentiostat	Sweep potential range	± 5 V
	Current range	± 224 mA
	Current measuring ranges	200 pA...224 mA
Galvanostat	Potential measuring ranges	5 mV...5 V
Resolution	Applied potential	15 µV
	Measured potential	150 µV
	Applied current	0.0031% of current measuring range
	Measured current	0.0031% of current measuring range Current measured in the smallest current measuring range (200 pA) 6 fA
Accuracy	Applied current	± (0.2% of current +0.2% of current measuring range)
	Measured current	± (0.2% of current +0.2% of current measuring range)
	Applied potential	± (0.2% of potential ± 1 mV)
	Measured potential	± (0.2% of potential ± 1 mV)
Temperature measurement	Measuring range (Pt1000)	0...+100 °C
	Accuracy (Pt1000)	± 0.5 °C
Power connection	Voltage	100...240 V
	Frequency	50...60 Hz
	Power consumption	45 W
Requirements for the PC	PC with Windows operating system with min. 1 USB interface (Version 1.1 or higher) per connected device. The detailed hardware requirements for the PC and the supported operating systems can be found in the installation instructions for the current viva software version, which is provided digitally on the product pages of the Metrohm webiste.	
Client/Server operation	Network	Min. 10 Mbit/s, stable and permanent communication via TCP/IP



Ordering Information

	Manual
2.884.0010	884 Professional VA, instrument without measuring head
2.884.0110	884 Professional VA manual for MME
2.884.0210	884 Professional VA manual for RDE/CVS
	Semiautomatic
2.884.1110	884 Professional VA semiautomated for MME
2.884.1210	884 Professional VA semiautomated for RDE/CVS
	MVA-22: Fully automated VA system for trace analysis
2.884.1110	884 Professional VA semiautomated for MME
2.919.0130	919 IC Autosampler plus for VA
2.843.0240	843 Membrane Pump Station for Professional CVS systems
6.2441.300	Remote cable
6.1456.210	Measuring vessel for use with sample changer operation
	MVA-23: Fully automated CVS system for organic additives
2.884.1120	884 Professional VA semiautomated for RDE/CVS
2.858.0110	858 Professional Sample Processor for VA/CVS
2.843.0240	843 Membrane Pump Station for Professional CVS systems
6.2441.300	Remote cable
2.800.0020	800 Dosino (2 ×)
6.5339.500	Equipment with 2 dosing units
	Measuring heads
6.1256.010	Measuring head for RDE
6.1256.020	Measuring head for MME
6.1256.030	Measuring head for SPE
	Electrode kits
6.5339.000	CVS electrode equipment with 1 mm platinum electrode for Professional VA/CVS
6.5339.010	CVS electrode equipment with 2 mm platinum electrode for Professional VA/CVS
6.5339.020	CVS electrode equipment with 3 mm platinum electrode for Professional VA/CVS
6.5339.030	VA electrode equipment with Multi-Mode Electrode pro for Professional VA
6.5339.040	VA electrode equipment with glassy carbon RDE for Professional VA
6.5339.050	VA electrode equipment with scTRACE Gold for Professional VA
6.5339.060	CVS electrode equipment with 2 mm platinum electrode for Professional VA/CVS instruments for intensive use
6.5339.070	VA accessory equipment with SPE electrode shaft for professional VA instruments



viva

Information regarding the current viva software version and available licenses can be found on the product pages of the Metrohm website.

viva

www.metrohm.com

Subject to modifications
Design Ecknauer+Schoch ASW, printed in Switzerland at Metrohm AG, CH-9100 Herisau
8.884.5001EN – 2020-02

Metrohm