894 Professional CVS

Cyclic Voltammetric Stripping for the determination
of additives in electroplating baths

Metrohm

894 Professional CVS and **viva** – CVS flexible, convenient and secure!

The 894 Professional CVS together with **viva** software is the most powerful CVS system for the determination of organic additives in electroplating baths.

More flexibility

The 894 Professional CVS stands out for its unique flexibility. Due to the system's entirely modular design, it can be expanded and upgraded at any time with additional units such as dosing devices, pumps, and sample changers. The **viva** PC software too provides for maximum flexibility. All parameters are freely accessible in **viva** giving users virtually unlimited possibilities to put together their own methods.

viva controls the 894 Professional CVS as well as any other devices connected. Important methods are already pre-installed in **viva**, so that the system can be put into operation quickly and easily in just a few steps.

More convenience

Another key benefit of **viva** is the integrated database. In addition to automatic data acquisition and evaluation, it 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: Any solutions, electrodes, and many accessories used in the system can be monitored in compliance with GLP (Good Laboratory Practice) for maximum reliability.

Last but not least, more than 10 years of experience in CVS have made Metrohm a trusted and reliable partner in analyzing galvanic baths.

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)

- Chronopotentiometry (CP)
 - Galvanostatic
  - Open-circuit potential (OCP)

The most important benefits at a glance

894 Professional CVS

- Customized measuring system due to modular design
- Superior accuracy and reliability due to built-in calibrator
- Exchangeable measuring head
- Versatile automation options
- Straightforward liquid handling with 800 Dosinos, pumps, and level sensors

viva

- Individualized, task-focused method programming
- Database with numerous functions for convenient viewing and evaluation of measuring results
- Data security and automatic backup functions
- Traceability and security of measuring results for customer audits
- Control chart functions
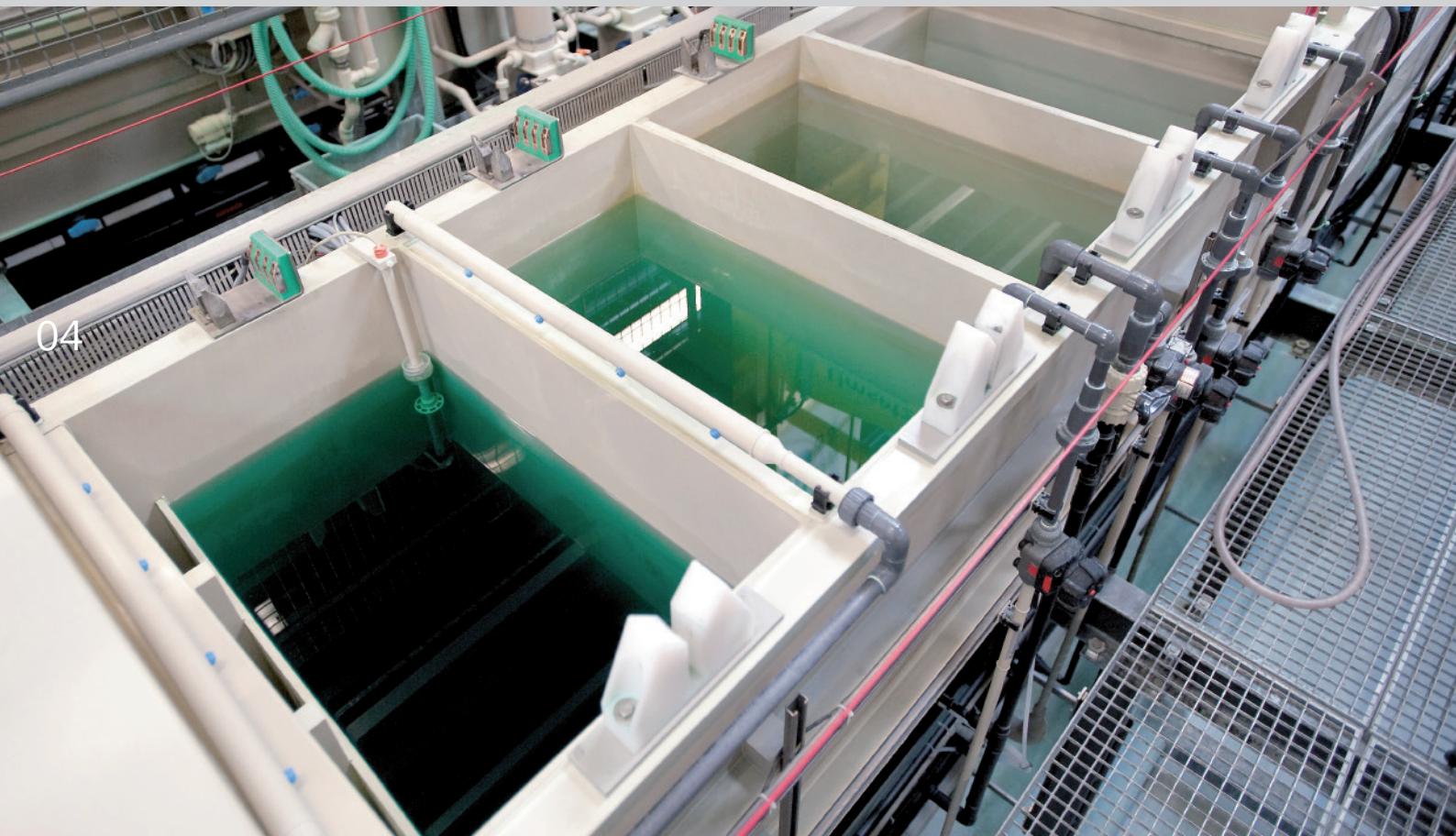
# Determination techniques for various additives

Suppressor determination with DT

With the proven Dilution Titration (DT), the concentration of the suppressor component can be determined cost-effectively and efficiently. Without a method change re-quired, the concentration of the suppressor is determined or a new calibration curve is recorded at hourly, daily or even weekly intervals.
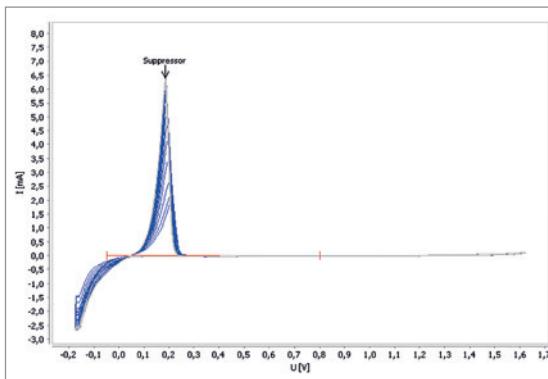

Typical voltammogram
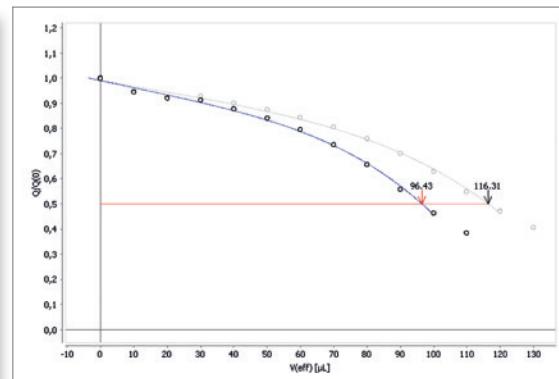
DT calibration curve and DT determination

Brightener determination with (M)LAT

MLAT (Modified Linear Approximation Technique) or LAT (Linear Approximation Technique) enable the fast and straightforward quantification of the exact amount of brighteners. A wide spectrum of electroplating baths can be covered by the selective utilization of the CVS or CPVS measurement techniques (for pulse-plating procedures or electrolytes containing iron). Within just a few minutes, the result is shown on the monitor, can be exported to a LIMS or a report can be generated automatically.
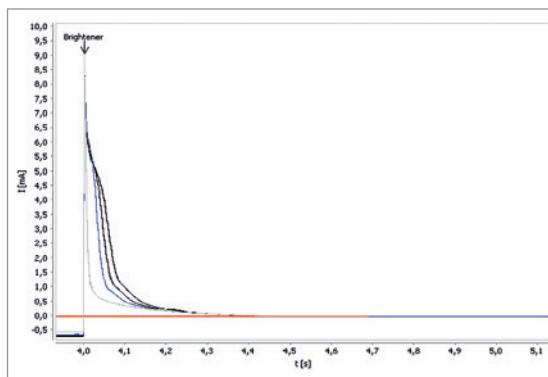
Typical chronoamperogram
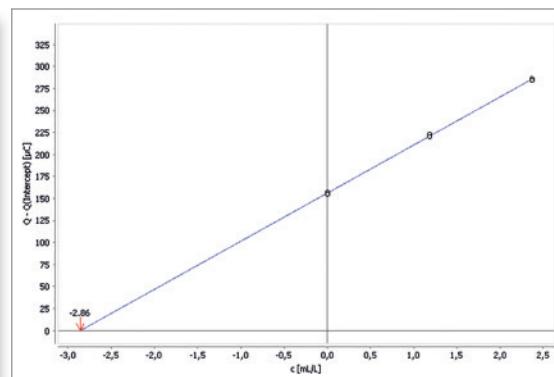
Typical calibration curve with an MLAT

Leveler determination with RC

Many electroplating baths contain a third additive (leveler) in addition to those already mentioned (brightener and suppressor). As simple as never before, this additive can also be analyzed using the 894 Professional CVS, thus making the comprehensive monitoring of the bath components complete.

Save time and money with the 894 Professional CVS

In order to reduce cost of ownership per determination, it is possible with the 894 Professional CVS to reduce the amount of the reagents used 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.

* Up to 70% of the quantity usually used

Status

894 Professional CVS

The 894 Professional CVS in detail

Even the manual version of the 894 Professional CVS is a fully-fledged CVS analysis system when combined with a separately available electrode kit for the respective application. The system's internal calibrator and the new potentiostat that is extremely accurate in all measuring ranges provide for superior accuracy and sensitivity of measurements.

Last but not least, the 894 Professional CVS is a class of its own due to its attractive design.

Quick method change due to exchangable measuring head

Thanks to the new, exchangable measuring head, the measuring system can be refitted for a different application in just a matter of seconds. Three short steps are all it takes to replace all of the electrodes and tubing connections.

Superior reliability of measurements due to integrated calibrator

The 894 Professional CVS has a built-in certified calibrator. This is used to readjust the potentiostat prior to each measurement. Even in the case of changing ambient conditions (temperature, humidity, etc.), this ensures that the measurement is always accurate and reliable.

High performance on a small footprint

With a footprint of only 18.8 cm × 45.2 cm, the 894 Professional CVS takes up only very little bench space. The modular design makes it convenient to use and allows maximum flexibility as desired and required.

Communication power

4 MSB connections permit the operation of several 800 Dosinos. The 894 Professional CVS is connected to the computer via USB. An integrated USB hub enables the connection of additional PC peripheral devices, e.g. printers or barcode readers.

Temperature measurement

The optional temperature sensor does not only record the temperature of measuring solution. Together with a temperature controlled water bath it is possible to control the temperature of the measuring solution for even more reliable measuring results.

Metrohm CVS systems – flexible automation

Flexible and modular

Thanks to the modular concept, a manually operated 894 Professional CVS is quickly upgraded to a fully automatic CVS analysis system. The 894 Professional CVS grows with the requirements in the laboratory.

894 Professional CVS manual

Even the manual version, the 894 Professional CVS enables reliable routine analysis in plating operations. The solutions necessary for analysis are added manually. All available calibration techniques are of course supported without any additional limitations.

894 Professional CVS semiautomated

Routine analysis is made significantly easier with the semi-automated system. The 894 Professional CVS semiautomated is recommended for routine analysis of organic additives in individual plating bath samples. It enables the convenient performance of determinations with a minimum intervention by laboratory personnel. VMS and the sample are automatically added with 800 Dosino dosing systems.

An optional accessory kit is available for semiautomated brightener determinations. This enables the automatic addition of intercept solution and brightener standard solution. Only the sample needs to be added manually. The measuring vessel can be rinsed automatically after each analysis by an optionally available 843 Pump Station. This enhances both user convenience and measuring accuracy, as the need for user intervention is reduced to a minimum.

MVA-20 894 Professional CVS automated

The MVA-20 894 Professional CVS automated is a fully automated system with sample changer intended for CVS analysis in any routine laboratory for a small to medium-sized number of samples. With the MVA-20, the samples are automatically introduced by a 919 IC Autosampler plus for CVS. On this system the suppressor content can be determined in a series of up to 27 samples. Up to 14 samples can be analyzed automatically during brightener determination series. The possibility of recalibrating methods during a sample series provides for highest accuracy. It is also possible to combine various calibration techniques in a determination series.

MVA-21 894 Professional CVS automated

Fully automated system is recommended wherever a particularly high sample throughput is required. On this system the suppressor content can be determined in up to 56 samples by using an 858 Professional CVS Sample Processor. The possibility of recalibrating methods during a sample series guarantees highest accuracy. The robotic arm and the integrated peristaltic pump allow up to 28 samples to be fed into the measuring system automatically for brightener content determination. In addition to that, for the first time, a combination of different calibration techniques is possible without limitation.

System overview

Suppressor	Automatic dosing		Automatic rinsing	Number of samples / run
	Solutions	Sample		
894 Professional manual	✗	✗	✗	1
894 Professional semiautomated	√ (1×)	✗	✗	1
894 Professional semiautomated + rinsing equipment	√	√	√	1
MVA-20	√	√	√	Maximum 27
MVA-21	√	√	√	Maximum 56

| Brightener	Automatic dosing		Automatic rinsing	Number of samples / run
	Solutions	Sample		
894 Professional manual	✗	✗	✗	1
894 Professional semiautomated	√ (1×)	✗	✗	1
894 Professional semiautomated + equipment for 2 Dosinos	√ (3×)	✗	✗	1
894 Professional semiautomated + rinsing equipment	√	√	√	1
MVA-20	√	√	√	Maximum 14
MVA-21	√	√	√	Maximum 28

viva – the new Metrohm software for voltammetry

viva is the most powerful software for CVS determinations. Easy to use and highly flexible, **viva** is the first CVS software in the market allowing individual, task-focused method programming.

The user-friendliness of the software is clearly visible in the «Workplace» of the user interface. All of the information required for the determination is presented here. It goes without saying that the layout of «Workplace» can be configured at discretion so that only data relevant to the user is displayed.
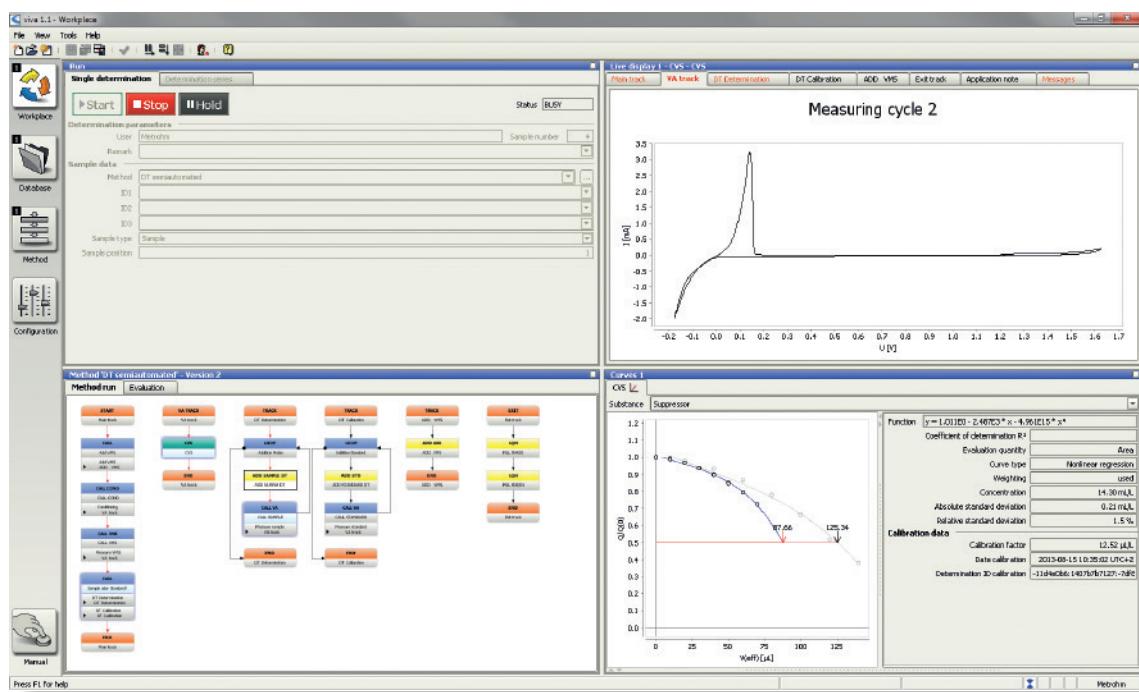
The «Run» window is the «Cockpit» for **viva**, from which all measurements can be controlled. The desired method, any problem identification data and the volumes used, among other things, are defined here. With just a few mouse clicks, a sample table for implementing a determination series can be compiled and then saved for later use on any storage medium.
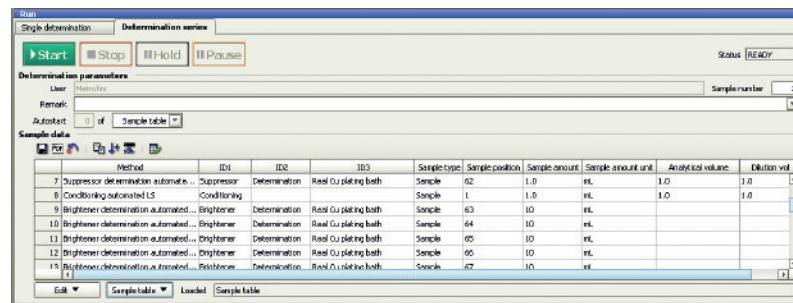
Animated graphics and text information in the live window provide the user with an overview of the progress of the current measurement. The display of the measured voltammogram in real time, information on the remaining measurement time or on the status of the pumps or 800 Dosinos being used are all information that is available at any time while a method is running and that provide information on the current measurement.
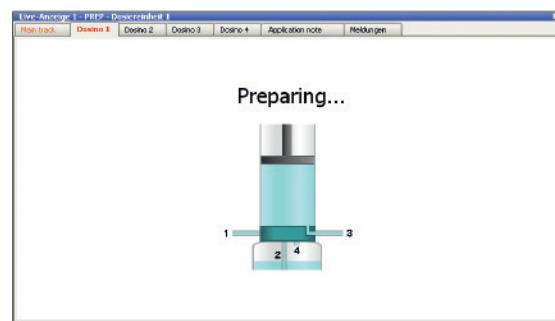
The method used and the associated evaluation parameters are clearly displayed in the method window. The current command is highlighted in color during a measurement.
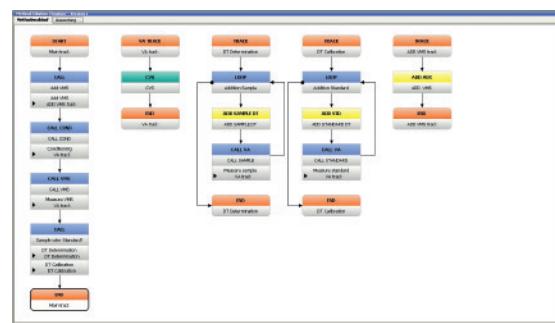
Curves

The measured voltammograms are superimposed on each other in the curve window. The associated calibration curve and the measurement results are shown with a simple click.
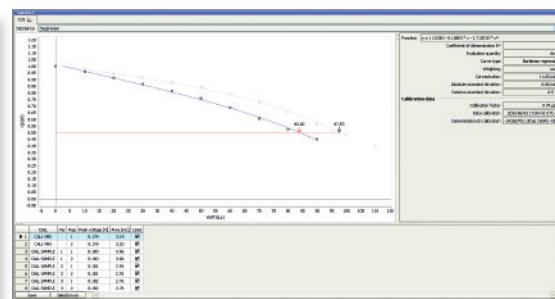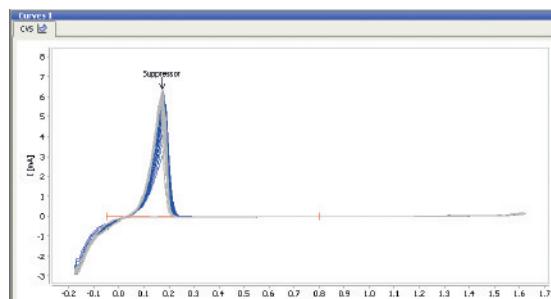
viva – smart features for superior usability

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

viva does not impose a preset measuring sequence on the user. Instead, methods can be programmed step by step adding command by command and following the logic of the application – it is that simple! Even parallel execution of commands is possible!
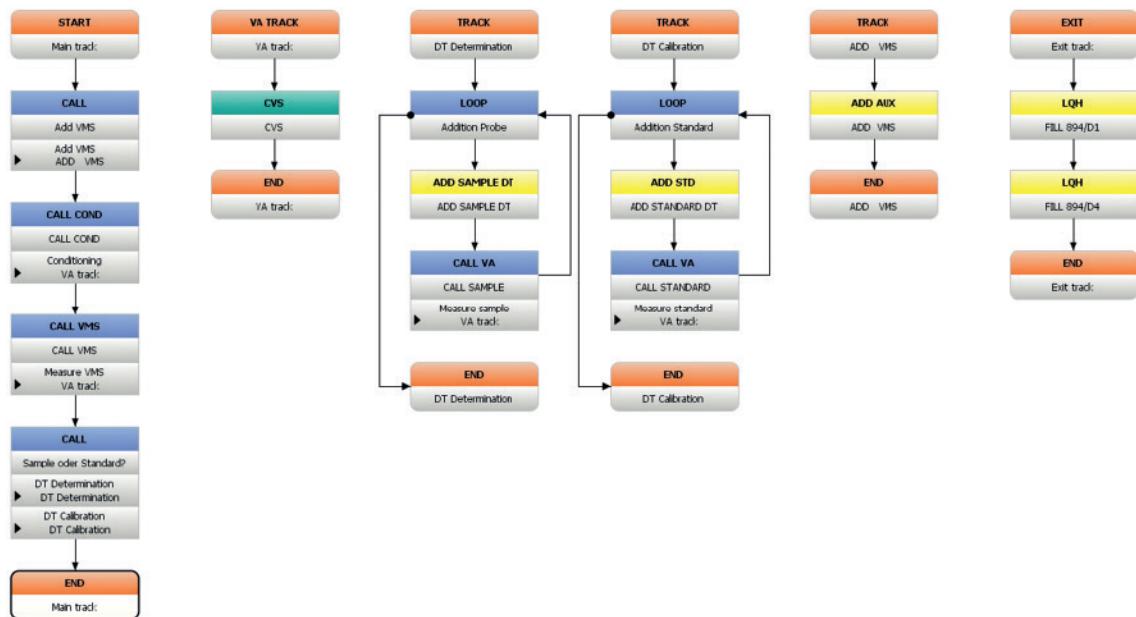
However, the intelligence of **viva** does not stop there: The sequence of any method can be made dependent on results already calculated for the current measurement or on other events. For example, standard addition volumes can be automatically calculated by **viva**.

viva supports the user in creating his own methods. Thus, the software checks the plausibility of any sequence of commands, and, if not plausible, suggests possible solutions. This prevents errors making programming even of complex methods easy.

With **viva**, the user no longer has to think about calculating volumes, results, etc. – that is all done automatically. Even the correct unit of the result (µL/L, mL/L, ...) is automatically determined by **viva**.

However, **viva** is also perfect for anyone, who does not want to create his or her own methods: Method templates which are already pre-installed for manual, semi-automated, or fully automated operation make method programming easy and can be used as a basis for individual adaptations.
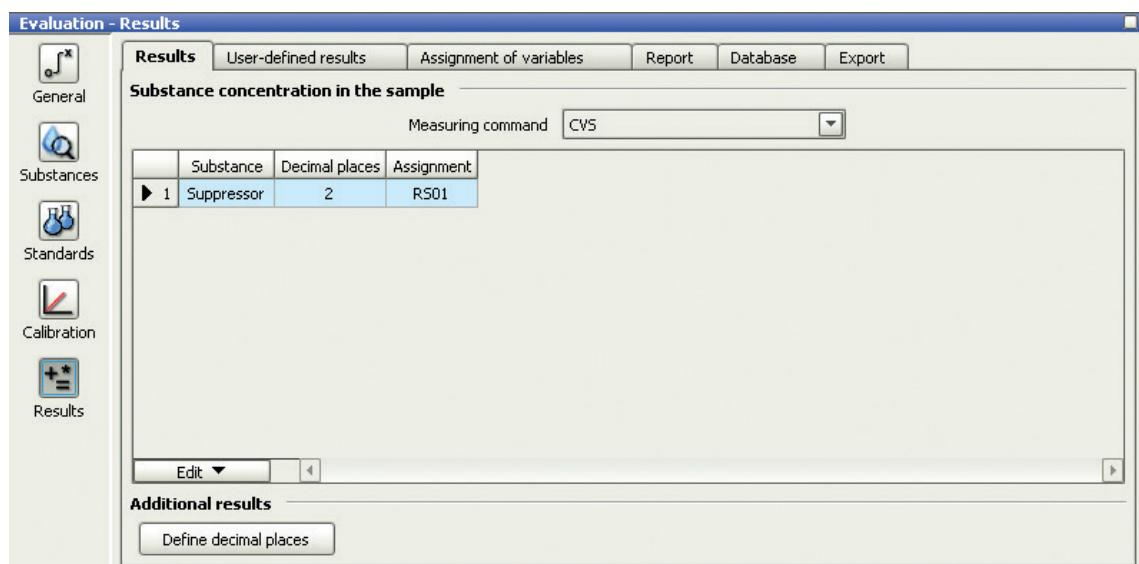
viva – convenient data management

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

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

The determination overview can be freely configured. This means that all measurement results can be easily viewed. In the «Curve» and «Information» subwindows, the respective measurement curve, calibration curve, and other information on the determination, method, and instrument parameters can be viewed for the selected determination.
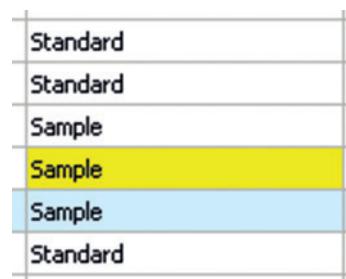
Easy-to-use sort, search, and filter functions simplify the finding of data.

Reprocessing a determination

Is the voltammogram showing unidentified 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. Measured data that belongs together is marked and recalculated in a single step. Of course, the original data is not lost and all versions of the determination are archived.

The «History» function can be used to retrieve not only the original and the final versions, but also all of the intermediate ones between them.

Report creation

The report generator offers a wide range of choices when designing the analysis report, whether it is 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 which can be adapted without any great effort to meet the respective requirements. This means a customized report can be created in just a few seconds.
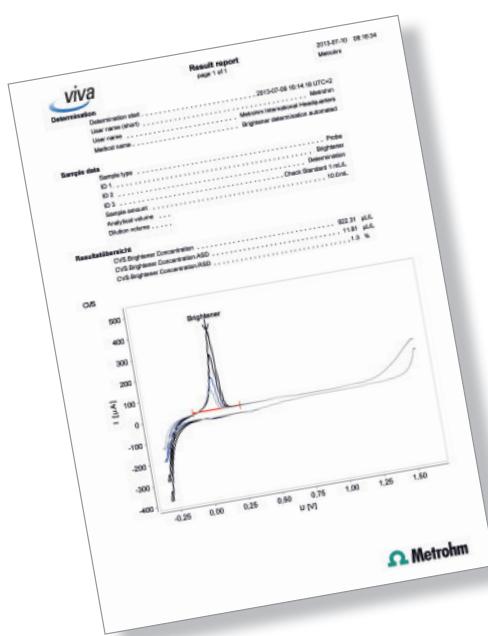
Individual report with all the relevant details for the determination

Tabular report (with or without curve), in portrait or landscape format, provides an overview of larger measurement series

Control chart

The control chart function offers the option of defining and visualizing warning and intervention limits.
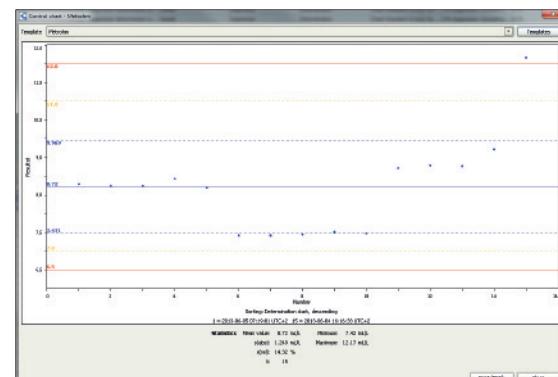
viva – convenient data management and maximum security

Central data management possible

The **viva** client-server version does not differ from local installations with respect to operation and scope of functions. However, all of the methods and determinations are saved centrally on the **viva** server. The benefit of this is that any data produced can be viewed and edited from every PC that has a **viva** client installed on it, whether at the work station in the lab or in an office. This means that all measured data is available across the company.

Simple user administration

Data security and traceability of results is of increasing importance. Access rights for each user can be defined in **viva** in accordance with in-house company security guidelines. Unauthorized access to program parts and data is prevented by means of password protection. This allows program parts to be hidden which are not required, simplifying operation even further.
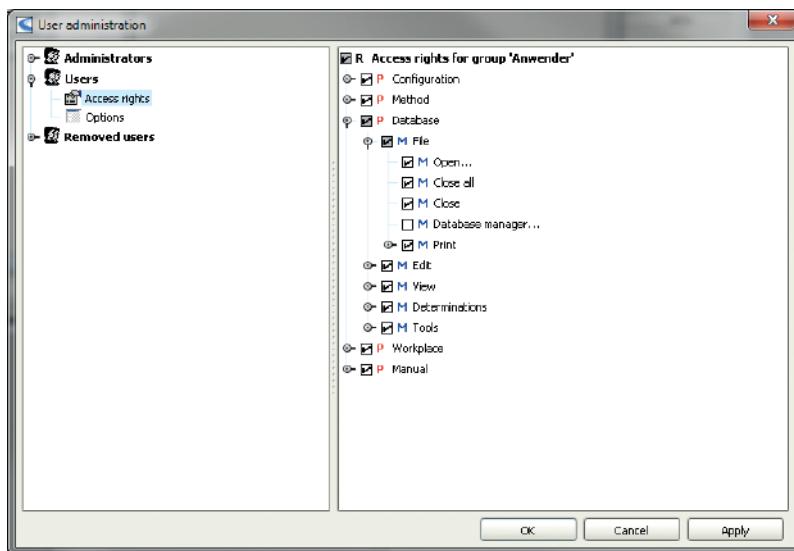
Data export

Today it is often not enough just to enter a result in a table. Measurement results need to be transferred to a QM system or LIMS. In this step as well, **viva** supports the user with a wide range of export functions and file formats.
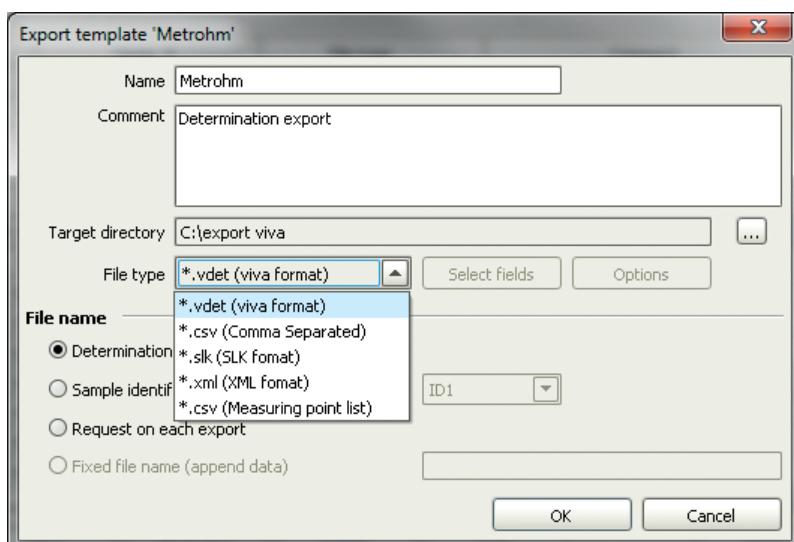
Data security

viva also manages data security. The entire database and all methods can be saved at freely definable intervals. This means that lost data can be restored as quickly as possible.
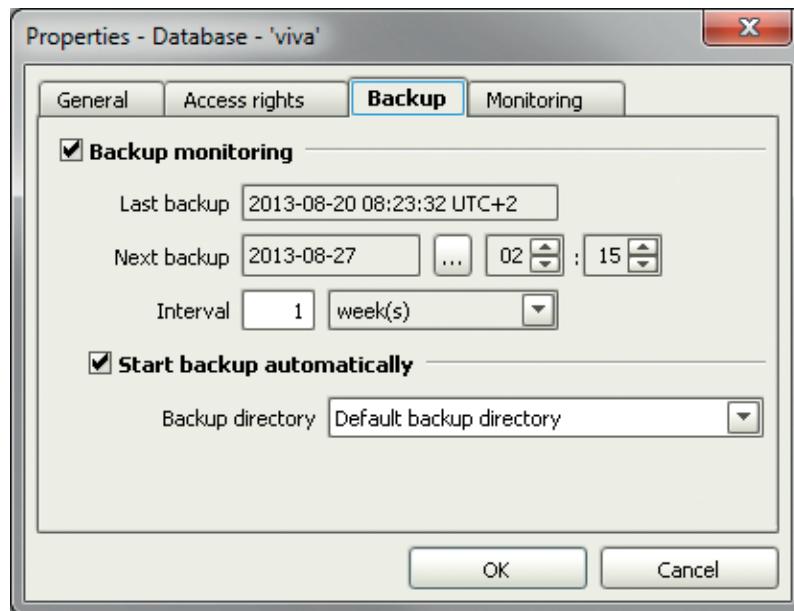
GLP – Good Laboratory Practice

With **viva**, the regular maintenance intervals of the complete analysis system, along with the accessories used, can be monitored automatically and in compliance with GLP. If the defined working life is exceeded, then corresponding measures (e.g. automatically generated e-mail, termination of determination) are triggered. Thanks to this built-in quality assurance tool, expired solutions, unchecked electrodes or dosing units overdue for maintenance are a thing of the past.

Technical specifications

894 Professional CVS		
Voltammetric measurement stand with built.in potentiostat and galvanostat		
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	+63 pA...+224 mA
Galvanostat	Potential measuring ranges	-5.000...+5.000 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 (63 pA) 2 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)
	Potential applied	± (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
Minimum requirements of PC	Processor	Pentium 4
	Pulse frequency	1 GHz
	RAM	4 GB
	Hard disk memory	1 GB for program
	Free memory for data	64 GB
	Operating system	Windows XP Professional SP2 (32-Bit)
		Windows Vista Business / Enterprise / Ultimate (32-Bit)
		Windows 7 Professional / Ultimate / Enterprise (32-Bit / 64-Bit)
		Windows 8 Professional / Enterprise (32-Bit / 64-Bit)
		Windows Server 2003 (32-Bit / 64-Bit)
		Windows Server 2008 (32-Bit / 64-Bit)
		Windows Server 2008 R2 (64-Bit)
		Windows Server 2012 (64-Bit)
	Graphics card / screen	Min. resolution 1024 × 768 pixels or higher
	Connectors	min. 1 USB port (version 1.1 or higher) per connected instrument
Client/Server operation	Network	min. 10 Mbit/s, stable and permanent Communication via TCP/IP

Ordering Information

Manual

2.894.0210	894 Professional CVS manual

Partially automated

2.894.1210	894 Professional CVS semiautomated

MVA-20: Fully automated for small sample series

2.894.1210	894 Professional CVS semiautomated
2.919.0120	919 IC Autosampler plus for CVS
2.843.0240	843 Membrane Pump Station for Professional CVS Systems
6.2441.300	Remote cable
2.800.0010	800 Dosino (2 ×)
6.5339.500	Equipped with 2 dosing units

MVA-21: Fully automated for large sample series

2.894.1210	894 Professional CVS semiautomated
2.858.0110	858 Professional CVS Sample Processor
2.843.0240	843 Membrane Pump Station for Professional CVS Systems
6.2441.300	Remote cable
2.800.0010	800 Dosino (2 ×)
6.5339.500	Equipped with 2 dosing units

CVS electrode kits

6.5339.000	CVS electrode equipment with 1 mm platinum electrode for Professional CVS instruments
6.5339.010	CVS electrode equipment with 2 mm platinum electrode for Professional CVS instruments
6.5339.020	CVS electrode equipment with 3 mm platinum electrode for Professional CVS instruments

Temperature sensor

6.1110.120	Pt1000 temperature sensor (class B) for Professional CVS instruments
6.2104.140	Electrode cable for connecting temperature sensors to plug-in head G

viva

6.6065.112	**viva** 1.1 Full CD: 1 license
6.6065.113	**viva** 1.1 Multi CD: 3 licenses

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