viva 3.0

Manual

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Technical Communication
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1 Introduction

1.1 Welcome to viva

Introduction

viva is a control and database software for VA measuring instruments.

Overview of the main program features

- *Easy-to-operate and easily configurable user interface*
- *Simple integration of devices and accessories*
- *Convenient method editor*
- *Database-based program with client/server functionality*
- *Wide range of import and export functions*
- *Conformity*
- *Comprehensive online help*
- *Program versions*

1.2 Operation

Introduction

The modern **user interface** makes it easy for users to find their way around **viva**. All commands and control elements are located where you would expect. The bar on the left edge of the screen gives you access to the five basic elements of *viva*:

Workplace *Database* *Method* *Configura-tion* *Manual*

Depending on the access permissions, these buttons are either visible or hidden. The menu bar is in the upper part of the screen. It is also possible for the individual commands to be hidden, depending on the access permissions.

In the center of the screen, you can find the **information windows** with the settings, sample entry masks, live curves or results. This view can be set individually for each user with the aid of the layout manager. As a result, users see only those windows or buttons they actually need for their work. This reduces the introductory period for routine users to a minimum. Incorrect operation as a result of overcrowded screens is also a thing of the past.

A wide range of tried-and-tested methods allow any user to create new methods quickly and simply and to use them immediately.

1.3 Instrument integration

Introduction

The following instruments can be operated with **viva**:

- *919 IC Autosampler plus*
- *894 Professional CVS*
- *884 Professional VA*
- *858 Professional Sample Processor*
- *846 Dosing Interface*
- *814/815 USB Sample Processor*
- *089 Photometer*
- *Avantes spectrometer*
- *Barcode reader*

- *RS-232 device*

1.4 Method editor

Introduction

viva contains a graphical **method editor**, with which you can define simple and complex analysis procedures. With the aid of the numerous templates, methods can be created quickly and easily. For most routine and automated tasks, there are tried-and-tested methods available. Just a few clicks and they are adapted and ready to use.

Overview of functions

- Method editor *(see chapter 5.2, page 389)*
- Method manager *(see chapter 5.3, page 402)*
- Separate management of access permissions for each method group *(see chapter 5.4.2, page 408)*
- Templates for method development and calculations *(see chapter 5.2.1, page 389)*
- Plausibility check for methods *(see chapter 5.2.5, page 398)*

1.5 Database

Introduction

viva is based on an **object-oriented database** that has proven itself in practice. All program settings, the user administration, methods and templates are stored in the **configuration database** and the determination data is stored in the **determination databases** defined by the user. These databases can be installed locally on the computer reserved for measurements and represent a simple measurement system. **viva** is, however, scalable and grows with increasing operational requirements. As soon as data security and central data management make it necessary, **viva** is installed as a **client/server configuration**. The **viva** database is then installed on a server. All measurement and office computers work as clients. All results are stored centrally in this network and can be accessed and reprocessed by all client PCs. In addition, all clients use the same method pool.

The new database has all the major tools necessary for managing, searching for and grouping results. Quick filters allow the user to browse through thousands of determinations within seconds and to display the result clearly. Chart plots provide a quick overview of the chronological sequence of the results.

All options for **reprocessing** are available to the user.

Overview of functions

- Object-oriented client/server database *(see chapter 6.2.3.1, page 800)*
- Layout manager for database view *(see chapter 3.1.7, page 90)*
- Quick filters *(see chapter 4.5.2.4, page 283)*
- Efficient search functions *(see chapter 4.5.2.3, page 280)*
- Access permissions control for every database *(see chapter 4.3.5.3, page 217)*
- Automatic database backup *(see chapter 4.3.5.4, page 218)*
- Quick result overview or specially designed control charts *(see chapter 4.5.2.16, page 336)*
- Reprocessing of determinations *(see chapter 4.5.2.5, page 288)*

1.6 Communication

Introduction

viva is communicative. Data generated in **viva** can be exported in XML and CSV format. This therefore enables a simple connection to all customary LIMS. In addition, exporting to long-term archiving systems is also supported.

The **Report generator** provides a simple and flexible solution for creating analysis reports. The report generator allows you to freely define the report templates. It is therefore possible to display one or more determinations in a layout of your choice as a PDF file or as a printout at any time.

A special feature is that **viva** can send messages, error messages or results from the method run to the user by **e-mail**.

Overview of functions

- Various export formats, e.g. XML, CSV, TXT *(see chapter 4.4.3, page 266)*
- Report templates *(see chapter 4.4.1.4.1, page 225)*
- E-mail functions for status messages, error messages or results *(see chapter 2.5, page 83)*

1.7 Conformity

Introduction

viva sets new standards with respect to the fulfilling of **GMP and GLP requirements**. The latest quality standards and validation procedures were implemented already at the development and programming stage of the software. Access permissions for program functions and determinations are defined in a centralized user administration, in which you can create as many users as you like with freely definable access profiles. The system administrator can conveniently access the user administration from any **viva** client. Access to the software is password-protected and the **viva** or Windows login can be selected.

Data management is **version-controlled**, and all data is protected against unauthorized access, modification or deletion in the database. The database itself controls access to the data in network operation and provides archiving and restore functions.

Conformity-relevant properties of viva

- Completely developed and validated with conformity in mind
- Central user administration *(see chapter 6.2.1, page 787)*.
- Detailed access permissions *(see chapter 6.2.1.2, page 788)*
- Password protection under viva or Windows *(see chapter 6.2.2, page 794)*
- Documentation of all method and result modifications *(see chapter 4.5.2.13, page 335)*

1.8 Versions

Introduction

viva is available in **two sales versions** which differ with regard to the scope and functions. An **upgrade** is possible at any time.

	viva 3.0 full	viva 3.0 multi
Product	6.6065.302	6.6065.303
Maximum number of instruments per PC	4	4
User management	•	•
Security settings	•	•
Client/server support		•
Number of licenses	1	3

	viva 3.0 full	viva 3.0 multi
Additional licenses as an option		•
XML data export to LIMS	•	•
Upgrade possible	•	

1.9 Online help

Introduction

Calling up the help

viva has a very extensive and detailed online help that can be accessed in two ways:

- **General access** The **Help ▶ viva Help** menu item or the icon is used to open the online help with the topic *Welcome to viva*. From there you can jump to the desired topic via **Contents**, **Index**, **Search** or personal **Favorites**.
- **Context-sensitive access** You can jump directly to the topic which contains information on the active element in **viva** (dialog window, tab) with the **[F1]** function key on the keyboard.

Symbols and conventions

The following icons and formatting are used in this documentation:

6.4.2Device table	Link to another help topic that contains information about the marked term.
Method	**Dialog text** Designation for names of parameters, menu items, tabs and dialog windows in the software.
100	Designation for parameter values in input fields.
File ▶ New...	Menu or menu item; path needed to reach a certain point in the program.
[Next]	**Button**
	Formula editor Formulas can be entered in fields with this icon. The formula editor opens when you click on the *(see chapter 2.3, page 14)* icon.
1	**Instruction step** Carry out these steps in the sequence shown.

	CAUTION This symbol draws attention to possible damage to instruments or instrument parts.
	Note This symbol highlights additional information and tips.
	Formula field Formulas can be entered directly or via the formula editor. To open the formula editor, right-click in the formula field with the blue margin.

2 General program functions

2.1 Program parts

2.1.1 Program parts

General program functions

viva has five different program parts which can be opened by clicking on the corresponding symbol in the vertical bar on the left. The symbol for the opened program part is shown in color, the symbols for the other program parts in black and white. The menus, toolbars and content of the main window depend on the program part currently opened.

Workplace program part

- Opening/closing workplaces
- Starting single determinations and determination series
- Sample tables

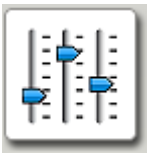
Database program part

- Opening/closing databases
- Managing databases
- Reprocessing
- Creating report templates

Method program part

- Opening/closing existing methods
- Creating new methods
- Managing methods

Configuration program part



- Configuring instruments, solutions, dosing units, sensors, common variables and rack data
- Security settings
- User administration
- Program administration

Manual program part

- Manual control of instruments

NOTICE

Access to the individual program parts can be deactivated in the user administration. In this case, the corresponding symbols are hidden.

2.1.2 Workplace - User interface

Program part: **Workplace**

Workplace symbol

Clicking on the workplace symbol in the vertical bar on the left opens the **Workplace** program part while at the same time the workplace symbol is shown in color. The upper left corner of the symbol contains a black field displaying the number of workplaces currently opened *(see chapter 3.2.3, page 94)*.

Elements

The user interface of the **Workplace** program part comprises the following elements:

- Workplace-specific menu bar.
- Workplace-specific toolbar.
- Main window, in which up to 6 subwindows can be displayed.

2.1.3 Database - User interface

Program part: **Database**

Database icon

Clicking on the database symbol in the vertical bar on the left opens the **Database** program part; the database symbol is shown in color at the

same time. The upper left corner of the symbol contains a black field displaying the number of databases currently opened *(see chapter 4.2, page 211)*.

Elements

The user interface of the **Database** program part comprises the following elements:

- Database-specific menu bar.
- Database-specific toolbar.
- Main window, in which up to six subwindows can be displayed.

2.1.4 Method - User interface

Program part: **Method**

Method icon

Clicking on the method symbol in the vertical bar on the left opens the **Method** program part; the database symbol is shown in color at the same time. The upper left corner of the symbol contains a black field displaying the number of methods currently opened *(see chapter 5.2.3, page 391)*.

Elements

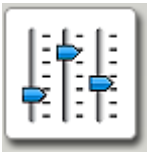
The user interface of the **Method** program part comprises the following elements:

- Method-specific menu bar.
- Method-specific toolbar.
- Main window in which several methods can be opened and a maximum of two can be displayed at the same time.

2.1.5 Configuration - User interface

Program part: **Configuration**

Configuration icon



Clicking on the configuration symbol in the vertical bar at the left opens the **Configuration** program part; the database symbol is shown in color at the same time.

Elements

The user interface of the **Configuration** program part comprises the following elements:

- Configuration-specific menu bar.
- Configuration-specific toolbar.
- Main window, in which up to six subwindows can be displayed.

2.1.6 Manual control - User interface

Program part: **Manual control**

Manual control - Symbol

Clicking on the **Manual** symbol in the vertical bar on the left opens the **Manual control** program part in a separate window; the **Manual** symbol is displayed in color at the same time.

Elements

The user interface of the **Manual control** program part comprises the following elements:

- *Instrument selection*
- *Functions/parameters*
- *Graphical display*

2.2 Login / password protection

2.2.1 General information on login / password protection

Program parts: **Workplace / Database / Method / Configuration**

Login into viva

viva can be configured so that all users have to log in with their **user name** and **password** and this data is automatically checked. This requires a **User administration** to be set up and the corresponding **Security settings** to be made. This data is saved in the configuration database. In the case of client/server systems, this is on the server and applies globally for all clients (central user administration).

Recommended settings

In order to set the settings, the **Password monitoring by viva** check box must be activated in the **Security settings** dialog window on the **Login/Password protection** tab. The following conditions will then be complied with:

- A **login with user name and password** is required each time the program is started.
- **User names** must be **unique**. Users entered once cannot be deleted.
- **Passwords** must be **unique** for each user. None of the expired passwords already used once by the user may be reused.
- Passwords must be changed after a defined **validity period**.
- The **number of login attempts** is limited. If this number is exceeded, the user will automatically be set to the status **inactive**.

Actions

If the login is activated, the following actions can be performed:

- *Logging in at program start*
- *Logging out manually*
- *Logging out automatically*
- *Changing password*

2.2.2 Logging in

Program parts: **Workplace / Database / Method / Configuration**

If both of the options **Enforce login with user name** and **Enforce login with password** are activated in the **Security settings**, the **Login** dialog window will appear each time the program is started and after each time a user logs out.

User

Entry of a short name for the user.

Entry	**24 characters**

Password

Entry of the password.

Entry	**24 characters**

NOTICE

Users who log in for the first time or users whose status has been reset from **disabled** or **removed** back to **enabled** must log in with the **Start password** *(see chapter 6.2.1.3, page 792)* specified by the administrator. Afterwards, the **Change password** window, in which a new password needs to be entered, will open automatically.

[Change password]

Opens the **Change password** window, in which the new password needs to be entered and confirmed.

[Cancel]

The login is canceled and the program is terminated.

2.2.3 Logging out manually

Menu item: **Workplace / Database / Method / Configuration ▶ File ▶ Logout**

A logged-in user can log out at any time with the **File ▶ Logout...** menu item. The logout options defined in the **Security settings** apply. After the logout, the **Login** window appears, in which a new user can log in.

2.2.4 Logging out automatically

Program part: **Configuration**

If the automatic logout is activated in the **Security settings**, then the user will be logged out automatically after a defined waiting time if no operating functions have been performed in the meantime via keyboard or mouse. Afterwards, the **Login** window opens, in which, however, only the same user or the members of the same user group can log in again.

NOTICE

Users with administrator rights can always log in; an emergency stop is also possible.

2.2.5 Changing the password

Dialog window: **Login ▶ [Change password] ▶ Change password**

NOTICE

In **viva**, the password can only be changed if the option **Password monitoring by viva** is set in the **Security settings**.

[Change password]

This button in the **Login** dialog window opens the **Change password** window, in which the new password needs to be entered and confirmed.

NOTICE

The password always needs to be changed before the **Passwords expire every** period of the password expires. For users who are logging in for the first time or whose status has been reset from **disabled** or **removed** back to **enabled**, this window is automatically opened after logging in with the **Start password**. Here you also need to enter the **Start password** assigned by the administrator for **Old password**.

Old password

Entry of the previous password.

Entry	**24 characters**

New password

Entry of the new password. The password options are defined in the **Security settings** on the **Login/Password protection** tab.

Entry	**24 characters**

Confirm password

Confirmation of the new password.

Entry	**24 characters**

2.3 Formula editor

The formula editor serves as a support when entering formulas for result calculation. It has an automatic **syntax check**, which is activated when the formula is applied. The general rules of priority apply for the calculation operations.

The **Formula editor** dialog window contains the following elements:

- **Input field**
  Entry of the calculation formula *(see chapter 2.3.1, page 15)*.
- **Buttons**
  Buttons for the quick entry of operators, parentheses and brackets *(see chapter 2.3.1, page 15)*.
- **Variables**
  Selection of the variables available for the calculation formula *(see chapter 2.3.3, page 17)*.
- **Operators/functions**
  Selection of the operators and functions available for the calculation formula *(see chapter 2.3.4, page 47)*.

- **Description**
  Description of the selected variables, operators or functions.

2.3.1 Input field

Dialog window: **Formula editor**

The calculation formula is entered in the input field of the formula editor. The following options are available for the entry:

Entry via keyboard

- **Numbers**
  Numbers as well as mathematical functions can be entered directly via the keyboard.
- **Text**
  Text must be enclosed in quotation marks **"** (e.g. **"my text"**).
- **Variables**
  Variables must be entered with an apostrophe **'** at the beginning and at the end (e.g. **'MV.my variable'**).
- **Time**
  Time indications must always be made with the aid of the **Time( )** function.

Entry using the buttons

Mathematical operators and parentheses or brackets can simply be inserted in the formula using the corresponding buttons. A space is automatically inserted before and after the character.

+	*Addition*	=	*Equal to*	AND	*Logical AND*
–	*Subtraction*	>	*Greater than*	OR	*Logical OR*
×	*Multiplication*	<	*Less than*	( )	Round parentheses
/	*Division*	<>	*Not equal to*	{ }	Curly brackets: request values of variables with index; the index is in curly brackets
^	*Potentiation*	<=	*Less than or equal to*		*Molar mass calculator*
		>=	*Greater than or equal to*		Undo last action
					Redo last action

Entry via selection

The element selected in the **Variables** or **Operators/Functions** fields can be added to the formula with a double-click or with **[Add]**.

2.3.2 Calculation algorithms

Dialog window: **Formula editor**

Numerical format

The IEEE 754 (1985) standard for binary floating-point arithmetic is implemented in "double precision" (64 bit) in the software.

Rounding-off process

Measured values and results are rounded off symmetrically (commercial rounding). I.e., **1, 2, 3, 4** are always rounded down whereas **5, 6, 7, 8, 9** are always rounded up.

Examples

2.33 yields **2.3**

2.35 yields **2.4**

2.47 yields **2.5**

-2.38 yields **-2.4**

-2.45 yields **-2.5**

Statistics

The mean value as well as the absolute and relative standard deviation of results *R* are calculated using the following formulas:

Mean value

$$\bar{x}_k = \frac{1}{n} \cdot \sum_{i=1}^{n} R_{k,i}$$

Absolute standard deviation

$$Sabs_k = +\sqrt{\frac{\sum_{i=1}^{n} \left(R_{k,i} - \bar{x}_k\right)^2}{n-1}}$$

Relative standard deviation (in %)

$$Srel_k = 100 \cdot \frac{Sabs_k}{\bar{x}_k}$$

The statistical calculations of the software have been implemented so that they can be checked to as great a degree as possible by the user. The individual values are therefore incorporated in the statistics with full accuracy.

It is not the number of decimal places which is decisive for the accuracy of the calculations, but rather the number of significant digits of the decimal numbers displayed. As a result of the binary 64-bit numerical format

implemented on the basis of the IEEE 754 standard, the resulting decimal numbers have 15 reliable significant decimal places.

You can influence the number of significant digits by selecting the unit and the number of decimal places. As the result unit to be set sometimes contains the prefix "milli" as well as the actual physical unit, the number of significant places changes accordingly by three places during such a conversion.

Example

The displayed result of **mg/L** has 15 reliable digits. It should be rounded off to three decimal places according to the above rounding-off process:

1234.568 mg/L (7 significant places, 3 of them decimal places)

The unit "**g/L**" means that the same result **g/L** is also rounded off to three decimal places:

1.235 g/L (4 significant places, 3 of them decimal places)

The number of significant digits has now been reduced by three to four digits by omitting the prefix "milli".

NOTICE

The above losses with respect to accuracy caused by rounding off in the range of the maximum reliable places are only theoretically relevant. Most of the time they are lower by several orders of magnitude than, for example, the uncertainties resulting from sample size.

2.3.3 Variables

2.3.3.1 Variables - Overview

Dialog window: **Formula editor**

Variables are automatically generated by the program during or at the end of the determination. You can use the formula editor to access these and either use the values for further calculations or output them as a result.

Variable types

The following types of variables are differentiated:

Name	Syntax	Description
Sample data variables	**SD.'Variable name'.'Variable identification'**	Sample data variables contain all of the sample data of the determination.
Command variables	**'Command name'.'Variable name'**	Command variables are variables which are generated by the individual commands in the method run. The command variables are displayed in the order determined by the commands executed in the method run.

Name	Syntax	Description
Automatically calculated result variables	**RS.'Command name'.'Substance name'.'Variable identification'**	The automatically calculated result variables are automatically generated by the program during the evaluation.
Evaluation parameter variables	**ED.Standards.'Standard name'.'Variable identification'** **ED.Calibration.'Command name'.'Substance name'.'Variable identification'**	Evaluation parameter variables are generated automatically during the evaluation.
User-defined result variables	**RS.'Result name'.'Variable identification'**	User-defined result variables are generated from the results defined by the user.
Determination variables	**DV.'Variable identification'**	Determination variables are general variables and cannot be assigned to individual commands.
System variables	**SV.'Variable identification'**	System variables are general variables which are adopted in the determination at the start of the determination.
Common variables	**CV.'Variable name'.'Variable identification'**	Common variables are client-specific variables, which are adopted from the table of the **Configuration** program part at the start of the determination and assigned to the determination.
Global variables	**GV.'Variable name'.'Variable identification'**	Global variables apply to all clients and are adopted from the table of the **Configuration** program part at the start of the determination and assigned to the determination.

Entering variables

Variables must always be entered with an apostrophe **'** at the beginning and at the end (e.g. **'DV.DUR'**).

NOTICE

When using variables, always observe their data type (**Number**, **Text** or **Date/Time**).

Variations and replications

Because of the fact that in voltammetry all data is saved in a single data set when working without solution exchanges, all of the result variables belonging to one voltammogram are clearly distinguished by an index **X** for the **variations** and another index **Y** for the **replications**.

Variation refers to a measurement after modification of the measuring solution, e.g., after a standard solution has been added.

Replication refers to an identical repetition of a measurement.

The following rules apply for this:

- **Variation index only after the measuring command has been called up with CALL VA**
  A variation index is attributed only to those peak evaluation results for which the measuring command has been called up by a **CALL VA** call command.
- **Increasing the variation index with ADD STD**
  The peak evaluation results of a measuring command are assigned a variation index, which is increased with the corresponding **ADD STD** or **ADD SAMPLE DT** command.
- **Increasing the replication index with loops or several measuring cycles**
  The results of the peak evaluation of a measuring command are assigned a replication index. The replication index is increased with repetitions due to loops (**LOOP** command) around a measuring command. In a **CVS** or **CPVS** measuring command, the replication index is increased by several measuring cycles within the command.
- **Both indices begin with 1**
  Variation index and replication index both start with 1.
- **Increasing the variation index sets the replication index to 1**
  Increasing the variation index automatically causes the replication index to be reset to 1.
- **Increasing the variation index only if the previously added solution contains at least one substance to be determined**
  When an **ADD STD** command is run through, the substances contained in the solution are identified on the basis of the name of the standard solution in the standards table. The respective measuring command is subsequently determined in the table of substances and the variation index is increased by 1 when this measuring command is run through.
- **Increasing the variation index only once if two substances are added to two separate solutions**
  If two substances are added to two different solutions with two different **ADD STD**-type commands and detected in the same measuring command, then the variation index is increased only once for this measuring command.
- **Increasing the variation index for all measuring commands when the same substance is added**
  If a standard solution containing a substance that is to be determined in different measuring commands is added using the **ADD STD** command, then the variation index for this substance is increased in all measuring commands.

2.3.3.2 Sample data variables

Dialog window: **Formula editor ► Variables**

Sample data variables are method-specific and are defined in the method's **START** command. The data type (**Text**, **Number**, **Date/Time**) of the variables is defined there. Either sample data variables (e.g., **Sample amount**, **Sample amount unit**, **Sample position**, **ID1 - ID16**) or fixed values can be assigned to these variables. The **Variables** field of the formula editor lists all the **Sample data variables** that are available for the current method.

Syntax

'SD.Variable name.Variable identification'

Examples: **'SD.TestDate'**, **'SD.RemainingTime.VAL'**, **'SD.TestValue.OVF'**

The sample data variables can be selected directly in the formula editor under **Variables ► Sample data variables** so as to avoid syntax errors.

Sample data variables

Identification	Description	Data type
VAL	Value of the sample data variable (optional, i.e., **'SD.Factor'** = **SD.Factor.VAL'**) (**Text**, **Number** or **Date/Time**)	Text, Number or Date/Time
OVF	Exceeding limits for sample data variable (**Number**: **1 = limit exceeded**, **0 = limit not exceeded**)	Number
In the following lines you will find the sample data variables present in the default settings which appear in the **Workplace** and which can be edited and deleted in the **START** command of the corresponding method.		
ID1	Value of **ID1**	Text, Number or Date/Time
ID1.OVF	Exceeding limit for **ID1**	Number
ID2	Value of **ID2**	Text, Number or Date/Time
ID2.OVF	Exceeding limit for **ID2**	Number
ID3	Value of **ID3**	Text, Number or Date/Time
ID3.OVF	Exceeding limit for **ID3**	Number
Sample type	Value of **Sample type**	Text
Sample type.OVF	Exceeding limit for **Sample type**	Number
Sample position	Value of **Sample position**	Number

Identification	Description	Data type
Sample position.OVF	Exceeding limit for **Sample position**	Number
Sample amount	Value of **Sample amount**	Number
Sample amount.OVF	Exceeding limit for **Sample amount**	Number
Sample amount unit	Value of **Sample amount unit**	Text
Sample amount unit.OVF	Exceeding limit for **Sample amount unit**	Number
Analytical volume	Value of **Analytical volume**	Number
Analytical volume.OVF	Exceeding limit for **Analytical volume**	Number
Dilution volume	Value of **Dilution volume**	Number
Dilution volume.OVF	Exceeding limit for **Dilution volume**	Number

2.3.3.3 Sample data variables of the next sample data line

Dialog window: **Formula editor ► Variables**

Sample data variables are method-specific and are defined in the method's **START** command. The data type (**Text**, **Number**, **Date/Time**) of the variables is defined there. Either sample data variables (e.g., **Sample amount**, **Sample amount unit**, **Sample position**, **ID1 - ID16**) or fixed values can be assigned to these variables. The **Variables** field of the formula editor lists all the **Sample data variables** that are available for the current method.

Syntax

'SD.NEXT.Variable name.Variable identification'

These variables contain the sample data of the *next line of the sample table* of a determination series. These variables are distinguished in the syntax from the sample data variables of the current sample data line by means of the word **NEXT**. The data type (**Text**, **Number** or **Date/Time**) depends on the variable.

The sample data variables can be selected directly in the formula editor under **Variables ► Sample data variables ► NEXT** in order to avoid syntax errors.

Sample data variables

Identification	Description	Data type
VAL	Value of the sample data variable (optional, i.e., **'SD.Factor'** = **SD.Factor.VAL'**) (**Text**, **Number** or **Date/Time**)	Text, Number or Date/Time
OVF	Exceeding limits for sample data variable (**Number**: **1 = limit exceeded**, **0 = limit not exceeded**)	Number
In the following lines you will find the sample data variables present in the default settings which appear in the **Workplace** and which can be edited and deleted in the **START** command of the corresponding method.		
ID1	Value of **ID1**	Text, Number or Date/Time
ID1.OVF	Exceeding limit for **ID1**	Number
ID2	Value of **ID2**	Text, Number or Date/Time
ID2.OVF	Exceeding limit for **ID2**	Number
ID3	Value of **ID3**	Text, Number or Date/Time
ID3.OVF	Exceeding limit for **ID3**	Number
Sample type	Value of **Sample type**	Text
Sample type.OVF	Exceeding limit for **Sample type**	Number
Sample position	Value of **Sample position**	Number
Sample position.OVF	Exceeding limit for **Sample position**	Number
Sample amount	Value of **Sample amount**	Number
Sample amount.OVF	Exceeding limit for **Sample amount**	Number
Sample amount unit	Value of **Sample amount unit**	Text
Sample amount unit.OVF	Exceeding limit for **Sample amount unit**	Number
Analytical volume	Value of **Analytical volume**	Number
Analytical volume.OVF	Exceeding limit for **Analytical volume**	Number
Dilution volume	Value of **Dilution volume**	Number

Identification	Description	Data type
Dilution volume.OVF	Exceeding limit for **Dilution volume**	Number

NOTICE

The following rules apply for sample data variables of the next sample data line:

- If a sample data variable of the next sample data line is used in a determination, then the data type of these variables has to match that of the current sample data line. If this is not the case, then the value **invalid** will be assigned to the variable.
- Sample data variables of the next sample data line are always read out of the sample table at the beginning of the determination.
- In the case of a single determination or if the current determination is the last determination of a series, all the sample data variables of the next sample data line contain the value **invalid**.

2.3.3.4 Command variables

Dialog window: **Formula editor ► Variables**

The command variables are method-specific and depend on which commands are used in the method. Included among the command variables are also solution and sensor variables, which are applied automatically from the corresponding tables in the **Configuration** for the instrument-dependent commands when the determination is started and which are assigned to the individual commands. The **Variables** field of the formula editor lists all command variables that are available for the current method.

Syntax

'Command name.Variable identification'

Examples: **'Track 6.BSY'**, **'ADD STD 4.VOL'**

Command variables can be selected directly in the formula editor under **Variables ► Command variables** in order to avoid syntax errors.

Command variables

Unless marked otherwise, all the variables listed here in alphabetical order are of the **Number** type.

NOTICE

In the case of variables with the index **{x}**, the required number **1–9** must be entered for **x** (e.g., **RS.CVS 3.VAR{3}.VTOT** for the total volume in the measuring vessel after the third addition).

If no index is specified, then the last index will be used automatically (e.g., **RS.CVS 3.VAR.VTOT** for the total volume after the last addition).

Identification	Description	Commands
ACO	Addition counter = current number of completed runs of the command	ADD SAMPLE DT, ADD STD
BP{x}.CNT	Intensity for the break point x (1–9) in counts	MEAS Opt
BP{x}.MEA	Measured value for the break point x (1–9) in the unit of the measured value	MEAS Opt
BP{x}.TEM[1)]	Temperature for the break point x (1–9) in °C	MEAS Opt
BP{x}.TIM	Time for the break point x (1–9) in s	MEAS Opt
BP{x}.TRN	Transmission for the break point x (1–9) in %	MEAS Opt
BSY	Command status: **1 = BUSY**, **HOLD** or **ERROR** **0 = READY** **invalid** (variable not available) **= Command has never been started**	All except START and END
C0	Coefficient c0 of the calibration curve	CAL LOOP Opt, CAL Spec
C1	Coefficient c1 of the calibration curve	CAL LOOP Opt, CAL Spec
C2	Coefficient c2 of the calibration curve	CAL LOOP Opt, CAL Spec
C3	Coefficient c3 of the calibration curve	CAL LOOP Opt, CAL Spec
CAL	Status of the calibration: **1 = calibrated normally**, **0 = canceled**, because reference wavelength was not found.	CAL Spec
COD	Coefficient of determination (R^2), which is calculated on the basis of the calibration function and of the confidence interval.	CAL LOOP Opt
CP{#}.MEA	Measured wavelength of the calibration point in nm. If no measured peak can be assigned, then **not found** will be entered.	CAL Spec
CP{#}.REF	Reference wavelength of the calibration point in nm.	CAL Spec

Identification	Description	Commands
CYL	Cylinder volume of the exchange or dosing unit used for the command	ADD AUX, ADD SAMPLE, ADD SAMPLE DT, ADD STD, EMPTY, LQH, PREP
DBL	Total duration for the processing of the command in s	CAL MEAS Opt, CAL Spec, CVS, CPVS, CP, LSV, DP, ELECTRODE TEST, SQW, CV, LOOP, MEAS Opt, MEAS Opt Conc, MEAS Ref, MEAS Spec, MEAS TMF, MEAS T, STIR, STIR & PURGE
ELT	Variable for electrode test: **0** = Electrode test has not been performed **1** = Electrode test has been performed once **2** = Electrode test has been performed twice **3** = Electrode test has been performed three times **invalid** (variable not available) **= Command has never been started**	CVS, CPVS, CP, LSV, DP, ELECTRODE TEST, SQW, CV
EME	End measured value (measured value after processing of the command) in the unit of the measured value	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
ETE[1)]	End temperature (temperature after the command has been processed) in °C	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF, MEAS T
FIN	Command status: **1 = Command has been called and ended at least once** **0 = Command has been called and never ended** **invalid** (variable not available) **= Command has never been called**	All except START and END
FP{x}.CNT	Intensity for the fixed point x (1–9) in counts	MEAS Opt

Identification	Description	Commands
FP{x}.MEA	Measured value for the fixed point x (1–9) in the unit of the measured value	MEAS Opt
FP{x}.TEM[1)]	Temperature for the fixed point x (1–9) in °C	MEAS Opt
FP{x}.TIM	Time in s until the fixed point x (1–9) is reached	MEAS Opt
FP{x}.TRN	Transmission for the fixed point x (1–9) in %	MEAS Opt
HR	Highest current measuring range used: **1** = 224 mA | **3** = 20 mA | **5** = 2 mA | **7** = 200 µA | **9** = 20 µA | **11** = 2 µA | **13** = 200 nA | **15** = 20 nA | **17** = 2 nA | **19**= 200 pA	CVS, CPVS, LSV, CV
HR	Highest current measuring range used: **1** = 224 mA | **3** = 20 mA | **5** = 2 mA | **7** = 200 µA | **9** = 20 µA | **11** = 2 µA | **13** = 200 nA	DP, SQW
HR	Highest potential measuring range used: **1** = 5 V | **3** = 0.5 V | **5** = 50 mV | **7** = 5 mV	CP
IME	Initial measured value (measured value before start conditions are processed) in the unit of the measured value	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
ITE[1)]	Initial temperature (temperature before start conditions are processed) in °C	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF, MEAS T
LCO	Loop counter = current number of completed runs, both of Repeat loops and While loops	CALL COND, CAL LOOP Opt, LOOP
LR	Lowest current measuring range used: **19**= 200 pA | **17** = 2 nA | **15** = 20 nA | **13** = 200 nA | **11** = 2 µA | **9** = 20 µA | **7** = 200 µA | **5** = 2 mA | **3** = 20 mA | **1** = 224 mA	CVS, CPVS, LSV, CV
LR	Lowest current measuring range used: **13** = 200 nA | **11** = 2 µA | **9** = 20 µA | **7** = 200 µA | **5** = 2 mA | **3** = 20 mA | **1** = 224 mA	DP, SQW
LR	Lowest potential measuring range used: **7** = 5 mV | **5** = 50 mV | **3** = 0.5 V | **1** = 5 V	CP
LP.CAx	Calculated value x (1–3) for the last measuring point in the measuring point list	MEAS Opt, MEAS Opt Conc

Identification	Description	Commands
LP.CNT	Intensity of the last measuring point in the measuring point list in counts	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc
LP.EXx	External value x (1–3) for the last measuring point in the measuring point list	MEAS Opt, MEAS Opt Conc
LP.MEA	Measured value for the last measuring point in the measuring point list in the unit of the measured value	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
LP.TEM[1)]	Temperature for the last measuring point in the measuring point list in °C	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
LP.TIM	Time in s until the last measuring point in the measuring point list is reached	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
LP.TRN	Transmission of the last measuring point in the measuring point list in %	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc
LPO	Current absolute lift position in mm (entry when the command has ended)	LIFT
LST	Start time of the loop command (**Date/Time**)	CALL COND CAL LOOP Opt, LOOP
MA.CNT	Intensity for maximum measured value in counts	MEAS Opt
MA.MEA	Maximum measured value in the unit of the measured value	MEAS Opt
MA.TEM[1)]	Temperature for the maximum measured value in °C	MEAS Opt
MA.TIM	Time in s until the maximum measured value is reached	MEAS Opt
MA.TRN	Transmission for maximum measured value in %	MEAS Opt
MI.CNT	Intensity for minimum measured value in counts	MEAS Opt
MI.MEA	Minimum measured value in the unit of the measured value	MEAS Opt
MI.TEM[1)]	Temperature at minimum measured value in °C	MEAS Opt
MI.TIM	Time for the minimum measured value in s	MEAS Opt
MI.TRN	Transmission for minimum measured value in %	MEAS Opt

Identification	Description	Commands
MTE[2)]	Temperature measurement with sensor; (**1 = on**, **0 = off**)	CAL MEAS Opt, MEAS Opt, MEAS Opt Conc, MEAS TMF
NMP	Number of measuring points in measuring point list	CAL MEAS Opt, CVS, CPVS, CP, LSV, DP, SQW, CV, MEAS Opt, MEAS Opt Conc, MEAS TMF, MEAS T
OUT	Number of outliers	CAL LOOP Opt
PK{x}.ABS	Absorbance of the peak x (1–9) in mAU	MEAS Spec
PK{x}.TRN	Transmission of the peak x (1–9) in %	MEAS Spec
PK{x}.CNT	Intensity of the peak x (1–9) in counts	MEAS Spec
PK{x}.CNR	Intensity of the peak x (1–9) in the reference spectrum in counts	MEAS Spec
PK{x}.CND	Intensity of the peak x (1–9) in the dark spectrum in counts	MEAS Spec
PK{x}.WVL	Wavelength of the peak x (1–9) in nm	MEAS Spec
PK{x}.SAT	Detector with peak x (1–9) saturated: **1 = saturated**;**0 = not saturated**	MEAS Spec
RAN	Current absolute rotation angle of the rack in ° in relation to the axis of the selected tower (entry when the command has ended)	MOVE
RPM	Stirring rate in min^{-1}. For the **STIR** command with the 884 Professional VA or 894 Professional CVS, the stirring rate is indicated with the unit min^{-1}. For the **STIR** command with the 741 Magnetic Stirrer, the stirring rate is indicated as dimensionless quantity between –15 and +15.	CVS, CPVS, CP, LSV, DP, ELECTRODE TEST, SQW, CV, STIR, STIR & PURGE
RPO	Current rack position (entry when the command has ended); **0** means **'not defined'**	MOVE
SAN	Current absolute swing angle of the robotic arm in ° (entry when the command has ended)	MOVE, SWING
SDV	Actual value of the standard deviation when the command is canceled	CALL COND
SPO	Current external position (entry when the command has ended); **0** means **invalid position**	SWING
SRAT	Signal ratio at the most recent command run when using a DT.	LOOP
STC{x}	Concentration of the standard solution x (1–50) used for the command	CAL LOOP Opt

Identification	Description	Commands
STY	Type of stop with which the command was stopped: **1 = finished normally**, **0 = stopped manually with [Quit] or [Stop]**	CAL MEAS Opt, CAL Spec, CVS, CPVS, CP, LSV, DP, ELECTRODE TEST, SQW, CV, MEAS Opt, MEAS Opt Conc, MEAS Ref, MEAS Spec, MEAS TMF, MEAS T, STIR, STIR & PURGE
STY	Stop type used for stopping the LOOP command: **0 = manual** or **after error**; **1 = maximum number of runs**; **2 = maximum run time**; **3 = signal ratio**; **4 = condition**	LOOP
TMF	Transmission factor (dimensionless)	MEAS TMF
TOL	Tolerance within which a measured peak can be assigned to a calibration wavelength.	CAL Spec
TOU	Timeout status: **1 = Max. waiting time expired**; **0 = Max. waiting time not expired**	RECEIVE, SCAN, TRANSFER
VOL	Dosed volume increment in L	ADD STD, ADD STD, ADD SAMPLE DT, ADD STD, LQH
VOLTOT	Dosed total volume in L	ADD SAMPLE DT, ADD STD

[1] Command variable is invalid for the Avantes spectrometer

[2] For the Avantes spectrometer, MTE always equals 0

2.3.3.5 Evaluation parameter variables

Dialog window: **Formula editor ► Variables**

The automatically calculated evaluation parameter variables for the voltammetry commands contained in the method are automatically generated by the program during the evaluation. The **Variables** field of the formula editor lists all the variables which are available for the current method.

Syntax

'ED.Standards.Standard name.Substance name.Variable identification'

Examples: **'ED.Standards.Suppressor.Cu.CONC'**

You can select the method variables directly in the formula editor under **Variables ► Evaluation parameter variables** in order to avoid syntax errors.

Available evaluation parameter variables

Identification	Description	Data type
CONC	Substance concentration in the standard solution	Number
UNI	Basic unit of the substance concentration in the standard solution.	Text

Syntax

'ED.Calibration.Command name.Substance name.Variable identification'

Examples: **'ED.Calibration.CVS 10.Suppressor.EVRATIO'**

You can select the method variables directly in the formula editor under **Variables ► Evaluation parameter variables** in order to avoid syntax errors.

Available evaluation parameter variables

Identification	Description	Data type
EVRATIO	Evaluation ratio of a substance for the calibration curve (DT).	Number

2.3.3.6 Automatically calculated result variables

Dialog window: **Formula editor ► Variables**

The automatically calculated result variables for the voltammetry commands contained in the method are automatically generated by the program during the evaluation. In the formula editor, the **Variables** field lists all variables which are available for the current method under **Result variables**. In addition, all variables are listed that are always available if a substance has been defined, regardless of whether the variables are created in the method run or not.

Syntax

'RS.Command name.Substance name.VAR{x}.REP{x}.Variable identification'

Example: **'RS.CVS_1.Cu.VAR{2}.REP{3}.HGT'**

'RS.Command name.Substance name.Variable identification'

Example: **'RS.CVS_1.Cu.CALC0'**

'RS.Command name.VAR{x}.FP{z}.Variable identification'

Example: **'RS.CVS_1.VAR{1}.FP{1}.CUR.MNV'**

You can select the method variables directly in the formula editor under **Variables ▶ Result variables** in order to avoid syntax errors.

Result variables in general

The following result variables are generated in the measuring process if a substance has been defined in the method for the measuring command **CVS**, **CPVS**, **LSV**, **DP**, **SQW** or **CV**. The generated result variables can be used in formulas.

Result variables per substance

Designation **RS.'Command name'.'Substance name'.'Variable identification'**

Identification	Description	Data type
CONC	Substance concentration in the sample *(see chapter 5.6.7.6.1, page 766)*.	Number
CONC.UNI	Unit of the concentration of the substance in the sample *(see chapter 5.6.7.6.2, page 767)*.	Text
CONC.ASD	Absolute standard deviation of the substance concentration in the sample *(see chapter 5.6.7.6.3, page 768)*.	Number
CONC.RSD	Relative standard deviation of the substance concentration in the sample *(see chapter 5.6.7.6.4, page 768)*.	Number
CONCM	Substance concentration in the measuring vessel *(see chapter 5.6.7.7.15, page 775)*.	Number
CONCM.UNI	Unit of the substance concentration in the measuring vessel *(see chapter 5.6.7.7.16, page 775)*.	Text
CONCM.ASD	Absolute standard deviation of the substance concentration in the measuring vessel *(see chapter 5.6.7.7.17, page 775)*.	Number
CONCM.RSD	Relative standard deviation of the substance concentration in the measuring vessel *(see chapter 5.6.7.7.18, page 776)*.	Number
AMOUNT	Mass, amount or volume of a substance that has entered the measuring vessel via the sample amount *(see chapter 5.6.7.7.19, page 776)*.	Number
AMOUNT.UNI	Unit of mass, amount or volume of a substance that has entered the measuring vessel via the sample amount.	
CALC0	Zero-order coefficient of the calibration curve or standard addition curve *(see chapter 5.6.7.4.1, page 762)*.	Number
CALC1	First-order coefficient of the calibration curve or standard addition curve *(see chapter 5.6.7.4.2, page 762)*.	Number

Identification	Description	Data type
CALC2	Second-order coefficient of the calibration curve *(see chapter 5.6.7.4.3, page 763)*.	Number
CALC4	Fourth-order coefficient of the calibration curve *(see chapter 5.6.7.4.4, page 764)*.	Number
R2	Coefficient of determination R^2, which is calculated on the basis of the calibration function and of the confidence interval *(see chapter 5.6.7.4.5, page 765)*.	Number
VEFFSTD	Effective addition volume of the added standard solution for the evaluation ratio *(see chapter 5.6.7.7.3, page 770)*.	Number
VEFFSTD.UNI	Unit of the effective addition volume of the added standard solution for the evaluation ratio *(see chapter 5.6.7.7.4, page 771)*.	Text
VEFFSTD.ASD	Absolute standard deviation of the effective addition volume of the added standard solution for the evaluation ratio *(see chapter 5.6.7.7.5, page 771)*.	Number
VEFFSTD.RSD	Relative standard deviation of the effective addition volume of the added standard solution for the evaluation ratio *(see chapter 5.6.7.7.6, page 771)*.	Number
VEFFSMPL	Effective addition volume of the added sample solution for the evaluation ratio *(see chapter 5.6.7.7.7, page 771)*.	Number
VEFFSMPL.UNI	Unit of the effective addition volume of the added sample solution for the evaluation ratio *(see chapter 5.6.7.7.8, page 772)*.	Text
VEFFSMPL.ASD	Absolute standard deviation of the effective addition volume of the added sample solution for the evaluation ratio *(see chapter 5.6.7.7.17, page 775)*.	Number
VEFFSMPL.RSD	Relative standard deviation of the effective addition volume of the added sample solution for the evaluation ratio *(see chapter 5.6.7.7.10, page 773)*.	Number
CALFACT	Calibration factor DT. It corresponds to the concentration of the standard in the measuring vessel for the evaluation ratio *(see chapter 5.6.7.7.11, page 773)*.	Number
CALFACT.UNI	Unit of the calibration factor DT *(see chapter 5.6.7.7.12, page 774)*.	Text
CALFACT.ASD	Absolute standard deviation of the calibration factor DT *(see chapter 5.6.7.7.13, page 774)*.	Number
CALFACT.RSD	Relative standard deviation of the calibration factor DT *(see chapter 5.6.7.7.14, page 775)*.	Number

Result variables if called by CALL BLANK

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL BLANK** and can be used in formulas:

Result variables for BLANK, per substance and replication

Designation **RS.'Command name'.'Substance name'.BLANK.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number
AREANORM	Standardized area of a peak (**AREA/BLANK.AREA.MNV**) *(see chapter 5.6.7.7.1, page 768)*.	Number
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
HGTNORM	Standardized height of a peak (**HGT/BLANK.HGT.MNV**) *(see chapter 5.6.7.7.2, page 769)*.	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)* or potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

Result variables for BLANK, per substance

Designation **RS.'Command name'.'Substance name'.BLANK.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number

Identification	Description	Data type
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables if called by CALL COND

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL COND** and can be used in formulas:

Result variables for CALL COND, per substance and replication

Designation **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Identification	Description	Data type
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)* or potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

Result variables for CALL COND, per substance

Designation **RS.'Command name'.'Substance name'.CALL COND{x}.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
AREA.MNVDELTA	Difference between the mean value of the peak areas of all replications for the measurement **{x}** and the mean value of the peak areas of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.7, page 755)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number
HGT.MNVDELTA	Difference between the mean value of the peak heights of all replications for the measurement **{x}** and the mean value of the peak heights of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.7, page 755)*.	Number
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Identification	Description	Data type
MVAL.MNVDELTA	Difference between the mean value of the measured values of all replications for the measurement **{x}** and the mean value of the measured values of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.17, page 760)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables if called by CALL VMS

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL VMS** and can be used in formulas:

Result variables for VMS, per substance and replication

Designation **RS.'Command name'.'Substance name'.VMS.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number
AREANORM	Standardized area of a peak (**AREA/VMS.AREA.MNV**) *(see chapter 5.6.7.7.1, page 768)*.	Number
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
HGTNORM	Standardized height of a peak (**HGT/VMS.HGT.MNV**) *(see chapter 5.6.7.7.2, page 769)*.	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)* or potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

Result variables for VMS, per substance

Designation **RS.'Command name'.'Substance name'.VMS.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables if called by CALL INTERCEPT

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL INTERCEPT** and can be used in formulas:

Result variables for INTERCEPT, per substance and replication

Designation **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number

Identification	Description	Data type
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)* or potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

Result variables for INTERCEPT, per substance

Designation **RS.'Command name'.'Substance name'.INTERCEPT.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number

Identification	Description	Data type
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables if called by CALL ELECTROLYTE

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL ELECTROLYTE** and can be used in formulas:

Result variables for ELECTROLYTE, per substance and replication

Designation **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number
AREANORM	Standardized area of a peak (**AREA/ELECTROLYTE.AREA.MNV**) *(see chapter 5.6.7.7.1, page 768)*.	Number
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
HGTNORM	Standardized height of a peak (**HGT/ELECTROLYTE.HGT.MNV)**) *(see chapter 5.6.7.7.2, page 769)*.	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Identification	Description	Data type
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)* or potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

Result variables for ELECTROLYTE, per substance

Designation **RS.'Command name'.'Substance name'.ELECTROLYTE.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables if called by CALL VA

The following result variables are generated in the method run when the commands **CVS**, **CPVS**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL VA** and can be used in formulas:

Result variables per substance, variation and replication

Designation **RS.'Command name'.'Substance name'.VAR{x}.REP{y}.'Variable identification'**

Identification	Description	Data type
AREA	Peak area *(see chapter 5.6.7.3.3, page 753)*.	Number
AREANORM	Standardized area of a peak (**AREA**/**AREA.MNV**) *(see chapter 5.6.7.7.1, page 768)*. **AREA.MNV** = **VMS.AREA.MNV**[1] or **AREA.MNV** = **ELECTROLYTE.AREA.MNV**[2] (Only one of these 2 variables may be present in a determination.)	Number
BTYPE	Baseline type **CVS**, **CPVS**: **15** = Horizontal automatically | **16** = Horizontal manually | **17** = Horizontal through 0 automatically | **18** = Horizontal through 0 manually Baseline type **LSV**, **DP**, **SQW**, **CV**: **1** = Linear automatically | **2** = Linear manually | **3** = Exponential automatically | **4** = Exponential manually | **5** = Polynomial automatically | **6** = Polynomial manually | **7** = Horizontal start automatically | **8** = Horizontal end automatically | **9** = Horizontal start manually | **10** = Horizontal end manually	Number
END	End base point, where the peak evaluation baseline ends *(see chapter 5.6.7.3.19, page 761)*.	Number
HGT	Peak height *(see chapter 5.6.7.3.8, page 755)*.	Number
HGTNORM	Standardized height of a peak (**HGT**/**HGT.MNV**) *(see chapter 5.6.7.7.2, page 769)*. **HGT.MNV** = **VMS.HGT.MNV**[1] or **HGT.MNV** = **ELECTROLYTE.HGT.MNV**[2] (only one of the 2 variables may be present in a determination)	Number
MVAL	Measured value *(see chapter 5.6.7.3.13, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
POT	Peak potential of a substance *(see chapter 5.6.7.3.2, page 752)*.	Number
START	Start base point, where the peak evaluation baseline begins *(see chapter 5.6.7.3.18, page 760)*.	Number
SUBST	Substance name *(see chapter 5.6.7.3.1, page 752)*.	Text

[1] for calibration method **DT**

[2] for calibration method **RC**

Result variables per substance and variation

Designation **RS.'Command name'.'Substance name'.VAR{x}.'Variable identification'**

Identification	Description	Data type
AREA.MNV	Mean value of the peak areas of all replications *(see chapter 5.6.7.3.4, page 753)*.	Number
AREA.ASD	Absolute standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.5, page 754)*.	Number
AREA.RSD	Relative standard deviation of the peak areas of all replications *(see chapter 5.6.7.3.6, page 754)*.	Number
AREA.MNVDELTA	Difference between the mean value of the peak areas of all replications for the measurement **{x}** and the mean value of the peak areas of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.7, page 755)*.	Number
HGT.MNV	Mean value of the peak heights of all replications *(see chapter 5.6.7.3.9, page 756)*.	Number
HGT.ASD	Absolute standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.10, page 756)*.	Number
HGT.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.11, page 757)*.	Number
HGT.MNVDELTA	Difference between the mean value of the peak heights of all replications for the measurement **{x}** and the mean value of the peak heights of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.7, page 755)*.	Number
MVAL.MNV	Mean value of the measured values of all replications *(see chapter 5.6.7.3.14, page 758)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.ASD	Absolute standard deviation of the measured values of all replications *(see chapter 5.6.7.3.15, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.RSD	Relative standard deviation of the peak heights of all replications *(see chapter 5.6.7.3.16, page 759)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number
MVAL.MNVDELTA	Difference between the mean value of the measured values of all replications for the measurement **{x}** and the mean value of the measured values of all replications for the measurement **{x-1}** *(see chapter 5.6.7.3.17, page 760)*. Only available for the **CVS**, **LSV**, **DP**, **SQW** and **CV** commands.	Number

Result variables per variation

Designation **RS.'Command name'.VAR{x}.'Variable identification'**

The following result variables are generated in the method run, regardless of whether a substance is defined or not, when the commands **CVS**, **CPVS**, **CP**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL VA** and can be used in formulas:

Identification	Description	Data type
VTOT	Total volume in the measuring vessel for variation {x} *(see chapter 5.6.7.5.1, page 766)*.	Number

Result variables per variation and replication

Designation **RS.'Command name'.VAR{x}.REP{y}.FP{z}.'Variable identification'**

The following result variables are generated in the method run, regardless of whether a substance is defined or not, when the commands **CVS**, **CPVS**, **CP**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL VA** and can be used in formulas:

Identification	Description	Data type
TIM	Time in s until the fixed point Z (Z = 1–10) is reached.	Number
CUR	Current of the fixed point Z (Z = 1–10) in A.	Number
POT	Potential of a fixed point Z (Z = 1–10) in V *(see chapter 5.6.7.3.20, page 761)*.	Number

Result variables per variation, replication and fixed point

Designation **RS.'Command name'.VAR{x}.FP{z}.'Variable identification'**

The following result variables are generated in the method run, regardless of whether a substance is defined or not, when the commands **CVS**, **CPVS**, **CP**, **LSV**, **DP**, **SQW** and **CV** are called by **CALL VA** and can be used in formulas:

Identification	Description	Data type
TIM.MNV	Mean value of all replications of a variation for the time of the selected fixed point.	Number
TIM.ASD	Absolute standard deviation of all replications of a variation for the time of the selected fixed point.	Number
TIM.RSD	Relative standard deviation of all replications of a variation for the time of the selected fixed point.	Number
TIM.UNI	Unit of the result in s.	Text
CUR.MNV	Mean value of all replications of a variation for the current of the selected fixed point.	Number
CUR.ASD	Absolute standard deviation of all replications of a variation for the current of the selected fixed point.	Number
CUR.RSD	Relative standard deviation of all replications of a variation for the current of the selected fixed point.	Number

Identification	Description	Data type
CUR.UNI	Unit of the result in A.	Text
POT.MNV	Mean value of all replications of a variation for the potential of a selected fixed point.	Number
POT.ASD	Absolute standard deviation of all replications of a variation for the potential of a selected fixed point.	Number
POT.RSD	Relative standard deviation of all replications of a variation for the potential of a selected fixed point.	Number
POT.UNI	Unit of the result in V.	Text

2.3.3.7 User-defined result variables

Dialog window: **Formula editor ► Variables**

User-defined result variables are generated for the user-defined results defined by the user in the method. A basic distinction is made between **single results** and **multiple results**.

A **single result** is an individual numerical value which is calculated according to a specified formula.

In the case of a **multiple result**, a formula is specified with which a result is calculated in the same way for each substance.

Syntax

Single result:

- **'RS.Result name'**

Multiple result:

- **'RS.Command name.ASU.Result name'**, where **ASU** stands for "all substances" and represents all substances as a wildcard.
- **'RS.Command name.Substance name.Result name'**, where the **Substance name** represents precisely one specific substance.

Result variables CALC

In a method with a CALC command, the following additional result variables are available. These result variables are not calculated automatically.

Identification	Description
.OVF	Limit value violation for result; **1 = limit exceeded**, **0 = limit not exceeded**
.UNI	Result unit (**Text**)

2.3.3.8 Determination variables

Dialog window: **Formula editor ▶ Variables**

Determination variables are general variables that are generated in the method run. They are not assigned to individual commands. The **Variables** field of the formula editor lists the **Determination variables** which are available for the current method, sorted according to name.

Syntax

'DV.Variable identification'

Examples: **'DV.DUR'**, **'DV.STT'**

Determination variables can be selected directly in the formula editor under **Variables ▶ Determination variables** so as to avoid syntax errors.

Available determination variables

Designation	Description	Data type
DUR	Duration of the determination in s	Number
STT	Moment at which the determination has been started	Date/Time

2.3.3.9 System variables

Dialog window: **Formula editor ▶ Variables**

System variables are general variables which are adopted in the determination at the start of the determination. They are assigned neither to individual commands nor to determinations. The **Determination variables** field of the formula editor lists all the **System variables** that are available for the current method.

Syntax

'SV.Variable identification'

Examples: **'SV.SIN'**, **'SV.SLI'**

System variables can be selected directly in the formula editor under **Variables ▶ System variables** so as to avoid syntax errors.

Available system variables

Designation	Description	Data type
ACC	Autostart actual counter	Number
ACE	Autostart setpoint counter	Number
DID	Determination ID	Text
FUN	Full name of the logged-in user	Text
ORG	Method run: **1 = original determination**, **0 = reprocessing**	Number

Designation	Description	Data type
REM	Remarks	Text
RUN	Sample number	Number
SEN	Indication whether the end of the sample table has been reached; **1 = yes**, **0 = no**	Number
SIN	Indication whether the determination has been started as a single determination or within a series; **1 = single determination**, **0 = series determination**	Number
SLI	Sample table actual line (**number**)	Number
STC	Start counter	Number
STO	Indication whether the determination has been stopped (manual stop, stop via SEND command, emergency stop) or terminated normally; **1 = stopped**, **0 = terminated normally**	Number
USN	Short name of the logged-in user	Text

2.3.3.10 Common variables

Dialog window: **Formula editor ► Variables**

Common variables apply to all methods and are adopted from the corresponding table in the **Configuration** program part where the common variables can be defined and assigned to the determination at the time of its start. The **Variables** field of the formula editor lists all of the **Common Variables** which are available, sorted according to variable name.

Syntax

'CV.Variable name.Variable identification'

Examples: **'CV.TestDate'**, **'CV.AverageTemp.UNI'**

You can select the common variables directly in the formula editor under **Variables ► Common Variables** in order to avoid syntax errors.

Available common variables

Designation	Description	Data type
'none'	Value of the common variable	Number
UNI	Unit of the common variable	Text

2.3.3.11 Global variables

Dialog window: **Formula editor ► Variables**

Global variables apply to all clients and are adopted at the start of the determination and assigned to it from the corresponding table in the **Configuration** program part where global variables can be defined. The **Variables** field of the formula editor lists all of the available **Global Variables**, sorted according to variable name.

Syntax

'GV.Variable name.Variable identification'

Examples: **'GV.TestDate'**, **'GV.AverageTemp.UNI'**

You can select the global variables directly in the formula editor under **Variables ► Global Variables** in order to avoid syntax errors.

Available global variables

Designation	Description	Data type
'none'	Value of the global variable	Number
UNI	Unit of the global variable	Text

2.3.4 Operators/functions

2.3.4.1 Operators/functions - Overview

Dialog window: **Formula editor ► Operators/Functions**

Overview of the operators and functions

Operators	Functions
Arithmetic: ▪ *Addition* (+) ▪ *Subtraction* (-) ▪ *Multiplication* (*) ▪ *Division* (/) ▪ *Potentiation* (^)	**Arithmetic:** ▪ *Exponential function* (Exp) ▪ *Natural logarithm* (Ln) ▪ *Common logarithm* (Log) ▪ *Square root* (Sqrt) ▪ *Absolute value* (Abs) ▪ *Fraction* (Frac) ▪ *Integer* (Int) ▪ *Round integer* (Round) ▪ *Sign* (Sign) ▪ *Quantiles of the Student's t-distribution* (Tinv)
Logic: ▪ *AND* ▪ *OR*	**Date/Time:** ▪ *Time()* ▪ *Time(Date)* ▪ *Time(Date+Time)*

Operators	Functions
Comparison: ▪ *Equal to* (=) ▪ *Greater than* (>) ▪ *Greater than or equal to* (>=) ▪ *Less than* (<) ▪ *Less than or equal to* (<=) ▪ *Not equal to* (<>)	**Type conversion:** ▪ *NumberToText* ▪ *NumberToTime* ▪ *TextToNumber* ▪ *TextToTime* ▪ *TimeToNumber* ▪ *TimeToText*
	Text: ▪ *TextPosition* ▪ *SubText* ▪ *Trim*
	Miscellaneous: ▪ *Error* ▪ *Case*

Priority rules of the operators

The operators are evaluated in the order in which they are listed in the table below. In order to attain the required order, it may be necessary to place operands in parentheses.

	Operators
Arithmetic	^
	*, /
	+, -
Comparison	<, <=, >, >=
Logic	AND, OR

2.3.4.2 Arithmetical operators

2.3.4.2.1 Addition

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 + Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type.

Examples

Operand1	Operand2	Result	Example	Remark
both operands of the same type:				
Number	Number	Number	**1.2 + 3 = 4.2**	–

Operand1	Operand2	Result	Example	Remark
Text	Text	Text	**"Metrohm" + "AG" = "Metrohm AG"**	If the maximum permissible length (65,536 characters) of the character string is exceeded by addition of the operands, the surplus characters will be removed from the second operand.
Time	Time	Number	**Time(1998;04;06) + Time(1964;02;03) = 59,300.875** (for UTC+1)	Result: Number of days calculated from December 1899, dependent on the system time
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Text	**1.2 + "Metrohm" = "1.2Metrohm"**	–
Text	Number	Text	**"Metrohm" + 1.2 = "Metrohm1.2"**	–
Number	Time	Number	**2.0 + Time(1999;11;7) = 36,472.96** (for UTC+1)	Result: Number of days calculated from December 1899, dependent on the system time
Time	Number	Number	**Time(1999;10;7) + 2.0 = 36,441.92** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time
Text	Time	Text	**"Metrohm" + Time(1999;10;7) = "Metrohm1999-10-07 00:00:00 UTC+2"**	Before the operation, the operand of the **Date/Time** type is converted to **Text**.
Time	Text	Text	**Time(1999;01;7) + "Metrohm" = "1999-01-07 00:00:00 UTC +1Metrohm"**	The same rules apply here as for the previous operation.

2.3.4.2.2 Subtraction

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

Operand1 – Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type.

Examples

Operand1	Operand2	Result	Example	Remark
both operands of the same type:				
Number	Number	Number	**1.2 – 3 = –1.8**	–
Text	Text	Text	**"Metrohm" – "AG" = invalid**	This operation is not allowed.
Time	Time	Number	**Time(1998;01;06) – Time(1964;12;03) = 12,087.00** (for UTC+1)	Result: Number of days calculated from December 1899, dependent on the system time

Operand1	Operand2	Result	Example	Remark
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Text	**1.2 – "Metrohm" = invalid**	This operation is not allowed.
Text	Number	Text	**"Metrohm" – 1.2 = invalid**	This operation is not allowed.
Number	Time	Number	**2.0 – Time(1999;10;7) = – 36,437.917** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time
Time	Number	Number	**Time(1999;10;7) – 2.5 = 36,437.917** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time
Text	Time	Text	**"Metrohm" – Time(1999;10;7) = invalid**	This operation is not allowed.
Time	Text	Text	**Time(1999;10;7) – "Metrohm" = invalid**	This operation is not allowed.

2.3.4.2.3 Multiplication

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 * Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type.

Examples

Operand1	Operand2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**1.2 * 3 = 3.6**	–
Text	Text	Text	**"Metrohm" * "AG" = invalid**	This operation is not allowed.
Time	Time	Number	**Time(1998;05;06) * Time(1902;02;03) = 27478004.545** (for UTC+1 or +2 in the summer time)	Result: Number of days calculated from December 1899, dependent on the system time
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Text	**2 * "Metrohm" = "MetrohmMetrohm"**	–
Text	Number	Text	**"Metrohm" * 2 = "MetrohmMetrohm"**	–
Number	Time	Number	**2.0 * Time(1999;10;7) = 72,879.833** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time

Operand1	Operand2	Result	Example	Remark
Time	Number	Number	**Time(1999;10;7) * 2.0 = 72,879.833** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time
Text	Time	Text	**"Metrohm" * Time(1999;10;7) = invalid**	This operation is not allowed.
Time	Text	Text	**Time(1999;10;7) * "Metrohm" = invalid**	This operation is not allowed.

2.3.4.2.4 Division

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 / Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type.

Examples

Operand1	Operand2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**1.2 / 3 = 0.4**	Operand2 must not be zero!
Text	Text	Text	**"Metrohm" / "AG" = invalid**	This operation is not allowed.
Time	Time	Number	**Time(1998;04;06) / Time(1964;02;03) = 1.533** (for UTC +1 or +2 in the summer time)	Result: Number of days calculated from December 1899, dependent on the system time
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Text	**1.2 / "Metrohm" = invalid**	This operation is not allowed.
Text	Number	Text	**"Metrohm" / 1.2 = invalid**	This operation is not allowed.
Number	Time	Number	**10,000 / Time(1999;10;7) = 0.274** (for UTC+2)	Result: Number of days calculated from December 1899, dependent on the system time
Time	Number	Number	**Time(1999;02;17) / 10,000 = 3.621** (for UTC+1)	Result: Number of days calculated from December 1899, dependent on the system time
Text	Time	Text	**"Metrohm" / Time(1999;10;7) = invalid**	This operation is not allowed.
Time	Text	Text	**Time(1999;10;7) / "Metrohm" = invalid**	This operation is not allowed.

2.3.4.2.5 Potentiation

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 ^ Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type.

Examples

Operand1	Operand2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**1.2 ^ 3 = 1.728**	Complex results (i.e., consisting of a combination of a real and an imaginary part) are displayed as an error.
Text	Text	Text	**"Metrohm" ^ "AG" = invalid**	This operation is not allowed.
Time	Time	Number	**Time(1900;01;05) ^ Time(1900;01;02) = 196.371** (for UTC+1)	Result: Number of days calculated from December 1899, dependent on the system time
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Text	**1.2 ^ "Metrohm" = invalid**	This operation is not allowed.
Text	Number	Text	**"Metrohm" ^ 1.2 = invalid**	This operation is not allowed.
Number	Time	Number	**1.2 ^ Time(1900;02;03) = 586.198** (for UTC+1)	–
Time	Number	Number	**Time(1999;10;7) ^ 2.5 = 253,479,847,878.04** (for UTC+2)	–
Text	Time	Text	**"Metrohm" ^ Time(1999;10;7) = invalid**	This operation is not allowed.
Time	Text	Text	**Time(1999;10;7) ^ "Metrohm" = invalid**	This operation is not allowed.

2.3.4.3 Logical operators

2.3.4.3.1 AND

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 AND Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false). The following cases are possible:

Operand1	Operand2	Result
1	1	1
0	1	0
1	0	0
0	0	0

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 AND 4 --> 1** **4 AND 0 --> 0**	Numbers greater than 0 are interpreted as **1** (true).
Text	Text	Number	**"Metrohm" AND "AG" --> 1** **"" AND "AG" --> 0**	An empty character string (**""**) is interpreted as **0** (false), everything else as **1** (true). The first operation therefore corresponds to **1 AND 1 --> 1.**
Time	Time	Number	**Time(1999;10;07) AND Time(1999;10;07) --> 1**	**Time()**: see *Time(Date)*
Operands of a different type:				
Number	Text	Number	**1.2 AND "1.2" --> 1** **0 AND "1" --> 1** **0 AND "0" --> 1** **0 AND "" --> 0**	Before the operation, the operand of the **Number** type is converted to the **Text** type, as a conversion from **Text** to **Number** is not useful. During the second operation, the 0 is therefore converted to **"0"**, which corresponds to the logical value **1** (true), as every character string that is not empty is interpreted as 1.
Text	Number	Number	**"Metrohm" AND 1.2 --> 1**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 AND Time(1999;10;7) --> 1** **0 AND Time(1999;10;07) --> 0**	Before the operation, the operand of the **Date/Time** type is converted to **Number** and all dates since December 30, 1899 are interpreted as **1** (true).
Time	Number	Number	**Time(1999;10;7) AND 2.5 --> 1**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" AND Time(1999;10;7) --> 1** **"" AND Time(1999;10;07) --> 0**	Before the operation is carried out, the operand of the **Date/Time** type is converted to the **Text** type, and every non-empty character string is interpreted as **1** (true).
Time	Text	Number	**Time(1999;10;7) AND "Metrohm" --> 1**	The same rules apply here as for the previous operation.

2.3.4.3.2 OR

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 OR Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false). The following cases are possible:

Operand1	Operand2	Result
1	1	1
0	1	1
1	0	1
0	0	0

Examples

Operand1	Operand2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 OR 4 --> 1** **4 OR 0 --> 1**	Numbers greater than 1 are automatically interpreted as 1 (true)
Text	Text	Number	**"Metrohm" OR "AG" --> 1** **"" OR "Metrohm" --> 1** **"" OR "" --> 0**	An empty character string ("") is interpreted as 0 (false), everything else as 1 (true). The first operation therefore corresponds to 1 OR 1 --> 1
Time	Time	Number	**Time(1999;10;07) OR Time(1964;02;03) --> 1**	**Time()**: see *Time(Date)*
Operands of a different type: The operand which does not correspond to the result type is converted to the relevant result type before the operation.				
Number	Text	Number	**1.2 OR "1.2" --> 1** **0 OR "" --> 1**	Before the operation, the operand of the **Number** type is converted to the **Text** type, as a conversion from **Text** to **Number** is not useful. During the second operation, the 0 is therefore converted to "0", which corresponds to the logical value 1 (true), as every character string that is not empty is interpreted as 1.
Text	Number	Number	**"Metrohm" OR 1.2 --> 1**	The same rules apply here as for the previous operation.

Operand1	Operand2	Result	Example	Remark
Number	Time	Number	**2.0 OR Time(1999;10;7) --> 1** **0 OR Time(1964;02;03) --> 1**	Before the operation, the operand of the **Date/Time** type is converted to **Number** and all dates since December 30, 1899 are interpreted as 1 (true).
Time	Number	Number	**Time(1999;10;7) OR 2.5 --> 1**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" OR Time(1999;10;7) --> 1**	Before the operation is carried out, the operand of the **Date/Time** type is converted to the **Text** type, and every non-empty character string is interpreted as 1 (true).
Time	Text	Number	**Time(1999;10;7) OR "Metrohm" --> 1**	The same rules apply here as for the previous operation.

2.3.4.4 Relational operators

2.3.4.4.1 Equal to

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

Operand1 = Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Operand1	Operand2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 = 5 --> 1** **4 = 5 --> 0**	–
Text	Text	Number	**"Metrohm" = "AG" --> 0** **"aG" = "AG" --> 0**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!
Time	Time	Number	**Time(1998;04;06) = Time(1964;02;03) --> 0**	*(see chapter 2.3.4.6.2, page 67)*
Operands of a different type:				
Number	Text	Number	**1.2 = "1.2" --> 11.2 = "Metrohm" --> 0**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.

Oper-and1	Oper-and2	Result	Example	Remark
Text	Number	Number	**"Metrohm" = 1.2 --> 0**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 = Time(1999;10;07) --> 0**	Before the relational operation, the operand of the **Date/Time** type is converted to a **Number**. During execution of the operation, the exact value is always used after this conversion, even if maximum 5 places after the comma can be displayed *(see chapter 2.3.4.7.5, page 72)*.
Time	Number	Number	**Time(1999;10;7) = 2.0 --> 0**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" = Time(1999;10;07) --> 0**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999-10-07 00:00:00 UTC+2"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;07) = "Metrohm" --> 0**	The same rules apply here as for the previous operation.

2.3.4.4.2 Greater than

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 > Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 > 4 --> 1** **4 > 5 --> 0**	–
Text	Text	Number	**"Metrohm" > "AG" --> 1** **"Aarau" > "Zug" --> 0**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!
Time	Time	Number	**Time(1998;04;06) > Time(1964;02;03) --> 1**	*(see chapter 2.3.4.6.2, page 67)*

Oper-and1	Oper-and2	Result	Example	Remark
Operands of a different type:				
Number	Text	Number	**1.2 > "Metrohm" --> 01.23 > "1.2" --> 1**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Text	Number	Number	**"Metrohm" > 1.2 --> 1**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 > Time(1999;10;07) --> 0**	Before the comparison, the operand is converted from **Date/Time** to a **Number**.
Time	Number	Number	**Time(1999;10;07) > 2.0 --> 1**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" > Time(1999;10;07) --> 1**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999-10-07 00:00:00 UTC +2"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;7) > "Metrohm" --> 0**	The same rules apply here as for the previous operation.

2.3.4.4.3 Greater than or equal to

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 >= Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 >= 4 --> 1** **4 >= 5 --> 0**	–
Text	Text	Number	**"Metrohm" >= "AG" --> 1**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!

Oper-and1	Oper-and2	Result	Example	Remark
Time	Time	Number	**Time(1998;04;06) >= Time(1964;02;03) --> 1**	*(see chapter 2.3.4.6.2, page 67)*
Operands of a different type:				
Number	Text	Number	**1.2 >= "1.2" --> 11.2 >= "Metrohm" --> 0**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Text	Number	Number	**"Metrohm" >= 1.2 --> 1**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 >= Time(1999;10;07) --> 0**	Before the comparison, the operand is converted from **Date/Time** to a **Number**.
Time	Number	Number	**Time(1999;10;07) >= 2.0 --> 1**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" >= Time(1999;10;07) --> 1**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999-10-07 00:00:00 UTC +2"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;7) >= "Metrohm" --> 0**	The same rules apply here as for the previous operation.

2.3.4.4.4 Less than

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 < Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				
Number	Number	Number	**5 < 4 --> 0** **4 < 5 --> 1**	–

Oper-and1	Oper-and2	Result	Example	Remark
Text	Text	Number	**"Metrohm" < "AG" --> 0**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!
Time	Time	Number	**Time(1998;04;06) < Time(1964;02;03) --> 0**	*(see chapter 2.3.4.6.2, page 67)*
Operands of a different type:				
Number	Text	Number	**1.2 < "Metrohm" --> 11.2 < "1" --> 0**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Text	Number	Number	**"Metrohm" < 1.2 --> 0**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 < Time(1999;10;07) --> 1**	Before the comparison, the operand is converted from **Date/Time** to a **Number**.
Time	Number	Number	**Time(1999;10;07) < 2.0 --> 0**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" < Time(1999;10;07) --> 0**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999-10-07 00:00:00 UTC +2"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;7) < "Metrohm" --> 1**	The same rules apply here as for the previous operation.

2.3.4.4.5 Less than or equal to

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

Operand1 <= Operand2

The operands can be entered either directly or as variables and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				

Oper-and1	Oper-and2	Result	Example	Remark
Number	Number	Number	**5 <= 4 --> 0** **4 <= 5 --> 1**	–
Text	Text	Number	**"Metrohm" <= "AG" --> 0**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!
Time	Time	Number	**Time(1998;04;06) <= Time(1964;02;03) --> 0**	*(see chapter 2.3.4.6.2, page 67)*
Operands of a different type:				
Number	Text	Number	**2 <= "1.2" --> 01.2 <= "Metrohm" --> 1**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Text	Number	Number	**"Metrohm" <= 1.2 --> 0**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 <= Time(1999;10;07) --> 1**	Before the comparison, the operand is converted from **Date/Time** to a **Number**.
Time	Number	Number	**Time(1999;10;07) <= 2.0 --> 0**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" <= Time(1999;10;07) --> 0**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999.10.07"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;7) <= "Metrohm" --> 1**	The same rules apply here as for the previous operation.

2.3.4.4.6 Not equal to

Dialog window: **Formula editor ► Operators/Functions**

Syntax

Operand1 <> Operand2

The operands can be entered either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. The result type is always a number (**1** = true, **0** = false).

Examples

Oper-and1	Oper-and2	Result	Example	Remark
Operands of the same type:				

Oper-and1	Oper-and2	Result	Example	Remark
Number	Number	Number	**5 <> 4 --> 1** **5 <> 5 --> 0**	–
Text	Text	Number	**"Metrohm" <> "AG" --> 1**	When making a comparison between two texts, the **ASCII value** of the character string is compared *(see chapter 2.3.4.10, page 79)*. **Attention:** Uppercase and lowercase letters have different values!
Time	Time	Number	**Time(1998;04;06) <> Time(1964;02;03) --> 1**	*(see chapter 2.3.4.6.2, page 67)*
Operands of a different type:				
Number	Text	Number	**1.2 <> "1.2" --> 01.2 <> "Metrohm" --> 1**	Before the relational operation, the **Number** is converted to **Text**, afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Text	Number	Number	**"Metrohm" <> 1.2 --> 1**	The same rules apply here as for the previous operation.
Number	Time	Number	**2.0 <> Time(1999;10;07) --> 1**	Before the comparison, the operand is converted from **Date/Time** to a **Number**.
Time	Number	Number	**Time(1999;10;07) <> 2.5 --> 1**	The same rules apply here as for the previous operation.
Text	Time	Number	**"Metrohm" <> Time(1999;10;07) --> 1**	Before the operation, the operand is converted from **Date/Time** to **Text** (in this example: **"1999-10-07 00:00:00 UTC +2"**), afterwards the texts are compared according to **ASCII value** *(see chapter 2.3.4.10, page 79)*.
Time	Text	Number	**Time(1999;10;7) <> "Metrohm" --> 1**	The same rules apply here as for the previous operation.

2.3.4.5 Arithmetical functions

2.3.4.5.1 Exponential function

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = Exp(number)

Calculates e ^ number. Other notation for $y = e^{(number)}$, where e is the Euler number (e = 2.71828…).

Parameters

Number Exponent

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Exp(1.5) = 4.48169

Exp('CV.AverageTemp') = Power of the exponent (common variable **CV.AverageTemp**) for base e

2.3.4.5.2 Natural logarithm

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Ln(number)

Returns the logarithm of the entered number for base e. Alternative notation for $y = \log_e(\text{number})$, where e is the Euler number (e = 2.71828…).

Parameters

Number > 0

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Ln(3) = 1.09861

Ln('CV.AverageTemp') = Natural logarithm of the value of the common variable **CV.AverageTemp** for base e

2.3.4.5.3 Common logarithm

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Log(number)

Returns the logarithm of the entered number for base 10. Alternative notation for $y = \log_{10}(\text{number})$.

Parameters

Number > 0

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Log(10) = 1

Log('CV.AverageTemp') = Common logarithm of the value of the common variable **CV.AverageTemp**

2.3.4.5.4 Square root

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Sqrt(number)

Returns the square root of the entered number. Alternative notation for y = $\sqrt{}$ **number** or y = $^{2}\sqrt{}$ **number**.

Parameters

Number ≥ 0

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Sqrt(33) = 5.745

Sqrt('CV.AverageTemp') = Square root of the value of the common variable **CV.AverageTemp**

2.3.4.5.5 Absolute value

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Abs(number)

Returns the absolute value of the entered number, i.e. the value of the number irrespective of its sign.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Abs(–55.3) = 55.3

Abs('CV.AverageTemp') = Value of the common variables **CV.AverageTemp** without signs

2.3.4.5.6 Fraction

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Frac(number)

Returns the fraction of the entered number.

NOTICE

In the results properties, the number of **Decimal places** of the result must always be given, as otherwise the fraction cannot be displayed.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Frac(–55.325) = 0.325

Frac('CV.AverageTemp') = Value of the common variable **CV.AverageTemp** without sign

2.3.4.5.7 Integer

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Int(number)

Returns the integer of the entered number.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Int(–55.325) = –55

Int('CV.AverageTemp') = Integer of the value of the common variable **CV.AverageTemp**

2.3.4.5.8 Rounding integer

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = Round(number)

Returns the rounded value of the entered number as a whole number.

NOTICE

If the first decimal place is 5 or greater, the number is rounded up to the next whole number (commercial rounding).

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Round(–55.5259) = –56

Round('CV.AverageTemp') = Rounded value of the common variable **CV.AverageTemp**

2.3.4.5.9 Sign

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = Sign(number)

Returns the sign of the entered number: **1** for a positive number, **–1** for a negative number.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

Examples

Sign(–55.3) = –1

Sign(26.115) = 1

Sign('CV.AverageTemp') = Sign of the value of the common variable **CV.AverageTemp**

2.3.4.5.10 Quantiles of the Student's t-distribution

Dialog window: **Formula editor ► Operators/Functions**

Syntax

t_s **= Tinv(Probability, Degrees of freedom)**

Calculates the quantiles of the Student's t-distribution for two-sided intervals.

The result describes the half interval length as a multiple of the standard deviation of a sampling totality with given **degrees of freedom** within which, with the indicated **probability**, the mean value of the distribution lies, when the interval is centered on the mean value of the sampling totality.

Parameters

Probability

Number type, value range: 0 - 1. Direct entry as number or as formula providing a number. If the type or value is non-permitted, then the result will become **invalid**. This is to indicate the probability of the unknown mean value of the t-distributed result falling within the two-sided interval.

Degrees of freedom

Number type, value range: 1 - n. Direct entry as number or as formula providing a number. If the type of value is non-permitted, then the result will become **invalid**. The number of independent samplings for calculating the standard deviation, reduced by the number of adjusted parameters for the model to which the standard deviation refers, must be specified as degrees of freedom (Degrees of freedom = Number of samplings – Number of parameters).

Examples

Tinv(0.95; 9) = 2.26: With a 10-fold determination (e.g., of a titer) half the interval length corresponds to 2.26 times the standard deviation.

Calculation of the confidence interval for a mean value of sampling: A variance-homogenous sampling with a range n for a normally distributed quantity with an expected value μ has the mean value x_m, the standard deviation s and the degrees of freedom $v = n - 1$. The half interval length $t_s \cdot s/\sqrt{n}$ then indicates how high, within the given probability, the maximum absolute difference is between the mean value x_m and the expected value μ. Here the **confidence interval** is the full interval length, centered to the mean value: $\mu = x_m \pm t_s \cdot s/\sqrt{n}$.

Titer determination: 0.991, 1.021, 0.995, 1.003, 1.007, 0.993, 0.998, 1.015, 1.003, 0.985

Mean value = 1.001

Standard deviation = 0.0111

Student's t-quantiles for a probability of 95% = 2.26

Confidence interval of the titer = 1.001 ± 0.008

2.3.4.6 Date/Time functions

2.3.4.6.1 Time()

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Time()

Returns the current date and the current time.

Parameters

none

Return value

Current date and current time in the **yyyy-mm-dd hh:mm:ss UTC ±xx** format

NOTICE

UTC = Coordinated Universal Time, from which the times in the various time zones of the earth are derived. CET (Central European Time) is equal to UTC plus 1 hour, in the summer time UTC plus 2 hours.

2.3.4.6.2 Time(Date)

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Time(year; month; day)

Returns the entered figures in the **Date/Time** format.

Parameters

year	**00 - 99** or **1,000 - 9,999**
month	**1 - 12**
day	**1 - 31**

A parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

NOTICE

Only the integral part is used for all parameters.

A variable of the **Date/Time** type cannot be transferred as a parameter here.

Both for the automatic and explicit conversion of a **Time** to the **Number** type, the number of days are counted since **December 30, 1899** at **01 hours**.

Attention: December 30, 1899 01 hours = 0.00000 days, this number is **rounded off** to 5 decimal places, although a relational operation, for example, is carried out using the exact value!

Return value

Date/Time in the **yyyy-mm-dd hh:mm:ss UTC ±xx** format

NOTICE

UTC = Coordinated Universal Time, from which the times in the various time zones of the earth are derived. CET (Central European Time) is equal to UTC plus 1 hour, in the summer time UTC plus 2 hours.

Examples

Time(2004;02;02) = 2004-02-02 00:00:00 UTC +1 (dependent on the system time)

Time('CV.TestYear';'CV.TestMonth';'CV.TestDay') = Date comprised of the common variables

2.3.4.6.3 Time(Date + Time)

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Time(year; month; day; hour; minute; second)

Returns the entered figures in the **Date/Time** format.

Parameters

year	**00 - 99** or **1,000 - 9,999**
month	**1 - 12**
day	**1 - 31**
hour	**0 - 23**

minute **0 - 59**

second **0 - 59**

A parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this is not possible, the result of this operation is returned as **invalid**.

NOTICE

Only the integral part is used for all parameters.

A variable of the **Date/Time** type cannot be transferred as a parameter here.

Both for the automatic and explicit conversion of a **Time** to the **Number** type, the number of days are counted since **December 30, 1899** at **01 hours**.

Attention: December 30, 1899 01 hours = 0.00000 days, this number is **rounded off** to 5 decimal places, although a relational operation, for example, is carried out using the exact value!

Return value

Date/Time in the **yyyy-mm-dd hh:mm:ss UTC ±xx** format

NOTICE

UTC = Coordinated Universal Time, from which the times in the various time zones of the earth are derived. CET (Central European Time) is equal to UTC plus 1 hour, in the summer time UTC plus 2 hours.

Examples

Time(2004;06;02;10;30;25) = 2004-06-02 10:30:25 UTC +2
(dependent on the system time)

Time('CV.TestYear';'CV.TestMonth';'CV.TestDay';'CV.TestHour';'CV.TestMin';'CV.TestSec') = Date comprised of the common variables

2.3.4.7 Type conversion functions

2.3.4.7.1 NumberToText

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = NumberToText(number)

Returns the entered number as **Text**.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type.

Examples

NumberToText(–55.3) = **–55.3**

NumberToText('CV.AverageTemp') = Value of the common variable (AverageTemp) as **Text**

2.3.4.7.2 NumberToTime

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = NumberToTime(number)

Returns the entered number as **Date/Time**, where the number is interpreted as the number of days since December 30, 1899 at 01 hours.

Parameters

Number

The parameter can be indicated either directly as a number or as a variable of the **Number** type.

Examples

NumberToTime(35545.526) = **1997-04-25 14:37:26 UTC+2** (dependent on the system time)

NumberToTime(35780.55) = **1997-12-16 14:12:00 UTC+1** (dependent on the system time)

NumberToTime('CV.TestDate') = Value of the common variable (TestDate) as **Date/Time**

2.3.4.7.3 TextToNumber

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = TextToNumber(Text)

Returns the entered text as a **number**.

Parameters

Text

The parameter may only contain **numerical characters** or variables of the **Text** type, as otherwise a type conversion is not possible. The result of this conversion or the calculation would then be **invalid**. In addition, text must be marked by **quotation marks**.

Examples

TextToNumber("–55.3") = **–55.3**

TextToNumber('CV.AverageTemp') = Value of the variables (Average-Temp) as **Number**

TextToNumber('SD.ID1') = entered text of **ID 1** as **Number**

2.3.4.7.4 TextToTime

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = TextToTime(Text;Format)

Returns the entered text as **Date/Time**.

Parameters

Text

The parameter may only contain **numerical characters** or variables of the **Text** type, as otherwise a type conversion is not possible (Result = **invalid**). You can use the following characters as the **separator** between year, month, etc.: slash (**/**), period (**.**), minus (**-**), semicolon (**;**), colon (**:**), space and comma. You can determine the **sequence** of the individual data yourself, but you must specify this in the **Format** parameter.

Format

Indicates in which format or order the text has been entered. This parameter must be highlighted by **quotation marks** and can comprise the following code characters:

Characters	Meaning
y	Year

Characters	Meaning
M	Month
d	Day
H	Hour 0 - 23
h	Hour AM/PM
m	Minute
s	Second
a	AM/PM marking

NOTICE

If you indicate the time in the **AM/PM** format, it is necessary (in addition to the formatting character **h**) to use the AM/PM marking **a** (see first example below).

Examples

TextToTime("2004-12-3 5:22:01 PM";"yMdhmsa") = **2004-12-03 17:22:01 UTC+1** (dependent on the system time)

TextToTime("12-15-01 2001:3:5";"HmsyMd") = **2001-03-05 12:15:01 UTC+1** (dependent on the system time)

TextToTime('CV.TestDate';'CV.TestFormat') = Values of the common variables in the time format indicated

TextToTime('SD.ID1';'CV.TestFormat') = entered text of ID1 in the time format indicated

2.3.4.7.5 TimeToNumber

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = TimeToNumber(Time)

Returns the entered time as a **Number**.

NOTICE

Both for the automatic and explicit conversion of a **Time** to the **Number** type, the number of days are counted since **December 30, 1899 at 01 hours**.

Attention: December 30, 1899 01 hours = 0.00000 days, this number is **rounded off** to 5 decimal places, although a relational operation, for example, is carried out using the exact value.

Parameters

Time

This parameter can be indicated either in the form of a time function or as a variable of the **Time** type.

Examples

TimeToNumber(Time()) = current date and current time represented as **Number** (in days since December 1899)

TimeToNumber(Time(1999;12;31;23;59;59)) = 36,525.95832

TimeToNumber(Time('TestYear';'TestMonth';'TestDay')) = Value of the common variables as number of days as a **Number**

2.3.4.7.6 TimeToText

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = TimeToText(Time)

Returns the time entered as **Text**.

y = TimeToText(Time;Format)

Returns the time entered as **Text** in the required format.

Parameters

Time

This parameter can be indicated either in the form of a time function or as a variable of the **Date/Time** type.

Format

Indicates in which format or order the time is to be output as text. This parameter can comprise the following code characters and must be marked by **quotation marks**:

Characters	Meaning	Example
y	two-digit year number	**03**
yyyy	four-digit year number	**1999**
M	one- or two-digit month number	**4, 12**
MM	two-digit month number	**04, 12**
MMM	month name short form	**Jul, Aug**
MMMM	month name	**July, August**
d	one- or two-digit day number	**2, 25**
dd	two-digit day number	**02, 25**
h	one- or two-digit hour number (1 - 12 AM/PM)	**5, 11**
hh	two-digit hour number (1 - 12 AM/PM)	**05, 11**
H	one- or two-digit hour number (0 - 23)	**8, 17**
HH	two-digit hour number (0 - 23)	**08, 17**
m	one- or two-digit minute number	**2, 25**
mm	two-digit minute number	**02, 25**
s	one- or two-digit second number	**3, 55**
ss	two-digit second number	**03, 55**
E	weekday short form	**Mon, Tue, Wed**
EEEE	weekday	**Monday, Tuesday**
D	one-, two- or three-digit number of the day in the year	**2, 35, 142**
DD	two- or three-digit number of the day in the year	**02, 35, 142**
DDD	three-digit number of the day in the year	**002, 035, 142**
F	one-digit number of the weekday in the month, e.g., the **2**nd Monday in May	**2**
w	one- or two-digit number of the week in the year	**5, 25**
ww	two-digit number of the week in the year	**05, 25**
W	one-digit number of the week in the month	**3**
a	Format AM/PM	**AM, PM**

Characters	Meaning	Example
'	Quotation marks used for entering any text	
''	Entry of '	'

NOTICE

If you wish to indicate the time in the **AM/PM** format, it is necessary, in addition to the formatting character **h**, to use the AM/PM marking **a** (see last example below).

Examples

TimeToText(Time()) = current date and current time (system) as **Text**

TimeToText(Time(2004;05;04)) = **2004-05-04 00:00:00 UTC+2** (dependent on the system time)

TimeToText('CV.TestTime') = Value of the common variable (type **Time**) as **Text**

TimeToText(Time(2000;12;31);"EEEE', 'dd'.'MMMM' 'yyyy") = **Sunday, December 31, 2000**

TimeToText(Time(1997;05;22);"M'/'d'/'yyyy', 'ha") = 5/22/1997, 12PM

2.3.4.8 Text functions

2.3.4.8.1 TextPosition

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = TextPosition(Text; sample text)

Returns the **Index** which indicates at which point the **sample text** appears for the first time in the **Text**. The numbering of the index begins at **1**!

Parameters

Text

The parameter can be indicated either directly or as a variable of the **Text**, **Number** or **Date/Time** type.

Sample text

The parameter can be indicated either directly or as a variable of the **Text**, **Number** or **Date/Time** type. If the types of the two parameters do not coincide, the type is converted from **Sample text** to **Text**. If the **Sample text** is not included in the **Text**, the status **invalid** is returned.

NOTICE

Entries of the **Number** type are always provided with a decimal place.

Example: **TextPosition("12345";3)** = **invalid**, as the 3 is converted to 3.0 before the operation and this is not included in the text.

Examples

TextPosition("Citric acid";"acid") = 8, the word "**acid**" occurs in the text from index number 8 onwards

TextPosition("Citric acid";"Acid") = **invalid**, the word "**Acid**" (capitalized) does not occur in the text

TextPosition("Citric acid";"salt") = **invalid**, the word "**salt**" does not occur in the text

TextPosition(Time(2004;05;05);"5") = **7**

TextPosition(3362.14;"6") = **3**

TextPosition('SD.ID2';"Carbonate") = Index in which the word part "**Carbonate**" begins for the first time in the ID2

2.3.4.8.2 SubText

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = SubText(Text; Position; Length)

Returns that part of the text from **Text** which begins at the index **Position** and which has the length **Length**.

Parameters

Text

The parameter can be indicated either directly as text or as a variable of the **Text** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If this type conversion is not possible, the result of this operation is returned as **invalid**.

Position

The numbering of the **Position** begins at **1**. The parameter can be indicated either **directly as a number** or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If a type conversion is not possible or the position does not exist, the result of this operation is returned as **invalid**.

Length

The parameter can be indicated either directly as a number or as a variable of the **Number** type. If the parameter does not correspond to the expected type, it will automatically be converted to it. If a type conversion is not possible or the length indicated here is greater than the length of the subtext, then **invalid** will be returned.

Examples

SubText("Citric acid";8;4) = **acid**

SubText("Citric acid";8;5) = **invalid**, only 4 characters exist from position 8 onwards

SubText('MV.ID2';1;3) = the first three characters of the identification 2

2.3.4.8.3 Trim

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Trim(Text)

Returns the **Text** without spaces before and after.

y = Trim(Text; sample text)

Returns the **Text** without **Sample text**.

Parameters

Text

The parameter can be indicated either directly or as a variable of the **Text**, **Number** or **Date/Time** type.

Sample text

The parameter can be indicated either directly or as a variable of the **Text**, **Number** or **Date/Time** type. If the types of the two parameters do not coincide, the type is converted from **Sample text** to the **Text** type.

NOTICE

Entries of the **Number** type are always provided with a decimal place.

Example: **Trim("12345";3)** = **12345**, as the 3 is converted to 3.0 before the operation and this is not included in the text.

Examples

Trim(" Citric acid ") = **"Citric acid"**

Trim("Citric acid";"acid") = **Citric**

Trim("Citric acid";"salt") = **Citric acid**

2.3.4.9 Miscellaneous functions

2.3.4.9.1 Case

Dialog window: **Formula editor ► Operators/Functions**

Syntax

y = Case(Condition; value_true; value_false)

y = Case(Condition; value_true; value_false; value_error)

Returns **value_true** if the condition is true. Otherwise **value_false** is given. If an error occurs in the condition (result **invalid**), **value_error** is given.

Parameters

Condition Number

Any variable (**Number** type) can be entered here, or a relational or logic operation can be performed whose operators can be transferred either directly or as a variable. These can be of the **Text**, **Number** or **Date/Time** type.

Value_true

If **condition <> 0**, this parameter is saved as a result of the function. This parameter can be transferred either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. Entire operations can also be transferred here.

Value_false

If **condition = 0**, this parameter is saved as a result of the function. This parameter can be transferred either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. Entire operations can also be transferred here.

Value_error

If **condition = invalid**, this parameter is saved as a result of the function. This parameter can be transferred either directly or as a variable and can be of the **Text**, **Number** or **Date/Time** type. Entire operations can also be transferred here.

Examples

Case('SD.ID1' = "";"ID1 empty";"ID1 not empty") = if no entry has been made for ID1 in the run window, the text **ID1 empty**, otherwise **ID1 not empty**, will be saved in the result.

Case('RS.IntermediateRes' > 5.5;"Intermediate result too high";'RS.IntermediateRes' * 26.5;"Error occurred") = If the result "**IntermediateRes**" is greater than 5.5, then the text "**Intermediate result too high**" will be written into the result, otherwise the intermedi-

ate result will be multiplied by 26.5. If an error occurs during the comparison (**'RS.IntermediateRes' > 5.5**) then "**Error occurred**" will be saved as a result of this operation.

2.3.4.9.2 Error

Dialog window: **Formula editor ▶ Operators/Functions**

Syntax

y = Error(value)

Returns **+1** if the **value is invalid** (error) or **0** if the **value is valid**. This function can be used, §, to check variables for their existence or validity.

Parameters

Value

The variable to be tested.

Examples

Error('RS.IntermediateRes') = 0: The intermediate result was able to be calculated.

Error('RS.IntermediateRes') = 1: The intermediate result is invalid.

2.3.4.10 ASCII table

Dialog window: **Formula editor**

Only printable characters are listed in the table below:

ASCII value (dec)	Characters	ASCII value (dec)	Characters	ASCII value (dec)	Characters
32	Space	64	At sign (@)	96	Grave accent (`)
33	Exclamation mark (!)	65	A	97	a
34	Quotation mark (")	66	B	98	b
35	Hash mark (#)	67	C	99	c
36	Dollar ($)	68	D	100	d
37	Percent (%)	69	E	101	e
38	Ampersand (&)	70	F	102	f
39	Apostrophe (')	71	G	103	g
40	Opening parentheses (()	72	H	104	h
41	Closing parentheses ())	73	I	105	i

ASCII value (dec)	Characters	ASCII value (dec)	Characters	ASCII value (dec)	Characters
42	Multiplication sign (*)	74	J	106	j
43	Addition sign (+)	75	K	107	k
44	Comma (,)	76	L	108	l
45	Minus sign (-)	77	M	109	m
46	Period (.)	78	N	110	n
47	Slash mark (/)	79	O	111	o
48	0	80	P	112	p
49	1	81	Q	113	q
50	2	82	R	114	r
51	3	83	S	115	s
52	4	84	T	116	t
53	5	85	U	117	u
54	6	86	V	118	v
55	7	87	W	119	w
56	8	88	X	120	x
57	9	89	Y	121	y
58	Colon (:)	90	Z	122	z
59	Semicolon (;)	91	Square bracket ([)	123	Curly bracket ({)
60	Less than (<)	92	Backslash (\)	124	Vertical stroke (¦)
61	Equals (=)	93	Square bracket (])	125	Curly bracket (})
62	Greater than (>)	94	Circumflex (^)	126	Tilde (~)
63	Question mark (?)	95	Underscore (_)		

2.3.5 Molar mass calculator

Dialog window: **Molar mass calculator**

The **Molar mass calculator** dialog window is used for simple entry of molar masses into the formula editor and is opened with the button.

Mode of operation

The molecular formula of any given chemical compound can be entered into the **Empirical formula** field; if you click on **[OK]** the molar mass of the compound is calculated and directly entered into the formula editor.

The molecular formula can be entered either directly or by clicking on the symbols of the periodic table.

Examples

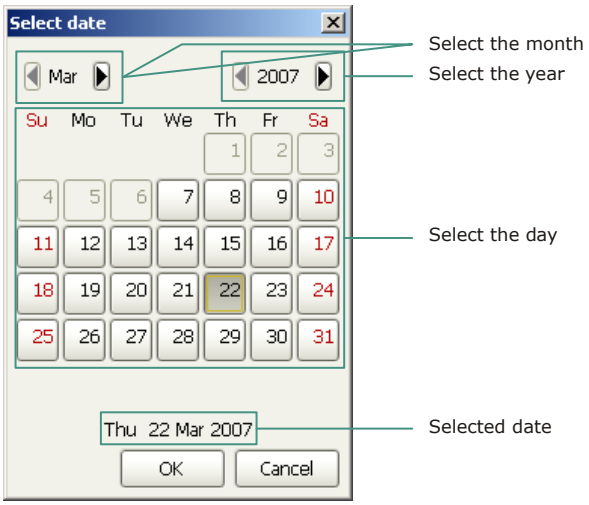
Molecular formula	Molar mass
H2SO4	**98.0734**
Ca(OH)2	**74.09268**
AlCl3*6H2O	**238.43174**

2.4 Editing

2.4.1 Selecting the date

Dialog window: **Select date**

The **Select date** dialog window serves for entering a date in a field and is opened with the … button.



2.4.2 Text editor

Dialog window: **Text editor**

The text editor serves for entering formatted text in text fields and is opened with the T button.

The toolbar of the text editor includes the following functions:

Cut selected text and copy it to the clipboard.

Copy selected text to the clipboard.

Insert text from the clipboard.

Open editor for entering a hyperlink *(see chapter 2.4.3, page 83)*.

Open formula editor for entering calculation formulas *(see chapter 2.3, page 14)*.

NOTICE

In order for results of formulas of the **Date** type to be output correctly, for text windows they must be converted to **Text** using the function **TimeToText** *(see chapter 2.3.4.7.6, page 73)*.

Font size in pt.

Select font color.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

2.4.3 Hyperlink

Dialog window: **Hyperlink**

The **Hyperlink** dialog window is used for entering a hyperlink in a field and is opened with the button.

Displayed text

Designation of the hyperlink that is displayed.

Link target

Address of the link target to which the hyperlink refers (Web site, e-mail address, file, …).

The button opens a selection dialog for linking a file as a link target.

2.5 E-mail

2.5.1 Sending an e-mail

Dialog window: **[E-mail...] ► Send e-mail**

E-mail template

Selection of the template for sending e-mails.

Subject

Subject to describe the message.

3 Workplace

3.1 Workplace - General

3.1.1 Workplace - Definition

Program part: **Workplace**

Workplace is defined in ***viva*** as the program part in which up to 4 workplaces can be opened next to one another for the simultaneous, independent running of determinations.

3.1.2 Workplace - User interface

Program part: **Workplace**

Workplace symbol

Clicking on the workplace symbol in the vertical bar on the left opens the **Workplace** program part while at the same time the workplace symbol is shown in color. The upper left corner of the symbol contains a black field displaying the number of workplaces currently opened *(see chapter 3.2.3, page 94)*.

Elements

The user interface of the **Workplace** program part comprises the following elements:

- Workplace-specific menu bar.
- Workplace-specific toolbar.
- Main window, in which up to 6 subwindows can be displayed.

3.1.3 Workplace - Menu bar

3.1.3.1 Workplace - Main menus

Program part: **Workplace**

The menu bar in the **Workplace** program part contains the following main menu items:

- *File*
  Creating, editing, closing workplaces; saving methods.

- *View*
  Changing layout, loading views, saving views, editing properties of subwindows.
- *Tools*
  Run test, sample tables, sample assignment table, text templates.
- *Help*
  Opening help, showing program info.

3.1.3.2 Workplace - File menu

Program part: **Workplace**

File	
Workplace ►	
New...	Opens a new workplace *(see chapter 3.2.1, page 93)*.
Properties...	Edit properties of the selected workplace *(see chapter 3.2.2, page 93)*.
Close	Closes the selected workplace *(see chapter 3.2.4, page 95)*.
Method ►	
Save	Saves the method with the modified live parameters *(see chapter 5.2.6, page 399)*.
Save as...	Save the method with the modified live parameters under a new name *(see chapter 5.2.6, page 399)*.
Logout...	Logs out user *(see chapter 2.2.3, page 13)*.
Exit	Exits the program.

3.1.3.3 Workplace - View menu

Program part: **Workplace**

View	
Change layout...	Change the layout of the loaded workplace view *(see chapter 3.1.7.2, page 91)*.
Load view...	Load a saved workplace view *(see chapter 3.1.7.3, page 92)*.
Save view...	Saves the current workplace view *(see chapter 3.1.7.4, page 92)*.
Split vertically	Splits the workplace window vertically and displays two workplaces side by side *(see chapter 3.2.3.3, page 94)*.

Split horizontally	Splits the workplace window horizontally and displays two workplaces below each other *(see chapter 3.2.3.4, page 95)*.
Unsplit	Undoes the splitting of the workplace window *(see chapter 3.2.3.2, page 94)*.
Properties ▶	
Properties Run window	Sets the properties for the **Single determination** or **Determination series** tabs in the **Run** subwindow.
Properties live display 1	Set the properties for the **Live display 1** subwindow *(see chapter 3.8.5, page 166)*.
Properties live display 2	Set the properties for the **Live display 2** subwindow *(see chapter 3.8.5, page 166)*.
Properties curves 1	Set the properties for the **Curves 1** subwindow *(see chapter 3.9, page 171)*.
Properties curves 2	Set the properties for the **Curves 2** subwindow *(see chapter 3.9, page 171)*.
Toolbar	Activates/deactivates the toolbar display.

3.1.3.4 Workplace - Tools menu

Program part: **Workplace**

Tools	
Run test	Carries out start test for determinations *(see chapter 3.6.2, page 120)*.
Sample table ▶	
New...	Opens a new, empty sample table *(see chapter 3.3.1.1, page 95)*.
Open...	Open a saved sample table *(see chapter 3.3.1.2, page 95)*.
Manager...	Manage saved sample tables *(see chapter 3.3.3.1, page 114)*.
Sample assignment table...	Define sample identifications which can be assigned a certain method *(see chapter 3.4.1, page 117)*.
Text templates...	Create text templates for sample identification *(see chapter 3.5, page 119)*.

3.1.3.5 Help menu

Program part: **Workplace / Database / Method / Configuration**

viva Help	Opens viva Help.
About	Displays information about the program and the installation.

3.1.4 Workplace - Toolbar

Program part: **Workplace**

	Opens a new, empty sample table *(see chapter 3.3.1.1, page 95)*.
	Open a saved sample table *(see chapter 3.3.1.2, page 95)*.
	Manage saved sample tables *(see chapter 3.3.3.1, page 114)*.
	Change the layout of the loaded workplace view *(see chapter 3.1.7.2, page 91)*.
	Load a saved workplace view *(see chapter 3.1.7.3, page 92)*.
	Saves the current workplace view *(see chapter 3.1.7.4, page 92)*.
	Carries out start test for determination(s) *(see chapter 3.6.2, page 120)*.
	Splits the workplace window vertically and displays two workplaces side by side *(see chapter 3.2.3.3, page 94)*.
	Splits the workplace window horizontally and displays two workplaces below each other *(see chapter 3.2.3.4, page 95)*.
	Undoes the splitting of the workplace window *(see chapter 3.2.3.2, page 94)*.
	Logs out user *(see chapter 2.2.3, page 13)*.
	Opens viva Help.

3.1.5 Workplace - Subwindows

Program part: **Workplace**

Selection

The following subwindows can be displayed in the main window:

- *Run*
  Window for controlling runs and entering sample data. This subwindow is permanently on display.
- *Method*
  Displays the currently loaded method.
- *Live display 1*
  Displays live curves, measured values and messages for the ongoing determination.
- *Live display 2*
  Displays live curves, measured values and messages for the ongoing determination.
- *Curves 1*
  Displays the voltammograms recorded for the ongoing determination.
- *Curves 2*
  Displays the voltammograms recorded for the ongoing determination.
- *Report*
  Displays reports of recorded determinations.

Display

The subwindows can be enlarged or made smaller to suit by dragging the separating bar between the windows.

By clicking on the ☐ button above at the right, the subwindows can be maximized so that only one subwindow is displayed in the main window. The original view of all subwindows is restored when the ☐ button is clicked again in the maximized subwindow.

3.1.6 Workplace - Functions

Program part: **Workplace**

The following functions can be carried out in the **Workplace** program part:

Views

- *Defining the workplace view layout*
- *Loading workplace view*
- *Saving workplace view*
- *Renaming workplace view*
- *Deleting workplace view*

Workplaces

- *Creating a workplace*
- *Editing a workplace*
- *Selecting a workplace*
- *Closing a workplace*

Sample tables

- *Creating a sample table*

- *Opening a sample table*
- *Editing a sample table*
- *Editing sample data*
- *Saving a sample table*
- *Printing the sample table*
- *Defining the sample table properties*
- *Managing sample tables*

Single determination

- *Starting/stopping a single determination*
- *Interrupting/resuming a single determination*
- *Entering sample data*
- *Defining properties*

Determination series

- *Starting/stopping series*
- *Interrupting/resuming a determination*
- *Interrupting/resuming a series*
- *Loading a sample table*
- *Editing a sample table*
- *Entering sample data*
- *Defining properties*

Method subwindow

- *Zooming*
- *Modifying parameters live*
- *Canceling commands*

Live display subwindow

- *Defining properties*

Curves subwindow

- *Defining properties*

Report subwindow

- *Selecting a report*

Tools

- *Performing a run test*
- *Editing the sample assignment table*
- *Defining text templates*

3.1.7 Views

3.1.7.1 Views - General

Program part: **Workplace / Database / Configuration**

Definition

The contents and design of the main window in the **Workplace**, **Database** and **Configuration** program parts is called a **View**. The following elements belong to a view:

- Number, arrangement, sequence and size of the subwindows.
- Representation within the individual subwindows, i.e. column sequence, column width, sorting and filter.

Functions

The following functions are possible for views:

- *Changing the layout*
  Defining the number, arrangement and sequence of the subwindows for the current view.
- *Saving a view*
  Saving the current view.
- *Loading a view*
  Loading a saved view.
- *Renaming a view*
  Renaming a saved view.
- *Deleting a view*
  Deleting a saved view.

Saving automatically

The current view will be saved automatically when the program is closed if the corresponding option is activated under **Save on closing** in the **Configuration** program part under **Tools ► Options...** on the **Save** tab.

Loading automatically

By default, the view that is saved when the program is closed will be loaded automatically the next time that the program is opened. As an alternative, a default view that is loaded automatically the first time that the program part is opened can be defined for each user group.

By default, views are opened with the following subwindows with the very first program start:

- **Workplace**
  Run, **Method**, **Live display 1**, **Curves 1**
- **Database**
  Determination overview, **Curves 1**, **Information**, **Results**

- **Configuration**
  Devices, **Solutions**, **Dosing units**, **Sensors/Electrodes**

Export/import

Views can also be exported and imported. In this way these views can be exchanged between different client/server systems.

3.1.7.2 Changing the layout

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Change layout... ▶ Change layout**

The **Change layout** dialog window is opened with the symbol or the **View ▶ Change layout...** menu item.

Select layout

Selection of a graphical symbol for the number and arrangement of the subwindows.

Selection	**'Selection of the possible combinations'**

Available subwindows

Display of the subwindows that are still available for being displayed in the view.

Selection	**'Selection of the subwindows'**

Displayed subwindows

Display of the subwindows that are shown in the view.

Selection	**'Subwindow'**

Adds the selected subwindow to the view.

Removes the selected subwindow from the view.

Moves the selected subwindow upward (modifies sequence).

Moves the selected subwindow downward (modifies sequence).

3.1.7.3 Loading a view

Dialog window: **Workplace / Database / Configuration ► View ► Load view... ► Load view**

The **Load view** dialog window is opened with the symbol or the **View ► Load view...** menu item.

Name

Name of the view to be loaded.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Load]

Loads the selected view.

3.1.7.4 Saving a view

Dialog window: **Workplace / Database / Configuration ► View ► Save view... ► Save view**

The **Save view** dialog window is opened with the symbol or the **View ► Save view...** menu item.

Name

Name under which the view is to be saved.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Save]

Saves the view under the given name. The saved views are globally valid and available for client/server systems.

3.1.7.5 Renaming a view

Dialog window: **Workplace / Database / Configuration ► View ► Load view... ► Load view ► [Rename] ► Rename view**

To be able to rename a view, either open the **Load view** or the **Save view** dialog window and click on the **[Rename]** button. The **Rename view** window opens afterwards.

Rename view 'Name' to

Entry of a new name for the view.

Entry	**50 characters**

3.1.7.6 Deleting a view

Function: **Workplace / Database / Configuration ▶ View ▶ Load/save view… ▶ [Delete]**

To delete a view, open either the **Load view** or **Save view** dialog window and press the **[Delete]** button. The delete procedure must then be confirmed.

3.2 Workplaces

3.2.1 Creating a new workplace

Dialog window: **Workplace ▶ File ▶ Workplace ▶ New... ▶ New workplace**

The properties of the new workplace can be defined in this dialog window.

Name

Entry of a name for the new workplace or selection from a list containing the 10 most recently used names.

Entry	**50 characters**

Color

Selection of the color for the title bar of the subwindows and the status symbol for the new workplace in the status bar.

Selection	**blue** | **green** | **ochre** | **brown**
Default value	**blue**

3.2.2 Editing a workplace

Dialog window: **Workplace ▶ File ▶ Workplace ▶ Properties... ▶ Workplace properties**

The properties of the selected workplace can be defined in this dialog window.

Name

Entry of a name for the selected workplace or selection from a list containing the 10 most recently used names.

Entry	**50 characters**

Color

Selection of the color for the title bar of the subwindows and the status symbol for the selected workplace in the status bar.

Selection	**blue** | **green** | **ochre** | **brown**
Default value	**blue**

3.2.3 Displaying the workplace

3.2.3.1 Selecting a workplace

Program part: **Workplace**

The number of currently opened workplaces is displayed in the upper left-hand corner of the workplace symbol. If two or more workplaces are opened, then these workplaces, which can be displayed either next to one another or one above the other in the main window, can be selected with the aid of the workplace symbol.

One workplace is opened and is displayed in the main window.

Two workplaces are opened. Normally only one workplace is displayed in the main window, but the option exists of displaying two workplaces at once, either next to one another or one above the other.

A menu with the names of the currently opened workplaces is displayed by clicking with either the left or right mouse button on the workplace symbol. The workplaces displayed in the main window are then marked with a checkmark. Clicking on the desired workplace will cause it to be displayed in the main window in place of the previously selected one.

3.2.3.2 Displaying an individual workplace

Menu item: **Workplace ▶ View ▶ Unsplit**

In the default settings, the most recently opened workplace is displayed by itself in the main window. If the display of two workplaces is activated, then the symbol or the **View ▶ Unsplit** menu item can be used to switch back to the display of just one single workplace.

3.2.3.3 Displaying workplaces next to one another

Menu item: **Workplace ▶ View ▶ Split vertically**

Two workplaces are displayed next to one another in the main window with the symbol or the **View ▶ Split vertically** menu item.

3.2.3.4 Displaying workplaces one above the other

Menu item: **Workplace ▶ View ▶ Split horizontally**

Two workplaces are displayed one above the other in the main window with the symbol or the **View ▶ Split horizontally** menu item.

3.2.4 Closing a workplace

Menu item: **Workplace ▶ File ▶ Workplace ▶ Close**

The selected workplace is closed with this menu item.

3.3 Sample tables

3.3.1 Editing the sample table

3.3.1.1 Creating a new sample table

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ New... ▶ Sample table 'New sample table'**

A new sample table, which can subsequently be edited, is opened with the icon or the **Tools ▶ Sample table ▶ New...** menu item.

3.3.1.2 Open

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table**

One of the globally available sample tables can be opened with the icon or the **Tools ▶ Sample table ▶ Open...** menu item.

List of sample tables

The list of sample tables contains information about all the saved sample tables. The table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order.

Name

Name of the sample table.

Saved

Date and time when the sample table was saved.

Saved by

Short name of the user who saved the sample table.

Lines

Number of lines in the sample table.

Comment

Comment on the sample table that was entered on the **Comment** tab as a comment regarding the sample table *(see chapter 3.3.2.6, page 114)*.

Open sample table

Name

Name of the sample table that is to be opened. If a sample table from the table is selected, then the name will be entered automatically in this field. It can, however, also be entered manually.

Entry	**50 characters**

[Open]

Opens the selected sample table.

3.3.1.3 Editing the sample table

Dialog window: **Workplace ► Tools ► Sample table ► Open... ► Open sample table ► [Open] ► Sample table 'Name'**

A newly created sample table or one that has been opened can be edited and saved in this dialog window.

Toolbar

	Saves the sample table.
	Outputs the sample table as a PDF file.
	Resets lines that have been processed, i.e., they can be edited again.
	Duplicates the selected lines. The new lines are inserted below the selected range.
	Increments the selected cells automatically.
	Fills the selected cells automatically.
	Checks whether all sample data in the sample table is correct.

Sample data table

This table contains the sample data lines that have already been saved in the sample table and a line for entering new data that contains a star instead of a line number. The table cannot be edited or sorted directly.

For the meaning of the columns, see *Editing the sample data*.

Window menus

[Edit] contains the following menu items:

Edit line	Edit the selected line.
Insert new line	Inserts a new empty line above the selected line.
Cut lines	Cuts the selected lines and transfers them to the clipboard.
Copy lines	Copies the selected lines to the clipboard.
Paste lines	Pastes lines from the clipboard above the selected line.
Delete lines	Deletes the selected lines.
Increment	The range that is to be automatically incremented from a column in the table can be selected with the cursor, which takes on the form ✚. In this process, the number standing at the end of the expression will be automatically increased by 1 in the selected cells of a column, starting from the first selected cell. This works with pure numbers as well as with character strings ending with a number (e.g. **ABC10** → **ABC11** → **ABC12**…).
Filling	Fills the selected cells automatically.
Duplicate	Duplicates the selected line(s). The new lines are inserted below the selected range.
Mark lines	Marks the selected lines with a red background for the line number. Before the start of such a line, the corresponding actions defined under **Properties** on the **Process** tab *(see chapter 3.3.2.4, page 110)* will be triggered.
Unmark lines	Removes the line marking for the selected lines.
Set lines inexecutable	Sets the selected lines to "inexecutable", i.e., these lines will not be executed in the run. Such lines are struck through with a red line.
Set lines executable	Sets the selected lines to "executable", i.e., they will be executed in the run.

[Sample table] contains the following menu items:

Save	Saves the current sample table under the same name.
Save as...	Save the current sample table under a new name.

Print (PDF)...	Outputs the sample table as a PDF file.
Properties...	Edit the properties of the selected sample table.
Import data...	Import a sample table from a file with the format ***.csv**.

Moving lines with drag and drop

The lines selected in the sample table can be moved into the working sample table via drag and drop.

Copying lines with drag and drop

The lines selected in the sample table can be copied into the working sample table with drag and drop by pressing the **Ctrl key**.

3.3.1.4 Editing the sample data

Dialog window: **Workplace ► Tools ► Sample table ► Open... ► Open sample table ► [Open] ► Sample table 'Name' ► [Edit] ► Edit line ► Edit line - Sample table 'Name'**

Method

Entry or selection of the method from the current method group with which the determination is to be carried out. The method selection is continuously restricted as the first characters are entered; this allows a quick selection of the required method.

Entry	**50 characters**
Selection	**Method selection**

Opens the **Open method** dialog window for the extended method selection. If a method is selected in this window from a method group other than the current one, then this group will henceforth be the current method group for the quick selection of methods in the **Method** field. This button is active only if more than one method group is present.

NOTICE

If a method is changed and saved in the method editor or during reprocessing, then the latest method version will be loaded when a new determination is started.

NOTICE

The following sample data fields can no longer be edited if they were defined as **Fixed value** in the method *(see chapter 5.5.2.8.2.5, page 549)*.

ID1 - ID16

Sample identifications ID1 - ID16. Any text can be entered in this field. The type and limit value check takes places during the sample table test or during the run test when a determination is started. For sample identifications of the **date/time** type, the entry must be formatted as **YYYY-MM-DD** or **YYYY-MM-DD hh:mm**. If text templates are defined for sample identification, a selection can be made among them *(see chapter 3.5.1, page 119)*.

Entry	**100 characters**
Selection	**Selection of text templates**

Sample type

Selection of sample type.

Selection	**Sample** | **Standard** | **Intercept**
Default value	**Sample**

Sample position

Position of the sample on the rack. This number is used to move to the sample position with the command **MOVE**. For this, the **Sample position** option must be set for the parameter **Move** under **Target**.

Input range	**1 to 999** (Increment: **1**)
Default value	**1**

Sample amount

Numerical value for the sample amount for which the standard result is calculated *(see glossary, page 1072)*. Only numbers, decimal point, +, – and e may be entered in this field. The limit value check does not take place until the start of the determination.

NOTICE

If a value is entered or imported into this field, then the time of the data entry and the data source (**manual**, **'Name of the barcode reader'** or **'Name of the import file'**) are additionally stored automatically, placed in the determination and identified in the information subwindow as entry date and data source.

NOTICE

If a negative value is entered into this field, then this will also be calculated as a negative in the formula editor.

Entry	**Number with 10 digits at most**
Default value	**1.0**

Sample amount unit

Unit of the sample amount. Any text can be entered into this field.

Entry	**16 characters**
Selection	**L** | **mL** | **µL** | **g** | **mg** | **µg** | **pieces**
Default value	**mL**

Analytical volume

Volume portion (aliquot) of the diluted sample's dilution volume used for the determination *(see glossary, page 1051)*. This volume is added to the measuring vessel with the **ADD SAMPLE** command.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Dilution volume

Maximum filling volume used for dilution of the sample *(see glossary, page 1059)*.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Navigation

Shows the currently selected line in the sample table with the following functions:

Jump to the first line in the sample table.

Jump to the previous line in the sample table.

Option of entering the desired line number to which the program jumps when **[Enter]** is pressed.

Jump to the next line in the sample table. If the end of the table has been reached, then a new line will be inserted automatically and the program will jump to it.

The same function can also be triggered by pressing the **[Enter]** key.

Jump to the last line in the sample table.

Jump to a new, empty line.

Display application note

on | off (Default value: **off**)

If this check box is activated, then the application note defined in the method will be displayed during the editing of the sample data.

Functions

[Apply]

Applies the sample data entered in the respective line of the sample table. If the end of the table has been reached, then a new line will be generated automatically. The same function can also be triggered by pressing the **[Enter]** key. The next line will, however, also be highlighted automatically when **[Enter]** is used.

[Close]

Closes the input window. The current sample data will not be applied in the sample table (this needs to be triggered beforehand with **[Apply]**).

3.3.1.5 Duplicating sample data

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Edit] ▶ Duplicate ▶ Duplicate**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Edit] ▶ Duplicate ▶ Duplicate**

Number:

Request to inquire how many times the selected lines are to be duplicated. The new lines are inserted below the selected range.

Input range	**1 to 999**
Default value	**1**

3.3.1.6 Importing sample data

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Import data... ▶ Select files to import**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Import data... ▶ Select files to import**

You can select a ***.csv** file with the sample data to be imported in this dialog window.

File name

Input or selection of the file that is to be imported.

Selection	**'File name'**

File type

Selection of the import format for the import of data from a file (only ***.csv** is possible).

Selection	***.csv** | ***.csv (Unicode)**
Default value	***.csv**

[Open]

The sample data from the selected file is inserted at the end of the sample table.

NOTICE

No matter the number of data fields defined on the **Display** tab, the import file must always contain for each line the entirety of sample data in the format **Method;ID1;...;ID16;Sample type;Sample position;Sample amount;Unit;Analysis volume;Dilution volume**.

3.3.1.7 Sample table test

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ Sample table test - 'Sample table name'**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Sample table test... ▶ Sample table test - 'Sample table name'**

The symbol is used to carry out the sample table test. Clicking on it causes the **Sample table test - 'Sample table name'** dialog window to open, in which information pertaining to the test is displayed.

NOTICE

The **Sample table test** only checks whether all sample data is correct (as opposed to the **Run test** *(see chapter 3.6.2, page 120)*, which also checks the required hardware).

Line

Display of the line number of the currently tested sample data line.

Status displays

One of the following status displays appears below the line number:

Selection	**Sample table running... | Sample table stopped manually | Sample table test finished without errors | Sample table test finished with errors**

Sample table running...
This display appears while the test is running. In addition, a progress bar appears. The test can be canceled by clicking on [x] next to the progress bar.

Sample table stopped manually
This display appears if the user has manually canceled the sample table test.

Sample table test finished without errors
This display appears at the end of a sample table test that has been completed without an error.

Sample table test finished with errors
This display appears if an error has occurred during the sample table test. The errors that have occurred are listed in the **Test report** field.

Test report

Display of the errors that have occurred during the sample table test together with the line number.

3.3.1.8 Saving a sample table

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Save as... ▶ Save sample table**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Save as... ▶ Save sample table**

A name for the working sample table to be saved can be entered or selected in this dialog window.

List of sample tables

The list of sample tables contains information about all the saved sample tables.

Name

Name of the sample table.

Saved

Date and time when the sample table was saved.

Saved by

Short name of the user who saved the sample table.

Lines

Number of lines in the sample table.

Comment

Comment on the sample table that was entered on the **Comment** tab as a comment regarding the sample table *(see chapter 3.3.2.6, page 114)*.

Save sample table

Name

Entry of the name under which the sample table is to be saved.

NOTICE

The name of the sample table must be unique throughout the entire client/server system.

Entry	**50 characters**

[Save]

Saves the sample table under the required name.

3.3.1.9 Printing a sample table (PDF)

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Print (PDF)... ▶ Print sample table (PDF)**

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Print (PDF)... ▶ Print sample table (PDF)**

The output format for the PDF output can be selected in this dialog window.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output in portrait format.

Landscape
Output in landscape format.

3.3.2 Sample table - Properties

3.3.2.1 Properties - Overview

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ New... ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name'**

The properties for a sample table are set on the following tabs:

- *Display*
  Definition of the columns that are to be displayed in the sample table.
- *Edit*
  Options for editing the sample table in the **Sample table** and **Edit line** dialog windows.
- *Process*
  Options for processing the working sample table on the **Determination series** tab.
- *Data import*
  Activating/deactivating the import of external data for sample table fields.
- *Comment*
  Entry of a comment on the sample table.

3.3.2.2 Properties - Display

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Display**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Display**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Display**

Definition of the controls and columns that are to be displayed in the sample table or working sample table.

Controls

NOTICE

This parameter group is visible only if the dialog window is opened via the **Determination series** tab.

[Pause] / [Cont]

on | off (Default value: **on**)

Activating/deactivating the display of the **[Pause]** or **[Cont]** buttons.

[Hold] / [Cont]

on | off (Default value: **on**)

Activating/deactivating the display of the **[Hold]** or **[Cont]** buttons.

Determination parameters

NOTICE

This parameter group is visible only if the dialog window is opened via the **Determination series** tab.

Sample number

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample number** field.

User

on | off (Default value: **on**)

Activating/deactivating the display of the **User** field.

Remark

on | off (Default value: **on**)

Activating/deactivating the display of the **Remark** field.

Sample data

NOTICE

The names defined here will be used **only** for the column headers in the sample table.

The names defined in the **START** command under **Sample data variables** will always be used when editing a sample line and for the determination data.

ID1 - ID3

on | off (Default value: **on**)

Activating/deactivating the display of the columns **ID1 - ID3** in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**ID1 - 3**

ID4 - ID16

on | off (Default value: **off**)

Activating/deactivating the display of the columns **ID4 - ID16** in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**ID4 - 16**

Sample type

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample type** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample type**

Sample position

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample position** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample position**

Sample amount

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample amount** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample amount**

Sample amount unit

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample amount unit** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample amount unit**

Analytical volume

on | off (Default value: **on**)

Activating/deactivating the display of the **Analytical volume** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Analytical volume**

Dilution volume

on | off (Default value: **on**)

Activating/deactivating the display of the **Dilution volume** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Dilution volume**

3.3.2.3 Properties - Edit

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Edit**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Edit**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Edit**

Options for the editing of the sample table.

Accept data with

on | off (Default value: **off**)

Selection of the data field that must be filled for the automatic import of data via barcode reader or file in order for the data of the line to be applied to the sample data storage and to move on to the next line.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16** | **Sample type** | **Sample position** | **Sample amount** | **Sample amount unit** | **Analytical volume** | **Dilution volume**
Default value	**Sample amount**

Lock editing in working sample table

on | off (Default value: **off**)

If this check box is activated, then the editing of lines in the working sample table is locked.

Copy automatically into next line

Method

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

ID1 - ID3

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

ID4 - ID16

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Sample type

This field will automatically be filled with the content of the previous line when a new sample data line is generated.

Sample position + 1

on | off (Default value: **on**)

If this check box is activated, then the content of this field will automatically be incremented by **+1** when a new sample data line is created.

Sample amount

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Sample amount unit

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Analytical volume

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Dilution volume

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

3.3.2.4 Properties - Process

Tab: **Workplace ► Tools ► Sample table ► Open... ► Open sample table ► [Open] ► Sample table 'Name' ► [Sample table] ► Properties... ► Properties - Sample table 'Name' ► Process**

Dialog window: **Workplace ► View ► Properties ► ► Properties Run window ► Properties - Determination series ► Process**

Dialog window: **Workplace ► Run ► Determination series ► [Sample table] ► Properties... ► Properties - Determination series ► Process**

Options for processing the working sample table in the workplace window on the **Determination series** tab.

Delete processed lines

on | off (Default value: **off**)

If this check box is activated, then lines in the working sample table which have already been processed completely will be deleted automatically.

Method selection by assignment ID

on | off (Default value: **off**)

If this check box is activated, then the selected sample identification will be used for the method selection in the working sample table. This identification is assigned the designation **Assignment ID**, which can no longer be changed. If this ID matches one of the assignment IDs from the sample assignment table *(see chapter 3.4, page 117)*, then the respective method will be loaded.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16**
Default value	**ID1**

Request assignment ID

on | off (Default value: **off**)

If this check box is activated, then the **Assignment ID** will be requested immediately after the start of the determination.

Actions for marked sample table lines

Selection	**Pause series ([Pause]) and show message** | **Stop series ([Stop])**
Default value	**Pause series ([Pause]) and show message**

Pause series ([Pause]) and show message
If this option is selected, then the series is interrupted before the start of the marked line (equivalent to [Pause]). At the same time a message will appear which also contains the text defined in the message box.

Stop series ([Stop])
If this option is selected, then the series is stopped before the start of the marked line (equivalent to [Stop]).

Starts the text editor, with which the message can be entered and edited.

3.3.2.5 Properties - Data import

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Data import**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Data import**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Data import**

Activating/deactivating the import of external data for sample table data fields.

NOTICE

The successful completion of the data import is indicated during the run by an acoustic signal (beep).

Import from barcode reader

on | off (Default value: **off**)

If this check box is activated, then the external data from the selected barcode reader will be imported into the open sample table. The instrument properties of the barcode reader will define the field into which that data is imported *(see chapter 7.9.4, page 958)*.

Barcode reader

Selection of the barcode reader from which data is to be imported.

Selection	**'Instrument name'**
Selection	**Always accept data | Accept data only for active window**
Default value	**Always accept data**

Always accept data
If this option is selected, then the data sent from the barcode reader is imported into the open sample table for which this barcode reader is defined as data source.

Accept data only for active window
If this option is selected, then the data sent from the barcode reader is only imported into the open sample table if this is actively selected (i.e. when the focus is on the window).

Confirmation necessary to accept data during determination

on | off (Default value: **off**)

If this check box is activated, then data is imported during a determination only if the **Sample data request** dialog of a **REQUEST** command is opened or if a line from the sample table is open for editing in the **Edit line - Sample table 'Name'** dialog window.

Import from file

on | off (Default value: **off**)

If this check box is activated, then external data from a file (e.g. via LIMS) will be imported into a sample table. When this is the case, a check is made to determine whether the specified import file is available when the sample table is opened, when the sample table is loaded into the working sample table and also periodically (every 10 s) when the sample table is open (although not when the dialog window **Edit line** is open). If the import file is available, then the data from this file is automatically inserted at the end of the sample table. The import file is deleted after each import.

NOTICE

No matter the number of data fields defined on the **Display** tab, the import file must always contain for each line the entirety of sample data in the format **Method;ID1;...;ID16;Sample type;Sample position;Sample amount;Unit;Analysis volume;Dilution volume**.

Import file

File that is to be imported. The file can be selected in the **Select files to import** dialog window with .

Entry	**File name**

Import format

Selection of the import format for the import of data from a file.

Selection	***.csv** | ***.csv (Unicode)**
Default value	***.csv**

***.csv**
Format for the import of CSV files with Western European ASCII character sets.

***.csv (Unicode)**
Format for the import of CSV files with Unicode character sets.

3.3.2.6 Properties - Comment

Tab: **Workplace ► Tools ► Sample table ► Open... ► Open sample table ► [Open] ► Sample table 'Name' ► [Sample table] ► Properties... ► Properties - Sample table 'Name' ► Comment**

Dialog window: **Workplace ► View ► Properties ► ► Properties Run window ► Properties - Determination series ► Comment**

Dialog window: **Workplace ► Run ► Determination series ► [Sample table] ► Properties... ► Properties - Determination series ► Comment**

Entry of a comment on the sample table.

Comment on sample table

Entry of a comment on the sample table. This comment will be displayed in the column of the same name in the **Open sample table** and **Sample table manager** dialog windows.

Entry	**1,000 characters**

3.3.3 Sample table manager

3.3.3.1 Sample table manager

Dialog window: **Workplace ► Tools ► Sample table ► Manager... ► Sample table manager**

The saved sample tables can be managed with the symbol or the **Tools ► Sample table ► Manager...** menu item.

List of sample tables

The list of sample tables contains information about all the saved sample tables. The table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order.

Name

Name of the sample table.

Saved

Date and time when the sample table was saved.

Saved by

Short name of the user who saved the sample table.

Lines

Number of lines in the sample table.

Comment

Comment on the sample table that was entered on the **Comment** tab as a comment regarding the sample table *(see chapter 3.3.2.6, page 114)*.

Window menus

The **[Edit]** menu below the list of sample tables contains the following menus:

Rename...	Rename the selected sample table *(see chapter 3.3.3.2, page 115)*.
Copy	Copies the selected sample tables *(see chapter 3.3.3.3, page 115)*.
Delete...	Deletes the selected sample tables *(see chapter 3.3.3.4, page 116)*.
Export...	Exports the selected sample tables in the ***.mstab** file format *(see chapter 3.3.3.5, page 116)*.
Import...	Import sample tables from ***.mstab** files *(see chapter 3.3.3.6, page 116)*.

3.3.3.2 Renaming sample table

Dialog window: **Workplace ► Tools ► Sample table ► Manager... ► Sample table manager ► [Edit] ► Rename... ► Rename sample table**

The selected sample table can be renamed in this dialog window.

Renaming sample table 'Name' to

Entry of the new name for the sample table.

NOTICE

The name of the sample table must be unique throughout the entire client/server system.

Entry	**50 characters**

3.3.3.3 Copying sample table

Menu item: **Workplace ► Tools ► Sample table ► Manager... ► Sample table manager ► [Edit] ► Copy**

The selected sample tables are copied under the name **Copy of 'Name'** with the **[Edit] ► Copy** menu item in the **Sample table manager** dialog window.

3.3.3.4 Deleting a sample table

Menu item: **Workplace ▶ Tools ▶ Sample table ▶ Manager... ▶ Sample table manager ▶ [Edit] ▶ Delete...**

The selected sample tables are deleted with the **[Edit] ▶ Delete...** menu item in the **Sample table manager** dialog window.

3.3.3.5 Exporting a sample table

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Manager... ▶ Sample table manager ▶ [Edit] ▶ Export... ▶ Select directory for export**

The **Select directory for export** dialog window, in which the directory for the export must be selected, is opened with the **[Edit] ▶ Export...** menu item. The selected sample table is exported into a file with the name **'Name'.mstab**.

3.3.3.6 Importing a sample table

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Manager... ▶ Sample table manager ▶ [Edit] ▶ Import... ▶ Select files to import**

The **Select files for import** dialog window, in which the sample table (file format ***.mstab**) to be imported needs to be selected, is opened with the **[Edit] ▶ Import...** menu item.

3.3.3.7 Renaming imported sample table

Renaming imported sample table 'Name' to

Entry of the new name for the sample table.

NOTICE

The name of the sample table must be unique throughout the entire client/server system.

Entry	**50 characters**

3.4 Sample assignment table

3.4.1 Sample assignment table

Dialog window: **Workplace ▶ Tools ▶ Sample assignment table... ▶ Sample assignment table**

The **Sample assignment table** causes the samples to be processed automatically with the **correct method**. A particular method is assigned to a sample identification (**Assignment ID**). In order for this to work, the **Method selection by assignment ID** option must be activated on the **Process** tab in the properties of the **Single determination** or **Determination series** and one of the sample identifications must be selected as assignment ID. As soon as an **Assignment ID** has been recognized during the processing of sample data, the respective method will be loaded automatically. The **Method** field can then no longer be edited and is grayed out.

NOTICE

The sample assignment table is valid for all open workplaces and is saved per client.

The overview table shows all defined assignment IDs and cannot itself be directly edited. The table can be sorted according to the selected column in ascending or descending order by clicking on the column title **Assignment ID** or **Method**.

Assignment ID

Identification on the basis of which the method is assigned.

Method

Method that is loaded for the assignment ID.

[New]

Adds a new sample assignment.

[Properties]

Edit the selected sample assignment.

[Delete]

Deletes the selected sample assignment.

3.4.2 Sample assignment

Dialog window: **Workplace ► Tools ► Sample assignment table... ► [New] / [Properties] ► Sample assignment**

Assignment ID

Entry of an identification on the basis of which the method is assigned or selection of a defined text template. The assignment ID can contain any number of alphanumerical characters or wildcards (*****). No assignment ID can occur more than once; however, several different assignment IDs can assign the same method.

Entry	**50 characters**
Selection	**Selection of text templates**

NOTICE

The ***** character itself must be generated with ******. It can represent any number of characters. No identical pattern may be used when entering patterns. If a character string matches several patterns, then the first matching pattern in the table will be used.

Method

Selection of the method in the current method group. If you remain with the cursor in this field, then the name of the current method group will be displayed as tooltip **Group: 'Group name'**.

Selection	**Method selection**

Opens the **Open method** dialog window for the extended method selection. If a method is selected in this window from a method group other than the current one, then this group will henceforth be the current method group for the quick selection of methods in the **Method** field.

This button is active only if more than one method group is present.

3.4.3 Entering an assignment ID

Dialog window: **Workplace ► Sample assignment**

Assignment ID

Request of the assignment ID on the basis of which the method is assigned or selection of a defined text template.

Entry	**50 characters**
Selection	**Selection of text templates**

3.5 Text templates

3.5.1 List of text templates

Dialog window: **Workplace ▶ Tools ▶ Create and edit text templates ▶ Text templates**

Text templates can be defined for the fields **Remark** and **ID1 - ID16**. These templates can then be applied on the **Single determination** tab or in the sample table and the working sample table when these fields are entered. The text templates are saved for each client.

Text templates for

Selection of the field for which text templates are to be defined.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16** | **Remark**
Default value	**ID1**

List of text templates

All text templates defined for the selected field are shown in the list of text templates. The table cannot be edited. The table can be sorted in ascending or descending order by clicking on the **Text** column title.

Text

Shows the text templates defined for the selected field.

[New]

Adds a new text template *(see chapter 3.5.2, page 119)*.

[Properties]

Edit the selected text template *(see chapter 3.5.2, page 119)*.

[Delete]

Deletes the selected text template.

3.5.2 Editing a text template

Dialog window: **Workplace ▶ Tools ▶ Text templates... ▶ Text templates ▶ [New] / [Properties] ▶ Text templates**

Text templates can be edited in the **Text templates** dialog window.

Text

Text template entry.

Entry	**100 characters**

3.6 Run subwindow

3.6.1 Run - General

Subwindow: **Workplace ► Run**

Run subwindow

The **Run** subwindow contains the controls for controlling method runs and for administering sample data. It is always displayed in the **Workplace** program part, i.e., it cannot be removed from the workplace view. The subwindow can be enlarged and reduced as required; it can also be maximized.

Tabs

The **Run** subwindow consists of the following three tabs:

- *Single determination*
  Control of single determinations.
- *Determination series*
  Control of determination series.

NOTICE

If a run has been started on the **Single determination** tab (**Status** = **BUSY**), then the **Determination series** tab is no longer accessible (disabled). The same holds true for the **Single determination** tab in the event that a run has started on the **Determination series** tab.

3.6.2 Run test

Dialog window: **Workplace ► Single determination ► Tools ► Run test ► Run test - 'Workplace name' - Single determination**

Dialog window: **Workplace ► Determination series ► Tools ► Run test ► Run test - 'Workplace name' - Determination series**

NOTICE

As opposed to the **Sample table test**, which checks only whether all sample data is correct, the **Run test** also checks the required hardware.

Single determination

With the **Tools ► Run test** menu item or the symbol, the start test is carried out for the selected method. The workplace must have the status **READY** for this.

The **Run test - 'Workplace name' - Single determination** dialog window, in which information on the test is shown, opens during the run test.

Method

Display of the method for the single determination.

Determination series

The start test is carried out with the **Tools ▶ Run test** menu items or the symbol. The workplace must have the status **READY** for this. The start test will, however, only be carried out for the number of lines defined under **Autostart**.

The **Run test - 'Workplace name' - Determination series** dialog window, in which information on the test is shown, opens during the run test.

Line

Display of the line number of the currently tested sample data line for the determination series.

Status displays

One of the following status displays appears below the line number:

Selection	**Run test running... | Run test error | Run test finished without errors**

Run test running...
This display appears while the test is running. In addition, a progress bar appears. The test can be canceled by clicking on [x] next to the progress bar.

Run test error
This display appears if an error has occurred during the run test. In a determination series, the user can determine on the basis of the indicated line number to which line the error message appearing with the error and being displayed in the usual message window belongs.

Run test finished without errors
This display appears at the end of a run test that has been completed without an error.

3.6.3 Single determination

3.6.3.1 Single determination - Overview

Tab: **Workplace ► Run ► Single determination**

Parameters and sample data for single determinations can be edited and run functions can be triggered on the **Single determination** tab. It contains the following elements and functions:

- *Single determination - Controls*
  Buttons for starting, stopping, interrupting and resuming determinations.
- *Single determination - Status display*
  Shows the current status of the workplace.
- *Single determination - Determination parameters*
  Entry of general parameters for the determination.
- *Single determination - Sample data*
  Entry of method and sample identification for the next determination.
- *Properties - Single determination*
  Definition of the properties for the **Single determination** tab.

3.6.3.2 Single determination - Controls

Tab: **Workplace ► Run ► Single determination**

The following controls are located on the **Single determination** tab:

Starting a single determination (shortcut: **Ctrl G**)

This button is present in the status **READY** (no determination started). If the start can be triggered, then it will be green, otherwise light gray.

Stopping a single determination (shortcut: **Ctrl S**)

The button is present in the status **BUSY** (determination is running).

Interrupt run

The button is enabled (dark gray) in the status **BUSY** (determination is running). The button is disabled (light gray) in all other cases. When you click on **[Hold]**, this button will be replaced in the display by **[Cont]**.

However, **[Hold]** does not allow you to stop all partial steps of a voltammetry command *(see chapter 5.5.2.10, page 582)*.

Continue run

The button is only present in the status **HOLD** (determination interrupted). When you click on **[Hold]**, this button will be replaced in the display by **[Cont]**.

3.6.3.3 Single determination - Status display

Tab: **Workplace ► Run ► Single determination**

The current status of the workplace will be displayed on the **Single determination** tab:

Status

Selection	**READY** | **BUSY** | **HOLD** | **ERROR**

READY
Ready for the start of a determination.

BUSY
Determination is running.

HOLD
Determination interrupted.

ERROR
Error.

3.6.3.4 Single determination - Determination parameters

Subwindow: **Workplace ► Run ► Single determination**

User

If the option **Enforce login with user name** is enabled in the security settings, then the short name of the currently logged-in user will be displayed in this field. This field is then not available for editing. If work is done without login, then a user name can be entered in this field (only in the status **READY**).

Entry	**50 characters**

Sample number

The sample number is set to **0** for all workplaces at the time of each program start. Each time a determination is started, it is incremented by **+1**. It can be edited by the user only when it is in the status **READY**.

Input range	**0 to 99,999**
Default value	**0**

Remark

Freely definable remark on the determination, which is saved together with the determination. Predetermined text templates may also be selected instead of a manual entry *(see chapter 3.5.1, page 119)*.

NOTICE

The **Remark** field can be changed live also when determinations are in progress. The **Live modifications** dialog window is opened with the context-sensitive **Modify remark** menu item *(see chapter 3.6.3.6, page 127)*.

Entry	**100 characters**

3.6.3.5 Single determination - Sample data

Tab: **Workplace ► Run ► Single determination**

Method

Entry or selection of the method from the current method group with which the determination is to be carried out. The method selection is continuously restricted as the first characters are entered; this allows a quick selection of the required method.

Entry	**50 characters**
Selection	**Method selection**

Opens the **Open method** dialog window for the extended method selection. If a method is selected in this window from a method group other than the current one, then this group will henceforth be the current method group for the quick selection of methods in the **Method** field. This button is active only if more than one method group is present.

NOTICE

If a method is changed and saved in the method editor or during reprocessing, then the latest method version will be loaded when a new determination is started.

NOTICE

The following sample data fields can no longer be edited if they were defined as **Fixed value** in the method *(see chapter 5.5.2.8.2.4, page 549)*.

ID1

Sample identification ID1. Any text can be entered in this field. The type and limit value check does not take place until the start of the determination. For sample identifications of the type **Date/Time**, the entry must be formatted as **YYYY-MM-DD** or **YYYY-MM-DD hh:mm:ss**. Text templates may be selected if they are defined for sample identification *(see chapter 3.5, page 119)*.

Entry	**100 characters**
Selection	**Selection of text templates**

ID2

Sample identification ID2. Any text can be entered in this field. The type and limit value check does not take place until the start of the determination. For sample identifications of the type **Date/Time**, the entry must be formatted as **YYYY-MM-DD** or **YYYY-MM-DD hh:mm:ss**. Text templates may be selected if they are defined for sample identification *(see chapter 3.5, page 119)*.

Entry	**100 characters**
Selection	**Selection of text templates**

ID3

Sample identification ID3. Any text can be entered in this field. The type and limit value check does not take place until the start of the determination. For sample identifications of the type **Date/Time**, the entry must be formatted as **YYYY-MM-DD** or **YYYY-MM-DD hh:mm:ss**. Text templates may be selected if they are defined for sample identification *(see chapter 3.5, page 119)*.

Entry	**100 characters**
Selection	**Selection of text templates**

Sample type

Selection of sample type.

Selection	**Sample** | **Standard** | **Intercept**
Default value	**Sample**

Sample position

Position of the sample on the rack. This number is used to move to the sample position with the command **MOVE**. For this, the **Sample position** option must be set for the parameter **Move** under **Target**.

Input range	**1 to 999** (Increment: **1**)
Default value	**1**

Sample amount

Numerical value for the sample amount for which the standard result is calculated *(see glossary, page 1072)*. Only numbers, decimal point, +, – and e may be entered in this field. The limit value check does not take place until the start of the determination.

NOTICE

If a value is entered or imported into this field, then the time of the data entry and the data source (**manual**, **'Name of the barcode reader'** or **'Name of the import file'**) are additionally stored automatically, placed in the determination and identified in the information subwindow as entry date and data source.

NOTICE

If a negative value is entered into this field, then this will also be calculated as a negative in the formula editor.

Entry	**Number with 10 digits at most**
Default value	**1.0**

Sample amount unit

Unit of the sample amount. Any text can be entered into this field.

Entry	**16 characters**
Selection	**L** | **mL** | **µL** | **g** | **mg** | **µg** | **pieces**
Default value	**mL**

Analytical volume

Volume portion (aliquot) of the diluted sample's dilution volume used for the determination *(see glossary, page 1051)*. This volume is added to the measuring vessel with the **ADD SAMPLE** command.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Dilution volume

Maximum filling volume used for dilution of the sample *(see glossary, page 1059)*.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

NOTICE

The name of the sample data variables assigned in the **START** command is automatically displayed for the sample data variables. Generally, no formula input is possible in these fields.

3.6.3.6 Changing a remark

Dialog window: **Workplace ► Run ► Single determination ► Live modifications ► Modify remark**

The **Live modifications** dialog window, in which the remark can be modified live during an ongoing determination, opens with the context-sensitive **Modify remark** menu item.

Remark

Freely definable remark on the determination, which is saved together with the determination. Predetermined text templates may also be selected instead of a manual entry *(see chapter 3.5.1, page 119)*.

Entry	**100 characters**

3.6.3.7 Single determination - Determination run

Tab: **Workplace ► Run ► Single determination**

A determination that is started on the **Single determination** tab in the **Run** subwindow proceeds as follows:

1 - Loading the sample data

The sample data entered for the determination is loaded.

2 - Method selection

The following actions are triggered during method selection:

- **Method selection without assignment ID**
  The method selected in the **Method** field is loaded.
- **Method selection with assignment ID**
  If the option **Method selection by assignment ID** is activated on the **Process** tab in the properties of the single determination *(see chapter 3.6.3.8.4, page 132)*, then the method defined in the sample assignment table will be loaded *(see chapter 3.4.1, page 117)*.

3 - Start test

The following checks and actions are triggered during the start test:

- **Permission to carry out the method?**
  Check whether the logged-in user has the permission to carry out the required method *(see chapter 5.4.2.3, page 408)*.
- **Method runnable?**
  Check whether the requested method is runnable. In the case of non-runnable methods, a prompt will appear asking to carry out the method check and to modify the method accordingly *(see chapter 5.2.5, page 398)*.
- **Instrument (module) and rack check**
  Check whether the instruments (or instrument types), instrument modules (e.g. measuring input, tower, etc.) and racks requested in the instrument-specific commands are present and available or assigned. If an instrument has not yet been assigned in a command, then the **Device assignment** dialog window will open for the assignment of the instrument.
- **Checking solutions**
  Check whether the solutions requested in the instrument-specific commands are present and available.
- **Checking dosing units**
  Check whether the dosing units requested in the instrument-specific commands are present and available.
- **Checking sensors**
  Check whether the sensors requested in the instrument-specific commands are present and available.

NOTICE

The start test can also be triggered manually in the status **READY** using the **Tools ► Run test** menu item.

4 - Method start

The following checks and actions are triggered with the method start:

- **Checking sample data**
  Check whether the sample data entered corresponds to the method variables defined and whether it is valid.
- **Assigning determination ID**
  A unique determination ID is assigned for the determination.
- **Reserving instruments (or instrument modules)**
  The instruments or their function units used by the instrument-dependent commands of the method are reserved for the duration of the determination, i.e. they can neither be used on other workplaces nor operated manually.
- **Increasing sample number**
  The **Sample number** is increased by **+1**.

5 - Main run

The following actions can be carried out during processing of the loaded method:

- **Main track processing**
  After the start of the main track the status changes to **BUSY**. The commands of the main track and of the tracks requested by it are processed in sequence. If the main track requests tracks that are not free, it will wait until these tracks can be started.
- **Interrupting and continuing run**
  An ongoing determination can be interrupted with **[Hold]** and resumed with **[Cont]** at any time. In this case, all active tracks are interrupted and resumed together.
- **Canceling a run**
  An ongoing determination can be canceled at any time with **[Stop]**. Afterwards, the exit track (if present) is run through and the determination is ended.
- **Stop by error**
  If an error that causes the determination to be interrupted occurs in an ongoing determination, the error track (if present) is run through and the determination is ended.
- **Processing exit track**
  If the main track and all tracks requested by it are ended, the exit track (if present) is run through and the determination is ended. The status changes to **READY** after the end of the main track.

3.6.3.8 Single determination - Properties

3.6.3.8.1 Properties - Overview

Dialog window: **Workplace ► Run ► Single determination ► Properties Run window ► Properties - Single determination**

The properties for the **Single determination** tab are set on the following tabs:

- *Display*
  Definition of the columns that are to be displayed on the **Single determination** tab.
- *Edit*
  Definition of the sample data that is to be automatically copied to the next determination.
- *Process*
  Options for the processing of single determinations.
- *Data import*
  Activating/deactivating the import of external data for fields on the **Single determination** tab.

3.6.3.8.2 Properties - Display

Dialog window: **Workplace ► Run ► Single determination ► Properties Run window ► Properties - Single determination**

Definition of the controls and columns that are to be displayed on the **Single determination** tab.

Controls

[Hold] / [Cont]

on | off (Default value: **on**)

Activating/deactivating the display of the **[Hold]** or **[Cont]** buttons.

Determination parameters

Sample number

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample number** field.

User

on | off (Default value: **on**)

Activating/deactivating the display of the **User** field.

Remark

on | off (Default value: **on**)

Activating/deactivating the display of the **Remark** field.

Arrangement ID1...16

NOTICE

The **Sample amount** and **Sample amount unit** fields are always shown next to each other in one line.

Selection	**1 column** | **2 columns**
Default value	**1 column**

1 column
If this option is selected, then the sample identifications **ID1 - ID16** are shown in one column.

2 columns
If this option is selected, then the sample identifications **ID1 - ID16** are shown in two columns.

3.6.3.8.3 Properties - Editing

Dialog window: **Workplace ► Run ► Single determination ► Properties Run window ► Properties - Single determination**

Definition of the sample data that is to be automatically applied for the next **Single determination**.

Copy automatically into next determination

Sample amount

on | off (Default value: **on**)

Sample amount unit

on | off (Default value: **on**)

Sample position

on | off (Default value: **on**)

Sample type

on | off (Default value: **on**)

Analytical volume

on | off (Default value: **on**)

Dilution volume

on | off (Default value: **on**)

ID1 - ID16

on | off (Default value: **on**)

3.6.3.8.4 Properties - Process

Tab: **Workplace ► Run ► Single determination ► Properties Run window ► Properties - Single determination ► Process**

Options for the processing of single determinations.

Method selection by assignment ID

on | off (Default value: **off**)

If this check box is activated, then the selected sample identification will be used for the method selection. This identification is assigned the designation **Assignment ID**, which can no longer be changed. If this ID matches an assignment ID from the sample assignment table *(see chapter 3.4.1, page 117)*, then the respective method from this table will be entered in the **Method** field.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16**
Default value	**ID1**

Request assignment ID

on | off (Default value: **off**)

If this check box is activated, then the **Assignment ID** will be requested immediately after the start of the determination.

3.6.3.8.5 Properties - Data import

Tab: **Workplace ► Run ► Single determination ► Properties Run window ► Properties - Single determination ► Data import**

Activating/deactivating the import of external data for fields on the **Single determination** tab.

NOTICE

The successful completion of the data import is indicated during the run by an acoustic signal (beep).

Import from barcode reader

on | off (Default value: **off**)

If this check box is activated, then external data is imported from the selected barcode reader into the fields on the **Single determination** tab. The instrument properties of the barcode reader will define the field into which that data is imported *(see chapter 7.9.4, page 958)*.

Barcode reader

Selection of the barcode reader from which data is to be imported.

Selection	**Instrument name**
Selection	**Always accept data** | **Accept data only for active window**
Default value	**Always accept data**

Always accept data
If this option is selected, then the data sent from the barcode reader is imported into all **Single determination** tabs of the open workplaces for which this barcode reader is defined as data source.

Accept data only for active window
If this option is selected, then the data sent from the barcode reader will be imported only into the **Single determination** tab of the workplace which is actively selected.

Confirmation necessary to accept data during determination

on | off (Default value: **off**)

If this check box is activated, then data is only imported during a determination if the **Sample data request** dialog window of a **REQUEST** command is open.

3.6.4 Determination series

3.6.4.1 Determination series - Overview

Tab: **Workplace ► Run ► Determination series**

Parameters and sample data for determination series can be edited and run functions can be triggered on the **Determination series** tab in the **Run** subwindow. It contains the following elements and functions:

- *Controls*
  Buttons for starting, stopping, interrupting and resuming determinations and series.
- *Status display*
  Shows the current status of the workplace.
- *Sample data*
  Entry of sample data for the next determinations.
- *Properties*
  Definition of the properties for the **Determination series** tab.

3.6.4.2 Determination series - Controls

Tab: **Workplace ► Run ► Determination series**

The following controls are located on the **Determination series** tab:

Start series (shortcut: **Ctrl G**)

Start of the first determination of a sample series. The button is disabled as soon as the first determination begins running. If the start can be triggered, it is green, otherwise light gray.

Stop series (shortcut: **Ctrl S**)

Immediate stop of the ongoing determination of a sample series. The button is enabled as soon as the first determination begins running. If the stop can be triggered, it is red, otherwise light gray.

Interrupt run

Interrupts the ongoing determination of a sample series. The button is enabled (dark gray) in the status **BUSY** (determination is running). The button is disabled (light gray) in all other cases. When you click on **[Hold]**, this button will be replaced in the display by **[Cont]**.

However, **[Hold]** does not allow you to stop all partial steps of a voltammetry command *(see chapter 5.5.2.10.1, page 582)*.

Continue run

Continues the ongoing determination of a sample series. The button is only present in the status **HOLD** (determination interrupted). When you click on **[Cont]**, then this button will be replaced again in the display by **[Hold]**.

Interrupt series

With this button, the ongoing determination of a sample series will still be completed, but no new determination will be started. The button is enabled as soon as the first determination begins running. If the function can be triggered, it is yellow, otherwise light gray. When you click on **[Pause]**, this button will be replaced in the display by **[Cont]**.

Continue series

Starts the next determination of the interrupted sample series. The button is only present in the status **PAUSE** (series interrupted). When you click on **[Cont]**, then this button will be replaced again in the display by **[Pause]**.

3.6.4.3 Determination series - Status display

Tab: **Workplace ► Run ► Determination series**

The current status of the workplace is displayed on the **Determination series** tab:

Status

Selection	**READY** | **BUSY** | **HOLD** | **PAUSE** | **ERROR**

READY
Ready for the start of a determination.

BUSY
Determination is running.

HOLD
Determination interrupted.

PAUSE
Series is interrupted.

ERROR
Error.

3.6.4.4 Determination series - Determination parameters

Tab: **Workplace ► Run ► Determination series**

User

If the option **Enforce login with user name** is enabled in the security settings, then the short name of the currently logged-in user will be displayed in this field. This field is then not available for editing. If work is done without login, then a user name can be entered in this field (only in the status **READY**).

Entry	**50 characters**

Sample number

The sample number is set to **0** for all workplaces at the time of each program start. Each time a determination is started, it is incremented by **+1**. It can only be edited by the user in the status **READY**.

Input range	**0 to 99999**
Default value	**0**

Remark

Freely definable remark on the determination, which is saved together with the determination. Predetermined text templates may also be selected instead of a manual entry *(see chapter 3.5.1, page 119)*.

NOTICE

The **Remark** field can be changed live also when determinations are in progress. The **Live modifications** dialog window is opened with the context-sensitive **Modify remark** menu item *(see chapter 3.6.3.6, page 127)*.

Entry	**100 characters**

Autostart

Number of automatic, internal starts of determinations within a sample series.

The first field after **Autostart** shows the number of determinations already carried out (actual counter). This field cannot be edited, but it can be reset to **0** in the status **READY** or **PAUSE** with the context-sensitive **Reset autostart counter** menu item.

The second field after **Autostart** shows the total number of determinations to be carried out per series (setpoint counter). By default, it contains the entry **Sample table** indicating the number of lines in the working sample table. This field can only be edited in the status **READY**.

NOTICE

The second field after **Autostart** can also be modified live when a series is in progress. The context-sensitive **Modify autostart counter** menu item opens the **Live modifications** window *(see chapter 3.6.4.7, page 140)*.

Input range	**1 to 999**
Default value	**Sample table**

3.6.4.5 Determination series - Sample data

Tab: **Workplace ► Run ► Determination series**

The current working sample table, which contains the sample data for determination series in tabular form, is displayed under **Sample data**. Each line corresponds to a single determination.

This table contains the sample data lines that have already been saved in the sample table and a line for entering new data that contains a star instead of a line number. The table cannot be edited or sorted directly.

For the meaning of the columns, see *Editing sample data*.

The lines in the working sample table can exhibit different **background colors**:

- **Light gray background**
  Processed line. Data in this line can no longer be modified. These lines only appear if the option **Delete processed lines** is disabled on the **Process** tab *(see chapter 3.3.2.4, page 110)*.
- **Dark gray background**
  Selected, already processed line.
- **Light orange background**
  Currently running line.
- **Dark orange background**
  Selected line currently running.
- **White background**
  Lines that have not yet been processed. These lines can be edited.
- **Blue background**
  Selected line not yet processed.

Loaded

Shows the sample table whose data has been loaded into the working sample table. If no sample table has been loaded or if all lines have been deleted, then this field is empty. If data for a loaded sample table is modified retroactively or expanded to include new lines, then **(modified)** will be added to the display of the name.

Toolbar

	Saves the sample table.
	Outputs the sample table as a PDF file.
	Resets lines that have been processed, i.e., they can be edited again.
	Duplicates the selected line(s). The new lines are inserted below the selected range.
	Increments the selected cells automatically.
	Fills the selected cells automatically.
	Checks whether all sample data in the sample table is correct.

Window menus

[Edit] contains the following menu items:

Edit line	Edit the selected line.
Insert new line	Inserts a new, empty line above the selected line.
Cut lines	Cuts the selected lines and transfers them to the clipboard.
Copy lines	Copies the selected lines to the clipboard.
Paste lines	Pastes lines from the clipboard above the selected line.
Delete lines	Deletes the selected lines.
Increment	The range that is to be automatically incremented from a column in the table can be selected with the cursor, which takes on the form . In this process, the number standing at the end of the expression will be automatically increased by 1 in the selected cells of a column, starting from the first selected cell. This works not only with pure numbers but also with text expressions ending with a number (e.g. **ABC10** → **ABC11** → **ABC12**…).
Filling	Fills the selected cells automatically.

Duplicate	Duplicates the selected line(s). The new lines are inserted below the selected range.
Mark lines	Marks the line number of the selected lines with a red background. Before the start of such a line, the corresponding actions defined under Properties on the **Process** tab *(see chapter 3.3.2.4, page 110)* will be triggered.
Unmark lines	Removes the line marking for the selected lines.
Set lines inexecutable	Sets the selected lines to "inexecutable", i.e., these lines will not be executed in the run. Such lines are struck through with a red line.
Set lines executable	Sets the selected lines to "executable", i.e., they will be executed in the run.

[Sample table] contains the following menu items:

New	Loads a new, empty sample table.
Load...	Loads the saved sample table into the working sample table.
Save	Saves the current sample table under the same name.
Save as...	Save the current sample table under a new name.
Sample table test...	Checks whether all sample data in the working sample table is correct *(see chapter 3.3.1.7, page 103)*.
Print (PDF)...	Outputs the working sample table as PDF file.
Properties...	Set the properties of the working sample table.
Import data...	Import a sample table from a file with the format ***.csv**.
Reset	Resets lines that have been processed, i.e., they can be edited again.

Moving lines with drag and drop

The lines selected in the working sample table can be moved to an opened sample table via drag and drop.

Copying lines with drag and drop

The lines selected in the working sample table can be copied to an opened sample table with drag and drop by pressing the **Ctrl key**.

3.6.4.6 Changing a remark

Dialog window: **Workplace ► Run ► Single determination ► Live modifications ► Modify remark**

The **Live modifications** dialog window, in which the remark can be modified live during an ongoing determination, opens with the context-sensitive **Modify remark** menu item.

Remark

Freely definable remark on the determination, which is saved together with the determination. Predetermined text templates may also be selected instead of a manual entry *(see chapter 3.5.1, page 119)*.

Entry	**100 characters**

3.6.4.7 Modify autostart counter

Dialog window: **Workplace ► Run ► Determination series ► Modify autostart counter ► Live modifications**

The context-sensitive **Modify autostart counter** menu item opens the **Live modifications** dialog window.

Live modifications

Number of automatic, internal starts of determinations within a sample series.

The first field after **Autostart** shows the number of determinations already carried out (actual counter). This field cannot be edited.

The second field after **Autostart** shows the total number of determinations to be carried out per series (setpoint counter). By default, it contains the entry **Sample table** indicating the number of lines in the working sample table. The value can be modified live while a determination is running.

Input range	**1 to 999**
Default value	**Sample table**

3.6.4.8 Determination series - Determination run

Tab: **Workplace ► Run ► Determination series**

In the case of a series of determinations that is started on the **Determination series** tab in the **Run** subwindow, each determination proceeds as follows:

1 - Loading the sample data

The sample data for the determination entered on the current line in the **working sample table** will be loaded.

2 - Method selection

The following actions are triggered during method selection:

- **Method selection without assignment ID**
  The method selected in the **Method** column is loaded.
- **Method selection with assignment ID**
  If the option **Method selection by assignment ID** is activated on the **Process** tab in the properties of the determination series *(see chapter 3.3.2.4, page 110)*, then the method defined in the sample assignment table will be loaded *(see chapter 3.4.1, page 117)*.

3 - Start test

The following checks and actions are triggered during the start test:

- **Permission to carry out the method?**
  Check whether the logged-in user has the permission to carry out the required method *(see chapter 5.4.2.3, page 408)*.
- **Method runnable?**
  Check whether the requested method is runnable. In the case of non-runnable methods, a prompt will appear asking to carry out the method check and to modify the method accordingly *(see chapter 5.2.5, page 398)*.
- **Instrument (module) and rack check**
  Check whether the instruments (or instrument types), instrument modules (e.g. tower, etc.) and racks requested in the instrument-specific commands are present and available or assigned. If an instrument has not yet been assigned in a command, then the **Device assignment** dialog window will open for the assignment of the instrument.
- **Checking solutions**
  Check whether the solutions requested in the instrument-specific commands are present and available.
- **Checking dosing units**
  Check whether the dosing units requested in the instrument-specific commands are present and available.
- **Checking sensors**
  Check whether the sensors requested in the instrument-specific commands are present and available.

NOTICE

In the status **READY**, the start test can also be triggered manually with the ✔ symbol or the **Tools ▶ Run test** menu item. In addition, the sample data test will also be carried out afterwards.

4 - Method start

The following checks and actions are triggered with the method start:

- **Checking sample data**
  Check whether the sample data entered corresponds to the defined sample data variables and whether it is valid.
- **Assigning determination ID**
  A unique determination ID is assigned for the determination.
- **Reserving instruments (or instrument modules)**
  The instruments or their function units used by the instrument-dependent commands of the method are reserved for the duration of the determination, i.e. they can neither be used on other workplaces nor operated manually.
- **Increasing sample number**
  The **Sample number** is increased by **+1**.

5 - Main run

The following actions can be carried out during processing of the loaded method:

- **Processing a series start track**
  The **Series start track** is started at the beginning of the first determination of a series. If you click on **[Stop]** while this track is running, then the **Exit track** is started; if an error occurs, the **Error track** will be started.
- **Main track processing**
  After the start of the **Main track** the status changes to **BUSY**. The commands of the main track and of the tracks requested by it are processed in sequence. If the main track requests tracks that are not free, it will wait until these tracks can be started.
- **Stopping and continuing a run**
  An ongoing determination can be interrupted with **[Hold]** and resumed with **[Cont]** at any time. In this case, all active tracks are stopped and resumed together.
- **Stopping and continuing a series**
  An ongoing series can be interrupted at any time with **[Pause]**. In this case, the ongoing determination of the sample series will still be carried out to completion but no new determination will be started. The next determination of the interrupted sample series is started with **[Cont]**.
- **Canceling a run**
  An ongoing determination can be canceled at any time with **[Stop]**. Afterwards, the **Exit track** (if present) is run through and the determination is stopped.

- **Stop by error**
  If an error that causes the determination to be interrupted occurs in an ongoing determination, the **Error track** (if present) is run through and the determination is stopped.
- **Processing exit track**
  If the main track and all tracks requested by it are ended, then the **Exit track** (if present) is run through and the determination is ended.
- **Processing series end track**
  The **Series end track** is processed at the end of the last determination of a series. If you click on **[Stop]** while this track is running, then the determination is ended; if an error occurs, the **Error track** will be started.

3.6.4.9 Working sample table

3.6.4.9.1 Loading a new sample table

Menu item: **Workplace ► Run ► Determination series ► [Sample table] ► New**

A new, empty sample table is loaded as working sample table with the **[Sample table] ► New** menu item on the **Determination series** tab, i.e. all existing sample table lines will be deleted.

3.6.4.9.2 Loading a sample table

Dialog window: **Workplace ► Run ► Determination series ► [Sample table] ► Load... ► Load sample table**

One of the globally available sample tables can be selected in this dialog window for loading as a working sample table.

List of sample tables

The list of sample tables contains information about all the saved sample tables. The table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order.

Name

Name of the sample table.

Saved

Date and time when the sample table was saved.

Saved by

Short name of the user who saved the sample table.

Lines

Number of lines in the sample table.

Comment

Comment on the sample table that was entered on the **Comment** tab as a comment regarding the sample table *(see chapter 3.3.2.6, page 114)*.

Load sample table

Name

Name of the sample table that is to be loaded. If a sample table from the table is selected, then the name will be entered automatically in this field. It can, however, also be entered manually.

Entry	**50 characters**

[Load]

Loads the data of the selected sample table into the working sample table. In addition, all properties of the sample table, with the exception of the settings for **Import from file** and **Import format**, are applied for the working sample table.

3.6.4.9.3 Editing sample data

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Edit] ▶ Edit line ▶ Edit line - Working sample table - Workplace 'Name'**

The fields in this dialog window exhibit the same background colors as the lines in the working sample table:

- **Light gray background**
  Line that is already processed and whose data can no longer be modified.
- **Orange background**
  Line currently running.
- **White background**
  Line that has not yet been processed and that can still be edited.

NOTICE

Generally, no formula input is possible in the fields of this dialog window.

Method

Entry or selection of the method from the current method group with which the determination is to be carried out. The method selection is continuously restricted as the first characters are entered; this allows a quick selection of the required method.

Entry	**50 characters**
Selection	**Method selection**

Opens the **Open method** dialog window for the extended method selection. If a method is selected in this window from a method group other than the current one, then this group will henceforth be the current method group for the quick selection of methods in the **Method** field. This button is active only if more than one method group is present.

NOTICE

If a method is changed and saved in the method editor or during reprocessing, then the latest method version will be loaded when a new determination is started.

NOTICE

The following sample data fields can no longer be edited if they were defined as **Fixed value** in the method *(see chapter 5.5.2.8.2.5, page 549)*.

ID1 - ID16

Sample identifications ID1 - ID16. Any text can be entered in this field. The type and limit value check takes places during the sample table test or during the run test when a determination is started. For sample identifications of the **date/time** type, the entry must be formatted as **YYYY-MM-DD** or **YYYY-MM-DD hh:mm**. If text templates are defined for sample identification, a selection can be made among them *(see chapter 3.5.1, page 119)*.

Entry	**100 characters**
Selection	**Selection of text templates**

Sample type

Selection of sample type.

Selection	**Sample** | **Standard** | **Intercept**
Default value	**Sample**

Sample position

Position of the sample on the rack. This number is used to move to the sample position with the command **MOVE**. For this, the **Sample position** option must be set for the parameter **Move** under **Target**.

Input range	**1 to 999** (Increment: **1**)
Default value	**1**

Sample amount

Numerical value for the sample amount for which the standard result is calculated *(see glossary, page 1072)*. Only numbers, decimal point, +, – and e may be entered in this field. The limit value check does not take place until the start of the determination.

NOTICE

If a value is entered or imported into this field, then the time of the data entry and the data source (**manual**, **'Name of the barcode reader'** or **'Name of the import file'**) are additionally stored automatically, placed in the determination and identified in the information subwindow as entry date and data source.

NOTICE

If a negative value is entered into this field, then this will also be calculated as a negative in the formula editor.

Entry	**Number with 10 digits at most**
Default value	**1.0**

Sample amount unit

Unit of the sample amount. Any text can be entered into this field.

Entry	**16 characters**
Selection	**L** | **mL** | **µL** | **g** | **mg** | **µg** | **pieces**
Default value	**mL**

Analytical volume

Volume portion (aliquot) of the diluted sample's dilution volume used for the determination *(see glossary, page 1051)*. This volume is added to the measuring vessel with the **ADD SAMPLE** command.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Dilution volume

Maximum filling volume used for dilution of the sample *(see glossary, page 1059)*.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Navigation

Shows the currently selected line in the working sample table with the following functions:

Jump to the first line in the working sample table.

Jump to the previous line in the working sample table.

Option of entering the desired line number to which the program jumps when **[Enter]** is pressed.

Jump to the next line in the working sample table. If the end of the table has been reached, then a new line will be inserted automatically and the program will jump to it.

Jump to the last line in the working sample table.

Jump to a new, empty line.

Display application note

on | off (Default value: **off**)

If this check box is activated, then the application note defined in the method will be displayed during the editing of the sample data.

Functions

[Apply]

Applies the sample data entered in the respective line of the working sample table. If the end of the table has been reached, then a new line will be generated automatically. The same function can also be triggered by pressing the **[Enter]** key. The next line will, however, also be highlighted automatically when **[Enter]** is used.

[Close]

Closes the input window. The current sample data will not be applied in the working sample table (this needs to be triggered beforehand with **[Apply]**).

3.6.4.9.4 Duplicating sample data

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Edit] ▶ Duplicate ▶ Duplicate**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Edit] ▶ Duplicate ▶ Duplicate**

Number:

Request to inquire how many times the selected lines are to be duplicated. The new lines are inserted below the selected range.

Input range	**1 to 999**
Default value	**1**

3.6.4.9.5 Importing sample data

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Import data... ▶ Select files to import**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Import data... ▶ Select files to import**

You can select a ***.csv** file with the sample data to be imported in this dialog window.

File name

Input or selection of the file that is to be imported.

Selection	**'File name'**

File type

Selection of the import format for the import of data from a file (only ***.csv** is possible).

Selection	***.csv** | ***.csv (Unicode)**
Default value	***.csv**

[Open]

The sample data from the selected file is inserted at the end of the sample table.

NOTICE

No matter the number of data fields defined on the **Display** tab, the import file must always contain for each line the entirety of sample data in the format **Method;ID1;...;ID16;Sample type;Sample position;Sample amount;Unit;Analysis volume;Dilution volume**.

3.6.4.9.6 Sample table test

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ Sample table test - 'Sample table name'**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Sample table test... ▶ Sample table test - 'Sample table name'**

The symbol is used to carry out the sample table test. Clicking on it causes the **Sample table test - 'Sample table name'** dialog window to open, in which information pertaining to the test is displayed.

NOTICE

The **Sample table test** only checks whether all sample data is correct (as opposed to the **Run test** *(see chapter 3.6.2, page 120)*, which also checks the required hardware).

Line

Display of the line number of the currently tested sample data line.

Status displays

One of the following status displays appears below the line number:

Selection	**Sample table running... | Sample table stopped manually | Sample table test finished without errors | Sample table test finished with errors**

Sample table running...
This display appears while the test is running. In addition, a progress bar appears. The test can be canceled by clicking on [x] next to the progress bar.

Sample table stopped manually
This display appears if the user has manually canceled the sample table test.

Sample table test finished without errors
This display appears at the end of a sample table test that has been completed without an error.

Sample table test finished with errors
This display appears if an error has occurred during the sample table test. The errors that have occurred are listed in the **Test report** field.

Test report

Display of the errors that have occurred during the sample table test together with the line number.

3.6.4.9.7 Saving a sample table

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Save as... ▶ Save sample table**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Save as... ▶ Save sample table**

A name for the working sample table to be saved can be entered or selected in this dialog window.

List of sample tables

The list of sample tables contains information about all the saved sample tables.

Name

Name of the sample table.

Saved

Date and time when the sample table was saved.

Saved by

Short name of the user who saved the sample table.

Lines

Number of lines in the sample table.

Comment

Comment on the sample table that was entered on the **Comment** tab as a comment regarding the sample table *(see chapter 3.3.2.6, page 114)*.

Save sample table

Name

Entry of the name under which the sample table is to be saved.

NOTICE

The name of the sample table must be unique throughout the entire client/server system.

Entry	**50 characters**

[Save]

Saves the sample table under the required name.

3.6.4.9.8 Printing a sample table (PDF)

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Print (PDF)... ▶ Print sample table (PDF)**

Dialog window: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Print (PDF)... ▶ Print sample table (PDF)**

The output format for the PDF output can be selected in this dialog window.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output in portrait format.

Landscape
Output in landscape format.

3.6.4.10 Determination series - Properties

3.6.4.10.1 Properties - Overview

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series**

Dialog window: **Workplace ▶ View ▶ Properties ▶ Properties Run window ▶ Properties - Determination series**

The properties for the **Determination series** tab are set on the following tabs:

- *Display*
  Definition of the columns that are to be displayed in the working sample table.
- *Edit*
  Options for editing the working sample table on the **Determination series** tab and in the **Edit line** dialog window.
- *Process*
  Options for processing the working sample table on the **Determination series** tab.
- *Data import*
  Activating/deactivating the import of external data for working sample table fields.
- *Comment*
  Entry of a comment on the working sample table.

3.6.4.10.2 Properties - Display

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Display**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Display**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Display**

Definition of the controls and columns that are to be displayed in the sample table or working sample table.

Controls

NOTICE

This parameter group is visible only if the dialog window is opened via the **Determination series** tab.

[Pause] / [Cont]

on | off (Default value: **on**)

Activating/deactivating the display of the **[Pause]** or **[Cont]** buttons.

[Hold] / [Cont]

on | off (Default value: **on**)

Activating/deactivating the display of the **[Hold]** or **[Cont]** buttons.

Determination parameters

NOTICE

This parameter group is visible only if the dialog window is opened via the **Determination series** tab.

Sample number

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample number** field.

User

on | off (Default value: **on**)

Activating/deactivating the display of the **User** field.

Remark

on | off (Default value: **on**)

Activating/deactivating the display of the **Remark** field.

Sample data

NOTICE

The names defined here will be used **only** for the column headers in the sample table.

The names defined in the **START** command under **Sample data variables** will always be used when editing a sample line and for the determination data.

ID1 - ID3

on | off (Default value: **on**)

Activating/deactivating the display of the columns **ID1 - ID3** in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**ID1 - 3**

ID4 - ID16

on | off (Default value: **off**)

Activating/deactivating the display of the columns **ID4 - ID16** in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**ID4 - 16**

Sample type

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample type** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample type**

Sample position

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample position** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample position**

Sample amount

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample amount** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample amount**

Sample amount unit

on | off (Default value: **on**)

Activating/deactivating the display of the **Sample amount unit** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Sample amount unit**

Analytical volume

on | off (Default value: **on**)

Activating/deactivating the display of the **Analytical volume** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Analytical volume**

Dilution volume

on | off (Default value: **on**)

Activating/deactivating the display of the **Dilution volume** column in the sample table. The option also exists of renaming the heading of this column in the working sample table.

Entry	**50 characters**
Default value	**Dilution volume**

3.6.4.10.3 Properties - Edit

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Edit**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Edit**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Edit**

Options for the editing of the sample table.

Accept data with

on | off (Default value: **off**)

Selection of the data field that must be filled for the automatic import of data via barcode reader or file in order for the data of the line to be applied to the sample data storage and to move on to the next line.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16** | **Sample type** | **Sample position** | **Sample amount** | **Sample amount unit** | **Analytical volume** | **Dilution volume**
Default value	**Sample amount**

Lock editing in working sample table

on | off (Default value: **off**)

If this check box is activated, then the editing of lines in the working sample table is locked.

Copy automatically into next line

Method

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

ID1 - ID3

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

ID4 - ID16

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Sample type

This field will automatically be filled with the content of the previous line when a new sample data line is generated.

Sample position + 1

on | off (Default value: **on**)

If this check box is activated, then the content of this field will automatically be incremented by **+1** when a new sample data line is created.

Sample amount

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Sample amount unit

on | off (Default value: **on**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Analytical volume

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

Dilution volume

on | off (Default value: **off**)

If this check box is activated, then this field will automatically be filled with the content of the previous line when a new sample data line is created.

3.6.4.10.4 Properties - Process

Tab: **Workplace ► Tools ► Sample table ► Open... ► Open sample table ► [Open] ► Sample table 'Name' ► [Sample table] ► Properties... ► Properties - Sample table 'Name' ► Process**

Dialog window: **Workplace ► View ► Properties ► ► Properties Run window ► Properties - Determination series ► Process**

Dialog window: **Workplace ► Run ► Determination series ► [Sample table] ► Properties... ► Properties - Determination series ► Process**

Options for processing the working sample table in the workplace window on the **Determination series** tab.

Delete processed lines

on | off (Default value: **off**)

If this check box is activated, then lines in the working sample table which have already been processed completely will be deleted automatically.

Method selection by assignment ID

on | off (Default value: **off**)

If this check box is activated, then the selected sample identification will be used for the method selection in the working sample table. This identification is assigned the designation **Assignment ID**, which can no longer be changed. If this ID matches one of the assignment IDs from the sample assignment table *(see chapter 3.4, page 117)*, then the respective method will be loaded.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16**
Default value	**ID1**

Request assignment ID

on | off (Default value: **off**)

If this check box is activated, then the **Assignment ID** will be requested immediately after the start of the determination.

Actions for marked sample table lines

Selection	**Pause series ([Pause]) and show message** | **Stop series ([Stop])**
Default value	**Pause series ([Pause]) and show message**

Pause series ([Pause]) and show message
If this option is selected, then the series is interrupted before the start of the marked line (equivalent to [Pause]). At the same time a message will appear which also contains the text defined in the message box.

Stop series ([Stop])
If this option is selected, then the series is stopped before the start of the marked line (equivalent to [Stop]).

Starts the text editor, with which the message can be entered and edited.

3.6.4.10.5 Properties - Data import

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Data import**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Data import**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Data import**

Activating/deactivating the import of external data for sample table data fields.

NOTICE

The successful completion of the data import is indicated during the run by an acoustic signal (beep).

Import from barcode reader

on | off (Default value: **off**)

If this check box is activated, then the external data from the selected barcode reader will be imported into the open sample table. The instrument properties of the barcode reader will define the field into which that data is imported *(see chapter 7.9.4, page 958)*.

Barcode reader

Selection of the barcode reader from which data is to be imported.

Selection	**'Instrument name'**
Selection	**Always accept data | Accept data only for active window**
Default value	**Always accept data**

Always accept data
If this option is selected, then the data sent from the barcode reader is imported into the open sample table for which this barcode reader is defined as data source.

Accept data only for active window
If this option is selected, then the data sent from the barcode reader is only imported into the open sample table if this is actively selected (i.e. when the focus is on the window).

Confirmation necessary to accept data during determination

on | off (Default value: **off**)

If this check box is activated, then data is imported during a determination only if the **Sample data request** dialog of a **REQUEST** command is opened or if a line from the sample table is open for editing in the **Edit line - Sample table 'Name'** dialog window.

Import from file

on | off (Default value: **off**)

If this check box is activated, then external data from a file (e.g. via LIMS) will be imported into a sample table. When this is the case, a check is made to determine whether the specified import file is available when the sample table is opened, when the sample table is loaded into the working sample table and also periodically (every 10 s) when the sample table is open (although not when the dialog window **Edit line** is open). If the import file is available, then the data from this file is automatically inserted at the end of the sample table. The import file is deleted after each import.

NOTICE

No matter the number of data fields defined on the **Display** tab, the import file must always contain for each line the entirety of sample data in the format **Method;ID1;...;ID16;Sample type;Sample position;Sample amount;Unit;Analysis volume;Dilution volume**.

Import file

File that is to be imported. The file can be selected in the **Select files to import** dialog window with .

Entry	**File name**

Import format

Selection of the import format for the import of data from a file.

Selection	***.csv** | ***.csv (Unicode)**
Default value	***.csv**

***.csv**
Format for the import of CSV files with Western European ASCII character sets.

***.csv (Unicode)**
Format for the import of CSV files with Unicode character sets.

3.6.4.10.6 Properties - Comment

Tab: **Workplace ▶ Tools ▶ Sample table ▶ Open... ▶ Open sample table ▶ [Open] ▶ Sample table 'Name' ▶ [Sample table] ▶ Properties... ▶ Properties - Sample table 'Name' ▶ Comment**

Dialog window: **Workplace ▶ View ▶ Properties ▶ ▶ Properties Run window ▶ Properties - Determination series ▶ Comment**

Dialog window: **Workplace ▶ Run ▶ Determination series ▶ [Sample table] ▶ Properties... ▶ Properties - Determination series ▶ Comment**

Entry of a comment on the sample table.

Comment on sample table

Entry of a comment on the sample table. This comment will be displayed in the column of the same name in the **Open sample table** and **Sample table manager** dialog windows.

Entry	**1,000 characters**

3.7 Method subwindow

3.7.1 Method window - General

Subwindow: **Workplace ▶ Method**

Method subwindow

The **Method** subwindow shows the method loaded in the run window with its tracks and commands as well as the respective evaluation parameters. It is represented in the same way as in the **Method** program part. The subwindow can be activated in the **Workplace** program part during the definition of the layout and thus made visible. It can be enlarged and reduced as required; it can also be maximized.

Tabs

The **Method** subwindow consists of the following two tabs:

- *Method run*
  Display of the loaded method with tracks and commands.
- *Evaluation*
  Display of the evaluation parameters.

3.7.2 Method window - Method run

Tab: **Workplace ▶ Method ▶ Method run**

Representation of tracks and commands

The method loaded in the run window with its tracks and commands is shown on the **Method run** tab in the **Method** subwindow. It is represented in the same way as in the **Method** program part.

Active commands (commands in the status **BUSY**) are highlighted by a **violet** frame.

Zoom

By default, the method is displayed on the **Method run** tab in such a way that all tracks are completely shown. The following zoom levels can be selected for the display of the method with the context-sensitive **Zoom** menu item:

Selection	**200%** | **150%** | **100%** | **75%** | **50%** | **25%** | **Fit to width** | **Fit to height** | **Fit in window**
Default value	**Fit in window**

200%
Enlarges the view to 200%.

150%
Enlarges the view to 150%.

100%
Sets the view to 100%.

75%
Reduces the view to 75%.

50%
Reduces the view to 50%.

25%
Reduces the view to 25%.

Fit to width
Adjusts the view to window width.

Fit to height
Adjusts the view to window height.

Fit in window
Adjusts the view to window width and height.

Skipping a command

If a workplace is in the status **BUSY**, then you can cancel the completion of an active command and jump immediately to the following command with the context-sensitive **Quit** menu item. This applies only to commands with live display. This cancellation is documented in the determination (under **Messages**). The data and variables generated by the canceled command thus far are saved.

NOTICE

If an active **SEQUENCE** command is canceled, then only the single command that is currently active in the sequence is canceled and the next single command is started.

Live modifications

The properties window of the respective command, in which all parameters are listed but in which you can only edit the specified live parameters, is opened by double-clicking on a command or with the context-sensitive **Properties...** menu item. This parameter window additionally contains the **[Apply]** button, which is used to apply the modified live parameters, including while the parameter window is open. Live parameters can be modified both in the status **BUSY** and **READY**.

The modified parameters are valid until the method is changed, the user logs out or the program is closed. In these cases, a prompt asking whether to save the method anew appears. A new method version is created if you click on **[Yes]** and the old method version is maintained if you click on **[No]**.

If live parameters are modified, then these modifications are documented in the determination. In the determination's parameter report, all parameters that have been modified are highlighted with an asterisk (*****) and saved at the end of the determination. If parameters of already processed commands are modified, then these modifications only become effective for the following determination, but they are nevertheless highlighted as "modified live" in the method report of the completed determination. The markings will disappear as soon as the method is saved in the regular way.

Methods with modified live parameters can also be manually saved anew in the status **READY** at any time with **File ► Method ► Save** or **File ► Method ► Save as...**.

NOTICE

Fields whose content is defined by a formula cannot be modified live.

3.7.3 Method window - Evaluation

Tab: **Workplace ► Method ► Evaluation**

Representation of the evaluation parameters

The evaluation parameters for the loaded method are displayed on the **Evaluation** tab in the **Method** subwindow. They are represented in the same way as in the **Method** program part.

Live modifications

The specified live parameters can be modified live on the **Evaluation** tab. The modified parameters are applied with the **[Apply]** button. Live parameters can be modified both in the status **BUSY** and **READY**.

The modified parameters are valid until the method is changed, the user logs out or the program is closed. In these cases, a prompt asking whether to save the method anew appears. A new method version is created if you click on **[Yes]** and the old method version is maintained if you click on **[No]**.

If live parameters are modified, then these modifications are documented in the determination. In the determination's parameter report, all parameters that have been modified are highlighted with an asterisk (*****) and saved at the end of the determination. If parameters of already processed commands are modified, then these modifications only become effective for the following determination, but they are nevertheless highlighted as "modified live" in the method report of the completed determination. The markings will disappear as soon as the method is saved in the regular way.

Methods with modified live parameters can also be manually saved anew in the status **READY** at any time with **File ► Method ► Save** or **File ► Method ► Save as...**.

3.8 Live display subwindow

3.8.1 Live display - General

Subwindow: **Workplace ► Live display 1 / Live display 2**

Subwindow Live display

Live curves, measured values and messages pertaining to the method started in the run window on the **Single determination** or **Determination series** tab are shown in the two subwindows **Live display 1** and **Live display 2**. The subwindows can be activated in the **Workplace** program part during the definition of the layout and thus rendered visible. They can be enlarged and reduced as required, and they can also be maximized.

The display of curves and measured values in the **Live display** subwindow can be defined per window and per command type in the **Properties**.

Tabs

The **Live display 1** and **Live display 2** subwindows consist of the following tabs:

- *Tracks*
  A tab labeled with the track name is displayed for each track.

- *Application note*
  Shows the application note defined in the **START** command.
- *Messages*
  Shows the messages generated during the determination.

3.8.2 Live display - Tracks

Subwindow: **Workplace ► Live display 1 / Live display 2**

The main track of the loaded method (**START** command) is always shown in the **Live display** subwindow. Further tracks are only displayed if the live display is enabled in the corresponding **TRACK** command. A tab labeled with the track name is displayed for each track.

The live display elements (curve, measured value, message) defined in the **Properties** are displayed for the currently active command on these tabs. You have to switch manually between the tabs, i.e., there is no automatic switching when another track is called. This makes it possible to display two simultaneously active tracks next to each other in two live windows.

At the start of the determination the content of the track tabs is deleted. Afterwards the messages, curves and measured value displays defined by the active commands will appear in the track tabs. The tab titles of the active tracks will be displayed in red. Additionally, the command type and command name of the active command are displayed in the window title of the **Live display** subwindow.

If all tracks or individual tracks are stopped with **[Hold]** or with a **SEND** command, respectively, then **Track halted...** is displayed in these tracks.

After completion of the track, **Track finished** is displayed in all tracks except for the main track. After the determination has been finished, the following is displayed in the main track, depending on the determination run:

Selection	**Run: regular without remarks** | **Run: regular with remarks** | **Run: Stop** | **Run: Stop by error**

Run: regular without remarks
The determination has been finished automatically after it was processed regularly and without any remarks.

Run: regular with remarks
The determination has been finished automatically after it was processed regularly but with remarks *(see chapter 4.7.6, page 376)*.

Run: Stop
The determination has been canceled either manually with **[Stop]**, by stop criteria or a **SEND** command.

Run: Stop by error
The determination has been canceled automatically as a result of an error or not even started as a result of an error during the **start test**.

Context menu

Quit	Canceling the active command of the track.
Live display #	Setting the properties of the **Live display #** subwindow *(see chapter 3.8.5, page 166)*.

Zoom

Within the curve display, you can zoom as often as you like by spanning a section of the curve display from the top left to the bottom right with the left mouse button held down. To display the entire curve again, span an area from the bottom right to the top left with the left mouse button held down.

You can also zoom with the mouse. Rotate the scroll wheel downwards to zoom in the curve at the location of the cursor in steps and rotate the scroll wheel upwards to zoom out in steps.

Moving the curve

The curve can be moved to any location while holding the Ctrl key and the left mouse button pressed down, regardless of the zoom status. To display the entire curve again, span an area from the bottom right to the top left with the left mouse button held down.

3.8.3 Live display - Application note

Subwindow: **Workplace ► Live display 1 / Live display 2**

The application note of the loaded method defined in the **START** command is displayed on the **Display application note** tab. This tab is opened by default in the **Live display** subwindow when the method is opened.

3.8.4 Live display - Messages

Subwindow: **Workplace ► Live display 1 / Live display 2**

A scrollable message box containing all messages concerning events occurring during the run of the current determination is located on the **Messages** tab. Entries consist of messages that generate a database entry in the determination but which are not significant enough to result in the run being interrupted pending confirmation by the user.

Each message consists of Date, Time and Message text.

The message window is deleted when a run is started with **[Start]**. In this way, all messages of the last single determination or determination series can be viewed.

The label of the tab changes to **red** as soon as a new message has been entered. The label of the **Messages** tab changes to **black** again after you have viewed the messages and switched to another tab.

3.8.5 Live display - Properties

Dialog window: **Workplace ► Live display 1 / Live display 2 ► Properties Live display 1 / 2**

Command type

Selection of the command type for which the properties in the live display are to be defined. The curve properties defined for each command type are saved per live display window and per client.

Selection	**CVS** | **CPVS** | **CP** | **LSV** | **DP** | **SQW** | **CV** | **MEAS T** | **MEAS Opt** | **MEAS TMF**
Default value	**CVS**

Measured value display

on | off (Default value: **on**)

If this check box is activated, then the measured values required are displayed in the **Live display** subwindow.

Measured value 1

Selection of the measured value for measured value display 1. The measured quantities and the default value depend on the **Command type** selected.

CVS, CPVS, CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **off**
Default value	**Potential**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity** | **off**
Default value	**Potential**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**Temperature**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**Measured value**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt** | **off**
Default value	**Temperature**

Measured value 2

Selection of the measured value for measured value display 2. The measured quantities and the default value depend on the **Command type** selected.

CVS, CPVS, CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **off**
Default value	**Current**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity** | **off**
Default value	**Current**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**Time**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**Intensity**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt** | **off**
Default value	**Transmission**

Measured value 3

Selection of the measured value for measured value display 3. The measured quantities and the default value depend on the **Command type** selected.

CVS, CPVS, CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **off**
Default value	**Time**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity** | **off**
Default value	**Time**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**off**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**Transmission**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt** | **off**
Default value	**Time**

Curve display

on | off (Default value: **on**)

If this check box is activated, then the required curves are displayed in the **Live display** subwindow.

x Axis

Selection of the quantity to be shown on the x-axis.

CVS

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range**
Default value	**Potential**

CPVS, CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range**
Default value	**Time**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity**
Default value	**Potential**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Time**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Time**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt**
Default value	**Time**

y1 Axis

Selection of the quantity to be shown on the y1-axis (left y-axis).

CVS, CPVS

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range**
Default value	**Current**

CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Potential measuring range**
Default value	**Time**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity**
Default value	**Current**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Temperature**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Measured value**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt**
Default value	**Measured value**

Color

Selection of the curve color for the quantity shown on the y1-axis.

CVS, CPVS, CP, LSV, DP, SQW, CV

Selection	**Color selection** | **black**
Default value	**black**

MEAS T

Selection	**Color selection** | **blue**
Default value	**blue**

MEAS Opt, MEAS TMF

Selection	**Color selection** | **light blue**
Default value	**light blue**

y2 Axis

Selection of the quantity to be shown on the y2-axis (right y-axis).

CVS, CPVS, CP

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **off**
Default value	**off**

LSV, DP, SQW, CV

Selection	**Current** | **Potential** | **Time** | **Time to finish** | **Current measuring range** | **Sensitivity** | **off**
Default value	**off**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**off**

MEAS Opt

Selection	**Time** | **Measured value** | **Intensity** | **Transmission** | **Saturated pixels** | **Temperature** | **dε/dt** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**off**

MEAS TMF

Selection	**Time** | **Measured value** | **Transmission** | **Temperature** | **dε/dt** | **off**
Default value	**off**

Color

Selection of the curve color for the quantity shown on the y2-axis.

CVS, CPVS, CP, LSV, DP, SQW, CV

Selection	**Color selection** | **black**
Default value	**black**

MEAS T

Selection	**Color selection** | **pink**
Default value	**pink**

MEAS Opt, MEAS TMF

Selection	**Color selection** | **green**
Default value	**green**

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be displayed.

Background

Selection of the color for the curve background.

Selection	**Color selection** | **white**
Default value	**white**

3.9 Curves subwindow

3.9.1 Curve display

3.9.1.1 Curve display - General

Subwindow: **Workplace ► Curves #**

The **Curves 1** and **Curves 2** subwindows are subwindows in the **Workplace** program part. The measurement curves and calibration curves generated by the voltammetry commands during the ongoing determination are displayed in these subwindows.

The **Curves 1** and **Curves 2** subwindows can be activated in the **Workplace** program part during the definition of the layout and thus rendered visible. They can be enlarged and reduced as required, and they can also be maximized.

3.9.1.2 Curve display voltammetry command

3.9.1.2.1 Tabs

Subwindow: **Workplace ► Curves #**

In the curve window, a tab with the corresponding command name is provided for each run of a voltammetry command. Their sequence is determined by the method. The upper part of these tabs shows the recorded voltammograms or calibration curves and the lower part contains information on the individual measurement curves. The icons serve to maximize either the upper or the lower part to the size of the entire curve window or reset it again.

An icon representing the type of displayed curves is located next to the title of the tab. You can toggle between the types by clicking on this icon.

Shows the measurement curve *(see chapter 4.6.1.2.1, page 338)*.

Shows the calibration curve *(see chapter 4.6.1.2.2, page 343)*.

3.9.1.2.2 Measurement curve

Subwindow: **Workplace ► Curves #**

Displaying the measurement curve

The following elements are displayed in the upper part of the curve window:

- Axes with labeling (measured quantity and unit)
- Measuring point curves
- Peak label with substance name
- Baselines
- Base points

Zoom

Curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows curves completely.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies curves to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Table of measurement curves

A list of the measurement curves recorded is shown in the table below the curve display. It contains the following columns:

CALL

CALL command name that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Baseline type

Approximated baseline used to evaluate the detected peaks.

Start base point

Value of the base point, where the baseline of the peak evaluation begins.

End base point

Value of the base point, where the baseline of the peak evaluation ends.

Area / Height / Measured value

Peak areas, peak heights or measured values of all replications of a CALL COND command *(see chapter 5.5.2.2.7.2, page 430)*.

Area RSD / Height RSD / Measured value RSD

Relative standard deviation of the peak areas / peak heights / measured values of the last 2 runs of a CALL COND command *(see chapter 5.5.2.2.7.2, page 430)*.

Display

on | off (Default value: **on**)

Indicates whether a measurement curve is displayed in the curve window or not.

The parameters Area, Height or Measured value and Relative standard deviation of the area, the height or the measured value are only displayed in the table if a method contains the **CALL COND** command and the **Evaluation quantity** stop criterion is enabled.

Edit menu

The table cannot be edited directly but only via the following context-sensitive menu items:

Selection on	The check box in the **Display** column for the selected measurement curve is activated.
Selection off	The check box in the **Display** column for the selected measurement curve is deactivated.
Only selection on	The check boxes in the **Display** column are activated for the selected measurement curves, but deactivated for the not selected measurement curves.
All on	All check boxes in the **Display** column are activated.
All off	All check boxes in the **Display** column are deactivated.
Invert selection	The settings in the **Display** column for the selected measurement curves are inverted.
Highlight selection on/off	The selected measurement curves are highlighted.

3.9.1.2.3 Calibration curve

Subwindow: **Workplace ► Curves #**

Calibration curve display

The following elements are displayed in the upper left-hand part of the curve window:

- Axes with labeling (measured quantity and unit)
- Calibration points of the standard addition or the calibration curve
- Calculated calibration function
- Evaluation ratio (line) for calibration method **DT**
- Effective addition volume (numerical value) for calibration method **DT**
- Substance concentration in the measuring vessel (only for sample type **Sample**)

Zoom

Calibration curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete calibration curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows the calibration curve completely.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies the calibration curve to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Calibration results

The calibration results are displayed in the upper right-hand part of the curve window:

Concentration

Concentration

Substance concentration in the sample.

ASD

Absolute standard deviation of the substance concentration in the sample.

RSD

Relative standard deviation of the substance concentration in the sample.

Regression data

Function

Function that was applied for the calculation of the calibration curve.

R^2

Coefficient of determination calculated from the calibration function.

Evaluation quantity

Evaluation quantity (area, height or measured value) used for the evaluation.

Curve type

Curve type used for the calculation of the calibration function.

Weighting

Indicates whether the weighting **1/evaluation quantity²** was used.

Calibration data

Calibration factor

Concentration of the standard solution in the measuring vessel for the evaluation ratio (only for calibration method **DT**).

Intercept value

The intercept value is the charge that is obtained from the measurement of the intercept solution *(see glossary, page 1064)* (only for calibration method **LAT**).

Electrolyte value

The electrolyte value is the charge obtained from the measurement of the electrolyte solution *(see glossary, page 1060)* (only for calibration method **RC**).

Date

Date on which the calibration was carried out.

Determination ID

Determination ID of calibration.

Calibration curve table

The table below the calibration curve shows a list of the calibration points recorded. It contains the following columns:

CALL

CALL command name that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Peak potential

Peak potential determined.

Area

Peak area determined (for **Evaluation quantity** = **Area**).

Height

Peak height determined (for **Evaluation quantity** = **Height**).

Measured value

Current value determined (for **Evaluation quantity** = **Measured value**).

Display

on | off (Default value: **on**)

Indicates whether a measurement curve is displayed in the curve window or not.

Functions

The **[Edit]** menu beneath the table contains the following menu items:

Show all	Resets the zoom and shows the calibration curve completely.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies the calibration curve to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

3.9.2 Curve properties

3.9.2.1 Curve properties - General parameters

Dialog window: **Database / Workplace ► Curves # ► Properties Curves #**

Command type

Selection of the command type for which the curve properties are to be defined. The curve properties defined for each command type are saved per curve window and per client.

Selection	**CVS** | **CPVS** | **CP** | **LSV** | **DP** | **SQW** | **CV** | **MEAS Ref** | **MEAS Spec** | **MEAS Opt** | **CAL Spec** | **MEAS TMF** | **MEAS T**
Default value	**CVS**

NOTICE

When the dialog window is opened, the **Command type** that applies for the curve shown in the curve window will be selected by default.

3.9.2.2 Curve properties voltammetry command

3.9.2.2.1 Curve properties voltammetry command - x Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► x Axis**

Parameters for the graphical curve display on the x-axis.

Quantity

Selection of the quantity to be shown on the x-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Potential [V]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Potential [V]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Time [s]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Time [s]**

Label

Freely definable axis label for the x-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the x-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the x-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the x-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the x-axis. It is displayed on the left in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the x-axis. It is displayed on the right in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

3.9.2.2.2 Curve properties voltammetry command - y1 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical curve display on the y1-axis (left-hand y-axis).

Quantity

Selection of the quantity to be shown on the y1-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Current [A]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Potential [V]**

Label

Freely definable axis label for the y1-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y1-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation a*$10^{\pm x}$.
The following applies when choosing the exponential coefficient: 1 ≤ a < 10. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition 1 ≤ a < 1,000. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y1-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y1-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y1-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y1-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

3.9.2.2.3 Curve properties voltammetry command - y2 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2-axis (right-hand y-axis).

Quantity

Selection of the quantity to be shown on the y2-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity** | **off**
Default value	**off**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y2-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y2-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y2-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y2-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the y2-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y2-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

3.9.2.2.4 Curve properties voltammetry command - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical curve display.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

3.9.2.3 Curve properties measuring commands

3.9.2.3.1 Curve properties measuring commands - x axis

Tab: **Database ► Curves # ► Properties Curves # ► x Axis**

Parameters for the graphical display of the curves on the x axis.

Quantity

Selection of the quantity to be shown on the x axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Time [s]**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Time**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Time [s]**

Label

Freely definable axis label for the x axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

3.9.2.3.2 Curve properties measuring commands - y1 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical display of the curves on the y1 axis (left-hand y axis).

Quantity

Selection of the quantity to be shown on the y1 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Absorbance [mAU]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Measured value**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Temperature**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Measured value [mAU]**

Label

Freely definable axis label for the y1 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Smoothing

on | off (Default value: **off**)

Activates/deactivates smoothing for the curves.

Smoothing factor x axis

Factor for smoothing in the direction of the x axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Smoothing factor y axis

Factor for smoothing in the direction of the y axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Also show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve (solid line, same color) will be shown in addition to the smoothed curve (dotted line).

3.9.2.3.3 Curve properties measuring commands - y2 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2 axis (right-hand y axis).

Quantity

Selection of the quantity to be shown on the y2 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**off**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**off**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T

Selection	**13 colors** | **magenta**
Default value	**magenta**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✸ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T

Selection	**13 colors** | **magenta**
Default value	**magenta**

3.9.2.3.4 Curve properties measuring commands - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical display of curves.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

Show end points

on | off (Default value: **off**)

If this check box is activated, then the endpoints found will be shown on the curve with the ♦ symbol and labeled with **BP#** (break point), **FP#** (fixed point), **MI** (minimum value) or **MA** (maximum value).

Automatic EPs

Selection of the color for automatically set endpoints.

Selection	**13 colors** | **black**
Default value	**black**

Show evaluation lines

on | off (Default value: **off**)

If this check box is activated, then the evaluation lines (tangents, auxiliary lines) will be shown.

Tangents

Selection of the color for the tangent lines and evaluation lines.

Selection	**13 colors** | **light green**
Default value	**light green**

Auxiliary lines

Selection of the color for the auxiliary lines.

Selection	**13 colors** | **blue**
Default value	**blue**

3.9.2.3.5 Curve properties measuring commands - Measuring point list

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Measuring point list**

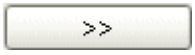
Parameters for the display of the measuring point list.

Available columns

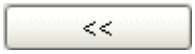
Shows all fields that can be displayed as columns in the measuring point list. The display depends on the command type.

Displayed columns

Shows all fields that will be displayed as columns in the measuring point list.



Adds the selected column to the measuring point list.



Removes the selected column from the measuring point list.

Changes the sequence of displayed columns by moving the selected column up and down.

3.10 Report subwindow

3.10.1 Report - General

Subwindow: **Workplace ► Report**

Report subwindow

The reports of determinations are displayed in the **Report** subwindow. The subwindow can be activated in the **Workplace** program part during the definition of the layout and thus made visible *(see chapter 3.1.7, page 90)*. It can be enlarged and reduced as required, and it can also be maximized.

Tabs

The subwindow consists of the following tabs:

- *Latest report*
  Display of the most recently automatically generated report.
- *Selected report*
  Display of the report selected in the report overview.
- *Report overview*
  Overview of the reports saved in the workplace.

3.10.2 Latest report

Tab: **Workplace ► Report ► Latest report**

The report most recently generated in the method run is automatically displayed on the **Latest report** tab. The content and format of the reports are determined by the report template selected.

3.10.3 Selected report

Tab: **Workplace ► Report ► Selected report**

The report selected in the report overview is shown on the **Selected report** tab. The content and format of the reports are determined by the report template selected.

3.10.4 Report overview

Tab: **Workplace ► Report ► Report overview**

The reports of the determinations since program start are shown in a table on the **Report overview** tab. The lines are arranged chronologically in ascending order. The table is automatically updated as new reports are received.

The table contains the following columns, which can be enlarged, reduced and moved with the mouse:

Date

Moment of the compilation of the report, together with date, time and time zone (UTC ± ##).

Report

Name of the report template that generated the report.

Method

Method name.

ID1 - ID16

Sample identifications **ID1 - ID16**.

[View]

Displays the selected report on the **Selected report** tab.

[Delete]

Deletes the selected reports in the report overview.

[Properties]

Opens the **Properties - Report overview** dialog window.

3.10.5 Properties report overview

Dialog window: **Workplace ► Report ► Report overview ► [Properties] ► Properties - Report overview**

Maximum number of reports

Maximum number of reports that can be saved in the report overview table. If this number is exceeded, then the oldest report will be deleted automatically.

Input range	**1 to 100**
Default value	**20**

4 Database

4.1 Database - General

4.1.1 Database - Definition

Program part: **Database**

Definition

The term **Database** is used in **viva** to refer to the program part in which the determinations saved in the databases can be displayed, managed, evaluated, reprocessed and printed out. The **determination databases** are also referred to as **databases**; they can, in contrast to the **configuration database**, be generated by the user and contain the determination data. Included among such determination data are the method data used for the determination, the measuring data generated during the determination and the results calculated from it.

Organization

In **local server systems** (**viva 3.0 full**), the databases are stored on the drives managed by the computer and are only available to those users registered on that computer who have the appropriate access permission.

In **client/server systems** (**viva 3.0 multi**) the databases are stored on drives managed centrally by the server and are globally available throughout the entire client/server system, i.e., all users with the appropriate access rights can use these databases.

4.1.2 Database - User interface

Program part: **Database**

Database icon

Clicking on the database symbol in the vertical bar on the left opens the **Database** program part; the database symbol is shown in color at the same time. The upper left corner of the symbol contains a black field displaying the number of databases currently opened *(see chapter 4.2, page 211)*.

Elements

The user interface of the **Database** program part comprises the following elements:

- Database-specific menu bar.
- Database-specific toolbar.
- Main window, in which up to six subwindows can be displayed.

4.1.3 Database - Menu bar

4.1.3.1 Database - Main menus

Program part: **Database**

The menu bar in the **Database** program part contains the following main menu items:

- *File*
  Opening and closing databases, database manager, printing.
- *Edit*
  Copying selected lines in the determination overview to the clipboard, marking all lines.
- *View*
  Changing the layout, loading a view, saving a view, modifying the sub-window properties.
- *Determinations*
  Searching, filtering, deleting, reprocessing determinations, etc.
- *Tools*
  Report templates, further templates.
- *Help*
  Opening program help, displaying program information.

4.1.3.2 Database - File menu

Program part: **Database**

Open...	Open a database *(see chapter 4.2.1, page 211)*.
Close all	Closes all open databases *(see chapter 4.2.6, page 213)*.
Close	Close database *(see chapter 4.2.6, page 213)*.
Database manager...	Manage determination databases *(see chapter 4.3, page 214)*.
Print ►	
Determination overview...	PDF file output of the determination overview *(see chapter 4.5.2.10, page 332)*.
Report...	PDF file output of the report *(see chapter 4.5.2.11, page 333)*.
Logout...	Logs out user *(see chapter 2.2.2, page 12)*.

Exit	Exits the program.
1 'File name'	Opens the selected database *(see chapter 4.2.1, page 211)*. The last five databases opened are displayed for selection.

4.1.3.3 Database - Edit menu

Program part: **Database**

Copy	Copies the selected lines in the determination overview to the clipboard.
Select all	Selects all lines in the current set of determinations in the determination overview.

4.1.3.4 Database - View menu

Program part: **Database**

Update	Refreshes the determination overview *(see chapter 4.5.2.1, page 279)*.
Change layout...	Modify the layout of the loaded database view *(see chapter 3.1.7.2, page 91)*.
Load view...	Load a saved database view *(see chapter 3.1.7.3, page 92)*.
Save view...	Saves the loaded database view *(see chapter 3.1.7.4, page 92)*.
Split vertically	Splits the database window vertically and displays two databases side by side *(see chapter 4.2.4, page 213)*.
Split horizontally	Splits the database window horizontally and displays two databases, one above the other *(see chapter 4.2.5, page 213)*.
Unsplit	Undoes the splitting of the database window *(see chapter 4.2.4, page 213)*.
Properties ►	
Column display...	Set the column display for the **Determination overview** subwindow *(see chapter 4.5.1.3, page 275)*.
Properties Curves 1 - 5	Set the properties for the **Curves 1 - 5** subwindow *(see chapter 4.6.2, page 347)*.
Properties Results	Set the properties for the **Results** subwindow *(see chapter 4.8.5, page 381)*.
Toolbar	Activates/deactivates the toolbar display.

4.1.3.5 Database - Determinations menu

Program part: **Database**

Comment...	Enter a comment on the selected determination *(see chapter 4.5.2.2, page 279)*.
Search...	Opens the **Search - Database 'Name'** dialog window for searching for determinations *(see chapter 4.5.2.3, page 280)*.
Filter ►	
Last filter	Applies the most recently used quick or special filter *(see chapter 4.5.2.4.2, page 283)*.
Quick filter	Quick filtering of the database with the content of the selected table cell *(see chapter 4.5.2.4.3, page 283)*.
Special filter...	Opens the **Special filter - Database 'Name'** window for the definition of user-specific filters *(see chapter 4.5.2.4.4, page 284)*.
Remove filter	Removes the current filter *(see chapter 4.5.2.4.5, page 285)*.
Send to...	Send the selected determinations per e-mail *(see chapter 4.5.2.6, page 329)*.
Export...	Export the selected determinations *(see chapter 4.5.2.7, page 330)*.
Import...	Import the selected determinations *(see chapter 4.5.2.8, page 331)*.
Show method...	Shows the method used for the focused determination *(see chapter 4.5.2.12, page 334)*.
Show history	Shows all versions of the focused determination in the determination table *(see chapter 4.5.2.13, page 335)*.
Make current	Makes the old version selected in the history view the current version once again *(see chapter 4.5.2.14, page 335)*.
Show calibration curve...	Shows the calibration curve for the focused determination *(see chapter 4.5.2.15, page 335)* (only for determinations with activated **CAL LOOP Opt**).
Control chart...	Shows the control chart and the statistical evaluation of the results of the selected determinations *(see chapter 4.5.2.16, page 336)*.
Reprocess...	Reprocess the selected determinations *(see chapter 4.5.2.5, page 288)*.

Delete	Deletes the selected determinations *(see chapter 4.5.2.9, page 332)*.

4.1.3.6 Database - Tools menu

Program part: **Database**

Report templates ▶	
New ▶	
Form report...	Opens the **Report template** window with an empty form report *(see chapter 4.4.1.3, page 224)*. This menu item is disabled as long as the database is empty.
Tabular report...	Opens the **Report template** window with an empty tabular report *(see chapter 4.4.1.3, page 224)*.
Open...	Opens a report template for editing *(see chapter 4.4.1.3, page 224)*. This menu item is disabled as long as the database is empty.
Manager...	Manage report templates *(see chapter 4.4.1.1, page 222)*.
Templates ▶	
Control chart templates...	Manage templates for control charts *(see chapter 4.4.2.1, page 262)*.
Export templates...	Manage export templates *(see chapter 4.4.3.1, page 266)*.

4.1.3.7 Help menu

Program part: **Workplace / Database / Method / Configuration**

viva Help	Opens viva Help.
About	Displays information about the program and the installation.

4.1.4 Database - Toolbar

Program part: **Database**

	Open a database *(see chapter 4.2.1, page 211)*.
	Close database *(see chapter 4.2.6, page 213)*.
	Management of the determination databases *(see chapter 4.3, page 214)*.
	Logs out user *(see chapter 2.2.2, page 12)*.

	Copies the selected lines in the determination overview to the clipboard.
	Refreshes the determination overview *(see chapter 4.5.2.1, page 279)*.
	Modify the layout of the loaded database view *(see chapter 3.1.7.2, page 91)*.
	Load a saved database view *(see chapter 3.1.7.3, page 92)*.
	Saves the loaded database view *(see chapter 3.1.7.4, page 92)*.
	Splits the database window vertically and displays two databases side by side *(see chapter 4.2.4, page 213)*.
	Splits the database window horizontally and displays two databases, one above the other *(see chapter 4.2.5, page 213)*.
	Undoes the splitting of the database window *(see chapter 4.2.4, page 213)*.
	Enter a comment on the selected determination *(see chapter 4.5.2.2, page 279)*.
	Opens the **Search - Database 'Name'** dialog window for searching for determinations *(see chapter 4.5.2.3, page 280)*.
	Applies the most recently used quick or special filter *(see chapter 4.5.2.4.2, page 283)*.
	Quick filtering of the database with the content of the selected table cell *(see chapter 4.5.2.4.3, page 283)*.
	Opens the **Special filter - Database 'Name'** window for the definition of user-specific filters *(see chapter 4.5.2.4.4, page 284)*.
	Removes the current filter *(see chapter 4.5.2.4.5, page 285)*.
	Imports the selected determinations *(see chapter 4.5.2.8, page 331)*.
	Shows the method used for the focused determination *(see chapter 4.5.2.12, page 334)*.
	Shows all versions of the focused determination in the determination table *(see chapter 4.5.2.13, page 335)*.

	Makes the old version selected in the history view the current version once again *(see chapter 4.5.2.14, page 335)*.
	Shows the calibration curve for the focused determination *(see chapter 4.5.2.15, page 335)* (only for determinations with activated **CAL LOOP Opt**).
	Shows the control chart and the statistical evaluation of the results of the selected determinations *(see chapter 4.5.2.16, page 336)*.
	Reprocess the selected determinations *(see chapter 4.5.2.5, page 288)*.
	Deletes the selected determinations *(see chapter 4.5.2.9, page 332)*.
	Opens a report template for editing *(see chapter 4.4.1.3, page 224)*.
	Opens viva Help.

4.1.5 Database - Subwindow

Program part: **Database**

Selection

The following subwindows can be displayed in the main window:

- *Determination overview*
  Overview of the determinations saved in the database. This subwindow is permanently on display.
- *Curves 1 - 5*
  Shows curves for the focused determination.
- *Information*
  Shows information on the focused determination.
- *Results*
  Shows the results of the focused determination.

Display

The subwindows can be enlarged or made smaller to suit by dragging the separating bar between the windows.

By clicking on the ☐ button above at the right, the subwindows can be maximized so that only one subwindow is displayed in the main window. The original view of all subwindows is restored by clicking on the ☐ button in the maximized subwindow once again.

If you change the view of the subwindows, these changes will remain in effect when the database is closed and reopened.

4.1.6 Database - Functions

Program part: **Database**

The following functions can be carried out in the **Database** program part:

Views

- *Modifying the layout of the database view*
- *Loading a database view*
- *Saving a database view*
- *Renaming a database view*
- *Deleting a database view*

Database manager

- *Creating a new database*
- *Renaming a database*
- *Editing database properties*
- *Backing up a database*
- *Restoring a database*
- *Deleting a database*

Determinations

- *Overview of functions*

Templates

- *Editing report templates*
- *Editing templates for control charts*
- *Editing export templates*

4.1.7 Views

4.1.7.1 Views - General

Program part: **Workplace / Database / Configuration**

Definition

The contents and design of the main window in the **Workplace**, **Database** and **Configuration** program parts is called a **View**. The following elements belong to a view:

- Number, arrangement, sequence and size of the subwindows.
- Representation within the individual subwindows, i.e. column sequence, column width, sorting and filter.

Functions

The following functions are possible for views:

- *Changing the layout*
  Defining the number, arrangement and sequence of the subwindows for the current view.

- *Saving a view*
  Saving the current view.
- *Loading a view*
  Loading a saved view.
- *Renaming a view*
  Renaming a saved view.
- *Deleting a view*
  Deleting a saved view.

Saving automatically

The current view will be saved automatically when the program is closed if the corresponding option is activated under **Save on closing** in the **Configuration** program part under **Tools ► Options...** on the **Save** tab.

Loading automatically

By default, the view that is saved when the program is closed will be loaded automatically the next time that the program is opened. As an alternative, a default view that is loaded automatically the first time that the program part is opened can be defined for each user group.

By default, views are opened with the following subwindows with the very first program start:

- **Workplace**
  Run, **Method**, **Live display 1**, **Curves 1**
- **Database**
  Determination overview, **Curves 1**, **Information**, **Results**
- **Configuration**
  Devices, **Solutions**, **Dosing units**, **Sensors/Electrodes**

Export/import

Views can also be exported and imported. In this way these views can be exchanged between different client/server systems.

4.1.7.2 Changing the layout

Dialog window: **Workplace / Database / Configuration ► View ► Change layout... ► Change layout**

The **Change layout** dialog window is opened with the symbol or the **View ► Change layout...** menu item.

Select layout

Selection of a graphical symbol for the number and arrangement of the subwindows.

Selection	**'Selection of the possible combinations'**

Available subwindows

Display of the subwindows that are still available for being displayed in the view.

Selection	**'Selection of the subwindows'**

Displayed subwindows

Display of the subwindows that are shown in the view.

Selection	**'Subwindow'**

Adds the selected subwindow to the view.

Removes the selected subwindow from the view.

Moves the selected subwindow upward (modifies sequence).

Moves the selected subwindow downward (modifies sequence).

4.1.7.3 Loading a view

Dialog window: **Workplace / Database / Configuration ► View ► Load view... ► Load view**

The **Load view** dialog window is opened with the symbol or the **View ► Load view...** menu item.

Name

Name of the view to be loaded.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Load]

Loads the selected view.

4.1.7.4 Saving a view

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Save view... ▶ Save view**

The **Save view** dialog window is opened with the symbol or the **View ▶ Save view...** menu item.

Name

Name under which the view is to be saved.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Save]

Saves the view under the given name. The saved views are globally valid and available for client/server systems.

4.1.7.5 Renaming a view

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Load view... ▶ Load view ▶ [Rename] ▶ Rename view**

To be able to rename a view, either open the **Load view** or the **Save view** dialog window and click on the **[Rename]** button. The **Rename view** window opens afterwards.

Rename view 'Name' to

Entry of a new name for the view.

Entry	**50 characters**

4.1.7.6 Deleting a view

Function: **Workplace / Database / Configuration ▶ View ▶ Load/save view… ▶ [Delete]**

To delete a view, open either the **Load view** or **Save view** dialog window and press the **[Delete]** button. The delete procedure must then be confirmed.

4.2 Database display

4.2.1 Opening a database

Dialog window: **Database ▶ File ▶ Open... ▶ Open database**

The icon or the **File ▶ Open...** menu item opens the **Open database** window, in which one of the databases available on the server (or on the local server) can be selected for opening. The names of all of the available databases are displayed in this window; the additional information is loaded afterwards. All of the databases are then displayed, even if the user does not have read permissions.

Database table

The database table contains information concerning all determination databases. The table cannot be edited. The table can be sorted according to the selected column in ascending or descending order by clicking on the column title (columns **Name**, **Number of records**, **Size**, **Readable**, **Editable**, **Comment**).

Name

Name of the database.

Number of records

Shows the number of records in the database.

Size

Shows the size of the database in KB.

Readable

Shows whether or not the database can be read by the user currently logged in.

Editable

Shows whether or not the database can be edited by the user currently logged in.

Comment

Shows comments about the database.

Opening a database

Database name

Name of the database to be opened. If a database is selected from the table, the name of the database will be entered automatically in this field. It can, however, also be entered manually.

Entry	**50 characters**

[Open]

Opens the selected database and shows its data records in the determination overview. The database name is displayed in the title bar of the program; the number of currently opened databases is displayed in the left upper corner of the database icon.

NOTICE

A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

4.2.2 Selecting a database

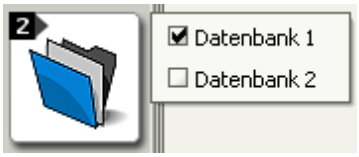
Program part: **Database**

The number of currently opened databases is displayed in the upper left corner of the database icon. If two or more databases are opened, then these databases, which can be displayed either next to one another or one above the other in the main window, can be selected with the aid of the database icon.

No database is opened. **No database loaded** is displayed in the main window.

A database is opened and is displayed in the main window.

Two databases are opened. Normally only one database is displayed in the main window, but the option exists of displaying two databases at once, either next to one another or one above the other.



A menu with the names of all the currently opened databases is displayed by clicking on the database icon with either the left or right mouse button. The databases displayed in the main window are then marked with a checkmark. Clicking on the desired database displays it in the main window in the place of the previously selected one.

4.2.3 Displaying a single database

Menu item: **Database ▶ View ▶ Unsplit**

In the default settings, the most recently opened database is displayed by itself in the main window. If the display of two databases is enabled, then the icon or the **View ▶ Unsplit** menu item can be used to switch back to the display of just one single database.

4.2.4 Displaying databases next to one another

Menu item: **Database ▶ View ▶ Split vertically**

Two databases are displayed next to one another in the main window with the icon or the **View ▶ Split vertically** menu item.

4.2.5 Displaying databases one above the other

Menu item: **Database ▶ View ▶ Split horizontally**

Two databases are displayed one above the other in the main window with the icon or the **View ▶ Split horizontally** menu item.

4.2.6 Closing a database

Menu items: **Database ▶ File ▶ Close / Close all**

Closing a single database

The icon or the **File ▶ Close** menu item can be used to close the focused database.

Closing all databases

All the opened databases are closed with the **File ▶ Close all** menu item.

4.3 Managing databases

4.3.1 Managing databases

Dialog window: **Database ► File ► Database manager... ► Database manager**

The icon or the **File ► Database manager...** menu item is used to open the **Database manager** window, in which a user with corresponding access rights can manage databases.

Database table

The database table contains information concerning all determination databases. The table cannot be edited. The table can be sorted according to the selected column (columns **Name**, **Number of records**, **Size**, **Last backup**, **Next backup** and **Comment**) in either ascending or descending order by clicking on the column title.

Name

Name of the database.

Number of records

Shows the number of records in the database.

Size

Shows the size of the database in KB.

Last backup

Shows the date and time of the last database backup.

Next backup

Shows the date and time at which the next backup is to be carried out.

Comment

Shows comments about the database.

Window menus and functions

The **[Edit]** menu beneath the database table contains the following menu items:

New...	Create a new database *(see chapter 4.3.2, page 215)*.
Delete	Deletes the selected database *(see chapter 4.3.4, page 216)*.
Rename...	Rename the selected database *(see chapter 4.3.3, page 215)*.

[Properties]

Opens the **Database manager** window for editing the database selected in the table *(see chapter 4.3.5.1, page 216)*.

[Backup]

Opens the **Backup the database 'Name'** window for backing up the database selected in the table *(see chapter 4.3.6, page 220)*.

[Restore]

Opens the **Restore databases** window for restoring backed-up databases *(see chapter 4.3.7, page 221)*.

[Close]

Closes the **Database manager** window.

4.3.2 Creating a new database

Dialog window: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Edit] ▶ New... ▶ New database**

The **[Edit] ▶ New...** menu item is used to open the **New database** dialog window, in which a name for the new database must be entered.

Name

Name of the new database.

Entry	**50 characters**
Default value	**New database #**

NOTICE

The database name must be unique in the entire client/server system.

The **Properties - Database - 'Database name'** dialog window opens for editing the database properties with **[OK]**.

4.3.3 Renaming a database

Dialog window: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Edit] ▶ Rename... ▶ Rename database**

The **[Edit] ▶ Rename...** menu item is used to open the **Rename database** window for renaming the selected database.

Rename database 'Name' to

Entry of the new database name.

Entry	**50 characters**

NOTICE

The database name must be unique in the entire client/server system.

4.3.4 Deleting a database

Menu item: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Edit] ▶ Delete**

The **[Edit] ▶ Delete** menu item is used to delete the selected database.

NOTICE

Databases that are open cannot be deleted.

4.3.5 Database properties

4.3.5.1 Database properties - Overview

Dialog window: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Properties] ▶ Properties - Database - 'Database name'**

The properties for a database are set on the following tabs:

- *General*
  General information about the database.
- *Access permissions*
  Database access permissions for user groups.
- *Backup*
  Definition of backup monitoring and automatic backups.
- *Monitoring*
  Definition of database monitoring.

4.3.5.2 Database properties - General

Tab: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Properties] ▶ Properties - Database - 'Database name' ▶ General**

General information about the database.

Comment

Freely definable comments about the database.

Entry	**250 characters**

Number of records

Shows the number of records in the database.

Size

Shows the size of the database in KB.

Created

Shows the date and time when the database was created.

Created by

Shows the user (short name) who created the database.

Modified

Shows the date and time of the last modification of the database properties.

Modified by

Shows the name of the user (short name) who carried out the modifications.

4.3.5.3 Database properties - Access rights

Tab: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Properties] ▶ Properties - Database - 'Database name' ▶ Access rights**

Database access permissions for user groups.

User group

Shows the user groups defined in the user administration.

Read

on | off (Default value: **on**)

Activates/deactivates the permission to open the database. The database can only be displayed but not modified (records cannot be deleted or reprocessed).

Edit

on | off (Default value: **off**)

Activates/deactivates the permission to edit the database. Records can be modified or deleted.

NOTICE

If access for editing is activated, then access rights for reading will also automatically be activated. If access for reading is deactivated, then access rights for editing will also automatically be deactivated.

4.3.5.4 Database properties - Backup

Tab: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Properties] ▶ Properties - Database - 'Database name' ▶ Backup**

Definition of backup monitoring and automatic backups.

Backup monitoring

on | off (Default value: **off**)

Activates/deactivates the backup monitoring for the selected database. If the **Backup monitoring** check box is enabled, then the **Next backup** field in the database table will be highlighted in **red** when the interval time elapses.

Last backup

Shows the date and time of the last database backup.

Next backup

Date on which the next backup must take place. This date can be selected by clicking on ... in the **Select date** dialog window.

Entry	**Date selection**
Default value	**Last backup + 1 month**

Interval

Entry of the interval for the backup monitoring. After each automatically or manually triggered backup, the interval entered here will be added automatically to the **Last backup**, and the **Next backup** field will be automatically adjusted accordingly.

Input range	**1 to 999**
Default value	**1**
Selection	**day(s)** | **week(s)** | **month(s)** | **year(s)**
Default value	**month(s)**

Start backup automatically

on | off (Default value: **off**)

Automatic start of the backup for the database in the defined **Backup directory**.

Backup directory

Selection of a directory predefined in the **Program administration** for the automatic backup.

Selection	**Selection of the backup directory** | **Default backup directory**
Default value	**Default backup directory**

NOTICE

Make sure that you have read and write permission for the selected directory.

4.3.5.5 Database properties - Monitoring

Tab: **Database ► File ► Database manager... ► Database manager ► [Properties] ► Properties - Database - 'Database name' ► Monitoring**

Definition of database monitoring.

Monitoring size

on | off (Default value: **off**)

Activates/deactivates size monitoring for the selected database. If this check box is activated, then the **Size** field in the database table will be highlighted in **red** when the limit value has been exceeded. At the same time, a corresponding message also appears when the database is opened.

Maximum size

Maximum permitted database size in MB.

Input range	**1 to 2,147,483,647 MB**
Default value	**5000 MB**

Monitoring number of records

on | off (Default value: **off**)

Activates/deactivates the monitoring of the number of records for the selected database. If this check box is activated, then the **Number of records** field in the database table will be highlighted in **red** when the limit value has been exceeded. At the same time, a corresponding message also appears when the database is opened.

Monitoring size

Maximum permitted number of records for database.

Input range	**1 to 2,147,483,647**
Default value	**1,000**

4.3.6 Backing up a database manually

Dialog window: **Database ▶ File ▶ Database manager... ▶ Database manager ▶ [Backup] ▶ Backup database**

[Backup] is used to open the **Backup database** dialog window:

Backup target

Backup directory

Selection of a directory predefined in the program administration for the backup.

Selection	**Selection of the backup directory** | **Default backup directory**
Default value	**Default backup directory**

NOTICE

Make sure that you have read and write permission for the selected directory.

Backup name

Selection of an already existing name or entry of a new name for the backup file. If an existing backup file is selected, it will be overwritten.

Entry	**50 characters**
Default value	**Backup ##**

NOTICE

If the backup directory is on a network drive, the backup date should be added manually to the **Backup name** because the backup date information is not available when the data is restored.

[Start]

Starts manual database backup. After the start, a progress bar appears in the window. The dialog window closes automatically once the backup has been completed.

4.3.7 Restoring a database

Dialog window: **Database ► File ► Database manager... ► Database manager ► [Restore] ► Restore databases**

The **Restore databases** dialog window is opened with **[Restore]**:

Backup directory

Selection of a directory that is predefined in the **Program administration** and in which the backed-up databases are located.

Selection	**'Name of the backup directory'** | **Default backup directory**
Default value	**Default backup directory**

Backup name

Selection of a backup file.

Selection	**Selection of backup files**

Backup date

Shows the time at which the database was backed up. This information is not available if the backup file is located on a network drive.

Database name

Shows the name of the database. This information is not available if the backup file is located on a network drive.

Number of records

Shows the number of records in the database. This information is not available if the backup file is located on a network drive.

Size

Shows the size of the database in KB.

Save as

Name under which the database is to be restored.

Entry	**50 characters**
Default value	**New database ##**

[Start]

Starts database restoring. After the start, a progress bar appears in the window. The dialog window closes automatically once the backup has been completed.

NOTICE

Existing databases cannot be overwritten, i.e., they must first be deleted so that the database can be restored under its old name.

4.4 Templates

4.4.1 Report templates

4.4.1.1 Managing report templates

4.4.1.1.1 Managing report templates

Dialog window: **Database ► Tools ► Report templates ► Manager... ► Report template manager**

The **Report template manager** window is opened with the **Tools ► Report templates ► Manager...** menu item.

List of report templates

The list of report templates contains information about all the saved report templates. The table cannot be edited. The table can be sorted according to the selected column (columns **Name**, **Saved**, **Saved by**, **Comment**) in either ascending or descending order by clicking on the column title.

Name

Name of the report template.

Saved

Date and time when the report template was saved.

Saved by

Short name of the user who saved the report template.

Comment

Comment on the report template.

Window menus

The **[Edit]** menu beneath the list of report templates contains the following menu items:

Rename...	Rename the selected report template *(see chapter 4.4.1.1.2, page 223)*.
Copy	Copies the selected report template(s) *(see chapter 4.4.1.1.3, page 223)*.

Delete...	Deletes the selected report template(s) *(see chapter 4.4.1.1.4, page 223)*.
Export...	Export the selected report template(s) *(see chapter 4.4.1.1.5, page 223)*.
Import...	Import report template(s) *(see chapter 4.4.1.1.6, page 224)*.

4.4.1.1.2 Renaming report templates

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Manager... ▶ Report template manager ▶ [Edit] ▶ Rename... ▶ Rename report template**

The **[Edit] ▶ Rename...** menu item in the **Report template manager** window opens the **Rename report template** window for renaming the selected report template.

Rename report template 'Name' to

Entry of the new name for the report template.

Entry	**50 characters**

NOTICE

The name of the report template must be unique throughout the entire client/server system.

4.4.1.1.3 Copying report templates

Menu item: **Database ▶ Tools ▶ Report templates ▶ Manager... ▶ Report template manager ▶ [Edit] ▶ Copy**

The **[Edit] ▶ Copy** menu item in the **Report template manager** window copies the selected report templates under the name **Copy of 'Report template name'**.

4.4.1.1.4 Deleting report templates

Menu item: **Database ▶ Tools ▶ Report templates ▶ Manager... ▶ Report template manager ▶ [Edit] ▶ Delete...**

The **[Edit] ▶ Delete...** menu item in the **Report template manager** window deletes the selected report templates.

4.4.1.1.5 Exporting report templates

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Manager... ▶ Report template manager ▶ [Edit] ▶ Export... ▶ Select directory for export**

The **[Edit] ▶ Export...** menu item in the **Report template manager** window exports the selected report templates, each one into a file with the name **'Name'.vrep**. The **Select directory for export** dialog window opens, in which the directory for export must be selected.

4.4.1.1.6 Importing report templates

Dialog window: **Database ► Tools ► Report templates ► Manager... ► Report template manager ► [Edit] ► Import... ► Select files to import**

The **[Edit] ► Import...** menu item in the **Report template manager** window opens the **Select files to import** dialog window, in which the report templates to be imported must be selected. These report templates are then imported.

4.4.1.2 Creating new report templates

Menu item: **Database ► Tools ► Report templates ► New**

New form report

The **Report template - New form report** program window is opened with an empty report template (which can then be edited) with the **Tools ► Report templates ► New ► Form report...** menu item.

In the **form report**, the report section always includes the whole area between the header and the footer. This means that at least one page will always be output for each determination.

New tabular report

The **Report template - New tabular report** program window is opened with an empty report template (which can then be edited) with the **Tools ► Report templates ► New ► Tabular report...** menu item.

In the **tabular report**, the report section can be set with the mouse. For each data set, one such report section will be filled with data and placed row by row on the page. Tabular reports from several determinations can thus be created in this way.

4.4.1.3 Opening report templates

Dialog window: **Database ► Tools ► Report templates ► Open... ► Open report template**

The icon or the **Tools ► Report templates ► Open...** menu item is used to open the **Open report template** window, in which one of the globally available report templates can be selected and opened.

List of report templates

The list of report templates contains information about all the saved report templates. The table cannot be edited. The table can be sorted according to the selected column (columns **Name**, **Saved**, **Saved by**, **Comment**) in either ascending or descending order by clicking on the column title.

Name

Name of the report template.

Saved

Date and time when the report template was saved.

Saved by

Short name of the user who saved the report template.

Comment

Comment on the report template.

Open report template

Name

Name of the report template to be opened. If a report template is selected from the table, the name will be entered automatically in this field. It can, however, also be entered manually.

Entry	**50 characters**

[Open]

Opens the **Report template** program window, in which the selected report template is shown and can be edited.

4.4.1.4 Editing report templates

4.4.1.4.1 Report template - General

4.4.1.4.1.1 Report template - Overview

Program window: **Database ► Report template - 'Name'**

Which determination data and which other items (e.g. text fields, images, graphics elements) are to be output in a report is defined in report templates. The templates can be created or edited in their own program window and then saved globally under a unique name. They are used for the automatic output of reports in determinations or for manual report output from the database.

There are two basically different types of report templates:

- **Form report**
  In the form report, the report section always includes the whole area between the header and the footer. This means that at least one page will always be output for each determination.
- **Tabular report**
  In the tabular report, the report section can be set with the mouse. For each data set, one such report section will be filled with data and placed row by row on the page. Tabular reports from several determinations can thus be created in this way.

4.4.1.4.1.2 Report template - User interface

Program window: **Database ► Report template - 'Name'**

Elements

The user interface of the **Report template - 'Name'** program window comprises the following elements:

- *Menu bar*
- *General toolbar*
- *Module-specific toolbar*
- *Module bar*
- *Main window*

4.4.1.4.1.3 Report template - Menu bar

4.4.1.4.1.3.1 Report template - Main menu

Dialog window: **Database ► Tools ► Report templates ► Open... ► Open report template ► [Open] ► Report template - 'Name'**

The menu bar in the **Report template - 'Name'** dialog window contains the following main menu items:

- *File*
  Saving report templates, page setup, page preview, closing window.
- *Edit*
  Undoing, redoing, cutting, copying, pasting, deleting, entering comment.
- *View*
  Updating view, page navigation.
- *Insert*
  Inserting pages.
- *Tools*
  Options.
- *Help*
  Opening program help.

4.4.1.4.1.3.2 Report template - File menu

Dialog window: **Database ► Tools ► Report templates ► Open... ► Open report template ► [Open] ► Report template - 'Name' ► File**

Save	Saves the opened report template *(see chapter 4.4.1.4.2.11, page 239)*.
Save as...	Save the opened report template under a new name *(see chapter 4.4.1.4.2.11, page 239)*.
Page setup...	Set up the page settings for the report template *(see chapter 4.4.1.4.2.2, page 231)*.

Page preview	Page preview of the report template with the data of the selected determination *(see chapter 4.4.1.4.2.8, page 236)*.
Close	Closes the **Report template - 'Name'** program window.

4.4.1.4.1.3.3 Report template - Edit menu

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Open... ▶ Open report template ▶ [Open] ▶ Report template - 'Name' ▶ Edit**

Undo:	Undoes the last action.
Redo:	Redoes the undone action.
Cut	Cuts the highlighted items and copies them to the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
Copy	Copies the selected items to the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
Paste	Pastes the highlighted items from the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
Delete	Deletes the highlighted items *(see chapter 4.4.1.4.2.6, page 235)*.
Comment	Enters a comment on the report template *(see chapter 4.4.1.4.2.9, page 237)*.

4.4.1.4.1.3.4 Report template - View menu

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Open... ▶ Open report template ▶ [Open] ▶ Report template - 'Name' ▶ View**

Update	Updates the view.
First page	Shows the first page of the report template *(see chapter 4.4.1.4.2.4, page 234)*.
Previous page	Shows the previous page of the report template *(see chapter 4.4.1.4.2.4, page 234)*.
Next page	Shows the next page of the report template *(see chapter 4.4.1.4.2.4, page 234)*.
Last page	Shows the last page of the report template *(see chapter 4.4.1.4.2.4, page 234)*.

4.4.1.4.1.3.5 Report template - Insert menu

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Open... ▶ Open report template ▶ [Open] ▶ Report template - 'Name' ▶ Insert**

Page before	Inserts a new page before the page shown *(see chapter 4.4.1.4.2.4, page 234)*.
Page after	Inserts a new page after the page shown *(see chapter 4.4.1.4.2.4, page 234)*.

4.4.1.4.1.3.6 Report template - Tools menu

Dialog window: **Database ▶ Tools ▶ Report templates ▶ Open... ▶ Open report template ▶ [Open] ▶ Report template - 'Name' ▶ Tools**

Options...	Set options for the report template *(see chapter 4.4.1.4.2.10, page 238)*.

4.4.1.4.1.3.7 Report template - Help menu

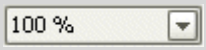
Dialog window: **Database ▶ Tools ▶ Report templates ▶ Open... ▶ Open report template ▶ [Open] ▶ Report template - 'Name' ▶ Help**

viva Help	Opens viva Help.

4.4.1.4.1.4 Report template - General toolbar

Program window: **Database ▶ Report template - 'Name'**

	Saves the opened report template *(see chapter 4.4.1.4.2.11, page 239)*.
	Page preview of the report template with the data of the selected determination *(see chapter 4.4.1.4.2.8, page 236)*.
	PDF file output of the report template with the data of the selected determination.
	Undoes the last action.
	Redoes the undone action.
	Cuts the highlighted items and copies them to the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
	Copies the selected items to the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
	Pastes the highlighted items from the clipboard *(see chapter 4.4.1.4.2.6, page 235)*.
	Deletes the highlighted items *(see chapter 4.4.1.4.2.6, page 235)*.

	Selection of the zoom level *(see chapter 4.4.1.4.2.7, page 236)*.
	Activates/deactivates the grid display *(see chapter 4.4.1.4.2.10, page 238)*.
	Activates/deactivates snapping to grid *(see chapter 4.4.1.4.2.10, page 238)*.

4.4.1.4.1.5 Report template - Module-specific toolbar

Program window: **Database ► Report template - 'Name'**

Depending on the module selected in the report template, other icons and input fields, with which the properties of these modules can be directly edited, are shown below the general toolbar *(see chapter 4.4.1.4.1.6, page 229)*.

4.4.1.4.1.6 Report template - Module bar

Program window: **Database ► Report template - 'Name'**

	If this option is enabled, then modules in the report template can be selected, reduced/enlarged and moved *(see chapter 4.4.1.4.2.6, page 235)*.
	If this option is enabled, then **text fields** can be inserted in the report template *(see chapter 4.4.1.4.3.1, page 240)*.
	If this option is enabled, then **data fields** can be inserted in the report template *(see chapter 4.4.1.4.3.2, page 241)*.
	If this option is enabled, then **date fields**, in which the actual date is entered, can be inserted in the report template *(see chapter 4.4.1.4.3.3, page 243)*.
	If this option is enabled, then **time fields**, in which the actual time is entered, can be inserted in the report template *(see chapter 4.4.1.4.3.4, page 245)*.
	If this option is enabled, then fields in which the **page number** is entered can be inserted in the report template *(see chapter 4.4.1.4.3.5, page 246)*.
	If this option is enabled, then fields in which the **number of pages** is entered can be inserted in the report template *(see chapter 4.4.1.4.3.6, page 248)*.
	If this option is enabled, then **fixed reports** can be inserted in the report template *(see chapter 4.4.1.4.3.7, page 250)*.

	If this option is enabled, then **group fields** can be inserted in the report template *(see chapter 4.4.1.4.3.8, page 251)*.
	If this option is enabled, then **result tables** can be inserted in the report template *(see chapter 4.4.1.4.3.9, page 252)*.
	If this option is enabled, then **images** can be inserted in the report template *(see chapter 4.4.1.4.3.10, page 254)*.
	If this option is enabled, then **lines** can be inserted in the report template *(see chapter 4.4.1.4.3.11, page 255)*.
	If this option is enabled, then **rectangles** can be inserted in the report template *(see chapter 4.4.1.4.3.12, page 257)*.
	If this option is enabled, then **curves** can be inserted in the report template *(see chapter 4.4.1.4.3.13, page 258)*.
	If this option is enabled, then **calibration curves** can be inserted in the report template *(see chapter 4.4.1.4.3.14, page 260)*.

4.4.1.4.2 Report template - Functions

4.4.1.4.2.1 Report template - Function overview

Program window: **Report template - 'Name'**

The following functions can be carried out in the **Report template - 'Name'** program window:

- *Page setup*
- *Defining sections in main window*
- *Inserting report pages*
- *Inserting a module*
- *Editing a module*
- *Zooming*
- *Showing the page preview*
- *Entering comments on report templates*
- *Defining options for report templates*
- *Saving a report template*

4.4.1.4.2.2 Report template - Page setup

Program window: **Report template - 'Name' ▶ File ▶ Page setup... ▶ Page setup**

The **File ▶ Page setup...** menu item in the **Report template - 'Name'** window opens the **Page setup** dialog window, in which the report format settings can be made.

General

only for form report

Settings

Selection	**Apply to current page** | **Apply to all pages**
Default value	**Apply to current page**

Apply to current page
The page settings are applied only to the currently selected report page.

Apply to all pages
The page settings are applied to all report pages.

Page format

Page format

Selection of the paper size. The width and height of the paper can be defined with **User-defined**.

Selection	**A4** | **Letter** | **Legal** | **User-defined**
Default value	**A4**

Width

Width of the paper size. This parameter can be edited only if **Page format** = **User-defined**.

Input range	**0.0 to 499.0 mm**
Default value	**210.0 mm**

Height

Height of the paper size. This parameter can be edited only if **Page format** = **User-defined**.

Input range	**0.0 to 499.0 mm**
Default value	**297.0 mm**

Orientation

Selection of the page layout.

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Page margins

Top

Upper page margin.

Input range	**0.0 to 499.0 mm**
Default value	**15.0 mm**

Bottom

Lower page margin.

Input range	**0.0 to 499.0 mm**
Default value	**15.0 mm**

Left

Left-hand page margin.

Input range	**0.0 to 499.0 mm**
Default value	**20.0 mm**

Right

Right-hand page margin.

Input range	**0.0 to 499.0 mm**
Default value	**20.0 mm**

Layout

Header

Height of the header.

Input range	**0.0 to 499.0 mm**
Default value	**15.0 mm**

Footer

Height of the footer.

Input range	**0.0 to 499.0 mm**
Default value	**15.0 mm**

Determination height

Height of the section for a single determination on a tabular report.

only for tabular report

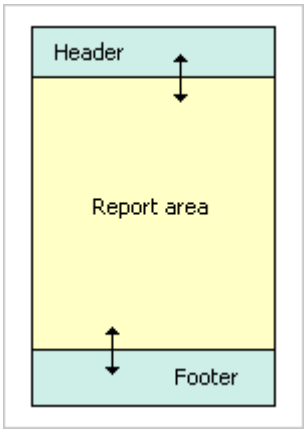
Input range	**0.0 to 499.0 mm**
Default value	**25.0 mm**

4.4.1.4.2.3 Report template - Defining sections

Program window: **Report template - 'Name'**

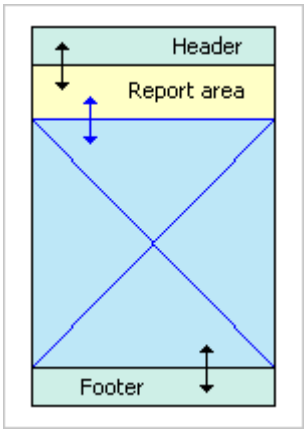
Defining sections for the form report

The header, footer and report sections can be enlarged or reduced with the left mouse button.



Defining sections for the tabular report

The header, footer and report sections can be enlarged or reduced with the left mouse button.



NOTICE

If a page break is to be prevented within the report section, then the height of the report section must be selected in such a way that there will be precisely the amount of space required for a whole-number multiple of report sections between the header and the footer.

4.4.1.4.2.4 Report template - Inserting pages

Menu item: **Report template - 'Name' ▶ Insert ▶ Page before / Page after**

Inserting page before

The **Insert ▶ Page before** menu item in the **Report template** program window is used to insert a new, empty report page before the report page shown.

Inserting page after

The **Insert ▶ Page after** menu item in the **Report template** program window is used to insert a new, empty report page after the report page shown.

Navigating

In report templates with several pages, the navigation bar can be used to switch to the required page.

Jump to first page.

Jump to previous page.

Jump to next page.

Jump to last page.

NOTICE

It is not possible to insert pages in templates for tabular reports.

4.4.1.4.2.5 Report template - Inserting modules

Program window: **Report template - 'Name'**

In order to insert a module into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button. The properties window for the corresponding module opens automatically afterwards.

Form report

The following modules can be inserted in a form report:

- **Header**
  Text, *data*, *date*, *time*, *page number*, *number of pages*, *image*, *line*, *rectangle*
- **Report section**
  Text, *data*, *date*, *time*, *fixed report*, *result table*, *image*, *line*, *rectangle*, *curve*, *calibration curve*, *group*
- **Footer**
  Text, *data*, *date*, *time*, *page number*, *number of pages*, *image*, *line*, *rectangle*

Tabular report

The following modules can be inserted in a tabular report:

- **Header**
  Text, *date*, *time*, *page number*, *number of pages*, *image*, *line*, *rectangle*
- **Report section**
  Text, *data*, *date*, *time*, *image*, *line*, *rectangle*, *curve*
- **Footer**
  Text, *date*, *time*, *page number*, *number of pages*, *image*, *line*, *rectangle*

4.4.1.4.2.6 Report template - Editing modules

Program window: **Report template - 'Name'**

Activating the selection

This icon in the module bar must be activated in order to be able to select modules in a report template for editing.

Selecting a single module

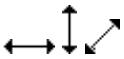
Single modules are selected with a left click. This automatically shows the corresponding properties of the module below the toolbar.

Selecting several modules

Several modules are selected by creating a frame around the required modules with the left mouse button.

Moving, reducing, enlarging modules

When this cursor icon appears, the selected modules can be moved about on the report template with the left mouse button pressed down.



When one of these cursor icons appears, the selected modules can be reduced or enlarged, respectively, on the report template with the left mouse button pressed down.

Cutting, copying, pasting, deleting modules

Cuts the selected modules and copies them to the clipboard.

Copies the selected modules to the clipboard.

Pastes modules from the clipboard.

Deletes selected modules.

Editing module properties

Opens the properties window for the selected module. Alternatively, the properties can also be edited directly below the toolbar.

4.4.1.4.2.7 Report template - Zooming

Program window: **Report template - 'Name'**

The required zoom factor for showing the report template can be selected in increments of **25%** from **25%** to **400%** with this list box on the toolbar.

4.4.1.4.2.8 Report template - Page preview

Preview window: **Report template - 'Name' ▶ File ▶ Page preview ▶ Report preview**

The icon or the **File ▶ Page preview** menu item in the **Report template - 'Name'** program window is used to open the **Report preview** window, in which a page preview of the report template is displayed with the data of the determinations selected in the determination overview.

Functions

Outputs the displayed report as a PDF file.

Select the required zoom factor for displaying the report preview; range **25%** to **400%** in increments of **25%**.

Selecting a determination

If several determinations have been selected for the report display, then the **Determination** navigation bar can be used to switch to the required determination.

Jump to first determination.

Jump to previous determination.

Jump to next determination.

Jump to last determination.

Selecting a report page

In reports with several pages, the **Page** navigation bar can be used to switch to the required page.

Jump to first page.

Jump to previous page.

Jump to next page.

Jump to last page.

4.4.1.4.2.9 Report template - Comment

Dialog window: **Report template - 'Name' ► Edit ► Comment ► Report template comment**

The **Report template comment** window, in which comments on the opened report template can be entered, is opened with the icon or the **Edit ► Comment** menu item in the **Report template - 'Name'** program window.

Report template comment

Comment on the report template shown in the list of report templates.

Entry	**1,000 characters**

4.4.1.4.2.10 Report template - Options

Dialog window: **Report template - 'Name' ► Tools ► Options... ► Options for report templates**

The **Options for report templates** dialog window, in which various settings for the report template can be defined, is opened with the **Tools ► Options...** menu item in the **Report template - 'Name'** program window.

Unit

Unit

Selection of the unit for the report templates.

Selection	**mm** | **cm** | **inch**
Default value	**mm**

Grid

X distance

Grid distance in x direction.

Input range	**1.0 to 100.0 mm**
Default value	**5.0 mm**

Y distance

Grid distance in y direction.

Input range	**1.0 to 100.0 mm**
Default value	**5.0 mm**

Display grid

on | off (Default value: **off**)

Activates/deactivates the grid display on the report template.

Snap at grid

on | off (Default value: **off**)

Activates/deactivates snapping to grid on the report template.

Default font

Font

Selection of the default font for the report templates.

Selection	**Arial** | **Windows fonts**
Default value	**Arial**

4.4.1.4.2.11 Report template - Saving

Dialog window: **Report template - 'Name' ► File ► Save / Save as... ► Save report template**

The icon or the **File ► Save** menu item is used to save an existing opened report template again under its own name without opening the **Save report template** window.

When saving a newly created report template with the **File ► Save** menu item or when saving an existing report template with the **File ► Save as...** menu item, the **Save report template** window, in which a name for the report template can be entered or selected, is opened.

List of report templates

The list of report templates contains information about all the saved report templates. The table cannot be edited. The table can be sorted according to the selected column in ascending or descending order by clicking on the column title (**Name**, **Saved**, **Saved by**, **Comment** column).

Name

Name of the report template.

Saved

Date and time when the report template was saved.

Saved by

Short name of the user who saved the report template.

Comment

Comment on the report template.

Saving the report template

Name

Entry of the name under which the report template is to be saved.

Entry	**50 characters**

NOTICE

The name of the report template must be unique throughout the entire client/server system.

[Save]

Saves the report template under the required name.

4.4.1.4.3 Report template - Modules

4.4.1.4.3.1 Report template - Text field

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

Text fields are used for outputting any texts in the report.

Inserting

In order to insert a text field into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Text field

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the text field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of the text field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Activates/deactivates line break for multi-line text fields.

Fills the field with dots.

Text

Text input for the text field.

4.4.1.4.3.2 Report template - Data field

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

Data fields are used for outputting determination data in a report.

Inserting

In order to insert a data field into a report template the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Data field

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of data field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of data field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Activates/deactivates the line break for multi-line data fields.

Fills the field with dots.

Prefix

Text placed before the contents of the data field.

Entry	**50 characters**

Data field

Shows path and name of selected data field (the field cannot be edited directly). opens a window for selecting the data field in which all the available fields for the determination overview are shown in tree-form. The path and name of the data field are entered with a double-click on the required field.

Suffix

Text placed after the contents of the data field.

Entry	**50 characters**

Preview

Shows a formatted example of text.

4.4.1.4.3.3 Report template - Date field

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

Date fields are used for outputting the current date in a report.

Inserting

In order to insert a date field into a report template the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Current date

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of date field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of date field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Fills the field with dots.

Prefix

Text placed before the contents of the date field.

Entry	**50 characters**

Suffix

Text placed after the contents of the date field.

Entry	**50 characters**

Preview

Shows the formatted date.

4.4.1.4.3.4 Report template - Time field

Program window: **Database ► Report template - 'Name'**

Time fields are used for outputting the actual time in the report.

Inserting

In order to insert a time field into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the time field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of time field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Fills the field with dots.

Prefix

Text placed before the contents of the time field.

Entry	**50 characters**

Suffix

Text placed after the contents of the time field.

Entry	**50 characters**

Preview

Shows the formatted time.

4.4.1.4.3.5 Report template - Page number

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

The actual page number in the report is output in a page number field.

Inserting

In order to insert a page number field into a report template, the corresponding icon must be selected on the module bar and then placed in the header or footer of the report template by creating a field with the left mouse button.

Properties - Page number

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the page number field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of the page number field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Fills the field with dots.

Prefix

Text placed before the contents of the page number field.

Entry	**50 characters**

Suffix

Text placed after the contents of the page number field.

Entry	**50 characters**

Preview

Shows the formatted page number.

4.4.1.4.3.6 Report template - Number of pages

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

This field shows the total number of pages in the report.

Inserting

In order to insert a number of pages field into a report template, the corresponding icon must be selected on the module bar and then placed in the header or footer of the report template by creating a field with the left mouse button.

Properties - Number of pages

X pos.

X position within the permitted range.

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the field.

Height

Height of the field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Bold.

Italic.

Underlined.

Left-justified.

Centered.

Right-justified.

Fills the field with dots.

Prefix

Text placed before the contents of the field.

Entry	**50 characters**

Suffix

Text placed after the contents of the field.

Entry	**50 characters**

Preview

Shows the formatted number of pages.

4.4.1.4.3.7 Report template - Fixed report

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

Fixed reports are used for outputting predefined partial reports of the determination in the report.

Inserting

In order to insert a fixed report into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Fixed report

X pos.

Shows the predefined X position for the fixed report.

Y pos.

Shows the Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Shows the predefined width of the fixed report.

Height

Height of the fixed report.

Input range	**0.0000 to (max. page height) mm**

Fixed report

Selection of a predefined fixed report.

Selection	**Evaluation parameters - General** | **Evaluation parameters - Calibration** | **Evaluation parameters - Results** | **Evaluation parameters - Standards** | **Evaluation parameters - Substances** | **User-defined results** | **Calibration data** | **Curves** | **Messages** | **Measuring parameters** | **Measuring point list** | **Method parameters** | **Results** | **Results overview** | **Variables** | **Used common variables** | **Used devices** | **Used global variables** | **Used solutions** | **Used sensors** | **Used colorimetric sensors**

NOTICE

Calibration data is shown only for the **CAL MEAS Opt** command. A **Measuring point list** can only be indicated for optical commands (**CAL Spec**, **CAL LOOP Opt** and **CAL MEAS Opt**). For a voltammetry command *(see chapter 5.5.2.10, page 582)*, the measuring point list has to be exported as an Excel file via an export template *(see page 268)*.

Command name

Entry of the name of the command for which data is to be output. If **not defined** is selected, the data for all curves present in the determination will be output by default.

This parameter appears only for **Fixed report** = **Calibration data**, **Curves** or **Measuring point list**.

Entry	**50 characters**
Selection	**not defined**
Default value	**not defined**

4.4.1.4.3.8 Report template - Group field

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

A group field is for the purpose of grouping together a variety of fields in the report template. All of the fields gathered together in a group field can be moved together as a group. The group field prevents a page break inside the group field.

The group field always extends across the entire width of a page; only the upper edge (Y value) and the height of the field can be configured.

NOTICE

The following fields, which do not permit page break controls, cannot be inserted into a group field:

- Fixed report
- Result table
- Curve
- Calibration curve/Calibration data

Inserting

In order to insert a group field into a report template the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Group field

X pos.

Shows the predefined X position for the field.

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Shows the predefined width of the field.

Height

Height of the field

Input range	**0.0000 to (max. page height) mm**

4.4.1.4.3.9 Report template - Result table

Program window: **Database ▶ Tools ▶ Report templates ▶ New/Open... ▶ Form report... ▶ Result table**

Result tables are used to output determination results in table form in the report.

Inserting

In order to insert a result table into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Result table field

X pos.

Shows the predefined X position for the field.

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Shows the predefined width of the field.

Height

Height of the field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Curve results

Option for displaying a table with curve results (area, height, peak potential, etc.).

Substance results

Option for displaying a table with substance results of a measuring command. These are results that occur only once per substance.

Measuring command

Selection list with all voltammetry commands with data acquisition defined in the method.

Substance

Selection list with all electroactive species identified with the selected measuring command in the sample.

Available results

Shows all curve results or substance results that can be displayed as columns in the result table.

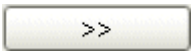
Displayed results

Result

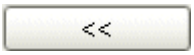
Shows all curve results or substance results that are displayed as columns in the result table.

Number of decimals

Number of decimal places for displaying the result.



Adds the selected column to the table.



Removes the selected column from the table.

Changes the sequence of displayed columns by moving the selected column up.

Changes the sequence of displayed columns by moving the selected column down.

4.4.1.4.3.10 Report template - Image

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

An image field is used for entering any external graphics on the report template. The file formats ***.jpg** and ***.gif** are supported.

Inserting

In order to insert an image into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Graphics field

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Image width.

Input range	**0.0000 to (max. page width) mm**

Height

Image height.

Input range	**0.0000 to (max. page height) mm**

Graphics file

Shows path and name of the selected graphics file (the field cannot be edited directly). [...] opens a window for selecting the graphics file. The path and name of the graphics file are then entered.

Size

Definition of how the graph is to be displayed.

Selection	**original** | **proportional** | **non-proportional**
Default value	**original**

original
Original size.

proportional
Proportional enlargement or reduction in size.

non-proportional
Non-proportional enlargement or reduction in size.

4.4.1.4.3.11 Report template - Line

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

Any line can be inserted in the report template.

Inserting

In order to insert a line into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Length

Length of the line.

Input range	**0.0 to (max. page width) mm**

Angle

Angle of the line.

Input range	**0.00 to 360.00 °**

Thickness

Thickness of the line.

Input range	**0.1 to 10.0 mm**
Default value	**0.5 mm**

Selection of the line color.

Selection of the type of line.

4.4.1.4.3.12 Report template - Rectangle

Program window: **Database ► Tools ► Report templates ► New ► Form report... ► Report template - New form report**

Any rectangle can be inserted in the report template.

Inserting

In order to insert a rectangle into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Rectangle

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the rectangle.

Input range	**0.0000 to (max. page width) mm**

Height

Height of the rectangle.

Input range	**0.0000 to (max. page height) mm**

Thickness

Thickness of the line for the rectangle.

Input range	**0.1 to 10.0 mm**
Default value	**0.5 mm**

Selection of the line color.

Selection of the type of line for the rectangle.

Activates/deactivates the fill color.

Selection of the fill color.

4.4.1.4.3.13 Report template - Curve field

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

Curve fields are used to output determination curves in the report.

Inserting

In order to insert a curve into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Curve field

NOTICE

The properties are saved individually for each curve field. It is thus possible to display e.g. several different curves for the same measuring command in several curve fields next to each other.

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the curve field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of the curve field.

Input range	**0.0000 to (max. page height) mm**

Command type

Selection of the command type for which a curve is to be output.

Selection	**CVS** | **CPVS** | **CP** | **LSV** | **DP** | **SQW** | **CV** | **MEAS Ref** | **MEAS Spec** | **MEAS Opt** | **CAL Spec** | **MEAS TMF** | **MEAS T**
Default value	**CVS**

Command name

Entry of the command name for which the curve is to be output. If **not defined** is selected, all curves present in the determination will be output with the selected **Command type**.

NOTICE

In addition to the command name, the index also has to be specified in the format **.#** (e.g. **Chloride.1**).

Selection	**not defined** | **50 characters**
Default value	**not defined**

Autoscaling

on | off (Default value: **on**)

If this check box is activated, all axes in the curve window are scaled automatically. In this case, the **Start value** and **End value** fields cannot be edited.

Tabs for voltammetry commands

Additional properties for the curve field can be set on the following tabs:

- *x-axis*
  Parameters for the graphical curve display on the x-axis.
- *y1-axis*
  Parameters for the graphical curve display on the y1-axis (left-hand y-axis).
- *y2-axis*
  Parameters for the graphical curve display on the y2-axis (right-hand y-axis).
- *Options*
  Options for the graphical curve display.

Tabs for measuring commands

Additional properties for the curve field can be set on the following tabs:

- *x-axis*
  Parameters for the graphical curve display on the x-axis.

- *y1-axis*
  Parameters for the graphical curve display on the y1-axis (left-hand y-axis).
- *y2-axis*
  Parameters for the graphical curve display on the y2-axis (right-hand y-axis).
- *Options*
  Options for the graphical curve display.
- *Measuring point list*
  Parameters for the display of the measuring point list.

4.4.1.4.3.14 Report template - Calibration curve field

Program window: **Database ▶ Tools ▶ Report templates ▶ New ▶ Form report... ▶ Report template - New form report**

Calibration curve fields are used for outputting calibration curves in the report.

Inserting

In order to insert a calibration curve field into a report template, the corresponding icon must be selected on the module bar and then placed on the report template by creating a field with the left mouse button.

Properties - Calibration curve field

X pos.

X position within the permitted range.

Input range	**0.0000 to (max. page width) mm**

Y pos.

Y position within the permitted range.

Input range	**0.0000 to (max. page height) mm**

Width

Width of the calibration curve field.

Input range	**0.0000 to (max. page width) mm**

Height

Height of the calibration curve field.

Input range	**0.0000 to (max. page height) mm**

Selection of the available Windows fonts.

Font size in pt.

Color selection.

Command name

Entry of the command name for which the calibration curve is to be output. If **All** is selected, the first calibration curve present in the determination will be output with the selected **command name** by default.

Selection	**All** | **40 characters**
Default value	**All**

All
The calibration curves are output for all command names.

Substance

Entry of the name of the substance for which the calibration curve is to be output.

Selection	**All** | **40 characters**
Default value	**All**

All
The calibration curves are output for all substances.

Curve view

Selection	**Default settings** | **User-defined**
Default value	**Default settings**

Default settings
The curve is displayed with the properties that are stored in the database (with the exception of the background color, which is always white). The tabs for configuring the display are disabled.

User-defined
The display of the curve in the report can be configured by the user.

Show grid

Show grid

on | off (Default value: **off**)

Activates/deactivates the grid display on the report template.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

4.4.2 Control chart templates

4.4.2.1 Managing control chart templates

Dialog window: **Database ► Tools ► Templates ► Control chart templates... ► Control chart templates**

The **Tools ► Templates ► Control chart templates...** menu item opens the **Control chart templates** dialog window, in which the globally available control chart templates can be managed.

Template table

The table with the defined templates cannot be edited, but it can be sorted according to the selected column in ascending or descending order by clicking on the column title.

Template name

Shows the name of the template.

Result

Shows the result for which the template can be used.

Comment

Shows the comments about the template.

Functions

[New]

Creates a new template. The **Properties - Control chart - 'Name'** dialog window opens, in which the properties for the new template can be defined.

[Properties]

Opens the **Properties - Control chart - 'Name'** dialog window, in which the properties of the template selected in the table can be edited.

[Delete]

Delete template.

[Copy]

Copies the template and saves it under the name **Copy of…**.

4.4.2.2 Editing control chart templates

4.4.2.2.1 Control chart template - Properties

Dialog window: **Database ▶ Tools ▶ Templates ▶ Control chart templates... ▶ Control chart templates ▶ [Properties] ▶ Properties - Control chart - 'Name'**

Template name

Name under which the control chart template is saved per client in the configuration database.

Entry	**50 characters**

Tabs

The properties of a control chart template can be set on the following tabs:

- *Graphics parameters*
  Parameters for the graphical display of the control chart.
- *Limit values*
  Definition of warning and intervention limits for the control chart.
- *Statistics*
  Shows the statistics data for the control chart.
- *Comment*
  Entry of a comment on the template.

4.4.2.2.2 Control chart template - Graphics parameters

Tab: **Database ▶ Tools ▶ Templates ▶ Control chart templates... ▶ Control chart templates ▶ [Properties] ▶ Properties - Control chart - 'Name' ▶ Graphical settings**

Parameters for the graphical display of the control chart.

x Axis

X value

Selection of the value to be shown on the x-axis.

Selection	**Determination number** | **Date/Time**
Default value	**Determination number**

Label

Freely definable axis label for the x-axis.

Entry	**25 characters**
Default value	**Number**

y Axis

Result

Selection of the result column whose value is to be displayed on the y-axis.

Selection	**RS01** | **RS02** | **RS03** | **RS04** | **RS05** | **RS06** | **RS07** | **RS08** | **RS09** | **RS10** | **RS11** | **RS12** | **RS13** | **RS14** | **RS15** | **RS16** | **RS17** | **RS18** | **RS19** | **RS20** | **RS21** | **RS22** | **RS23** | **RS24** | **RS25**
Default value	**RS01**

Label

Freely definable axis label for the y-axis.

Entry	**25 characters**
Default value	**Result**

Background

Background color

Selection of the background color for the control chart.

Selection	**Color selection** | **white**
Default value	**white**

Measured values

Shape

Selection of the symbol for the display of the measured values.

Selection	**Symbol selection** | •
Default value	•

Color

Selection of the color for the measuring point symbol.

Selection	**Color selection** | **blue**
Default value	**blue**

Link measured values

on | off (Default value: **off**)

If this check box is activated, then the measured value points will be joined by a line.

4.4.2.2.3 Control chart template - Limit values

Tab: **Database ► Tools ► Templates ► Control chart templates... ► Control chart templates ► [Properties] ► Properties - Control chart - 'Name' ► Limit values**

Definition of warning and intervention limits to be shown on the control chart.

Warning limits

Warning limits are displayed in **orange** on the control chart.

Lower limit

Lower warning limit.

Entry	**10 digits**
Input range	**-1.0E8 to 1.0E8 (max. 10 digits)**

Upper limit

Upper warning limit.

Entry	**10 digits**
Input range	**-1.0E8 to 1.0E8 (max. 10 digits)**

Intervention limits

Intervention limits are displayed in **red** on the control chart.

Lower limit

Lower intervention limit.

Entry	**10 digits**
Input range	**-1.0E8 to 1.0E8 (max. 10 digits)**

Upper limit

Upper intervention limit.

Entry	**10 digits**
Input range	**-1.0E8 to 1.0E8 (max. 10 digits)**

4.4.2.2.4 Control chart template - Statistics

Tab: **Database ► Tools ► Templates ► Control chart templates... ► Control chart templates ► [Properties] ► Properties - Control chart - 'Name' ► Statistics**

Definition of the display of statistics data on the control chart.

Show statistics data

on | off (Default value: **on**)

If this control chart is activated, then the statistics data for **mean value**, **standard deviation**, **number of measuring points** and **minimum and maximum value** will be shown underneath the graph display.

Draw in mean value

on | off (Default value: **on**)

If this check box is activated, then the **Mean value** will be shown on the control chart as a continuous line in the color of the measured values.

Draw in standard deviation

on | off (Default value: **on**)

If this check box is activated, then the two values **Mean value + absolute standard deviation** and **Mean value - absolute standard deviation** will be shown on the control chart as dotted lines in the color of the measured value.

4.4.2.2.5 Control chart template - Comment

Tab: **Database ► Tools ► Templates ► Control chart templates... ► Control chart templates ► [Properties] ► Properties - Control chart - 'Name' ► Comment**

Entry of a comment on the control chart template.

Comment

Comment on the control chart.

Entry	**1000 characters**

4.4.3 Export templates

4.4.3.1 Managing export templates

Dialog window: **Database ► Tools ► Templates ► Export templates... ► Export templates**

The **Tools ► Templates ► Export templates...** menu item opens the **Export templates** dialog window, in which the globally available templates for the manual or automatic export of determination data can be managed.

Template table

The table with the defined templates cannot be edited, but it can be sorted according to the selected column in ascending or descending order by clicking on the column title.

Name

Shows the name of the export template.

File type

Shows the file format of the export template for data export.

Comment

Shows the comment on the export template.

Functions

[New]

Create a new export template. The **Export template 'New file'** dialog window, in which the properties for the new template can be defined, opens.

[Properties]

Opens the **Export template 'Name'** dialog window, in which the properties of the template selected in the table can be edited.

[Delete]

Deletes the selected export template.

[Copy]

Copies the selected export template and saves it under the name **Copy of...**.

4.4.3.2 Editing export templates

4.4.3.2.1 Export template - Properties

Dialog window: **Database ► Tools ► Templates ► Export templates... ► Export templates ► [Properties] ► Export template 'Name'**

[Properties] opens the **Export template 'Name'** dialog window, in which the properties of the selected export template can be edited.

Name

Name of the export template.

Entry	**50 characters**

Comment

Freely definable comment on the export template.

Entry	**250 characters**

Target directory

Selection of the path for the directory in which the export file is saved (with).

Entry	**1,000 characters**

File type

Selection of the file format for data export:

Selection	***.vdet (viva format)** | ***.csv (Comma Separated)** | ***.slk (SLK format)** | ***.xml (XML format)** | ***.csv (Measuring point list)**
Default value	***.vdet (viva format)**

***.vdet (viva format)**
Program-specific data exchange format that can only be imported into other **viva** databases.

***.csv (Comma Separated)**
Data exchange format with unformatted text that can be imported into other PC programs (e.g. Excel, Access).

***.slk (SLK format)**
Data exchange format with formatted text that can be imported into other PC programs (e.g. Excel).

***.xml (XML format)**
Data exchange format with XML code that can be imported into corresponding PC programs.

***.csv (Measuring point list)**
Data exchange format for the measuring point list with unformatted text that can be imported into corresponding PC programs. The text file contains a document header with date/time of the determination and the determination ID. This is followed by the measuring point lists of the individual commands. The command name is listed first for each measuring point, followed by a header with the designations and the units of the measured values of the command. This is followed by the list of measuring points, each measuring point is listed in a separate line and consists of a time indication and all measured values generated by the command.

[Select fields]

Opens the **Select fields** dialog window, in which the required fields for the export can be selected, arranged in the required sequence and renamed.

NOTICE

Field selection is only possible for the file types ***.csv** and ***.slk**. With ***.vdet** and ***.xml**, all fields will always be exported.

[Options]

Opens the **Options** dialog window, in which the separators can be defined.

NOTICE

The options can only be set for the ***.csv (Comma Separated)** and ***.csv (Measuring point list)** file types.

File name

One of the following options can be selected for the definition of the name of the export file:

Selection	**Determination ID** | **Sample identification** | **Request on each export** | **Fixed file name (append data)**
Default value	**Determination ID**

Determination ID
If this option is selected, then the name of the export file will be formed from the unique **Determination ID**, the **computer name**, the date stamp **-YYYYMMDD-HHMMSS** and the suffix for the format.

Sample identification
If this option is selected, then the name of the export file will be formed from the selected sample identification **ID1 - ID16**, the **computer name**, the date stamp **-YYYYMMDD-HHMMSS** and the suffix for the format. If the generated name already exists in the directory, then a version number will be additionally appended to the date.

Request on each export
If this option is selected, then the name of the export file will be requested at each export. In addition to the entered name, the **Computer name** and the date stamp **-YYYYMMDD-HHMMSS** will be added automatically.

Fixed file name (append data)
If this option is selected, then the name of the export file will be formed from the name entered here and the suffix for the format. If the file is already present in the directory, then the data will be appended to this file.

NOTICE

The **Fixed file name (append data)** option can only be selected for the ***.csv (Comma Separated)** or ***.slk (SLK format)** file type.

4.4.3.2.2 Export template - Selecting fields

Dialog window: **Database ▶ Tools ▶ Templates ▶ Export templates... ▶ Export templates ▶ [Properties] ▶ Export template 'Name' ▶ [Select fields] ▶ Select fields**

[Select fields] in the properties window for export templates opens the **Select fields** dialog window, in which the fields for the data export can be selected for the ***.csv** and ***.slk** data types.

Available fields

Shows all the fields that can be exported.

Selected fields

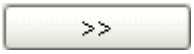
Shows all the fields that will be exported.

Default name

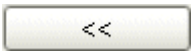
Non-editable name of the field to be exported.

Displayed name

Field name editable by the user for the exported field. The **Default name** is entered as default. If the field name is deleted, then the **Default name** will appear again.



Adds the selected field.



Removes the selected field.

Changes the sequence of the exported fields by moving the selected field upwards.

Changes the sequence of the exported fields by moving the selected field downwards.

4.4.3.2.3 Export template - Options for CSV format

Dialog window: **Database ▶ Tools ▶ Templates ▶ Export templates... ▶ Export templates ▶ [Properties] ▶ Export template 'Name' ▶ [Options] ▶ Options for CSV format**

The **Options for CSV format** dialog window, in which separators can be defined, is opened with **[Options]** in the properties window for export templates.

Field separator

Selection of the field separator.

Selection	**;** | **,** | **TAB**
Default value	**;**

Record separator

Selection of the data set separator (**CR** = Carriage return, **LF** = Line feed).

Selection	**CR/LF** | **CR** | **LF**
Default value	**CR/LF**

Header

on | off (Default value: **on**)

If this check box is activated, the column headers are output at the beginning of the export file.

4.4.3.2.4 Export template - Options for measuring point list

Dialog window: **Database ▶ Tools ▶ Templates ▶ Export templates... ▶ Export templates ▶ [Properties] ▶ Export template 'Name' ▶ [Options] ▶ Options for measuring point list**

The **Options for measuring point list** dialog window, in which separators can be defined, is opened with **[Options]** in the properties window for export templates.

Field separator

Selection of the field separator.

Selection	**;** | **,** | **TAB**
Default value	**;**

4.4.3.2.5 Export template - Request at file export

Dialog window: **Database ▶ Tools ▶ Templates ▶ Export templates... ▶ Export templates ▶ [Properties] ▶ Export template 'Name'**

If the **Request on each export** option has been selected in the properties of the export template under **File name** *(see chapter 4.4.3.2.1, page 267)*, then the **File export** dialog is displayed before the export of a determination. If several determinations have been marked for export, then this dialog will be displayed for each individual determination.

Target directory

Shows the target directory for the export file, which has been defined in the properties of the export template used *(see chapter 4.4.3.2.1, page 267)*.

File name

Entry of the name under which the export file is to be saved in the **Target directory**. Both the user name and the current time stamp are automatically appended to the name entered when the file is created.

[OK]

The corresponding determination will be exported to the indicated file.

[Cancel]

The export of *the corresponding determination* is canceled. If several determinations have been marked for export, then the **File export** dialog will be displayed afterwards for the next determination.

[Cancel all]

The export of *all selected determinations* is canceled.

4.4.3.3 XML export

XML export

General

An XML export file with all determination data can be created by using an XML report template for the export of determinations.

Structure

An XML export file is constructed as follows:

<?xml version="1.0" encoding="ISO-8859-1" ?>	
–<DeterminationReport>	Determination report
<xmlCreator val=""/>	Program name
<xmlCreatorVersion val=""/>	Program version

<xmlCreatorBuildNo val=""/>	Build number
<subtype val=""/>	
+ <Determination>	Determination data
+ <Method>	Method data
+ <Sample>	Sample data
+ <Results dynamic="">	Results overview
+ <ResultaSingle="">	Single results
+ <Command Data dynamic="">	Command variables
+ <Comvars dynamic="">	Common variables
+ <Globalvars dynamic="">	Global variables
+ <usedDevices dynamic="">	Device data
+ <usedSensors dynamic="">	Sensor data
+ <Colorreagents dynamic="">	Data of colorimetric sensors
+ <Method params dynamic="">	Method parameters
+ <Statistics>	Statistical data
–<System>	System data
<userName val="" />	User name (short name)
<userNameFull val="" />	User name (full name)
<clientName val="" />	Client ID
<progVersion val="" />	Program version - Build number
<licenseRoot val="" />	License code
</System>	
</DeterminationReport>	

NOTICE

dynamic= means that the following nodes can appear more than once.

The actual data is set between **" "**.

4.5 Determination overview

4.5.1 Determination overview - General

4.5.1.1 Determination overview - Overview

Subwindow: **Database ► Determination overview**

General

The **Determination overview** subwindow displays selected data in tabular form for the determinations contained in the open database. It is always displayed in the **Database** program part, i.e., it cannot be removed from the database view. The subwindow can be enlarged and reduced as required; it can also be maximized.

Elements

The **Determination overview** subwindow includes the following elements:

- *Determination table*
- *Filter selection*
- *Navigation bar*

4.5.1.2 Determination overview - Table

Subwindow: **Database ► Determination overview**

Data display

The information defined in the **Column display** regarding the determinations is displayed in the determination table. If the content of a field is larger than the column width, then the entire content will be shown as a **tooltip** if the mouse cursor hovers over the field.

Updating

As long as the **Database** program part remains open, changes in the determination table that are caused by ongoing determinations or by other users (adding, changing or deleting data sets) are not displayed automatically. The table must either be updated or resorted or filtered with **View ► Update**. The determination table is refreshed automatically every time a switch is made from a different program part to the **Database** program part.

Table view

Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**
  Sets the column width.

- **Double-clicking on the margin between column titles**
  Sets the optimal column width.
- **Dragging the column title**
  Moves the column to the required location.

Data record selection and table navigation

The determinations selected in the table are displayed in **blue**; the focused determination, whose data is displayed in the other subwindows, is marked with an arrow before the line number. There are various possibilities for record selection in the table.

In the determination table it is not possible to show more than 200 determinations at once. If more than 200 records are present in the database, then the Navigation bar must be used to switch to further sets of determinations.

4.5.1.3 Determination overview - Column display

Dialog window: **Database ► View ► Properties ► Column display... ► Column display**

The **Column display** dialog window is opened with **View ► Properties ► Column display...**. Here you can define the columns that are to be shown in the determination table.

Columns available

Shows all the fields that can be shown as columns in the determination table.

Columns displayed

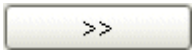
Shows all the fields that will be shown as columns in the determination table.

Default name

Non-editable name of the field that is displayed as a column.

Displayed name

Editable name (by double-click) of the column displayed in the determination overview.



Adds the selected column to the table.

Removes the selected column from the table.

Changes the sequence of the displayed columns by moving the selected column upwards.

Changes the sequence of the displayed columns by moving the selected column downwards.

4.5.1.4 Determination overview - Filter selection

Subwindow: **Database ► Determination overview**

Filter

Selection of the filter with which the determination table is to be filtered:

Selection	**All determinations** | **Quick filter** | **Temporary filter** | **'Filter name'**
Default value	**All determinations**

All determinations
The table is shown unfiltered.

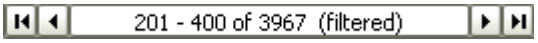
Quick filter
The table is filtered according to the most recently defined **Quick filter**.

Temporary filter
The table is filtered according to the **Special filter** that was most recently defined but not yet saved.

'Filter name'
The table is filtered according to the selected and saved **Special filter**.

4.5.1.5 Determination overview - Navigation bar

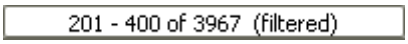
Subwindow: **Database ► Determination overview**



The navigation bar shown below the determination table is used for navigation in extensive tables in which all the determinations can no longer be displayed simultaneously. It contains the following elements:

Jump to the first set of determinations in the table.

Switches back to the previous set of determinations in the table.



Shows the selected set of **#### - ####** determinations in the table. If the table is not filtered, then the total number of all determinations will also be shown. If the table is filtered, then the total number of filtered determinations will appear with the additional information **(filtered)**.

Moves to the next set of determinations in the table.

Jump to the last set of determinations in the table.

4.5.1.6 Determination overview - Table navigation

Subwindow: **Database ▶ Determination overview**

The vertical and the horizontal scroll bars can be used to navigate in the determination table with the mouse. In addition, the following options are available with the keyboard:

[↑]

Moves the line cursor up by one field.

[↓]

Moves the line cursor down by one field.

[Ctrl] [End]

Jump to the last determination in the current set.

[Ctrl] [Home]

Jump to the first determination in the current set.

[Page Up]

Scrolls backward within the current set.

[Page Down]

Scrolls forward within the current set.

[Alt] [End]

Jump to last determination (of all).

[Alt] [Home]

Jump to first determination (of all).

[Alt] [←]

Jump to first record of previous set.

[Alt] [→]

Jump to first record of next set.

It is not possible to show more than 200 determinations at once in the determination table. If more than 200 determinations are present in the database then the navigation bar must be used to switch to further sets of determinations.

4.5.1.7 Determination overview - Data set selection

Subwindow: **Database ▶ Determination overview**

The determinations selected in the table are displayed in **blue**; the focused determination, whose data is displayed in the other subwindows, is marked with an arrow before the line number. The first determination is always selected and focused when a database is opened.

The following possibilities are available for the selection of determinations in the determination table:

- **Single determinations**
  Single determinations are selected by clicking on them with the mouse within the line (including line number). This determination, whose data is shown in the other opened subwindows, is now focused and marked with an arrow in front of the line number.
- **Several determinations in sequence**
  In order to select several determinations in sequence, the required range can be selected with the left mouse button pressed down. It is also possible to select a range by clicking on the first determination and **holding [Shift] while clicking** on the last determination. The last determination to be selected receives the focus.
- **Several determinations not in sequence**
  In order to select several determinations not in sequence, the individual determinations must be selected by left-clicking on them while holding down the **Ctrl key**. The last determination to be selected receives the focus.
- **All determinations**
  With **[Ctrl] [A]** or by clicking on the uppermost left-hand table cell, all the filtered determinations within the current set of determinations are selected. The focus is retained.

4.5.1.8 Determination overview - Functions

Subwindow: **Database ▶ Determination overview**

The following functions can be carried out with the determinations selected in the determination table:

Editing determinations

- *Updating the determination overview*
- *Entering a determination comment*

- *Sending determinations to*
- *Exporting determinations*
- *Importing determinations*
- *Reprocessing determinations*
- *Deleting determinations*

Searching and filtering determinations

- *Searching determinations*
- *Filtering determinations*

Other functions

- *Displaying a determination method*
- *Displaying the determination history*
- *Determinations - Displaying calibration curve*
- *Determinations - Displaying control chart*
- *Printing a control chart*
- *Printing a determination overview*
- *Printing a determination report*

4.5.2 Determination overview - Functions

4.5.2.1 Updating the determination overview

Menu item: **Database ▶ View ▶ Update**

The **View ▶ Update** menu item or the icon is used to update the determination table.

NOTICE

The determination table is refreshed automatically when the database is opened and when changing from another program part to the **Database** program part, but afterwards only when resorting or refiltering is carried out.

4.5.2.2 Determination comment

Dialog window: **Database ▶ Determinations ▶ Comment... ▶ Determination comment**

The **Determinations ▶ Comment...** menu item or the icon opens the **Determination comment** dialog window, in which new comments on the selected determination can be entered or an existing comment can be edited.

Comments entered in this way appear automatically as a tooltip text when the cursor hovers over the number field of a line in the determination table for more than one second. It is additionally displayed in the **Information** subwindow.

4.5.2.3 Searching for determinations

Dialog window: **Database ► Determinations ► Search... ► Search - Database 'Name'**

The **Determinations ► Search...** menu item or the icon opens the **Search - Database 'Name'** dialog window for the search for determinations.

Search in

Selection of the data field in which the search is to be carried out.

Selection	**All fields** | **'Field name'**

All fields
A search is made in all fields of the database.

'Field name'
A search is made only in the selected field. The 10 most recently selected fields are always available for selection.

[More...]

Opens the **Search - Field selection** dialog window, in which all fields that can be used for searching are displayed in the form of a tree. A field can be included in the search by highlighting it and closing the dialog window with **[OK]**.

Search options

Type

Selection of the type of format for fields in which several types are possible. Only this type will be shown for fields with a fixed type.

Selection	**Text** | **Number** | **Date**
Default value	**Text**

Operator

Selection of the comparison operator for the search criterion.

for fields of the type = text

Selection	**=** | **<>** | **empty** | **not empty**
Default value	**=**

for fields of the type = number

Selection	**=** | **<>** | **<** | **<=** | **>** | **>=** | **empty** | **not empty** | **invalid** | **out of limits**
Default value	**=**

invalid
Values with the entry **invalid** are searched for.

out of limits
Values that are outside of the defined limit values for the selected fields will be searched for (values shown in red).

for fields of the type = date

Selection	**=** | **<>** | **<** | **<=** | **>** | **>=** | **empty** | **not empty** | **invalid** | **out of limits** | **Today**
Default value	**=**

invalid
Values with the entry **invalid** are searched for.

out of limits
Values that are outside of the defined limit values for the selected fields will be searched for (values shown in red).

Today
A search is made for the current date. A range in days can also be defined in the **Search term** field if the search should be carried out within to this range, starting from the current date.

Search word

Entry of the search term for the search in the selected data field. For fields where **Type** = **Date**, the date can be selected by pressing on **[...]** in the **Select date** dialog window.

for fields of the type = text

Entry	**256 characters** Definition of a text expression as a search term. The last 10 search terms are saved and can be selected. The following wildcards can be used in the search term:
Selection	**^?** | **^#** | **^$** | **^***

^?
Wildcard for any character.

^#
Wildcard for any digit.

^$
Wildcard for any letter of the alphabet.

^*
Wildcard for any character string.

for fields of the type = number

Entry	**all possible numerical values** Definition of a numerical value as search term. The last 10 search terms are saved and can be selected.

for fields of the type = date

Entry	**all possible date values** Definition of a date as search term. The last 10 search terms are saved and can be selected.

for fields of the type = date and operator = today

Input range	**-9,999 to 9,999**
Default value	**0** Definition of a numerical value as a range in days in which, starting from the current date, the search is to be carried out. The last 10 search terms are saved and can be selected.

Search direction

Selection of the search direction.

Selection	**All** | **Down** | **Up**
Default value	**All**

All
A search will be made down to the end of the database and then again from the top down to the selected data set.

Down
A search will be made to the end of the database.

Up
A search will be made to the beginning of the database.

Match case

on | off (Default value: **off**)

If this option is enabled, then upper/lower case will be differentiated when searching in fields of the **Text** type.

Search for whole word only

on | off (Default value: **off**)

If this option is enabled, then the field contents must be identical with the search term during searches in **Text** fields (no part-search).

[Search next]

Search until next occurrence of the search term.

4.5.2.4 Filtering determinations

4.5.2.4.1 Filtering determinations - Overview

Subwindow: **Database ▶ Determination overview**

The following possibilities exist for filtering determinations in the determination table:

- *Filter selection in the filter bar*
- *Last filter*
- *Quick filter*
- *Special filter*
- *Remove filter*

4.5.2.4.2 Determinations - Last filter

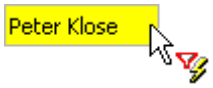
Menu item: **Database ▶ Determinations ▶ Filter ▶ Last filter**

The most recently applied filter is reactivated with the **Determinations ▶ Filter ▶ Last filter** menu item or with the icon.

4.5.2.4.3 Determinations - Quick filter

Menu item: **Database ▶ Determinations ▶ Filter ▶ Quick filter**

A rapid filtration can be carried out in accordance with the content of the selected table field using the **Determinations ▶ Filter ▶ Quick filter** menu item or the icon. After this function has been selected, the field in the determination table in which the cursor is located will have a colored background during navigation. At the same time, the following special filter icon appears:



Double-clicking with the left mouse button on the field selected in the table will cause its contents to be set as the filter criterion, and this filter will be applied directly to the table.

NOTICE

The quick filter can be applied again within the filtered table, so that the number of entries can be limited step by step.

4.5.2.4.4 Determinations - Special filter

Dialog window: **Database ► Determinations ► Filter ► Special filter... ► Special filter - Database 'Name'**

The **Determinations ► Filter ► Special filter...** menu item or the icon is used to open the **Special filter - Database 'Name'** dialog window for the definition of user-specific filters.

Filter

Selection of the filter to be loaded for editing.

Selection	**'Filter name'** | **New filter**
Default value	**New filter**

'Filter name'
The saved filter is loaded.

New filter
An empty table with the name **New filter** is loaded.

[Save filter]

Opens the **Save filter** dialog window, in which the filter conditions entered in the table can be saved as a special filter under the required name.

[Delete filter]

The currently loaded special filter is deleted.

Table view

The overview table shows all the defined filter criteria and cannot be directly edited. The filter criteria will be numbered automatically in sequence. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**
  Sets the column width
- **Double-clicking on the margin between column titles**
  Sets the optimal column width

If the content of a field is larger than the column width, then the entire content will be shown as a **tooltip** if the mouse cursor hovers over the field.

For the meaning of the columns, *see Editing filter criterion*.

Functions

The **[Edit]** menu beneath the filter table contains the following menu items:

Edit line	Opens the **Edit filter criterion** dialog window, in which the filter condition of the line selected in the table can be edited *(see chapter 4.5.2.4.7, page 286)*.
Insert new line	Inserts a new, empty line above the line selected in the table. The **Edit filter criterion** dialog window then opens automatically *(see chapter 4.5.2.4.7, page 286)*.
Cut lines	Transfers the selected lines to the clipboard.
Copy lines	Copies the selected lines to the clipboard.
Paste lines	Pastes lines from the clipboard above the selected line.
Delete lines	Deletes the selected lines.

[Apply filter]

Applies filter criteria to the determination table.

4.5.2.4.5 Determinations - Deleting a filter

Menu item: **Database ► Determinations ► Filter ► Remove filter**

The **Determinations ► Filter ► Remove filter** menu item or the icon is used to delete the most recently used filter, and all determinations will be displayed.

4.5.2.4.6 Determinations - Saving a filter

Dialog window: **Database ► Determinations ► Filter ► Special filter... ► Special filter - Database 'Name' ► [Save filter] ► Save filter**

The **[Save filter]** button is used to open the **Save filter** dialog window for saving a special filter.

All the saved special filters are shown in the upper field.

Filter name

Name under which the special filter is to be saved.

Entry	**50 characters**

[Save]

Saves the filter under the given name.

NOTICE

The filters are saved globally in the configuration database and are therefore available for all clients.

4.5.2.4.7 Determinations - Editing the filter criterion

Dialog window: **Database ► Determinations ► Filter ► Special filter... ► Special filter - Database 'Name' ► [Edit] ► Edit line ► Edit filter criterion 'Name'**

[Edit] ► Edit line is used to open the **Edit filter criterion 'Name'** dialog window, in which the filter criterion selected in the filter table can be edited.

Link

Selection of the type of link (logical operator) with the preceding filter criterion.

Selection	**AND** | **OR**
Default value	**AND**

AND
Logical "AND" link.

OR
Logical "OR" link.

Field

Selection of the data field for which a criterion is to be formulated.

Selection	**'Field name'** Filtering is carried out only for the selected field. The 10 most recently selected fields are always available for selection.

[More...]

Opens the **Filter - Field selection** dialog window, in which all fields that can be used for filtration are listed in the form of a tree. A field can be included by highlighting it and closing the dialog window with **[OK]**.

Condition

Type

Selection of the type of format for fields in which several types are possible. Only this type will be shown for fields with a fixed type.

Selection	**Text** | **Number** | **Date**
Default value	**Text**

Operator

Selection of the comparison operator for the filter criterion.

for fields of the type = text

Selection	**=** | **<>** | **empty** | **not empty**
Default value	**=**

for fields of the type = number

Selection	**=** | **<>** | **<** | **<=** | **>** | **>=** | **empty** | **not empty** | **invalid** | **out of limits**
Default value	**=**

invalid
Values with the **invalid** entry are filtered for.

out of limits
Values that are outside of the limit values defined for the selected fields will be filtered for (values shown in red).

for fields of the type = date

Selection	**=** | **<>** | **<** | **<=** | **>** | **>=** | **empty** | **not empty** | **invalid** | **out of limits** | **Today**
Default value	**=**

Today
A search is made for the current date. A range in days can also be defined in the **Comparative value** field, according to which filtration should be carried out, starting from the current date.

Comparative value

Selection or entry of the comparative value for the filter criterion. For fields where **Type** = **Date**, the date can be selected by pressing on **[...]** in the **Select date** dialog window.

for fields of the type = text

Entry	**256 characters** Definition of a text expression as comparative value. ***** can be used as a wildcard for any character string if the **Use asterisk (*) as wildcard** option is enabled.

for fields of the type = number

Entry	**all possible numerical values** Definition of a numerical value as comparative value.

for fields of the type = date

Entry	**all possible date values** Definition of a date as comparative value.

for fields of the type = date and operator = today	
Input range	**-9,999 to 9,999**
Default value	**0** Definition of a numerical value as a range in days in which, starting from the current date, filtering is to be carried out.

Match case

on | off (Default value: **off**)

If this option is enabled, then upper/lower case will be differentiated when filtering fields of the **Text** type.

Use asterisk (*) as wildcard

on | off (Default value: **off**)

If this option is activated, then the asterisk ***** is used as a wildcard for any character strings when filtering fields of the **Text** type.

4.5.2.5 Determinations - Reprocessing

4.5.2.5.1 Reprocessing - General

Dialog window: **Reprocess**

Reprocessing determinations

The determinations saved in the database can be reprocessed at any time. When doing so, you can change variables and evaluations and recalculate the results. The reprocessed determination can then be saved in the database as a new version.

Opening the reprocessing window

Determinations that have been selected in the **Determination overview** subwindow are reprocessed in the separate **Reprocess** dialog window, which is opened with **Determinations ► Reprocess...** or the icon. When the window is opened, the first of the selected determinations is always shown by default.

Closing the reprocessing window

The **Reprocess** dialog window is closed with **[OK]**, **[Cancel]** or the Close Window button.

NOTICE

The reprocessing window cannot be closed while the recalculation process is still running.

4.5.2.5.2 Reprocessing - Window

Dialog window: **Reprocess**

Subwindows

The **Reprocess** dialog window contains the following two subwindows, which can be enlarged and reduced by dragging the separating bar between them:

- *Modifications*
  Changing methods and variables.
- *Result view*
  Displaying the current results.

Status display

Reprocessing with history

Versioning status display of recalculated determinations *(see "Reprocessing with history", page 819)*.

Functions

If determinations have been modified in the **Modifications** subwindow, then the following functions can be triggered:

[Recalculate]

Recalculates the selected determination(s) with the modifications made to the method or variables in the **Modifications** subwindow.

A progress bar is shown during recalculation. Recalculation can be canceled with next to the bar. The results of this recalculation are automatically entered in the **Result view** subwindow.

This button is disabled as long as no modifications have been made. After recalculation, further data can be modified and recalculation triggered again.

[Reset]

Resets all modifications that were made but not yet saved during reprocessing to the original data and results.

This button is inactive for as long as no modifications have been made or recalculation has not been triggered.

[OK]

Closes the **Reprocess** dialog window. Each determination that has been modified by reprocessing will be saved as a new version with a version number increased by **+1**.

This button is disabled for as long as recalculation has not been triggered and if not all the selected determinations were able to be recalculated.

[Cancel] or

Closes the **Reprocess** dialog window. The result of the reprocessing made since the last saving will not be saved.

Reprocessing with history

Versioning behavior of reprocessed determinations.

Selection	**On** | **Off**
Default value	**Off**

On
A new version is created and saved each time a determination is reprocessed.

Off
The version number is increased with each reprocessing of a determination, but only two versions are stored in the database (the first, original version and the latest, reprocessed version). In the case of already reprocessed determinations, the version that was last saved is deleted and a new version is created.

4.5.2.5.3 Recalculation rules

Dialog window: **Reprocess**

The following rules apply for recalculating the selected and modified determinations:

- **Number of determinations**
  No more than 10 determinations may be selected for recalculation.
- **Start test**
  During the start test all device tests and device monitoring will be ignored.
- **Special tracks**
  Series start track, series end track and error tracks are not run through during recalculation.
- **Tracks with "Return immediately"**
  If the method contains tracks with the option **Return immediately** enabled, then a warning will appear, because it can no longer be guaranteed that during recalculation the method will run in the same way as during the determination.
- **Monitoring**
  If the method contains monitoring of variables, then the corresponding messages will be displayed and included in the report, but no e-mails will be sent and no beep will be produced. If one of the two actions **Cancel determination** or **Cancel determination and series** is activated, then recalculation will be canceled.

- **Voltammetry commands and measuring commands**
  For voltammetry and measuring commands that can be evaluated, only the evaluations for which data is present will be recalculated. All other parameters will be ignored.
- **Conditional CALL commands**
  In the case of a conditional CALL command, the track that was run through originally will always be called.
- **Waiting times and timeout times**
  All waiting times and timeout times of commands are set to **0** for recalculation.
- **Non-executed commands**
  The commands **REQUEST**, **WAIT**, **RECEIVE**, **SEND**, **TRANSFER**, **STIR**, **SCAN**, **CTRL**, **MOVE**, **SWING**, **LIFT**, **PUMP**, **RACK**, **HEATER**, **ADD AUX**, **ADD STD**, **ADD SAMPLE**, **ADD SAMPLE DT**, **LQH**, **PREP** and **EMPTY** are run through but no longer executed.
  Modified volumes for manual addition in **ADD** commands are now applied during recalculation.
- **Reports**
  The reports defined in the method are generated, but the defined output targets are ignored. A report can only be correctly generated during reprocessing if the defined report template has already been used in the regular determination run. If the required report template is not present in the original determination, a message entry is made, the report is skipped and reprocessing is continued.

- **Recalculating determinations with calibration method DT, RC or External calibration**
  - Determinations of the sample type **Sample** can be recalculated with a calibration. However, the determinations and the calibration must have been carried out with the same method. The method version may differ.
  - In order for the current calibration data to be used, **viva** automatically recalculates the determination of the sample type **Standard** first after the determinations have been selected.
  - In order for determinations of the sample type **Sample** to be reprocessed with a new, recalculated calibration, the selection of determinations may contain only **one** determination of the sample type **Standard**.
  - If a determination of the sample type **Standard** has been recalculated, then a prompt will appear asking whether the recalculated calibration data is to be saved and used for calculating the substance concentration(s) in future determinations.
    If you click on **[Yes]**, the calibration data of the recalculated standard solution will be used for calculating the substance concentration(s) in future determinations of the sample type **Sample**.
    If you click on **[No]**, the calibration data of the recalculated standard solution will not be made available for future determinations of the sample type **Sample**.
  - Determinations of the sample type **Sample** can be recalculated without requiring a determination of the sample type **Standard** to be selected. In this case, the original calibration data will be used.

- **Recalculating determinations with calibration method LAT**
  - Determinations of the sample type **Sample** can be recalculated with various intercept determinations. However, the sample determinations and the intercept determinations must have been carried out with the same method. The method version may differ.
  - In order for the current intercept values to be used, **viva** automatically recalculates the determination of the sample type **Intercept** first after sample and intercept selection.
  - In order for determinations of the sample type **Sample** to be reprocessed with a new, recalculated intercept determination, the selection of determinations may contain only **one** determination of the sample type **Intercept** and no more than **nine** determinations of the sample type **Sample**.
  - If a determination of the sample type **Intercept** has been recalculated, then a prompt will appear asking whether the recalculated calibration data is to be saved and used for calculating the substance concentration(s) in future determinations.
    If you click on **[Yes]**, the recalculated intercept value will be used for calculating the substance concentration(s) in future determinations of the sample type **Sample**.
    If you click on **[No]**, the recalculated intercept value will not be made available for future determinations of the sample type **Sample**.
  - Determinations of the sample type **Sample** can be recalculated without requiring a determination of the sample type **Intercept** to be selected. In this case, the original intercept values will be used.

4.5.2.5.4 Selection of baseline parameters

Dialog window: **Reprocess ▶ Recalculate**

Selection of baseline parameters

If the newly defined baseline parameters in the method and in the table of the measurement curve are different, then the user can click on the **Recalculate** button to select the baseline parameters that should be applied for recalculation.

Selection	**Baseline parameters of each single determination** | **Baseline parameters of the currently selected determination** | **Baseline parameters of the method**
Default value	**Baseline parameters of each single determination**

Baseline parameters of each single determination
The baseline parameters of the corresponding individual tables in the voltammetry commands curve display are applied for each determination opened for reprocessing.

Baseline parameters of the currently selected determination
The baseline parameters of the currently displayed determination are applied for each of the determinations opened for reprocessing.

Baseline parameters of the method
The baseline parameters from the method settings of the currently displayed method are applied for each of the determinations opened for reprocessing.

4.5.2.5.5 Modifications

4.5.2.5.5.1 Modifications - Overview

Subwindow: **Database ▶ Determination overview ▶ Determinations ▶ Reprocess... ▶ Reprocessing ▶ Modifications**

Modifications can be made on the following tabs in the **Modifications** subwindow of the **Reprocessing** dialog window:

- *Method*
  Modification of the method used in the selected determination.
- *Variables*
  Modification of the variables used in the selected determination.

4.5.2.5.5.2 Modifications - Method

Tab: **Database ▶ Determination overview ▶ Determinations ▶ Reprocess... ▶ Reprocess ▶ Modifications ▶ Method**

The method used in the determination is displayed with the two subwindows **Method run** and **Evaluation** on the **Method** tab.

NOTICE

The **Method** tab is only active if the methods used for the selected determinations are identical (method name, method version and method status must match).

Method name:

Shows the method name.

Version:

Shows the method version. For original methods, the additional text **(original)** is displayed after the version number. As soon as the method has been modified, the additional text **(modified)** is displayed after the

version number. This information is saved in the determination data when the recalculated determination is saved.

Saved:

Shows the date and time when the method version was saved.

[Save as]

Save the modified method under the same name or under a new name. If the modified method is saved under the name of an existing method, then all earlier method versions will be deleted and a new version with the number **1** will be generated.

[Modify method]

Opens the **Method editor** dialog window with the two subwindows **Method run** and **Evaluation**. In the **Method run** subwindow, you can change special parameters of existing commands but not insert or delete commands and tracks. Special evaluation parameters can be changed in the **Evaluation** subwindow.

If the **Method editor** dialog window is closed with **[OK]**, the method is checked *(see chapter 5.2.5, page 398)*. Afterwards, the modified method is displayed on the **Method** tab with the addition **(modified)**. This modified method is applied to the selected determinations with **[Recalculate]** and can be saved at any time with **[Save as]**.

4.5.2.5.5.3 Modifications - Variables

Tab: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocess ► Modifications ► Variables**

The variables used in the determination can be modified on the **Variables** tab.

Variable table

The variable table shows those variables used that are present in all the selected determinations and cannot be edited directly. The table can be sorted according to the selected column in ascending or descending order by clicking on the column title (columns **Variables**, **Value**).

Variable

Shows the name of the variable. The sample data variables defined in the **START** command (**SD.'Name'**) as well as all common variables (**CV.'Name'**) and global variables (**GV.'Name'**) used in the method are displayed.

Value

Shows the value of the variable. If a fixed value is defined for a variable, the value is displayed in *italics*.

[Modify]

Opens the **Modify variable** dialog window for modifying the value of an existing variable *(see chapter 4.5.2.5.5.4, page 296)*.

NOTICE

If a variable is modified, then all selected determinations will be recalculated with the new value by clicking on **[Recalculate]**. If a variable is not modified, then the original variable values will be used when several determinations are recalculated (i.e., variables with the same name but different values will not be overwritten until they are deliberately modified).

4.5.2.5.5.4 Modifying a variable

Dialog window: **Reprocess ▶ Modifications ▶ Variables ▶ [Modify] ▶ Modify variable**

The value of the selected variable is modified in the **Modify variable** dialog window.

Variable

Shows the name of the variable.

Value

Value of the variable. For variables of the type **Date/Time**, the date has to be entered in the *(see chapter 2.4.1, page 81)* dialog window.

Input range	**-1.0 E+99 to 1.0 E+99 (max. 15 digits)** (for **Type** = **Number**)
Entry	**100 characters** (for **Type** = **Text**)
Selection	**'Date'** (for **Type** = **Date/Time**)

4.5.2.5.6 Result view

The results defined in the method and calculated in the determination as well as the variables used for this are displayed and updated with each recalculation in the **Result view** subwindow of the **Reprocess** dialog window.

4.5.2.5.6.1 Result view - General

Subwindow: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocessing ► Result view**

Tabs

The results and curves of a determination are displayed on the following tabs:

- *Curves*
  Shows the measurement curves and calibration curves.
- *Results overview*
  Overview of all automatically generated and user-defined results.
- *Results*
  Details on the automatically generated results for each voltammetry command and each defined substance.
- *User-defined results*
  Details on the user-defined results.

Navigation

If several determinations are selected for reprocessing then the navigation buttons can be used to switch between the result view of the individual determinations:

Jump to the first determination.

Jump to the previous determination.

Jump to the next determination.

Jump to the last determination.

4.5.2.5.6.2 Result view - Curves

Subwindow: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocessing ► Curves**

The curves of the selected determination are displayed on the **Curves** tab. A tab with the corresponding command name is provided for each run of a measuring command; their sequence is determined by the method.

4.5.2.5.6.2.1 Voltammetry commands curve display

Tabs

In the curve window, a tab with the corresponding command name is provided for each run of a voltammetry command. Their sequence is determined by the method. The upper part of these tabs shows the recorded voltammograms or calibration curves and the lower part contains information on the individual measurement curves. The icons serve to maximize either the upper or the lower part to the size of the entire curve window or reset it again.

An icon representing the type of displayed curves is located next to the title of the tab. You can toggle between the types by clicking on this icon.

- Shows the measurement curve *(see chapter 4.6.1.2.1, page 338)*.
- Shows the calibration curve *(see chapter 4.6.1.2.2, page 343)*.

4.5.2.5.6.2.1.1 Measurement curve

Tab: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocess ► Result view ► Curves**

Displaying the measurement curve

The following elements are displayed in the upper part of the curve window:

- Axes with labeling (measured quantity and unit)
- Measuring point curves
- Peak label with substance name
- Baselines
- Base points

Zoom

Curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows curves completely.
Properties...	Opens the **Properties - Reprocess curves** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies curves to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Table of measurement curves

A list of the measurement curves recorded is shown in the table below the curve display. It contains the following columns:

CALL

Name of the **CALL** command that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Baseline type

Approximated baseline used to evaluate the detected peaks.

Start base point

Value of the base point, where the baseline of the peak evaluation begins.

End base point

Value of the base point, where the baseline of the peak evaluation ends.

Area / Height / Measured value

Peak areas, peak heights or measured values of all replications of a CALL COND command *(see chapter 5.5.2.2.7.2, page 430)*.

Area RSD / Height RSD / Measured value RSD

Relative standard deviation of the peak areas / peak heights / measured values of the last 2 runs of a CALL COND command *(see chapter 5.5.2.2.7.2, page 430)*.

Display

on | off (Default value: **on**)

Indicates whether a measurement curve is displayed in the curve window or not.

The parameters Area, Height or Measured value and Relative standard deviation of the area, the height or the measured value are only displayed in the table if a method contains the **CALL COND** command and the **Evaluation quantity** stop criterion is enabled.

Edit menu

The table cannot be edited directly but only via the following context-sensitive menu items:

Selection on	The check box in the **Display** column for the selected measurement curve is activated.
Selection off	The check box in the **Display** column for the selected measurement curve is deactivated.
Only selection on	The check boxes in the **Display** column are activated for the selected measurement curves, but deactivated for the not selected measurement curves.
All on	All check boxes in the **Display** column are activated.
All off	All check boxes in the **Display** column are deactivated.
Invert selection	The settings in the **Display** column for the selected measurement curves are inverted.
Highlight selection on/off	The selected measurement curves are highlighted.
Baseline parameters ►	
Properties...	Define the baseline properties.
Apply for all replications of the selected variations	Apply the defined baseline parameters for all replications of the selected variations.
Apply for all curves	Apply the defined baseline parameters for all curves.

NOTICE

Baseline parameters:

- Apply for all replications of the selected variations
- Apply for all curves

If several rows are selected in the table, then the parameters of the row marked with a black arrow will be applied.

This applies for the manual base point determination only. For the automatic base point determination, the base points are reset to automatically determined values during recalculation.

4.5.2.5.6.2.1.2 Calibration curve

Tab: **Database ▶ Determination overview ▶ Determinations ▶ Reprocess... ▶ Reprocess ▶ Result view ▶ Curves**

Calibration curve display

The following elements are displayed in the upper left-hand part of the curve window:

- Axes with labeling (measured quantity and unit)
- Calibration points of the standard addition or the calibration curve
- Calculated calibration function
- Evaluation ratio (line) for calibration method **DT**
- Effective addition volume (numerical value) for calibration method **DT**
- Substance concentration in the measuring vessel (only for sample type **Sample**)

Zoom

Calibration curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete calibration curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows the calibration curve completely.
Properties...	Opens the **Properties - Reprocess curves** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies the calibration curve to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Calibration results

The calibration results are displayed in the upper right-hand part of the curve window:

Concentration

Concentration

Substance concentration in the sample.

ASD

Absolute standard deviation of the substance concentration in the sample.

RSD

Relative standard deviation of the substance concentration in the sample.

Regression data

Function

Function that was applied for the calculation of the calibration curve.

R^2

Coefficient of determination calculated from the calibration function.

Evaluation quantity

Evaluation quantity (area, height or measured value) used for the evaluation.

Curve type

Curve type used for the calculation of the calibration function.

Weighting

Indicates whether the weighting **1/evaluation quantity²** was used.

Calibration data

Calibration factor

Concentration of the standard solution in the measuring vessel for the evaluation ratio (only for calibration method **DT**).

Intercept value

The intercept value is the charge that is obtained from the measurement of the intercept solution *(see glossary, page 1064)* (only for calibration method **LAT**).

Electrolyte value

The electrolyte value is the charge obtained from the measurement of the electrolyte solution *(see glossary, page 1060)* (only for calibration method **RC**).

Date

Date on which the calibration was carried out.

Determination ID

Determination ID of calibration.

Calibration curve table

The table below the calibration curve shows a list of the calibration points recorded. It contains the following columns:

CALL

Name of the **CALL** command that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Peak potential

Peak potential determined.

Area

Peak area determined (for **Evaluation quantity** = **Area**).

Height

Peak height determined (for **Evaluation quantity** = **Height**).

Measured value

Current value determined (for **Evaluation quantity** = **Measured value**).

Used

on | off (Default value: **on**)

Shows whether a calibration point is to be used for the calculation of the calibration curve or not.

Context-sensitive menu items for table

The table cannot be edited directly but only via the following context-sensitive menu items:

Selection on	The check box in the **Used** column for the selected calibration point is activated.
Selection off	The check box in the **Used** column for the selected calibration point is deactivated.
Only selection on	The check boxes in the **Used** column are activated for the selected calibration points, but deactivated for the not selected calibration points.
All on	All check boxes in the **Used** column are activated.
All off	All check boxes in the **Used** column are deactivated.
Invert selection	The settings in the **Used** column for the selected calibration points are inverted.
Highlight selection on/off	The selected calibration points are highlighted.

Functions

The **[Edit]** menu beneath the table contains the following menu items:

Selection on	The check box in the **Used** column for the selected calibration point is activated.
Selection off	The check box in the **Used** column for the selected calibration point is deactivated.
Only selection on	The check boxes in the **Used** column are activated for the selected calibration points, but deactivated for the not selected calibration points.
All on	All check boxes in the **Used** column are activated.
All off	All check boxes in the **Used** column are deactivated.
Invert selection	The settings in the **Used** column for the selected calibration points are inverted.
Highlight selection on/off	The selected calibration points are highlighted.

4.5.2.5.6.2.2 Measuring commands curve display

Tabs

In the curve window a tab with the corresponding command name and the run index (e.g. **Chloride.1**) is provided for each run of a measuring command; their sequence is determined by the method.

Curve display for measuring commands

The following elements are displayed in the upper part of the curve window:

- Axes with labeling (measured quantity and unit)
- Measurement curves

Zoom

Curves can be **zoomed** within the curve display as often as required by spanning a square with the left mouse button pressed down. Zooming can be undone by double-clicking or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items

Show all	Resets the zoom and shows curves completely.
Measuring point list...	Opens the **Measuring point list - 'Command name.#'** dialog window *(see chapter 4.5.2.5.6.2.3, page 305)*.
Properties Curves #...	Opens the **Properties - Reprocess curves** dialog window to define the properties of the curve display *(see chapter 3.9.2.3, page 190)*.
Copy graphics	Copies curves to the clipboard.

4.5.2.5.6.2.3 Curves - Measuring point list

Subwindow: **Database ► Curves #**

The context-sensitive **Measuring point list...** menu item in the curve window opens the **Measuring point list - 'Command name.#'** dialog window for displaying the measuring point list of the selected curve.

The display of the measuring points in the table can be defined per window and per command type *(see chapter 3.9.2.3.5, page 197)*.

NOTICE

No measuring point lists can be displayed for curves that have been generated with a voltammetry command *(see chapter 5.5.2.10.1, page 582)*.

4.5.2.5.6.2.4 Curve properties

4.5.2.5.6.2.4.1 Curve properties - General parameters

Dialog window: **Database / Workplace ► Curves # ► Properties Curves #**

Command type

Shows the command type for which the curve properties are to be defined.

4.5.2.5.6.2.4.2 Curve properties voltammetry command

Curve properties voltammetry command - x Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► x Axis**

Parameters for the graphical curve display on the x-axis.

Quantity

Selection of the quantity to be shown on the x-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Potential [V]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Potential [V]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Time [s]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Time [s]**

Label

Freely definable axis label for the x-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the x-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the x-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the x-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the x-axis. It is displayed on the left in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the x-axis. It is displayed on the right in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve properties voltammetry command - y1 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical curve display on the y1-axis (left-hand y-axis).

Quantity

Selection of the quantity to be shown on the y1-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Current [A]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Potential [V]**

Label

Freely definable axis label for the y1-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y1-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y1-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y1-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y1-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y1-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Curve properties voltammetry command - y2 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2-axis (right-hand y-axis).

Quantity

Selection of the quantity to be shown on the y2-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity** | **off**
Default value	**off**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y2-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y2-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y2-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y2-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the y2-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y2-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ╳ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Curve properties voltammetry command - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical curve display.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

4.5.2.5.6.2.4.3 Curve properties measuring commands

Curve properties measuring commands - x axis

Tab: **Database ► Curves # ► Properties Curves # ► x Axis**

Parameters for the graphical display of the curves on the x axis.

Quantity

Selection of the quantity to be shown on the x axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Time [s]**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Time**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Time [s]**

Label

Freely definable axis label for the x axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve properties measuring commands - y1 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical display of the curves on the y1 axis (left-hand y axis).

Quantity

Selection of the quantity to be shown on the y1 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Absorbance [mAU]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Measured value**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Temperature**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Measured value [mAU]**

Label

Freely definable axis label for the y1 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✸ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Smoothing

on | off (Default value: **off**)

Activates/deactivates smoothing for the curves.

Smoothing factor x axis

Factor for smoothing in the direction of the x axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Smoothing factor y axis

Factor for smoothing in the direction of the y axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Also show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve (solid line, same color) will be shown in addition to the smoothed curve (dotted line).

Curve properties measuring commands - y2 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2 axis (right-hand y axis).

Quantity

Selection of the quantity to be shown on the y2 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**off**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**off**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T

Selection	**13 colors** | **magenta**
Default value	**magenta**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T

Selection	**13 colors** | **magenta**
Default value	**magenta**

Curve properties measuring commands - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical display of curves.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

Show end points

on | off (Default value: **off**)

If this check box is activated, then the endpoints found will be shown on the curve with the ♦ symbol and labeled with **BP#** (break point), **FP#** (fixed point), **MI** (minimum value) or **MA** (maximum value).

Automatic EPs

Selection of the color for automatically set endpoints.

Selection	**13 colors** | **black**
Default value	**black**

Show evaluation lines

on | off (Default value: **off**)

If this check box is activated, then the evaluation lines (tangents, auxiliary lines) will be shown.

Tangents

Selection of the color for the tangent lines and evaluation lines.

Selection	**13 colors** | **light green**
Default value	**light green**

Auxiliary lines

Selection of the color for the auxiliary lines.

Selection	**13 colors** | **blue**
Default value	**blue**

Curve properties measuring commands - Measuring point list

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Measuring point list**

Parameters for the display of the measuring point list.

Available columns

Shows all fields that can be displayed as columns in the measuring point list. The display depends on the command type.

Displayed columns

Shows all fields that will be displayed as columns in the measuring point list.

>>

Adds the selected column to the measuring point list.

<<

Removes the selected column from the measuring point list.

Changes the sequence of displayed columns by moving the selected column up and down.

4.5.2.5.6.3 Result view - Results overview

Tab: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocess ► Result view ► Results overview**

All automatically generated results for each voltammetry command and each defined substance as well as all user-defined results are listed on the **Results overview** tab. Details on the automatically generated results are displayed on the **Results** tab *(see chapter 4.8.3, page 378)* and details on the user-defined results on the **User-defined results** *(see chapter 4.8.4, page 379)* tab.

Results for MLAT

For **Calibration method** = **MLAT** and **Sample type** = **Sample**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Concentration

Substance concentration in the sample.

'Command name','Substance name'.Concentration.ASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Concentration.RSD

Relative standard deviation of the substance concentration in the sample.

No results will be shown for **Calibration method** = **MLAT** and **Sample type** = **Intercept**.

Results for DT

For **Calibration method** = **DT** and **Sample type** = **Sample**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Concentration

Substance concentration in the sample.

'Command name','Substance name'.Concentration.ASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Concentration.RSD

Relative standard deviation of the substance concentration in the sample.

For **Calibration method** = **DT** and **Sample type** = **Standard**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Calibration factor

Substance concentration in the sample.

'Command name','Substance name'.Calibration factorASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Calibration factorRSD

Relative standard deviation of the substance concentration in the sample.

Results for RC

For **Calibration method** = **RC** and **Sample type** = **Sample**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Concentration

Substance concentration in the sample.

'Command name','Substance name'.Concentration.ASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Concentration.RSD

Relative standard deviation of the substance concentration in the sample.

The calibration data is stored in the database.

Results for LAT

For **Calibration method** = **LAT** and **Sample type** = **Sample**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Concentration

Substance concentration in the sample.

'Command name','Substance name'.Concentration.ASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Concentration.RSD

Relative standard deviation of the substance concentration in the sample.

For **Calibration method** = **LAT** and **Sample type** = **Intercept**, the following results will be displayed for each voltammetry command and each substance:

'Command name','Substance name'.Calibration factor

Substance concentration in the sample.

'Command name','Substance name'.Calibration factorASD

Absolute standard deviation of the substance concentration in the sample.

'Command name','Substance name'.Calibration factorRSD

Relative standard deviation of the substance concentration in the sample.

User-defined results

Depending on the result type, the following information will be displayed:

'Result name'

User-defined single result *(see "Result type", page 733)*.

'Command name'.'Substance name','Result name'

User-defined multiple result *(see "Result type", page 733)*.

4.5.2.5.6.4 Result view - Results

Tab: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocess ► Result view ► Results**

The following information will be displayed on the **Results** tab for each automatically generated result:

Result

Result designation, rounded result value and result unit.

Assignment

Assignment of the result to a result column **RS1–. RS25**.

Result variable

Designation of the result variables.

Exact value

Result value with full accuracy.

4.5.2.5.6.5 Result view - User-defined results

Tab: **Database ► Determination overview ► Determinations ► Reprocess... ► Reprocess ► Result view ► User-defined results**

The following information will be displayed on the **User-defined results** tab for each user-defined result:

Result

Result designation, rounded result value and result unit.

Assignment

Assignment of the result to a result column **RS1–. RS25**.

Formula

Formula for the calculation of the result.

Variables used

List of all variables (with variable name and value) used in the formula.

4.5.2.6 Sending determinations to

Dialog window: **Database ► Determinations ► Send to... ► Send determinations by e-mail**

The **Send determinations by e-mail** dialog window opens with the **Determinations ► Send to...** menu item.

File name

Selection of how the file name is to be formed for sending.

Selection	**Determination ID** | **Sample identification** | **File name**
Default value	**Determination ID**

Determination ID
The name of the export file is formed out of the unique determination ID, the computer name, the date stamp **"-YYYYMMDD-HHMMSS"** and the suffix for the format.

Sample identification
Selection of the sample data. The name of the export file is formed out of this ID, the computer name, the date stamp **"-YYYYMMDD-HHMMSS"** and the suffix for the format. If the generated name already exists in the directory, then a version number will be additionally appended to the date.

File name
Name under which the export file of a determination is to be saved as an attachment to the e-mail message. If more than one determination is selected, then a sequential number will be added to this name for each determination.

Sample identification

Only editable for **File name** = **Sample identification**, otherwise inactive.

Selection	**ID1** | **ID2** | **ID3** | **ID4** | **ID5** | **ID6** | **ID7** | **ID8** | **ID9** | **ID10** | **ID11** | **ID12** | **ID13** | **ID14** | **ID15** | **ID16**
Default value	**ID1**

Send with history

Option to select whether all versions or only the first and the last version of the determination(s) is to be sent.

Selection	**On** | **Off**
Default value	**Off**

On
If this option is selected, then all versions of the determination(s) will be sent.

Off
If this option is selected, then the first and the last version of the determination(s) will be sent.

After confirmation with **[OK]**, the default Windows e-mail client opens with an empty message and the export files of the selected determinations will be automatically added as an attachment in the ***.vdet** format.

4.5.2.7 Export determinations

Dialog window: **Database ▶ Determinations ▶ Export... ▶ Export determinations**

Click on the **Determinations ▶ Export...** menu item to open the **Export determinations** dialog window for exporting the selected determinations.

Selection

Selection of determinations for the export.

Selection	**All selected data records** | **All filtered data records**
Default value	**All selected data records**

All selected data records
All those determinations are exported that have been selected (highlighted) in the determination table.

All filtered data records
All the determinations from the determination table as a whole that correspond to the set filter are exported.

Export template

Selection of the export template for the data export.

Selection	**'Export template'**

Export with history

Option to select whether all versions or only the first and the last version of the determination(s) is to be exported.

Selection	**On** | **Off**
Default value	**Off**

On
If this option is selected, then all versions of the determination(s) will be exported.

Off
If this option is selected, then the first and the last version of the determination(s) will be exported.

4.5.2.8 Importing determinations

Dialog window: **Database ► Determinations ► Import... ► Import determinations**

The **Determinations ► Import...** menu item opens the **Import determinations** dialog window, in which the determinations to be imported must be selected. These determinations are then imported into the open database.

NOTICE

Exported determinations can be imported only in the ***.vdet** file format.

NOTICE

In the program directory under **...\viva\examples\determinations\...** you will find **example determinations** that can be imported into an opened database.

4.5.2.9 Deleting determinations

Menu item: **Database ▶ Determinations ▶ Delete**

The selected determinations are deleted after the prompt for confirmation with the icon or the **Determinations ▶ Delete** menu item.

NOTICE

If a database is opened simultaneously on several clients and if determinations are deleted on a client, then these will continue to be shown on the other clients in the determination table until the table is updated. All of the fields of these determinations will then have the entry **deleted**.

4.5.2.10 Printing a determination overview

Dialog window: **Database ▶ File ▶ Print ▶ Determination overview... ▶ Print determination overview (PDF)**

The **Print determination overview (PDF)** dialog window opens with the **File ▶ Print ▶ Determination overview...** menu item.

Selection

Selection	**Selected determinations** | **All filtered determinations**
Default value	**Selected determinations**

Selected determinations
If this option is selected, then a list will be produced with all of the determinations that are selected (highlighted) in the determination table.

All filtered determinations
If this option is selected, then a list will be produced with all the determinations in the determination table that meet the filter criterion.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
If this option is selected, then the determination table will be produced in portrait format.

Landscape
If this option is selected, then the determination table will be produced in landscape format.

[OK]

The determination table is produced in the required format as a PDF file and opened directly with Acrobat Reader; it can then be printed and/or saved.

4.5.2.11 Determinations - Report output

Dialog window: **Database ► File ► Print ► Report... ► Report output**

Selection

Selection	**Selected determinations** | **All filtered determinations**
Default value	**Selected determinations**

Selected determinations
If this option is selected, then the reports will be produced for all determinations that are selected (highlighted) in the determination table.

All filtered determinations
If this option is selected, then the reports will be produced for all the determinations in the determination table that meet the filter criterion.

Report type

Selection	**Original report(s)** | **Report template**
Default value	**Original report(s)**

Original report(s)
The report template that was selected at the time a method was created is referred to as the original report template. The determination reports are output at the **output target** defined below with this report template. If a determination is being reprocessed, a new determination version is created and the content of the original report is updated.

Report template
If this option is selected, then reports will be produced according to the selected report template at the **Output target** defined below.

Output target

Printer

on | off (Default value: **on**)

If this check box is activated, the reports are printed on the selected printer.

Selection	**Default printer** | **'Printer name'**
Default value	**Default printer**

PDF file

on | off (Default value: **off**)

If this check box is activated, then the reports are output as PDF files under the entered file name.

The … button opens a dialog window in which the desired directory is selected and a name for the PDF files can be entered. An index is appended automatically to the name at the time of output.

NOTICE

If several reports are output simultaneously as a PDF file, then an index will be automatically appended to the file name.

4.5.2.12 Determinations - Showing method

Dialog window: **Database ► Determinations ► Show method... ► Determination method 'Method name'**

The **Determinations ► Show method...** menu item or the icon opens the **Determination method 'Method name'** dialog window, in which the method used for the selected determination is displayed with the two subwindows **Method run** and **Evaluation**. In contrast to the **Method** program part, there are no parameters available for editing here.

Displaying command properties

The properties window of the corresponding command, in which the parameters are displayed, is opened by double-clicking on a command or with the context-sensitive **Properties...** menu item.

Zoom

By default, the determination method is displayed in such a way that all tracks are completely shown. The following zoom levels can be selected for the display of the method with the context-sensitive **Zoom** menu item:

Selection	**200%** | **150%** | **100%** | **75%** | **50%** | **25%** | **Fit to width** | **Fit to height** | **Fit in window**
Default value	**Fit in window**

Fit to width
Adjusts the view to window width.

Fit to height
Adjusts the view to window height.

Fit in window
Adjusts the view to window width and height.

Saving a method

[Save as...]

With this button, the determination method can be saved in a method group. To accomplish this, the **Save method** window is opened, in which the method group is selected and a method name can be entered or selected.

4.5.2.13 Determinations - Displaying history

Menu item: **Database ► Determinations ► Show history**

Activating/deactivating history view

With the **Determinations ► Show history** menu item or the icon, only the currently focused determination and all the saved determination versions will be shown in the determination table.

If the history view is disabled again with the **Determinations ► Show history** menu item or the icon, then the original selection of determinations will appear again in the determination table.

Making an old version current

The **Determinations ► Make current** menu item or the icon causes the determination version selected in the table to be made the current determination version again. This creates a new determination whose version number is increased by **+1** compared with the last version to have been saved.

4.5.2.14 Determinations - Making current

Menu item: **Database ► Determinations ► Update**

Making an old version current

The **Determinations ► Update** menu item or the icon causes the determination version selected in the table to be made the current determination version again. This creates a new determination whose version number is increased by **+1** compared with the last version to have been saved.

4.5.2.15 Determinations - Showing calibration curve

Dialog window: **Database ► Determinations ► Show calibration curve... ► Calibration curve/Calibration data**

Calibration curves are shown **only** for the **CAL LOOP Opt** command.

With the **Determinations ► Show calibration curve...** menu item or the icon the calibration curve or standard addition curve for the determination selected in the **Calibration curve/Calibration data** dialog window is shown.

Calibration curve for CAL LOOP Opt

In the **Calibration curve/Calibration data** dialog window, the calibration curve and calibration data are displayed for each **CAL LOOP Opt** command on a tab marked with the command name. The command type is shown above the calibration curve. The curve display shows the measured values and the line calculated from these measured values. The individual measured values and results are listed beneath: **conc ['Unit']**, **ε[mAU]**, **T [°C]**, **t [s]**, **Standard #**, **Wavelength**, **c0**, **c1**, **c2**, **c3**, **Confidence interval**, **Number of outliers** and **Calibration range**.

NOTICE

Calibration curves cannot be printed directly from the **Calibration curve/Calibration data** dialog window. Instead, you should use a report with a report template which contains the fixed report *(see chapter 4.4.1.4.3.14, page 260)*.

4.5.2.16 Determinations - Control chart

Dialog window: **Database ▶ Determinations ▶ Control chart... ▶ Control chart**

The **Determinations ▶ Control chart...** menu item or the icon opens the **Control chart - 'Template name'** dialog window, in which a control chart containing a statistical evaluation (mean value, number of determinations, absolute and relative standard deviation) is shown for the selected determinations according to the loaded template.

Template

Selection	**Default** | **'Template name'**
Default value	**Default**

Default
Selection of the saved templates for control charts *(see chapter 4.4.2.2, page 263)*. When the dialog window is opened, the last template to have been loaded will be loaded. If a new template is selected, then the display will be updated automatically.

[Templates]

Opens the **Control chart templates** dialog window *(see chapter 4.4.2, page 262)*.

Graph display

Shows the measured values together with warning and intervention limits and statistical values according to the settings of the selected template. If the cursor is moved to a point, then the number, date and value appear as a tooltip.

If **Determination number** is selected as x-value in the template, then the measured values for the determinations selected in the determination overview will be displayed in equidistant spacing according to the selected sorting. Additionally, the sorting and, for the first and last point, the date and time are shown as the legend.

If **Date/Time** is selected as x value in the template, then the measured values for the determinations selected in the determination overview will be displayed chronologically starting with the earliest determination. The time difference to the earliest determination is shown on the x-axis (automatically in minutes, hours or days).

[Print (PDF)]

Opens the **Print control chart (PDF)** *(see chapter 4.5.2.17, page 337)* dialog window. The content of the control chart can be shown as a PDF file in the required format.

4.5.2.17 Printing a control chart

Dialog window: **Database ► Determinations ► Control chart... ► Control chart - 'Name' ► Print (PDF) ► Print control chart (PDF)**

The format for the printout of the control chart is indicated in the **Print control chart (PDF)** dialog window.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Landscape**

Portrait
Outputs the control chart in portrait format.

Landscape
Outputs the control chart in landscape format.

Comment

Possibility of entering comments on the control chart; these comments will be output together with the control chart.

Entry	**1,000 characters**

[OK]

The control chart is output in the required format as a PDF file and opened directly with the Acrobat Reader. It can then be printed and/or saved.

4.6 Curves subwindow

4.6.1 Curve display

4.6.1.1 Curve display - General

Subwindow: **Database ► Curves #**

The subwindows **Curves 1** ... **Curves 5** are subwindows in the **Database** program part. The measuring curves and calibration curves generated by the measuring commands during the ongoing determination are shown in these subwindows. When navigating in the determination overview, this data is automatically refreshed (after a certain time delay).

The subwindows **Curves 1** ... **Curves 5** can be activated in the **Database** program part during the definition of the layout and thus rendered visible. They can be enlarged and reduced as required, and they can also be maximized.

4.6.1.2 Curve display voltammetry command

Tabs

In the curve window, a tab with the corresponding command name is provided for each run of a voltammetry command. Their sequence is determined by the method. The upper part of these tabs shows the recorded voltammograms or calibration curves and the lower part contains information on the individual measurement curves. The icons serve to maximize either the upper or the lower part to the size of the entire curve window or reset it again.

An icon representing the type of displayed curves is located next to the title of the tab. You can toggle between the types by clicking on this icon.

Shows the measurement curve *(see chapter 4.6.1.2.1, page 338)*.

Shows the calibration curve *(see chapter 4.6.1.2.2, page 343)*.

4.6.1.2.1 Measurement curve

Tab: **Database ► Curves # ►**

Displaying the measurement curve

The following elements are displayed in the upper part of the curve window:

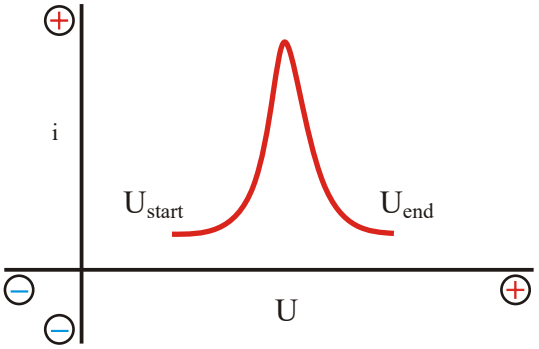
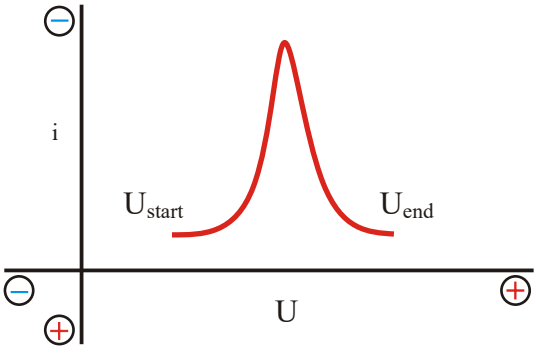
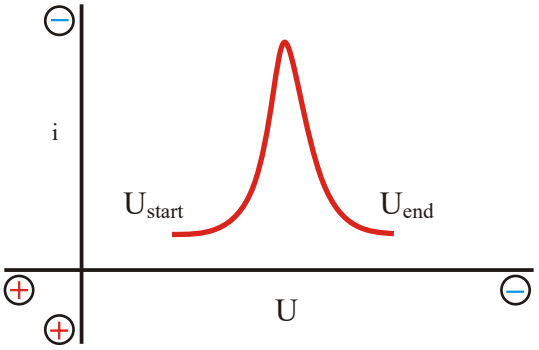
- Axes with labeling (measured quantity and unit)
- Measuring point curves
- Peak label with substance name
- Baselines
- Base points

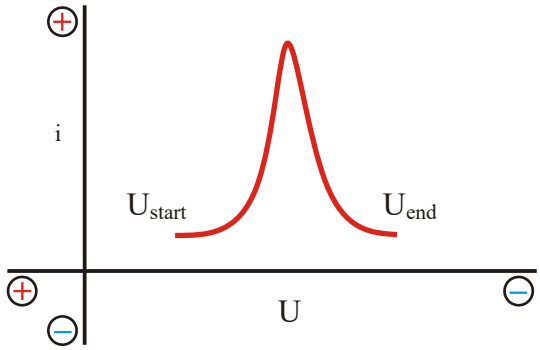
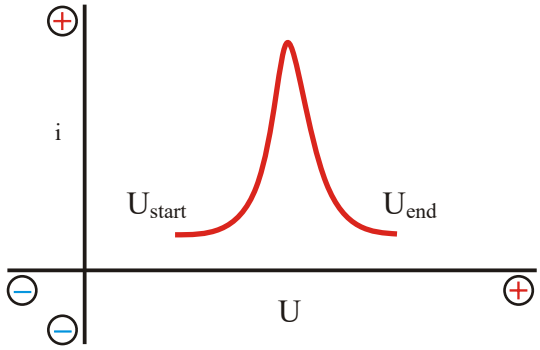
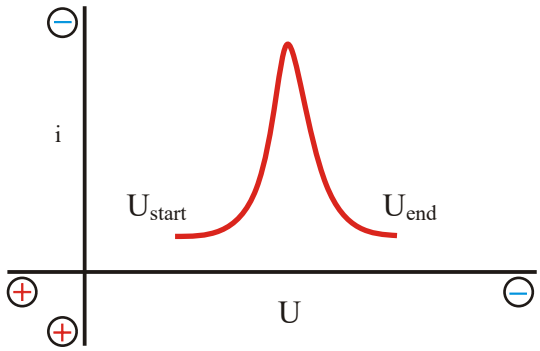
Display of the voltammograms with automatic scaling

When automatic scaling is activated, $\mathbf{U_{start}}$ is always displayed on the left and $\mathbf{U_{end}}$ on the right on the x-axis in DP/SQW voltammograms.

DP voltammograms

In a DP voltammogram with automatic scaling, there are four possibilities to display the current ***i*** on the y-axis as a function of the sweep direction and the algebraic sign of the pulse amplitude:

	DP voltammogram in **anodic sweep direction** and **pulse in sweep direction**. Positive currents are expected for an anodic DP voltammogram ($\mathbf{U_{start} < U_{end}}$) with pulse in sweep direction (**positive pulse amplitude**). These currents are displayed going up (positive current axis upwards, negative current axis downwards).
	DP voltammogram in **anodic sweep direction** and **pulse contrary to sweep direction**. Negative currents are expected for an anodic DP voltammogram ($\mathbf{U_{start} < U_{end}}$) with pulse contrary to sweep direction (**negative pulse amplitude**). These currents are displayed going up (negative current axis upwards, positive current axis downwards).
	DP voltammogram in **cathodic sweep direction** and **pulse in sweep direction**. Negative currents are expected for a cathodic DP voltammogram ($\mathbf{U_{start} > U_{end}}$) with pulse in sweep direction (**positive pulse amplitude**). These currents are displayed going up (negative current axis upwards, positive current axis downwards).

	DP voltammogram in **cathodic sweep direction** and **pulse contrary to sweep direction**. Positive currents are expected for a cathodic DP voltammogram (**$U_{start} > U_{end}$**) with pulse contrary to sweep direction (**negative pulse amplitude**). These currents are displayed going up (positive current axis upwards, negative current axis downwards).
SQW voltammograms The two following possibilities apply for the automatic scaling of the y-axis (with quantity = **Current**) in an SQW voltammogram:	
	SQW voltammogram in **anodic sweep direction**. Positive currents are expected for an anodic SQW voltammogram (**$U_{start} < U_{end}$**). These currents are displayed going up (positive current axis upwards, negative current axis downwards).
	SQW voltammogram in **cathodic sweep direction**. Negative currents are expected for a cathodic SQW voltammogram (**$U_{start} > U_{end}$**). These currents are displayed going up (negative current axis upwards, positive current axis downwards).

Zoom

Curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows curves completely.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies curves to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Table of measurement curves

A list of the measurement curves recorded is shown in the table below the curve display. It contains the following columns:

CALL

CALL command name that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Baseline type

Approximated baseline used to evaluate the detected peaks.

Start base point

Value of the base point, where the baseline of the peak evaluation begins.

End base point

Value of the base point, where the baseline of the peak evaluation ends.

Area / Height / Measured value

Peak areas, peak heights or measured values of all replications of a **CALL COND** command *(see chapter 5.5.2.2.7.2, page 430)*.

Area RSD / Height RSD / Measured value RSD

Relative standard deviation of the peak areas / peak heights / measured values of the last 2 runs of a **CALL COND** command *(see chapter 5.5.2.2.7.2, page 430)*.

Display

on | off (Default value: **on**)

Indicates whether a measurement curve is displayed in the curve window or not.

The parameters Area, Height or Measured value and Relative standard deviation of the area or height are only displayed in the table if the method contains the **CALL COND** command and the **Evaluation quantity** stop criterion is activated.

These parameters are displayed on the tab of the substance selected in the **CALL COND** command under evaluation quantity.

Edit menu

The table cannot be edited directly but only via the following context-sensitive menu items:

Selection on	The check box in the **Display** column for the selected measurement curve is activated.
Selection off	The check box in the **Display** column for the selected measurement curve is deactivated.
Only selection on	The check boxes in the **Display** column are activated for the selected measurement curves, but deactivated for the not selected measurement curves.
All on	All check boxes in the **Display** column are activated.
All off	All check boxes in the **Display** column are deactivated.
Invert selection	The settings in the **Display** column for the selected measurement curves are inverted.
Highlight selection on/off	The selected measurement curves are highlighted.
Save selection	The settings in the **Display** column for the selected measurement curves are saved.

4.6.1.2.2 Calibration curve

Tab: **Database ► Curves # ►**

Calibration curve display

The following elements are displayed in the upper left-hand part of the curve window:

- Axes with labeling (measured quantity and unit)
- Calibration points of the standard addition or the calibration curve
- Calculated calibration function
- Evaluation ratio (line) for calibration method **DT**
- Effective addition volume (numerical value) for calibration method **DT**
- Substance concentration in the measuring vessel (only for sample type **Sample**)

Zoom

Calibration curves can be **zoomed** as often as required by spanning an area of the curve display from the top left to the bottom right with the left mouse button held down. Zooming can be undone by spanning an area from the bottom right to the top left or using the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete calibration curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items for graph

Show all	Resets the zoom and shows the calibration curve completely.
Properties...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies the calibration curve to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

Calibration results

The calibration results are displayed in the upper right-hand part of the curve window:

Concentration

Concentration

Substance concentration in the sample.

ASD

Absolute standard deviation of the substance concentration in the sample.

RSD

Relative standard deviation of the substance concentration in the sample.

Regression data

Function

Function that was applied for the calculation of the calibration curve.

R^2

Coefficient of determination calculated from the calibration function.

Evaluation quantity

Evaluation quantity (area, height or measured value) used for the evaluation.

Curve type

Curve type used for the calculation of the calibration function.

Weighting

Indicates whether the weighting **1/evaluation quantity²** was used.

Calibration data

Calibration factor

Concentration of the standard solution in the measuring vessel for the evaluation ratio (only for calibration method **DT**).

Intercept value

The intercept value is the charge that is obtained from the measurement of the intercept solution *(see glossary, page 1064)* (only for calibration method **LAT**).

Electrolyte value

The electrolyte value is the charge obtained from the measurement of the electrolyte solution *(see glossary, page 1060)* (only for calibration method **RC**).

Date

Date on which the calibration was carried out.

Determination ID

Determination ID of calibration.

Calibration curve table

The table below the calibration curve shows a list of the calibration points recorded. It contains the following columns:

CALL

CALL command name that has called the corresponding VA track.

Var

Variation number.

Rep

Replication number.

Peak potential

Peak potential determined.

Area

Peak area determined (for **Evaluation quantity** = **Area**).

Height

Peak height determined (for **Evaluation quantity** = **Height**).

Measured value

Current value determined (for **Evaluation quantity** = **Measured value**).

Used

on | off (Default value: **on**)

Shows whether a calibration point is to be used for the calculation of the calibration curve or not.

Functions

The **[Edit]** menu beneath the table contains the following menu items:

Show all	Resets the zoom and shows the calibration curve completely.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.2, page 178)*.
Copy graphics	Copies the calibration curve to the clipboard.
Save view	Saves the height ratio between the curve window and the table.

4.6.1.3 Measuring commands curve display

Tabs

In the curve window, a separate tab with the respective command name (e.g. **CVS 1**) is displayed for each measuring command. The way the tabs are arranged depends on how the commands are ordered in the run.

Curve display for measuring commands

The following elements are displayed in the upper part of the curve window:

- Axes with labeling (measured quantity and unit)
- Measurement curves

Zoom

Curves can be **zoomed** within the curve display as often as required by spanning a square with the left mouse button pressed down. Zooming can be undone by clicking and holding the mouse button and moving the mouse to the upper left-hand corner or with the context-sensitive **Show all** menu command.

NOTICE

When a new determination is selected, the complete curve is always shown, i.e., the zoom range is not retained when the determination is changed.

Context-sensitive menu items

Show all	Resets the zoom and shows curves completely.
Measuring point list...	Opens the **Measuring point list - 'Command name.#'** dialog window.
Properties Curves #...	Opens the **Properties - Curves #** dialog window to define the properties of the curve display *(see chapter 3.9.2.3, page 190)*.
Copy graphics	Copies curves to the clipboard.
Save view	The settings concerning the display of individual curves and the height ratio between curve window and table are saved with this button.

4.6.1.4 Curves - Measuring point list

Subwindow: **Database ▶ Curves #**

The context-sensitive **Measuring point list...** menu item in the curve window opens the **Measuring point list - 'Command name.#'** dialog window for displaying the measuring point list of the selected curve.

The display of the measuring points in the table can be defined per window and per command type *(see chapter 3.9.2.3.5, page 197)*.

NOTICE

No measuring point lists can be displayed for curves that have been generated with a voltammetry command *(see chapter 5.5.2.10.1, page 582)*.

4.6.2 Curve properties

4.6.2.1 Curve properties - General parameters

Dialog window: **Database / Workplace ▶ Curves # ▶ Properties Curves #**

Command type

Selection of the command type for which the curve properties are to be defined. The curve properties defined for each command type are saved per curve window and per client.

Selection	**CVS** | **CPVS** | **CP** | **LSV** | **DP** | **SQW** | **CV** | **MEAS Ref** | **MEAS Spec** | **MEAS Opt** | **CAL Spec** | **MEAS TMF** | **MEAS T**
Default value	**CVS**

NOTICE

When the dialog window is opened, the **Command type** that applies for the curve shown in the curve window will be selected by default.

4.6.2.2 Curve properties voltammetry command

4.6.2.2.1 Curve properties voltammetry command - x Axis

Tab: **Workplace / Database ▶ Curves # ▶ Properties Curves # ▶ x Axis**

Parameters for the graphical curve display on the x-axis.

Quantity

Selection of the quantity to be shown on the x-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Potential [V]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Potential [V]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Time [s]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Time [s]**

Label

Freely definable axis label for the x-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the x-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the x-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the x-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the x-axis. It is displayed on the left in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the x-axis. It is displayed on the right in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

4.6.2.2.2 Curve properties voltammetry command - y1 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical curve display on the y1-axis (left-hand y-axis).

Quantity

Selection of the quantity to be shown on the y1-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity**
Default value	**Current [A]**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]**
Default value	**Current [A]**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]**
Default value	**Potential [V]**

Label

Freely definable axis label for the y1-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y1-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y1-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y1-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y1-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y1-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

4.6.2.2.3 Curve properties voltammetry command - y2 Axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2-axis (right-hand y-axis).

Quantity

Selection of the quantity to be shown on the y2-axis.

CVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

LSV, DP, SQW, CV

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **Sensitivity** | **off**
Default value	**off**

CPVS

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Current measuring range [A]** | **off**
Default value	**off**

CP

Selection	**Current [A]** | **Potential [V]** | **Time [s]** | **Potential measuring range [V]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2-axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Numerical format

Selection of the numerical format for the labeling of the y2-axis.

Selection	**decimal** | **scientific** | **engineering**
Default value	**engineering**

decimal
Only the significant digits with at least one decimal place are displayed. A maximum of 15 nonzero decimal places is displayed. Example: 0.1 A

scientific
Exponential notation $a*10^{\pm x}$.
The following applies when choosing the exponential coefficient: $1 \leq a < 10$. a is displayed with at least one decimal place. If necessary for the representation, up to 5 nonzero decimal places are displayed.
$10^{\pm x}$ is represented as E±x.Example: 1.0E-1 A

engineering
Numerical value a and a prefix (**m**, **µ**, **n**, **p**) that is added to the unit. The SI prefixes are used, which correspond to an order of magnitude of 10^3 each. When choosing the prefix, the biggest value according to amount to be displayed is decisive, with the condition $1 \leq a < 1{,}000$. a is displayed with at least one decimal place. If necessary for the representation, further nonzero decimal places are displayed.
Example: 100.0 mA

Manual scaling

on | off (Default value: **off**)

If this check box is activated, then the y2-axis can be manually scaled in the curve window. In this case, the **Start value** and **End value** fields can be edited. If this check box is not activated, then the y2-axis will be automatically scaled *(see: Display of the voltammograms with automatic scaling)*.

Start value

Initial value for scaling the y2-axis. It is displayed at the bottom in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**–1.00E+12**

End value

End value for scaling the y2-axis. It is displayed at the top in the curve window for all **Quantities** in all voltammetry commands.

Editable only when autoscaling is disabled.

Input range	**–1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Axis label

Selection of the color for the designation of the y2-axis.

Selection	**13 colors** | **black**
Default value	**black**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

Show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve will be displayed instead of the smoothed curve.

Show spikes

Symbol

Selection of the symbol for the display of spikes.

Selection	● | ✕ | ✷ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Spikes are not shown.

Peak label

on | off (Default value: **on**)

If this check box is activated, then the substance name will be shown above the corresponding family of curves (only once for the uppermost curve). The substance name can only be displayed if it was possible to allocate the peak to a substance from the substance table.

Orientation

Orientation of the peak label.

Input range	**0 to 90 °**
Default value	**0 °**

Line display

Display options for measurement curves and baselines. These options apply to both smoothed and original curves.

Conditioning

Color of the measurement curve for conditioning.

Selection	**light gray** | **13 colors**
Default value	**light gray**

Line thickness

Line thickness of the measurement curve for conditioning.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Blank/Intercept/VMS/Electrolyte

Color of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Selection	**dark gray** | **13 colors**
Default value	**dark gray**

Line thickness

Line thickness of the measurement curve for Blank/Intercept/VMS/Electrolyte.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Sample

Color of the measurement curve for sample solutions.

Selection	**blue** | **13 colors**
Default value	**blue**

Line thickness

Line thickness of the measurement curve for sample solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Spiking/standard

Color of the measurement curve for spiking solutions and standard solutions.

Selection	**black** | **13 colors**
Default value	**black**

Line thickness

Line thickness of the measurement curve for spiking solutions and standard solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Other

Color of the measurement curve for nondefined solutions.

CVS, CPVS, LSV, DP, SQW, CV

Selection	**orange** | **13 colors**
Default value	**orange**

CP

Selection	**green** | **13 colors**
Default value	**green**

Line thickness

Line thickness of the measurement curve for nondefined solutions.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

Baseline

on | off (Default value: **on**)

If this check box is activated, then the baseline and base points are shown (only for smoothed curves) and the color of the baseline can be selected. This parameter can be edited only if **Quantity** = **Current [A]**.

Selection	**red** | **13 colors**
Default value	**red**

Line thickness

Line thickness of baselines.

Input range	**1 to 10 pixels**
Default value	**1 pixels**

4.6.2.2.4 Curve properties voltammetry command - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical curve display.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

4.6.2.3 Curve properties measuring commands

4.6.2.3.1 Curve properties measuring commands - x axis

Tab: **Database ► Curves # ► Properties Curves # ► x Axis**

Parameters for the graphical display of the curves on the x axis.

Quantity

Selection of the quantity to be shown on the x axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Time [s]**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Time**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Wavelength [nm]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Time [s]**

Label

Freely definable axis label for the x axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the x axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

4.6.2.3.2 Curve properties measuring commands - y1 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y1 Axis**

Parameters for the graphical display of the curves on the y1 axis (left-hand y axis).

Quantity

Selection of the quantity to be shown on the y1 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels**
Default value	**Absorbance [mAU]**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3**
Default value	**Measured value**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature**
Default value	**Temperature**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels**
Default value	**Intensity [Counts]**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]**
Default value	**Measured value [mAU]**

Label

Freely definable axis label for the y1 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Manual scaling

Start value

Initial value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**-1.00E+12**

End value

End value for scaling the y1 axis.

Editable only when autoscaling is disabled.

Input range	**-1.00E+12 to +1.00E+12**
Default value	**+1.00E+12**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✸ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light blue**
Default value	**light blue**

MEAS T

Selection	**13 colors** | **dark blue**
Default value	**dark blue**

Smoothing

on | off (Default value: **off**)

Activates/deactivates smoothing for the curves.

Smoothing factor x axis

Factor for smoothing in the direction of the x axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Smoothing factor y axis

Factor for smoothing in the direction of the y axis.

Input range	**0.01 to 1,000**
Default value	**0.01**

Also show original curve

on | off (Default value: **off**)

If this check box is activated, then the original curve (solid line, same color) will be shown in addition to the smoothed curve (dotted line).

4.6.2.3.3 Curve properties measuring commands - y2 axis

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► y2 Axis**

Parameters for the graphical display of the overlaid curves on the y2 axis (right-hand y axis).

Quantity

Selection of the quantity to be shown on the y2 axis.

For MEAS Ref

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Spec

Selection	**Wavelength [nm]** | **Absorbance [mAU]** | **Intensity [Counts]** | **Intensity Dark [Counts]** | **Intensity Ref [Counts]** | **Transmission [%]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS Opt

Selection	**Time [s]** | **Measured value** | **Intensity [Counts]** | **Transmission [%]** | **Saturated pixels** | **Temperature [°C]** | **dε/dt [mAU/min]** | **Calculated 1 - 3** | **External 1 - 3** | **off**
Default value	**off**

MEAS T

Selection	**Time** | **dT/dt** | **Temperature** | **off**
Default value	**off**

For CAL Spec

Selection	**Wavelength [nm]** | **Intensity [Counts]** | **Saturated pixels** | **off**
Default value	**off**

For MEAS TMF

Selection	**Time [s]** | **Measured value [mAU]** | **Transmission [%]** | **Temperature [°C]** | **dε/dt [mAU/min]** | **off**
Default value	**off**

Label

Freely definable axis label for the y2 axis. If **auto** is selected, then the designation from the **Quantity** field will be used.

Selection	**50 characters** | **auto**
Default value	**auto**

Curve

Curve color

Selection of the color for the line of the curve.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T

Selection	**13 colors** | **magenta**
Default value	**magenta**

Symbol

Selection of the symbol for the display of the individual measuring points.

Selection	● | ✕ | ✸ | ■ | ▲ | **no symbol**
Default value	**no symbol**

no symbol
Measuring points are not shown.

NOTICE

The individual measuring points are no longer displayed for curves for which the distance between two measuring points is smaller than 5 pixels, even if a symbol has been selected. In this case, the graphics window might be enlarged in order for the symbols to be displayed again.

Symbol color

Selection of the color for the measuring point symbol.

Selection	**13 colors** | **light green**
Default value	**light green**

MEAS T	
Selection	**13 colors** | **magenta**
Default value	**magenta**

4.6.2.3.4 Curve properties measuring commands - Options

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Options**

Options for the graphical display of curves.

Show grid

on | off (Default value: **off**)

If this check box is activated, then a grid will be shown against the background.

Grid type

Selection of the type of grid line.

Selection	**Line types** | **dotted**
Default value	**dotted**

Grid color

Selection of the color for the grid lines.

Selection	**13 colors** | **gray**
Default value	**gray**

Background

Background color

Selection of the color for the curve background.

Selection	**13 colors** | **white**
Default value	**white**

Show end points

on | off (Default value: **off**)

If this check box is activated, then the endpoints found will be shown on the curve with the ♦ symbol and labeled with **BP#** (break point), **FP#** (fixed point), **MI** (minimum value) or **MA** (maximum value).

Automatic EPs

Selection of the color for automatically set endpoints.

Selection	**13 colors** | **black**
Default value	**black**

Show evaluation lines

on | off (Default value: **off**)

If this check box is activated, then the evaluation lines (tangents, auxiliary lines) will be shown.

Tangents

Selection of the color for the tangent lines and evaluation lines.

Selection	**13 colors** | **light green**
Default value	**light green**

Auxiliary lines

Selection of the color for the auxiliary lines.

Selection	**13 colors** | **blue**
Default value	**blue**

4.6.2.3.5 Curve properties measuring commands - Measuring point list

Tab: **Workplace / Database ► Curves # ► Properties Curves # ► Measuring point list**

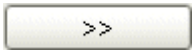
Parameters for the display of the measuring point list.

Available columns

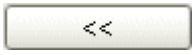
Shows all fields that can be displayed as columns in the measuring point list. The display depends on the command type.

Displayed columns

Shows all fields that will be displayed as columns in the measuring point list.



Adds the selected column to the measuring point list.



Removes the selected column from the measuring point list.

Changes the sequence of displayed columns by moving the selected column up and down.

4.7 Subwindow Information

4.7.1 Information - Overview

Subwindow: **Database ▶ Information**

General

General information about the focused determination in the determination table is shown in the **Information** subwindow. The subwindow can be activated in the **Database** program part during the definition of the layout and thus made visible. It can be enlarged and reduced as required; it can also be maximized.

Tabs

Information about the determination is shown on the following tabs:

- *Determination*
  Shows general information about the determination.
- *Method*
  Shows general information about the method used.
- *Sample*
  Shows general information about the sample used.
- *Configuration*
  Shows general information about the devices, sensors and common variables used.
- *Messages*
  Shows messages about the determination.
- *Determination comment*
  Shows the comment on the determination.

4.7.2 Information - Determination

Tab: **Database ▶ Information ▶ Determination**

Shows general information about the determination.

Identification

Information about the identification of the determination.

Determination ID:

Unique and unmistakable identification for the determination.

Server name:

Computer name of the server to which the client was connected when the determination was recorded.

Client ID:

ID of the client with which the determination was recorded.

Sample number:

Shows the **Sample number** entered in the run window.

Start counter:

Shows the start counter which is increased by +1 at the start of each determination. The start counter is saved for each client and cannot be reset.

Recording

Information about the recording of the determination.

Determination start:

Date and time at start of determination.

Determination duration [min]:

Duration of the determination from its start to its end or termination in min.

Determination run:

Way in which the determination was ended:

Selection	**regular without remarks** | **regular with remarks** | **stop** | **stop by error**

regular without remarks
The determination was finished automatically after the method had run normally and without any messages.

regular with remarks
The determination was finished automatically after the method had run normally but with messages.

stop
The determination was canceled manually with **[Stop]**.

stop by error
The determination was canceled automatically due to an error.

User (short name):

Short name of the user.

NOTICE

Which user is entered depends on the **No editing of workplaces in 'BUSY' status** option in the security settings *(see chapter 6.2.2.1, page 794)*.

Active	User who started the determination.
Inactive	User who was logged in when the determination was finished.

User (full name):

Full name of the user.

NOTICE

Which user is entered depends on the **No editing of workplaces in 'BUSY' status** option in the security settings *(see chapter 6.2.2.1, page 794)*.

Active	User who started the determination.
Inactive	User who was logged in when the determination was finished.

Remarks:

Shows the **Remark** about the determination entered in the run window of the workplace.

Program version:

Shows the program version and build number of **viva** with which the determination was recorded.

License ID:

Shows the license serial number with which the determination was recorded.

Status/Version

Information about the determination version.

Determination status:

Selection	**original** | **modified**

original
Determination data unaltered.

modified
Determination data modified.

Determination version:

Version of the determination. The unaltered original determination has the version number **1**, reprocessed determinations have a version number **>1**.

Reprocessing date:

Date and time when the reprocessed determination version was saved.

Reprocessed by (short name):

Short name of the user logged in when the determination was reprocessed.

Reprocessed by (full name):

Full name of the user logged in when the determination was reprocessed.

Reprocessed with program version:

Shows the program version and build number of **viva** with which the determination was reprocessed.

4.7.3 Information - Method

Tab: **Database ► Information ► Method**

Shows general information about the method used.

Identification

Information about the identification of the method.

Method name:

Name of the method.

Method group:

Name of the method group to which the method belonged at the moment of the determination.

Method ID:

Unambiguous and unmistakable identification for the method.

Method comment:

Comment on the method that was defined in the **Properties - Method** dialog window.

Status/Version

Information about the method version.

Method status:

Selection	**original** | **modified (live)** | **modified (reprocessed)**

original
Method when the determination was created .

modified (live)
Method was modified live.

modified (reprocessed)
Method was reprocessed.

Method version:

Version of the method with which the determination was generated.

Method saving date:

Date and time when the modified method version was saved.

Method saved by (short name):

Short name of the user logged in when the modified method was saved.

Method saved by (full name):

Full name of the user logged in when the modified method was saved.

4.7.4 Information - Sample

Tab: **Database ► Information ► Sample**

Shows general information about the sample used.

Sample data

Information about the sample. The only sample data shown is that for which a value is available.

Sample type:

Sample type of the sample.

Sample position:

Position of the sample.

Sample amount:

Value of the sample amount.

Unit:

Unit of the sample amount.

Analytical volume:

Volume portion (aliquot) of the diluted sample's dilution volume that was used for the determination.

Dilution volume:

Maximum filling volume used for dilution of the sample.

Entry date:

Date and time at which the sample amount was entered.

Data source:

Data source for the sample amount. In the case of a manual entry, **manual** is displayed.

Identifications

Information about the sample identifications.

ID1 to ID16:

Shows the sample identifications entered for the sample. The identifications will only be shown when a value is present.

NOTICE

If a different name has been defined for the method variables assigned to the sample data variables **ID1 - ID16, Sample amount, Unit, Sample position** in the **START** command, then the title shown here will consist of this name and additionally the standard name in brackets (e.g. **Batch (ID2)**).

4.7.5 Information - Configuration

Tab: **Database ▶ Information ▶ Configuration**

Shows general information on the devices, sensors and variables used.

Device 'Device name'

Information about the device used (only the existing device information will be shown).

Device type:

Type of device.

Program version:

Device program version.

Device serial number:

Serial number of the device.

FPGA version:

FPGA = Field Programmable Gate Array.

Version of the FPGA software of the device.

Sample Changers

Rack name:

Name of the rack on the sample changer.

Rack code:

Rack code of the rack on the sample changer.

Tower:

Number of the tower on which a Swing Head is used.

Swing Head type:

Type of Swing Head connected to the tower.

Swing Head serial number:

Serial number of the Swing Head connected to the tower.

Remote Box:

Connector at device.

Stirrer

Stirrer:

Stirrer connector at device.

Stirrer type:

Type of stirrer.

Serial number:

Serial number of the stirrer.

Dosing unit

Dosing device:

Dosing connector at device.

Dosing device type:

Dosing device type.

Dosing device serial number:

Serial number of the dosing device.

Dosing unit:

Type of the dosing unit.

Name of dosing unit:

Designation of the dosing unit.

Order number:

Order number of the dosing unit.

Serial number:

Serial number of the dosing unit.

Cylinder volume:

Cylinder volume of the dosing unit.

Cylinder serial number:

Serial number of the cylinder.

Sensor 'Sensor name'

Information about the sensor used.

Sensor type:

Type of the sensor.

Order number:

Order number of the sensor.

Sensor serial number:

Serial number of the sensor.

Device:

Name of device to which the sensor is connected.

Solution 'Solution name'

Solution type:

Type of the solution.

Production date:

Date on which the solution was produced.

Name of dosing unit:

Name of the dosing unit with which the solution was dosed.

Common variable 'Variable name'

Information about the common variable used.

Value:

Value and unit of the common variables at the start of the determination.

Assignment date:

Date and time of last value assignment.

Assignment method:

Method with which the value was assigned.

Global variable 'Variable name'

Information about the global variable used.

Value:

Value and unit of the global variables at the start of the determination.

Assignment date:

Date and time of last value assignment.

Assignment method:

Method with which the value was assigned.

Client ID:

Identification of the client (client ID) on which the value was assigned.

4.7.6 Information - Messages

Tab: **Database ► Information ► Messages**

Shows the messages generated during the determination run and messages about live modifications of sample data.

'Time'

Shows the time at which the message was generated in the run (date, time, UTC in the format **YYYY-MM-DD hh:mm:ss UTC……**).

Message title:

Shows the message title and number.

Message text:

Shows the message.

Message source:

Shows where the message comes from:

Selection	**Program** | **Track 'Track name' - Command 'Command name'**

Program
Message that cannot be assigned to a particular command.

Track 'Track name' - Command 'Command name'
Message produced by a command during the run.

4.7.7 Information - Determination comment

Tab: **Database ► Information ► Determination comment**

Determination comment:

Shows the comment entered for the determination.

4.8 Results subwindow

4.8.1 Results - General

Subwindow: **Database ► Results**

The results calculated according to the method for the determination focused in the determination table are displayed in the **Results** subwindow in the **Database** program part. When navigating in the determination overview, this data is automatically refreshed (after a certain time delay).

The **Results** subwindow can be activated during the definition of the layout and thus made visible. It can be enlarged and reduced as required, and it can also be maximized.

Tabs

The results of a determination are displayed on the following tabs:

- *Results overview*
  Shows all automatically generated results for each voltammetry command and each defined substance as well as the user-defined results.
- *Results*
  Shows the automatically generated results for each voltammetry command and each defined substance.
- *User-defined results*
  Shows the user-defined results.

4.8.2 Results - Result overview

Tab: **Database ▶ Results ▶ Results overview**

All automatically generated results for each voltammetry command and each defined substance as well as all user-defined results are listed on the **Results overview** tab. Details on the automatically generated results are displayed on the *Results* tab and details on the user-defined results on the *User-defined results* tab.

The following parameters are displayed for each automatically generated result:

Concentration

Substance concentration in the sample. Variable name = **CONC**

ASD

Absolute standard deviation of the concentration of a substance in the sample.

RSD

Relative standard deviation of the concentration of a substance in the sample.

The following result types are differentiated for the user-defined results:

Single result

User-defined single result that is calculated from an automatically generated result with the help of the specified formula. The user-defined single result is defined in the method *(see "Result type", page 733)*.

Multiple result

User-defined multiple result that is automatically also calculated from an automatically generated result with the help of the specified formula for all substances of the selected measuring command. A corresponding result variable is generated for each substance. The user-defined multiple result is defined in the method *(see "Result type", page 733)*.

4.8.3 Results - Results

Tab: **Database ▶ Results ▶ Results**

All automatically generated results for each voltammetry command and each defined substance can be displayed on the **Results** tab.

Which parameters are to be displayed for a result can be selected in the **Properties result window** dialog window *(see chapter 4.8.5, page 381)*. Right-clicking on the tab shows the **Properties Results** menu item, with which the dialog window can be opened.

The following parameters can be displayed for a result:

Results

on | off (Default value: **on**)

Shows the results that are defined in the calculation command.

Assignment

on | off (Default value: **on**)

Shows the assignment of a result to one of the 25 possible result columns.

Formula

on | off (Default value: **on**)

Shows the formula with which the concentration of a substance in a sample was calculated.

Variables

on | off (Default value: **off**)

Shows the variables used in the formula.

NOTICE

Variables that have not been created in the run are not displayed and lead to invalid results.

4.8.4 Results - User-defined results

Tab: **Database ► Results ► User-defined results**

Shows the single and multiple results defined by the user in the method.

Which results are to be displayed can be selected in the **Properties result window** dialog window *(see chapter 4.8.5, page 381)*. Right-clicking on the tab shows the **Properties Results** menu item, with which the dialog window can be opened.

'Result designation'

For single results, the name of the user-defined result is displayed as the title; for multiple results, the name of the voltammetry command and the substance are added before this name.

The following parameters can be displayed for a result:

Results

on | off (Default value: **on**)

Shows the results that are defined in the calculation command.

Assignment

on | off (Default value: **on**)

Shows the assignment of a result to one of the 25 possible result columns.

Formula

on | off (Default value: **on**)

Shows the formula with which the concentration of a substance in a sample was calculated.

Variables

on | off (Default value: **off**)

Shows the variables used in the formula *(see chapter 2.3.3, page 17)*.

NOTICE

Variables that have not been created in the run are not displayed and lead to invalid results.

Calculation of the concentration of a substance:

NOTICE

The calculation does not apply to Dilution Titration.

*Concentration(sample) = concentration(measuring cell) * (cell volume / sample amount) * (dilution volume / analysis volume)*

Concentration(sample)	Concentration of the analyte in the sample Variable = **CONC**
Concentration(measuring cell)	Concentration of the analyte in the measuring cell at the moment of sample measurement Variable = **CONCM**
Cell volume	Sum of the volumes of all solutions added to the measuring cell until the measurement of the sample. Variable = **VAR{1}.VTOT**

Sample amount	Volume of the sample in mL
Dilution volume	Volume to which the sample amount is filled up with ultrapure water
Analysis volume	'x' mL of the dilution volume, which is pipetted into the measuring cell

4.8.5 Results - Properties

Dialog window **Database ► View ► Properties ► Properties ResultsProperties Results ► Properties result window**

You can select the information that is to be displayed in the Results subwindow in the **Properties result window**.

Display for results overview

Selection of the information that is to be displayed on the **Results overview** tab.

Results

on | off (Default value: **on**)

Shows all results. For each result, the concentration, the relative standard deviation and the absolute standard deviation are displayed.

Display for results

Results

on | off (Default value: **on**)

Shows the results defined in the calculation command.

Assignment

on | off (Default value: **on**)

Shows the assignment.

Formula

on | off (Default value: **on**)

Shows the calculation formula.

Variables

on | off (Default value: **off**)

Shows the variables used in the formula.

Display for user-defined results

Selection of the information that is to be displayed on the **Calculation_#** tabs.

Results

on | off (Default value: **on**)

Shows the results defined in the calculation command.

Assignment

on | off (Default value: **on**)

Shows the assignment.

Formula

on | off (Default value: **on**)

Shows the calculation formula.

Variables

on | off (Default value: **off**)

Shows the variables used in the formula.

5 Method

5.1 Method - General

5.1.1 Method - Definition

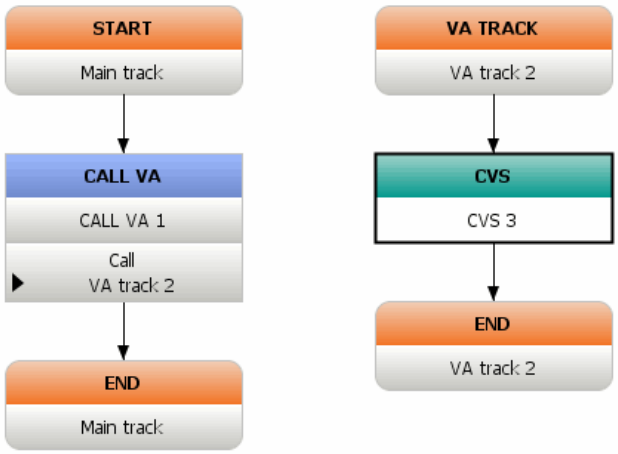
Program part: **Method**

Definition

In **viva** a **method** is an instruction for processing a sample, which can be created in the **Method** program part and started in the **Workplace** program part.

Structure

Each method contains **tracks** (subprograms) consisting of individual **commands**.



Management

Methods are organized in **method groups** and are always automatically assigned a new version, i.e. each time a method is stored a new **version** is created. Methods are stored in the **configuration database** and are globally accessible for all clients.

5.1.2 Method - User interface

Program part: **Method**

Method icon

Clicking on the method symbol in the vertical bar on the left opens the **Method** program part; the database symbol is shown in color at the same time. The upper left corner of the symbol contains a black field displaying the number of methods currently opened *(see chapter 5.2.3, page 391)*.

Elements

The user interface of the **Method** program part comprises the following elements:

- Method-specific menu bar.
- Method-specific toolbar.
- Main window in which several methods can be opened and a maximum of two can be displayed at the same time.

5.1.3 Method - Menu bar

5.1.3.1 Method - Main menus

Program part: **Method**

The menu bar in the **Method** program part contains the following main menu items:

- *File*
  Creating, opening, saving, closing, checking, managing, printing methods; logging out.
- *Edit*
  Defining method properties.
- *View*
  Toggling toolbar on and off.
- *Insert*
  Command, track.
- *Help*
  Opening viva help, showing information about the program.

5.1.3.2 Method - File menu

Program part: **Method**

New...	Create a new method *(see chapter 5.2, page 389)*.
Open...	Open an existing method *(see chapter 5.2.2, page 389)*.
Save	Saves the selected method *(see chapter 5.2.6, page 399)*.
Save as...	Save the selected method under a new name *(see chapter 5.2.6, page 399)*.
Close all	Closes all opened methods *(see chapter 5.2.8, page 401)*.

Close	Closes the selected method *(see chapter 5.2.8, page 401)*.
Method check	Checks the selected method for plausibility *(see chapter 5.2.5, page 398)*.
Method manager...	Opens the method manager *(see chapter 5.3.1, page 402)*.
Method groups...	Opens the method groups manager *(see chapter 5.4.1, page 407)*.
Print (PDF)...	Output of the method report as PDF file *(see chapter 5.2.7, page 400)*.
Logout...	Logs out the user and opens the **Login** dialog window *(see chapter 2.2.3, page 13)*.
Exit	Exits the program.
1 'Method name'	Opens the selected method.

5.1.3.3 Method - Edit menu

Program part: **Method**

Properties...	Opens the parameter window of the command selected in the method *(see chapter 5.2.4.2.8, page 397)*.
Undo:	Undoes last modification of the method.
Redo:	Restores the last undone modification of the method.
Cut	Cuts the selected elements (commands, tracks) and copies them to the clipboard.
Copy	Copies the selected elements (commands, tracks) to the clipboard.
Paste	Inserts the content of the clipboard (commands, tracks) above the selected command or on the right hand side of the selected track.
Delete	Deletes the selected elements (commands, tracks).
Comment...	Enter a new comment or edit an existing comment on the selected command *(see chapter 5.2.4.2.9, page 398)*.

5.1.3.4 Method - View menu

Program part: **Method**

Split vertically	Splits the method window vertically and displays two methods side by side *(see chapter 5.2.3.2, page 391)*.
Split horizontally	Splits the method window horizontally and displays two methods below each other *(see chapter 5.2.3.3, page 392)*.
Unsplit	Undoes the splitting of the method window *(see chapter 5.2.3.1, page 391)*.
Toolbar	Activates/deactivates the toolbar display.

5.1.3.5 Method - Insert menu

Program part: **Method**

New command...	Insert a new command above the selected command *(see chapter 5.2.4.2.1, page 394)*.
New track...	Insert a new track on the right-hand side of the selected track *(see chapter 5.2.4.1.1, page 393)*.

5.1.3.6 Help menu

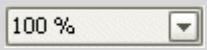
Program part: **Workplace / Database / Method / Configuration**

viva Help	Opens viva Help.
About	Displays information about the program and the installation.

5.1.4 Method - Toolbar

Program part: **Method**

	Create a new method *(see chapter 5.2, page 389)*.
	Open an existing method *(see chapter 5.2.2, page 389)*.
	Saves the selected method *(see chapter 5.2.6, page 399)*.
	Closes the selected method *(see chapter 5.2.8, page 401)*.
	Opens the method manager *(see chapter 5.3, page 402)*.
	Opens the method groups manager *(see chapter 5.4, page 407)*.

	Output of the method report as PDF file *(see chapter 5.2.7, page 400)*.
	Checks the selected method for plausibility *(see chapter 5.2.5, page 398)*.
	Opens the parameter window of the command selected in the method *(see chapter 5.2.4.2, page 394)*.
	Undoes last modification of the method.
	Restores the last undone modification of the method.
	Cuts the selected elements (commands, tracks) and copies them to the clipboard.
	Copies the selected elements (commands, tracks) to the clipboard.
	Inserts the content of the clipboard (commands, tracks) above the selected command or on the right hand side of the selected track.
	Deletes the selected elements (commands, tracks).
	Enter a new comment or edit an existing comment on the selected command *(see chapter 5.2.4.2, page 394)*.
	Insert a new command above the selected command *(see chapter 5.2.4.2, page 394)*.
	Insert a new track on the right-hand side of the selected track *(see chapter 5.2.4.1, page 392)*.
	Selection of the zoom level *(see chapter 5.2.3, page 391)*.
	Splits the method window vertically and displays two methods side by side *(see chapter 5.2.3.2, page 391)*.
	Splits the method window horizontally and displays two methods below each other *(see chapter 5.2.3.3, page 392)*.
	Undoes the splitting of the method window *(see chapter 5.2.3.1, page 391)*.
	Logs out user *(see chapter 2.2.3, page 13)*.
	Opens viva Help.

5.1.5 Method - Subwindow

Program part: **Method**

Display

The following two subwindows are displayed in the main window:

- *Method run*
  Displaying and editing the method run with tracks and commands.
- *Evaluation*
  Displaying and editing the evaluation parameters.

Representation

The subwindows can be enlarged or made smaller to suit by dragging the separating bar between the windows.

By clicking on the ☐ button above at the right, the subwindows can be maximized so that only one subwindow is displayed in the main window. The original view of the two subwindows is restored by clicking on the ☐ button in the maximized subwindow once again.

5.1.6 Method - Functions

Program part: **Method**

The following functions can be carried out in the **Method** program part:

Method editor

- *Creating a new method*
- *Opening a method*
- *Selecting a method*
- *Editing tracks*
- *Checking a method*
- *Saving a method*
- *Closing a method*

Managing methods

- *Managing methods*
- *Renaming a method*
- *Copying a method*
- *Moving a method*
- *Deleting a method*
- *Sending a method to*
- *Exporting a method*
- *Importing a method*
- *Showing the method history*

Managing method groups

- *Managing method groups*
- *Editing method groups*

5.2 Method editor

5.2.1 New method

Menu item: **Method ► File ► New...**

The icon or the **File ► New...** menu item opens the **New method** window, in which a method template can be selected for the new method.

Templates

Selection	**'Method template'** | **Blank method**
Default value	**Blank method**

'Method template'
Selection of a method template as a basis for creating a new method.

Blank method
A template containing only the **START** and **END** commands is loaded.

Description

Description of the selected method template.

[OK]

Opens the selected template for editing.

5.2.2 Opening a method

Menu item: **Method ► File ► Open...**

The **Open method** window is opened with the icon or the **File ► Open...** menu item. One of the globally available methods can be selected and opened.

Method group

Method group

Selection of the method group whose methods are to be displayed in the method table *(see chapter 5.4, page 407)*.

Selection	**'Method group'** | **Main group**
Default value	**Main group**

Method table

The method table contains information on all methods of the selected method group. The table cannot be edited. The table can be sorted according to the selected column (columns **Name**, **Saved**, **User**, **Full name**, **Version** and **Method comment**) in either ascending or descending order by clicking on the column title.

Name

Method name.

Saved

Date and time when the method was saved.

User

Short name of the user who saved the method.

Full name

Full name of the user who saved the method.

Version

Version number of the method.

Method comment

Comment on the method entered as *(see chapter 5.2.4.2.9, page 398)* in the **START** command.

Opening a method

Method name

Name of the method to be opened. If a method is selected from the table, the method name will be entered automatically in this field. It can, however, also be entered manually.

Entry	**50 characters**

[Open]

Opens the selected method in the main window in the place of the method that is already open. The method name is displayed in the title bar of the program; the number of currently opened methods is displayed in the left upper corner of the method icon.

NOTICE

A maximum of 9 methods can be opened, but only 2 can be displayed at the same time *(see chapter 5.2.3.1, page 391)*.

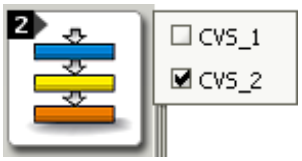
5.2.3 Selecting a method

The number of currently opened methods is displayed in the left upper corner of the method symbol. If two or more methods are opened, then you can use the method symbol to select the two methods that can be displayed in the main window *(see chapter 5.2.3.2, page 391)* or *(see chapter 5.2.3.3, page 392)*.

No method is opened. No method is displayed in the main window.

One method is opened and is displayed in the main window.

Two methods are opened. Normally only one method is displayed in the main window, but the option exists of displaying two methods *(see chapter 5.2.3.2, page 391)* or *(see chapter 5.2.3.3, page 392)*.



A menu with the currently opened methods is displayed by clicking with either the left or right mouse button on the method symbol. The methods displayed in the main window are then marked with a checkmark. Clicking on the desired method displays it in the place of the previously selected one.

5.2.3.1 Displaying a single method

Menu item: **Method ► View ► Unsplit**

In the default settings, the most recently opened method is displayed by itself in the main window. If the display of two methods is enabled, then the symbol or the **View ► Unsplit** menu item can be used to switch back to the display of just one single method.

5.2.3.2 Displaying methods next to each other

Menu item: **Method ► View ► Split vertically**

Two methods are displayed next to one another in the main window with the symbol or the **View ► Split vertically** menu item.

5.2.3.3 Displaying methods below each other

Menu item: **Method ► View ► Split horizontally**

Two methods are displayed below each other in the main window with the symbol or the **View ► Split horizontally** menu item.

5.2.3.4 Zoom for methods

Context-sensitive menu item: **Zoom**

The following zoom levels can be selected for the display of the method with the context-sensitive **Zoom** menu item or the

symbol on the toolbar:

Selection	**200%** Enlarges the view to 200%.
Selection	**150%** Enlarges the view to 150%.
Selection	**100%** Sets the view to 100%.
Selection	**75%** Reduces the view to 75%.
Selection	**50%** Reduces the view to 50%.
Selection	**25%** Reduces the view to 25%.
Selection	**Fit to width** Adjusts the view to window width.
Selection	**Fit to height** Adjusts the view to window height.
Selection	**Fit in window** Adjusts the view to window width and height.

5.2.4 Editing a method

5.2.4.1 Editing tracks

The following processing functions for tracks are available for a method currently opened in the main window:

5.2.4.1.1 Inserting a new track

Menu item: **Method ▶ Insert ▶ New track...**

The symbol or the **Insert ▶ New track...** menu item opens the **New track** window, in which the desired track type can be selected:

- *Normal track*
- *VA track*
- *Series start track*
- *Series end track*
- *Exit track*
- *Error track*

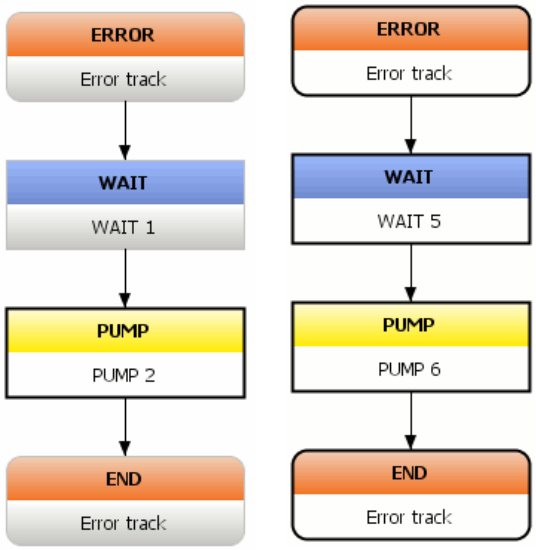
Clicking on **[OK]** inserts the new track on the right next to the selected track.

5.2.4.1.2 Selecting a track

Program part: **Method ▶ Method window**

You can select a track by left-clicking on the start command of the track. This highlights all commands of this track, i.e. they are enframed by a double-width line.

Non-selected track **Selected track**



5.2.4.1.3 Moving a track

Program part: **Method ▶ Method window**

Moving a track with drag and drop

To move a track with drag and drop, the track has to be selected first. Then you can move it to the desired position with the left mouse button held down. A vertical red arrow indicates the possible positions.

Moving a track via the clipboard

To move a track via the clipboard, the track has to be cut first. You can then select an existing track and insert the track from the clipboard to the right side next to the existing track.

5.2.4.1.4 Copying a track

Program part: **Method ► Method window**

Copying a track with drag and drop

In order to copy a track with drag and drop, the track has to be selected first. Then you can copy it to the desired position with the left mouse button and the Ctrl key simultaneously held down. A vertical red arrow indicates the possible positions.

Copying a track to the clipboard

The selected track can be copied to the clipboard with **Edit ► Copy**, the context-sensitive **Copy** menu item or the symbol.

5.2.4.1.5 Cutting a track

Menu item: **Method ► Edit ► Cut**

The selected track can be moved to the clipboard with **Edit ► Cut**, the context-sensitive **Cut** menu item or the symbol.

5.2.4.1.6 Inserting a track

Menu item: **Method ► Edit ► Paste**

The track copied to the clipboard can be inserted on the right side next to the selected track with **Edit ► Paste**, the context-sensitive **Paste** menu item or the symbol.

5.2.4.1.7 Deleting a track

Menu item: **Method ► Edit ► Delete**

The selected track is deleted with **Edit ► Delete**, the context-sensitive **Delete** menu item, the symbol or the Delete key.

5.2.4.2 Editing commands

The following processing functions for commands are available for a method currently opened in the main window:

5.2.4.2.1 Inserting a new command

Menu item: **Method ► Insert ► Insert new command above selected command**

The icon or the **Insert ► Insert new command above selected command** menu item opens the **New command** window, in which the desired command can be selected from the following categories:

- **Voltammetry**
  CP
  CPVS
  CVS
  DP
  ELECTRODE TEST
  LSV
  SQW
  CV
- **Call**
  CALL
  CALL COND
  CALL ELECTROLYTE
  CALL INTERCEPT
  CALL VA
  CALL VMS
- **Measure**
  MEAS Opt
  MEAS Opt Conc
  MEAS Ref
  MEAS Spec
  MEAS T
  MEAS TMF
- **Calibration**
  CAL LOOP Opt
  CAL MEAS Opt
  CAL Spec
- **Dosing**
  ADD AUX
  ADD SAMPLE
  ADD SAMPLE DT
  ADD STD
  EMPTY
  LQH
  PREP
  RLS DOS
  SET TOTAL VOLUME

- **Automation**
  HEATER
  LIFT
  MAIN VALVE
  MOVE
  PUMP
  RACK
  RLS DEV
  STIR
  STIR & PURGE
  SWING
- **Communication**
  CTRL
  RECEIVE
  SCAN
  SEND
  TRANSFER
- **Miscellaneous**
  LOOP
  REQUEST
  SEQUENCE
  WAIT
  CALC

The new command is inserted above the selected command after confirming the selection with **[OK]**.

5.2.4.2.2 Selecting a command

Subwindow: **Method**

A command is selected with a left mouse click. The selected command is enframed by a bold line. Further commands within the same track can be added to or removed from the selection with the left mouse button while the Ctrl key is held down.

Non-selected command **Selected command**

5.2.4.2.3 Moving a command

Subwindow: **Method**

Moving commands with drag and drop

To move commands with drag and drop they have to be selected first. They can then be moved to the desired position between two commands

with the left mouse button pressed. A horizontal red arrow indicates the possible positions.

Moving commands via the clipboard

To move commands via the clipboard they have to be cut first. You can then select a command in an existing track and insert the commands from the clipboard above this command.

5.2.4.2.4 Copying a command

Subwindow: **Method**

Copying commands with drag and drop

To copy commands with drag and drop they have to be selected first. They can then be copied to the desired position with the left mouse button and the Ctrl key simultaneously pressed. A horizontal red arrow indicates the possible positions.

Copying commands to the clipboard

The selected commands are copied to the clipboard with **Edit ▶ Copy**, the context-sensitive **Copy** menu item or the icon.

5.2.4.2.5 Cutting a command

Menu item: **Method ▶ Edit ▶ Cut**

The selected commands are moved to the clipboard with **Edit ▶ Cut**, the context-sensitive **Cut** menu item or the icon.

5.2.4.2.6 Inserting a command

Menu item: **Method ▶ Edit ▶ Paste**

The commands copied to the clipboard are inserted above the selected command with **Edit ▶ Paste**, the context-sensitive **Paste** menu item or the icon.

5.2.4.2.7 Deleting a command

Menu item: **Method ▶ Edit ▶ Delete**

The selected commands are deleted with **Edit ▶ Delete**, the context-sensitive **Delete** menu item, the icon or the Delete key.

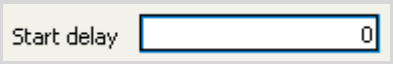
5.2.4.2.8 Command properties

Menu item: **Method ▶ Edit ▶ Properties...**

The properties window for the selected command, in which the command parameters can be set, is opened with **Edit ▶ Properties...**, the context-sensitive **Properties...** menu item, the icon or with a double-click on the command.

NOTICE

For many command parameters with numerical input, a **formula** can also be entered instead of the parameter value. These parameters are indicated by a bold, dark-blue frame around the input field:



To enter a formula, open the **Formula editor** by right-clicking on the input field.

Example

Entering an addition volume that is proportional to the sample amount in the **ADD AUX** command: **Volume = 'SD.Sample amount' * 0.5**

5.2.4.2.9 Command comment

Menu item: **Method ► Edit ► Comment...**

The **Command comment** dialog window, in which a new comment on the selected command can be entered or an existing command can be edited, is opened with **Edit ► Comment...**, the context-sensitive **Comment...** menu item or the icon.

Commands with a comment are marked with a red triangle in the right upper corner. If the cursor is near the triangle for more than 1 s, the comment is displayed as a tooltip.

Command without comment **Command with comment**

5.2.5 Checking a method

Menu item: **Method ► File ► Method check**

With the icon or the **File ► Method check** menu item, a method check for the method in focus is triggered. In the process, the following checks are carried out:

- Track check
- Command check
- Formula check
- Common variable and global variable check
- Template check

A respective error message is displayed for each error found. The check has to be started again afterwards. When the method check has been completed successfully, this is confirmed with a message.

5.2.6 Saving a method

Menu item: **Method ► File ► Save / Save as...**

An existing, focused method is saved again under its name without the **Save method** window being opened with the icon or the **File ► Save** menu item.

When saving a **newly** created method with the **File ► Save** menu item or when saving an existing method with the **File ► Save as...** menu item, the **Save method** window opens, in which the method group can be selected and a method name can be entered or selected.

Method group

Method group

Selection of the method group where the method is to be stored *(see chapter 5.4, page 407)*.

Selection	**'Method group'** | **Main group**
Default value	**Main group**

Method table

The method table contains information on all methods of the selected method group. The table cannot be edited. The table can be sorted according to the selected column (columns **Name**, **Saved**, **User**, **Full name**, **Version** and **Method comment**) in either ascending or descending order by clicking on the column title.

Name

Method name.

Saved

Date and time when the method was saved.

User

Short name of the user who saved the method.

Full name

Full name of the user who saved the method.

Version

Version number of the method.

Method comment

Comment on the method entered as *(see chapter 5.2.4.2.9, page 398)* in the **START** command.

Saving a method

Method name

Entry of the name under which the method is to be saved.

Entry	**50 characters**

NOTICE

The method name must be unique in the entire client/server system.

[Save]

Save the focused method under the desired method name in the selected method group.

The **method check** is automatically carried out before saving the method; it can also be started manually at any time *(see chapter 5.2.5, page 398)*. The method is checked as thoroughly as possible. Checks for devices, sensors, solutions and dosing units are not carried out until the start of the method in order to ensure that method commands can also be created for devices which are not yet configured in the system. If an error is detected during the method check, a message is displayed asking whether the method should be saved nevertheless. Faulty methods cannot be started.

A new method version with a new method identification is created each time a modified method is saved *(see chapter 5.3.10, page 406)*.

5.2.7 Printing a method report

Menu item: **Method ► File ► Print (PDF)...**

The **File ► Print (PDF)...** menu item or the PDF symbol can be used to open the **Print method reports (PDF)** window, where the desired report for the focused method can be selected and output as a PDF file.

Report selection

Select the content of the method report.

Selection	**Method sequence** | **Method parameters** | **Measuring parameters** | **Evaluation parameters**
Default value	**Method sequence**

Method sequence
Output of the method run in graphical format.

Method parameters
Output of all parameters of all commands.

Measuring parameters
Output of all parameters of the measuring commands. This part of the report includes the **Measuring parameters** fixed report *(see chapter 4.4.1.4.3, page 240)*.

Evaluation parameters
Output of all evaluation parameters of the areas *General*, *Substances*, *Standards*, *Calibration* and *Results*. This part of the report includes the **Evaluation parameters** fixed report *(see chapter 4.4.1.4.3, page 240)*.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output in portrait format.

Landscape
Output in landscape format.

5.2.8 Closing a method

Menu item: **Method ► File ► Close / Close all**

Closing a single method

The icon or the **File ► Close** menu item can be used to close the focused method. If the method has been modified, a prompt for confirmation to save the method as a new version will appear.

Closing all methods

All opened methods are closed with the **File ► Close all** menu item. A prompt for confirmation to save the method as a new version will appear for each method that has been modified.

5.3 Managing methods

5.3.1 Managing methods

Dialog window: **Method ► File ► Method manager... ► Method manager**

The **Method managerMethod manager** dialog window, where a user with corresponding access permission can manage methods, is opened with the symbol or the **File ► Method manager...** menu item.

Method group

Method group

Selection of the method group whose methods are to be displayed in the table.

Selection	**'Method group'** | **Main group**
Default value	**Main group**

[Method groups]

Opens the **Method groups** dialog window for managing the method groups *(see chapter 5.4.2, page 408)*.

Method table

The method table contains information about all methods of the selected method group. The table cannot be edited. The table can be sorted according to the selected column (**Name**, **Saved**, **User**, **Full name**, **Version** and **Method comment** columns) in either ascending or descending order by clicking on the column title.

Name

Name of the method.

Saved

Date and time when the method was saved.

User

Short name of the user who saved the method.

Full name

Full name of the user who saved the method.

Version

Version number of the method.

Method comment

Comment on the method entered as *Command comment* in the **START** command.

Window menus

The **[Edit]** menu below the method table contains the following menu items:

Rename...	Rename the selected method *(see chapter 5.3.2, page 403)*.
Copy	Copies the selected method(s) in the same method group *(see chapter 5.3.3, page 404)*.
Move...	Move the selected method(s) to a different method group *(see chapter 5.3.4, page 404)*.
Delete...	Deletes the selected method(s) *(see chapter 5.3.5, page 404)*.
Send to...	Export the selected method(s) and attach it (them) to an e-mail *(see chapter 5.3.6, page 404)*.
Export...	Export the selected method(s) *(see chapter 5.3.7, page 405)*.
Import...	Import method(s) *(see chapter 5.3.8, page 405)*.

[History]

Opens the **Method history** dialog window for the selected method *(see chapter 5.3.10, page 406)*.

[Close]

Closes the dialog window and saves the entries.

5.3.2 Renaming a method

Dialog window: **Method ► File ► Method manager... ► Method manager ► [Edit] ► Rename... ► Rename method**

The **Rename method** window for renaming the selected method is opened with the **[Edit] ► Rename...** menu item.

Rename method '%1' to

Entry of the new method name.

Entry	**50 characters**

NOTICE

The method name must be unique in the entire client/server system. Renaming a method is not regarded as a modification, i.e. the method version does not change.

5.3.3 Copying a method

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Copy**

With the **[Edit] ▶ Copy** menu item, the selected methods are saved in the same method group under the name **Copy of 'Method name'**.

5.3.4 Moving a method

Dialog window: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Move... ▶ Move method(s)**

The selected methods are moved to the desired method group with the **[Edit] ▶ Move...** menu item. The method group can be selected in the **Move method(s)** window.

Select method group

Selection of the method group to which the methods should be moved.

Selection	**'Method group'**

[Move]

Move method to the selected method group.

5.3.5 Deleting a method

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Delete...**

The selected methods and all method versions are deleted with the **[Edit] ▶ Delete...** menu item.

5.3.6 Sending a method to

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Send to...**

The selected methods are each exported as a file named **'Method name'.vmet** with the **[Edit] ▶ Send to...** menu item.

Afterwards, the Windows standard e-mail client will open with an empty message. The export files of the highlighted objects will automatically be added as an attachment. The user can complete the e-mail him- or herself and send it on. The exported methods are stored only temporarily on the computer and will be deleted automatically after the e-mail has been sent.

NOTICE

The exported methods are stored uncoded but with a checksum. If a file stored in this manner is tampered with, then it cannot be imported again.

5.3.7 Exporting a method

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Export...**

The selected methods are each exported as a file named **'Method name'.vmet** with the **[Edit] ▶ Export...** menu item. The **Select directory for export** dialog window opens, in which the directory for export must be selected.

NOTICE

The exported methods are stored uncoded but with a checksum. If a file stored in this manner is tampered with, then it cannot be imported again.

5.3.8 Importing a method

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Import...**

The **Select files to import** dialog window is opened with the **[Edit] ▶ Import...** menu item. Here you must select the methods to be imported and the method group into which the methods are to be imported. These methods are then imported into the opened method table.

NOTICE

In the program directory under **...\viva\examples\methods\...** you will find **sample methods** that can be imported into an opened method group.

5.3.9 Renaming an imported method

Menu item: **Method ▶ File ▶ Method manager... ▶ Method manager ▶ [Edit] ▶ Import...**

Methods with the same name as already existing methods can only be imported under a new name. The **Import method** window opens for renaming the method.

Rename imported method 'Name' to

Entry of the new method name.

Entry	**50 characters**

NOTICE

The method name must be unique in the entire client/server system. Renaming a method is not regarded as a modification, i.e. the method version does not change.

5.3.10 Showing the method history

Dialog window: **Method ► File ► Method manager... ► Method manager ► [History] ► Method history**

The **Method history** dialog window with a table display of all of the **versions** of the selected method is opened with the **[History]** button.

Name

Name of the method.

Version

Version number of the method.

Method ID

Unique method identification.

Saved

Date and time when the method was saved.

User

Short name of the user who saved the method.

Full name

Full name of the user who saved the method.

[Show method]

Opens the **Method 'Method name' - Version #** dialog window, in which the method for the selected method version is displayed.

[Make current]

Makes the selected method version the current method version again. This creates a new method whose version number is increased by **+1** compared with the last version to have been saved.

5.4 Method groups

5.4.1 Managing method groups

Dialog window: **Method ► File ► Method groups... ► Method groups**

The **Method groups** dialog window, in which a user with corresponding access permission can manage method groups, is opened with the symbol or the **File ► Method groups…** menu item. The information on the existing method groups is shown in a table. The table cannot be edited and is not automatically updated. By clicking on the column title the table can be sorted according to the selected column in either ascending or descending order.

Name

Name of the method group.

Number

Shows the number of methods in the method group.

Saved

Date and time when the method group was saved.

User

Short name of the user who saved the method group.

Full name

Full name of the user who saved the method group.

Comment

Comment on the method group.

[New]

Opens the **Properties - Method group - 'New Group'** dialog window for defining a new method group *(see chapter 5.4.2, page 408)*.

[Properties]

Opens the **Properties - Method group 'Name'** dialog window, in which the method group selected in the table can be edited *(see chapter 5.4.2.1, page 408)*.

[Delete]

Deletes the method group selected in the table.

5.4.2 Editing method groups

5.4.2.1 Method groups - Properties

Dialog window: **Method ▶ File ▶ Method groups... ▶ Method groups ▶ [Properties] ▶ Properties - 'Name' method group**

The **Properties - 'Name' method group** properties window for the selected method group is opened with the **[Properties]** button or by double-clicking on a line in the table.

The parameters for method groups are configured on the following tabs:

- *General*
  General parameters.
- *Access rights*
  Access rights for method groups and their methods.

5.4.2.2 Method groups - General

Tab: **Method ▶ File ▶ Method groups... ▶ Method groups ▶ [Properties] ▶ Properties - 'Name' method group ▶ General**

Name

Name of the method group. The name has to be entered when a new method group is created.

Entry	**50 characters**

Number

Shows the number of methods in the method group.

Comment

Freely definable remarks about the method group.

Entry	**1,000 characters**

5.4.2.3 Method groups - Access rights

Tab: **Method ▶ File ▶ Method groups... ▶ Method groups ▶ [Properties] ▶ Properties - 'Name' method group ▶ Access rights**

Access rights for method groups and their methods can be assigned per user group.

NOTICE

The **Administrators** user group always has both access rights, i.e. these rights cannot be disabled.

User group

Names of the user groups.

Execute

on | off (Default value: **on**)

Permission to start methods from a method group. Methods in this group can only be opened and started but cannot be edited or deleted.

Edit

on | off (Default value: **on**)

Permission to edit methods from a method group. Methods in this group can be opened, started, edited and deleted. New methods can be added as well.

5.5 Method run subwindow

The run instruction for the processing of a sample is defined in the **Method run** subwindow. Each method contains **tracks** (subprograms) consisting of individual **commands**.

5.5.1 Tracks

5.5.1.1 Tracks - General

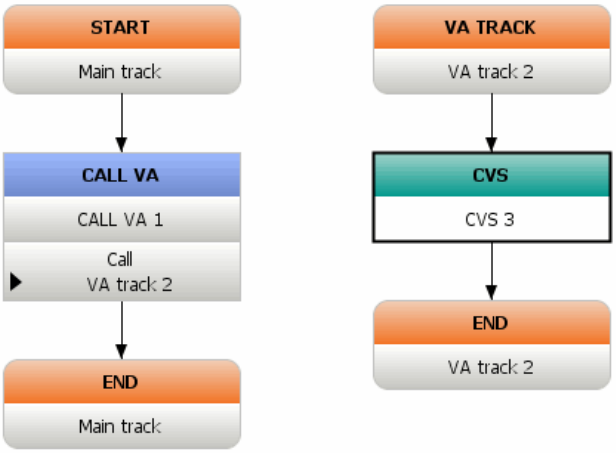
Subwindow: **Method**

Definition

A **track** is a partial run of a **method** consisting of **commands**. Apart from the **main track**, which is present in each method, there are: **normal tracks**, which can be created by the user and which are called with the **CALL** command; VA tracks, which are called with the **CALL VA**, **CALL VMS**, **CALL INTERCEPT** or **CALL COND** commands; and **special tracks** (series start track, series end track, exit track and error track), which cannot be called but which are automatically started if certain events occur.

Structure

Each track contains the **START** or **TRACK** command and the **END** command; between these, any commands can be inserted.



Display

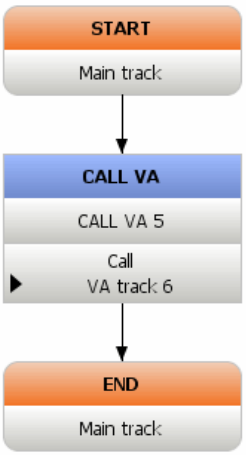
The individual tracks are arranged next to one another in the method window. The track name appears in the **START** and **TRACK** commands and in the **END** command.

5.5.1.2 Track types

5.5.1.2.1 Main track

Subwindow: **Method**

The **main track** contains the main run of the method and is present in every method. It starts with the **START** command *(see chapter 5.5.2.8.2, page 546)* and ends with the **END** command. The **START** command provides the required variables. The **END** command marks the end of the method run. The main track cannot be deleted or moved.



NOTICE

Apart from **ELECTRODE TEST**, no voltammetry commands *(see chapter 5.5.2.10, page 582)* can be inserted in a main track.

5.5.1.2.2 Normal track

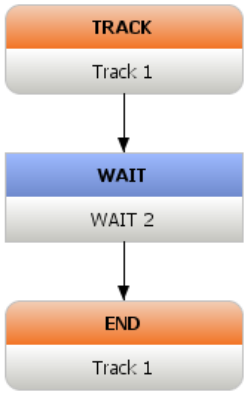
Subwindow: **Method**

A **normal track** is a track that can be generated manually by the user with **Insert ► New track... ► Normal track** or with the icon. It starts with the **TRACK** command *(see chapter 5.5.2.8.3, page 554)* and ends with the **END** command.

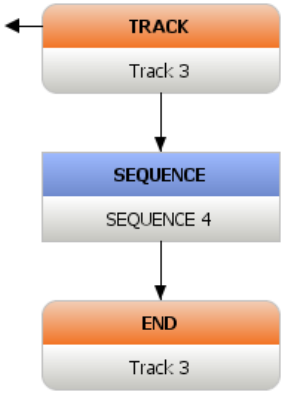
Normal tracks can be called via the **CALL** command and by entering the corresponding name. Branches and parallel processes can be realized in this way. The following two cases are distinguished when calling normal tracks:

- **Sequentially running normal track**
  If the **Return immediately** check box is deactivated in the **TRACK** command, then all commands of this track are processed one after the other when the normal track is called. Afterwards, the track gives a response to the **CALL** command that was calling and the run is continued from there.
- **Normal track run in parallel**
  If the **Return immediately** check box is activated in the **TRACK** command, then the corresponding command is marked with an arrow (see below). When the normal track is called, then the commands in this track are processed, but the track responds immediately to the **CALL** command that is calling. In this way, the run in the calling track is also continued, i.e., the two tracks are processed in parallel.

Sequentially running normal track



Normal track run in parallel



NOTICE

Apart from **ELECTRODE TEST**, no voltammetry commands *(see chapter 5.5.2.10, page 582)* can be inserted in a normal track.

5.5.1.2.3 VA track

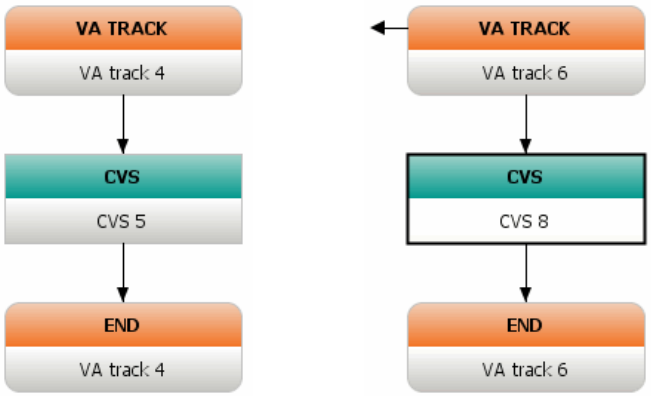
Subwindow: **Method**

A **VA track** is a track for *voltammetry commands* that can be generated manually by the user with **Insert ▶ New track... ▶ VA track** or with the icon. It starts with the **VA TRACK** command *(see chapter 5.5.2.8.4, page 555)* and ends with the **END** command.

VA tracks can be called with the commands **CALL VA**, **CALL VMS**, **CALL ELECTROLYTE**, **CALL INTERCEPT** or **CALL COND** and by entering the corresponding name. Branches and parallel processes can be realized in this way. The following two cases are distinguished when calling VA tracks:

- **Sequentially running VA track**
  If the **Return immediately** check box is deactivated in the **VA TRACK** command, then all commands of this track are processed one after the other when the VA track is called. Afterwards, the track gives a response to the CALL command that is calling and the run is continued from there.
- **VA track run in parallel**
  If the **Return immediately** check box is activated in the **VA TRACK** command, then the corresponding command is marked with an arrow (see below). When the VA track is called, then the commands in this track are processed, but the track responds immediately to the CALL command that is calling. In this way, the run in the calling track is also continued, i.e., the two tracks are processed in parallel.

Sequentially running VA track **VA track run in parallel**



NOTICE

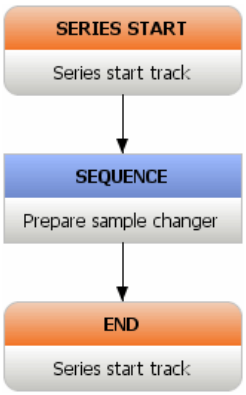
Only the following commands can be inserted in a VA track: *Voltammetry commands*, *STIR*, *STIR & PURGE*, *LOOP*, *WAIT*.

5.5.1.2.4 Series start track

Subwindow: **Method**

A **series start track** is a track that can be created manually by the user with **Insert ► New track... ► Series start track** or with the icon. It starts with the **SERIES START** command *(see chapter 5.5.2.8.5, page 555)* and ends with the **END** command. Only one series start track can be inserted in a given method.

The series start track is executed in the run only once at the beginning of the first determination of a series and before the main track. This track can be used, e.g., to initialize sample changers at the beginning of a series.



NOTICE

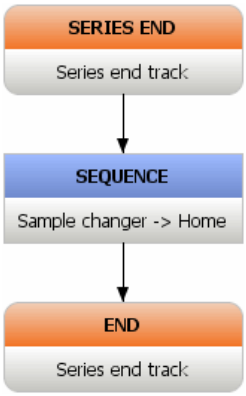
Apart from **ELECTRODE TEST**, no voltammetry commands *(see chapter 5.5.2.10.1, page 582)* can be inserted in a series start track.

5.5.1.2.5 Series end track

Subwindow: **Method**

A **series end track** is a track that can be generated manually by the user with **Insert ► New track... ► Series end track** or with the icon. It starts with the **SERIES END** command *(see chapter 5.5.2.8.6, page 556)* and ends with the **END** command. Only one series end track can be inserted in a given method.

The series end track is executed in the run only once at the end of the last determination of a series after the main track. This track can be used, e.g., to set sample changers to the required state at the end of a series.



NOTICE

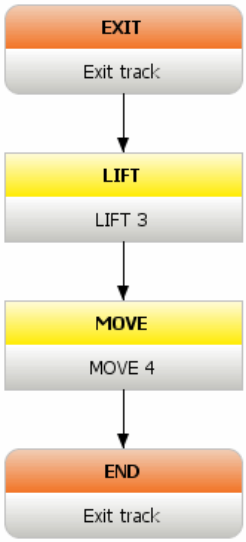
Apart from **ELECTRODE TEST**, no voltammetry commands *(see chapter 5.5.2.10.1, page 582)* can be inserted in a series end track.

5.5.1.2.6 Exit track

Subwindow: **Method**

An **exit track** is a track that can be generated manually by the user with **Insert ► New track... ► Exit track** or with the icon. It starts with the **EXIT** command *(see chapter 5.5.2.8.7, page 557)* and ends with the **END** command. Only one exit track can be inserted in a given method.

The exit track is executed in the run when all **normal tracks** and **VA tracks** as well as the **main track** have been completed or when the determination is manually canceled.



NOTICE

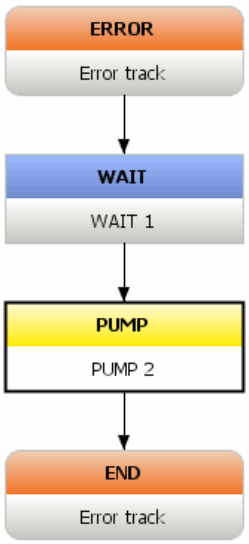
No voltammetry commands *(see chapter 5.5.2.10.1, page 582)* can be inserted in an exit track.

5.5.1.2.7 Error track

Subwindow: **Method**

An **error track** is a track that can be generated manually by the user with **Insert ► New track... ► Error track** or with the icon. It starts with the **ERROR** command *(see chapter 5.5.2.8.8, page 558)* and ends with the **END** command. Only one error track can be inserted in a given method.

If an error track is present in the method, then no error message will be displayed in the event of an error in the run, but the error track will be executed. In this case, the error track assumes the function of the main track. Normal tracks can also be called from it.



NOTICE

No voltammetry commands *(see chapter 5.5.2.10.1, page 582)* can be inserted in an error track.

5.5.1.3 Editing tracks

Subwindow: **Method**

The following processing functions for tracks are available for a method currently opened in the main window:

- *Inserting a new track*
- *Selecting a track*
- *Moving a track*
- *Copying a track*
- *Cutting a track*
- *Inserting a track*
- *Deleting a track*

5.5.2 Commands

5.5.2.1 Commands - General

5.5.2.1.1 Definition and representation

Subwindow: **Method**

Definition

A **command** is a part of a **track** with the following general properties:

- **Command type**
  The command type defines the function of the command. The designation of the command type (short description in capital letters) cannot be changed.
- **Command name**
  Each command has a freely selectable command name which must be unique within the method.

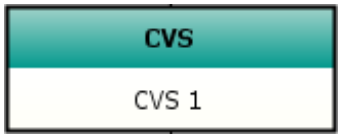
NOTICE

In the event that a command has been renamed afterwards, the cross-references to this command (e.g. command variables) are adjusted automatically within the method.

- **Command parameters**
  The number and type of command parameters depend on the command type and can be edited in the **command properties**.
- **Commands in the run**
  Commands within the same track are carried out in sequence, one after the other, in the method run.

Representation

Commands are displayed in two-line format. The first line contains the name of the command type (e.g. **CVS**) and the second line the command name, which can be freely defined and which is unique within the method. The default command name is composed of the command type and a consecutive number.



The field for the command type is color-coded for the various types of commands:

- **Orange**
  Track commands
- **Green**
  Commands for voltammetry and measuring
- **yellow**
  Sample changer and dosing commands
- **Blue**
  All other commands

5.5.2.1.2 Editing commands

Subwindow: **Method**

The following processing functions for commands are available for a method currently opened in the main window:

- *Inserting a new command*
- *Selecting a command*
- *Moving a command*
- *Copying a command*
- *Cutting a command*
- *Inserting a command*
- *Deleting a command*
- *Command properties*
- *Command comment*

5.5.2.1.3 Alphabetical command overview

Subwindow: **Method**

- *ADD AUX*
  Adding an auxiliary solution.
- *ADD SAMPLE*
  Adding the sample.
- *ADD SAMPLE DT*
  Adding the sample for the calibration method **DT**.
- *ADD STD*
  Adding a standard solution.
- *CALC*
  Calculating results and assigning common variables and global variables.
- *CAL LOOP Opt*
  Calibrating colorimetric sensors.
- *CAL MEAS Opt*
  Measuring standard solutions for the calibration of colorimetric sensors.
- *CAL Spec*
  Calibrate the wavelengths.
- *CALL*
  Calling normal tracks.
- *CALL COND*
  Calling VA tracks for the conditioning of electrodes.
- *CALL ELECTROLYTE*
  Calling VA tracks for calculating the electrolyte value.
- *CALL INTERCEPT*
  Calling VA tracks for calculating the intercept value.
- *CALL VA*
  Calling VA tracks.

- *CALL VMS*
  Calling VA tracks for calculating the VMS value.
- *CP*
  Electroplating bath analysis with CP (chronopotentiometry or open-circuit potential measurements).
- *CPVS*
  Electroplating bath analysis with CPVS (Cyclic Pulse Voltammetric Stripping).
- *CTRL*
  Setting remote output lines.
- *CV*
  Basic experiments in electrochemistry using CV (Cyclic Voltammetry).
- *CVS*
  Electroplating bath analysis with CVS (Cyclic Voltammetric Stripping).
- *DP*
  Trace analysis with DP (differential pulse measuring mode).
- *ELECTRODE TEST*
  Electrode test.
- *EMPTY*
  Empties a dosing unit.
- *ERROR*
  Start command for the error track.
- *EXIT*
  Start command for the exit track.
- *HEATER*
  Controlling the heater.
- *LIFT*
  Moves to a lift position.
- *LOOP*
  Multiple execution of method parts.
- *LQH*
  Extensive dosing possibilities with a Dosino.
- *LSV*
  Electroplating bath analysis and trace analysis with LSV (Linear Sweep Voltammetry).
- *MAIN VALVE*
  Opening and closing the main valve of the 884 Professional VA for the inert gas.
- *MEAS Opt*
  Measuring the absorbance.
- *MEAS Opt Conc*
  Measuring the concentration (direct measurement).
- *MEAS Ref*
  Measuring the reference spectrum.
- *MEAS Spec*
  Measuring the sample spectrum.

- *MEAS T*
  Measuring the temperature.
- *MEAS TMF*
  Determining the transmission factor.
- *MOVE*
  Moves to a rack position or an external position.
- *PREP*
  Preparing an exchange or dosing unit.
- *PUMP*
  Switching the connected or built-in pumps on/off.
- *RACK*
  Initializes the attached rack.
- *RECEIVE*
  Waiting for event or status messages.
- *REQUEST*
  Scans sample data.
- *RLS DEV*
  Releases a device for use in other methods that run in parallel.
- *RLS DOS*
  Releases a dosing device for use in other methods that run in parallel.
- *SCAN*
  Scanning remote input lines.
- *SEND*
  Sending event messages.
- *SERIES END*
  Start command for the series end track.
- *SERIES START*
  Start command for the series start track.
- *SEQUENCE*
  Combines several commands to one command.
- *SET TOTAL VOLUME*
  Entry of the current total volume in the measuring vessel.
- *SQW*
  Trace analysis with SQW (square-wave measuring mode).
- *START*
  Start command for the main track.
- *STIR*
  Controls a connected stirrer.
- *STIR & PURGE*
  Stirs and purges the measuring solution.
- *SWING*
  Swings the robotic arm (only with Swing Head).
- *TRACK*
  Start command for the normal track.
- *TRANSFER*
  Data transfer via RS-232 to external devices or programs.

- *VA TRACK*
  Start command for VA track.
- *WAIT*
  Stops the method run.

5.5.2.2 Call commands

5.5.2.2.1 Call commands - Overview

Menu item: **Method ► Insert ► New command... ► Call**

The following call commands can be selected:

- *CALL*
  Calling normal tracks (subprograms).
- *CALL VA*
  Calling VA tracks.
- *CALL VA*
  Calling VA tracks.
- *CALL VMS*
  Calling VA tracks.
- *CALL INTERCEPT*
  Calling VA tracks.
- *CALL COND*
  Calling VA tracks.
- *CALL ELECTROLYTE*
  Calling VA tracks.

5.5.2.2.2 CALL

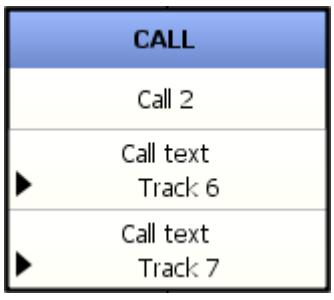
5.5.2.2.2.1 CALL - Overview

Dialog window: **Method ► CALL ► Properties... ► CALL - 'Command name'**

Command for **Calling normal tracks**. As an option, you can formulate conditions that must be fulfilled so that the **CALL** command is executed.

Appearance

The command has the following appearance:



A maximum of 10 calls per command are possible.

Parameters

The parameters for the **CALL** command are set in the following dialog window:

- *CALL*

Command variables

The following command variables are generated by the **CALL** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.2.2 CALL - Properties

Dialog window: **Method ► CALL ► Properties... ► CALL - Call #**

Command name

Name of the command.

Entry	**25 characters**

Call table

All of the defined calls that are listed in the table are executed simultaneously. The table cannot be edited directly.

NOTICE

The **CALL** command waits until all of the called tracks have been completed or have reported in. If there is to be no waiting for the completion of a track, then the **Return immediately** check box must be activated in the respective track command *(see chapter 5.5.2.8.1, page 546)*.

[New]

Opens the **Call - New** dialog window for entering a new call *(see chapter 5.5.2.2.2.3, page 423)*.

NOTICE

A maximum of 10 calls can be entered.

[Properties]

Opens the **Call - 'Call text'** dialog window to edit the call selected in the table *(see chapter 5.5.2.2.2.3, page 423)*.

[Delete]

Deletes the selected call.

5.5.2.2.2.3 CALL - Call

Dialog window: **Method ► CALL ► Properties... ► [New]**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the track to be called up. All of the normal tracks available in the method (with the exception of the main track) are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Conditions

Sample type

on | off (Default value: **off**)

Selection of sample type for calling the track. If this check box is activated, then the call is not carried out unless the sample type defined here matches the sample type specified in the Run window for the sample data.

Selection	**Sample** | **Standard** | **Intercept**
Default value	**Sample**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.2.3 CALL VA

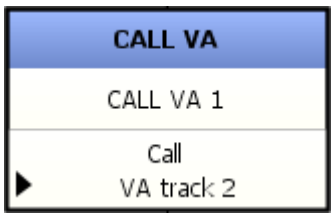
5.5.2.2.3.1 CALL VA - Overview

Dialog window: **Method ► CALL VA ► Properties... ► CALL VA - 'Command name'**

Command for **calling VA tracks**. As an option, you can formulate a condition that must be fulfilled so that the **CALL VA** command is executed.

Appearance

The command has the following appearance:



Parameters

The parameters for the **CALL VA** command are set in the following dialog window:

- *CALL VA*

Command variables

The following command variables are generated by the **CALL VA** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.3.2 CALL VA - Properties

Dialog window: **Method ► CALL VA ► Properties... ► CALL VA - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.2.4 CALL BLANK

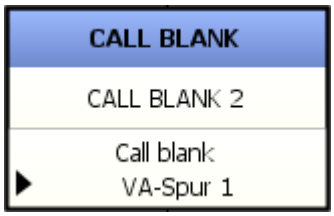
5.5.2.2.4.1 CALL BLANK - Overview

Dialog window: **Method ► CALL BLANK ► Properties... ► CALL BLANK - 'Command name'**

Command for **calling VA tracks** for blank value determination. As an option, you can formulate a condition that must be fulfilled so that the **CALL BLANK** command is executed.

Appearance

The command has the following appearance:



Parameters

The parameters for the **CALL BLANK** command are set in the following dialog window:

- *CALL BLANK*

Command variables

The following command variables are generated by the **CALL BLANK** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.4.2 CALL BLANK - Properties

Dialog window: **Method ► CALL BLANK ► Properties... ► CALL BLANK - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.2.5 CALL VMS

5.5.2.2.5.1 CALL VMS - Overview

Dialog window: **Method ► CALL VMS ► Properties... ► CALL VMS - 'Command name'**

Command for **calling a VA track**. The data acquired in the called VA track is used for the calculation of the **VMS value** *(see glossary, page 1074)* for the standardization of the calibration curves in the calibration method **DT** (Dilution Titration) *(see glossary, page 1058)*. As an option, you can formulate a condition that must be fulfilled so that the **CALL VMS** command is executed.

Appearance

The command has the following appearance:

Parameters

The parameters for the **CALL VMS** command are set in the following dialog window:

- *CALL VMS*

Command variables

The following command variables are generated by the **CALL VMS** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.5.2 CALL VMS - Properties

Dialog window: **Method ► CALL VMS ► Properties... ► CALL VMS - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.2.6 CALL INTERCEPT

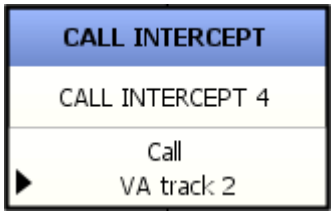
5.5.2.2.6.1 CALL INTERCEPT - Overview

Dialog window: **Method ► CALL INTERCEPT ► Properties... ► CALL INTERCEPT - 'Command name'**

Command for **calling a VA track**. The data acquired in the called VA track is used for calculating the **intercept value** *(see glossary, page 1064)* in the calibration methods **MLAT** (Modified Linear Approximation Technique) *(see glossary, page 1066)* and **LAT** (Linear Approximation Technique) *(see glossary, page 1064)*. As an option, you can formulate a condition that must be fulfilled so that the **CALL INTERCEPT** command is executed.

Appearance

The command has the following appearance:



NOTICE

Only one **CALL INTERCEPT** may be present in a method.

Parameters

The parameters for the **CALL INTERCEPT** command are set in the following dialog window:

- *CALL INTERCEPT*

Command variables

The following command variables are generated by the **CALL INTERCEPT** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.6.2 CALL INTERCEPT - Properties

Dialog window: **Method ► CALL INTERCEPT ► Properties... ► CALL INTERCEPT - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.2.7 CALL COND

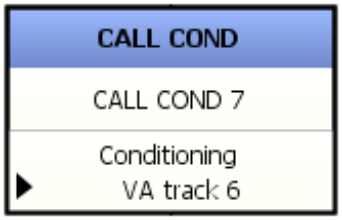
5.5.2.2.7.1 CALL COND - Overview

Dialog window: **Method ► CALL COND ► Properties... ► CALL COND - 'Command name'**

Command for the **repeated calling of a VA track** which continues to be executed until one of the stop criteria is fulfilled. This command is used chiefly for the conditioning of electrodes.

Appearance

The command has the following appearance:



Parameters

The parameters for the **CALL COND** command are set in the following dialog window:

- *CALL COND*

Command variables

The following command variables are generated by the **CALL COND** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **LCO** | **LST** | **SDV**

5.5.2.2.7.2 CALL COND - Properties

Dialog window: **Method ► CALL COND ► Properties... ► CALL COND - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'**

Stop criteria

Definition of four possible criteria for the cancellation of the command call. The stop criterion that is reached first applies for the cancellation. If no stop criterion is switched on, then the action will not be carried out.

Evaluation quantity

on | off (Default value: **on**)

If this check box is activated, then the call of the VA track will no longer be carried out if the standard deviation of the evaluation quantity for the selected substance falls below the specified value.

If the calibration method **no calibration** has been selected, then the standard deviation will be automatically calculated with the area of the selected substance.

Voltammetry command

Selection of the voltammetry command whose evaluation quantity is to be checked.

Selection	**'Voltammetry command'**

Substance

Selection of the substance for which the evaluation quantity is to be checked.

Selection	**'Substance'**

Standard deviation

Specification of the standard deviation of the evaluation quantity for the selected substance. If this value is not achieved, then the VA track will no longer be called again. All of the measuring results of the voltammetry command are used for the calculation of the standard deviation that were generated at the moment of the last two executions of the VA track called by **CALL COND**.

A standard deviation of around 2% is to be recommended for small signals (< 500 µC) and a value of around 0.5% for larger signals (> 500 µC).

Input range	**0.1 to 99.9 %**
Default value	**0.5 %**

Example: voltammetry command with 2 measurement cycles (replications)

The following single results **x-y** of run **x** and replication **y** will be used for the calculation of the standard deviation:

After 2 runs: **1-1**, **1-2**, **2-1**, **2-2**

After 3 runs: **2-1**, **2-2**, **3-1**, **3-2**

After 4 runs: **3-1**, **3-2**, **4-1**, **4-2**

etc.

The current values (peak areas or peak heights) are displayed on the workplace in the table of the **Curve** subwindow during conditioning. The current relative standard deviation of the conditioning is displayed on the workplace in the table of the **Curve** subwindow starting with the second run of a CALL COND command.

This applies only if the **Evaluation quantity** stop criterion is activated in the CALL COND command.

Number of runs

on | off (Default value: **off**)

If this check box is activated, then the defined action is triggered when the specified number of runs of the VA track has been achieved.

Number of runs

Number of runs of the VA track, after which the call of the VA track is to be canceled.

Input range	**0 to 999**
Default value	**20**

Action

Definition of the action that is to be executed if this stop criterion is fulfilled.

Selection	**Cancel command** | **Cancel determination** | **Cancel determination and series**

Cancel command
The running command **CALL COND** is canceled; afterwards the next command is started in the track.

Cancel determination
The ongoing determination is canceled, after which the next determination in the series is started (any exit track that may be present is executed, any error track that may be present is *not* executed).

Cancel determination and series
The ongoing determination is canceled, the next determination in the series will no longer be started (any exit track that may be present is executed, any error track that may be present is *not* executed).

Run time

on | off (Default value: **off**)

If this check box is activated, then the defined action is triggered when the specified run time has been reached.

Run time

Run time after which the call of the VA track is to be canceled.

Input range	**0.0 to 999.9 min**
Default value	**0.0 min**

Action

Definition of the action that is to be executed if this stop criterion is fulfilled.

Selection	**Cancel command** | **Cancel determination** | **Cancel determination and series**

Cancel command
The running command **CALL COND** is canceled; afterwards the next command is started in the track.

Cancel determination
The ongoing determination is canceled, after which the next determination in the series is started (any exit track that may be present is executed, any error track that may be present is *not* executed).

Cancel determination and series
The ongoing determination is canceled, the next determination in the series will no longer be started (any exit track that may be present is executed, any error track that may be present is *not* executed).

Condition

on | off (Default value: **off**)

If this check box is activated, the defined action will be triggered if the evaluation of the condition yields the result **1** (= true).

Condition

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

Entry	**1000 characters**
Default value	**'empty'**

Action

Definition of the action that is to be executed if this stop criterion is fulfilled.

Selection	**Cancel command** | **Cancel determination** | **Cancel determination and series**

Cancel command
The running command **CALL COND** is canceled; afterwards the next command is started in the track.

Cancel determination
The ongoing determination is canceled, after which the next determination in the series is started (any exit track that may be present is executed, any error track that may be present is *not* executed).

Cancel determination and series
The ongoing determination is canceled, the next determination in the series will no longer be started (any exit track that may be present is executed, any error track that may be present is *not* executed).

5.5.2.2.8 CALL ELECTROLYTE

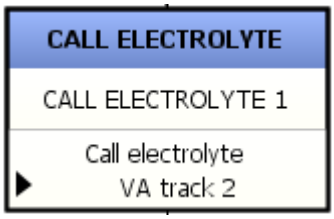
5.5.2.2.8.1 CALL ELECTROLYTE - Overview

Dialog window: **Method ▶ CALL ELECTROLYTE ▶ Properties... ▶ CALL ELECTROLYTE - 'Command name'**

Command for **calling a VA track**. The data acquired in the called VA track is used in the **RC (Response Curve)** *(see glossary, page 1069)* calibration method for the determination of additives with a suppressing effect (e.g. leveler) *(see glossary, page 1065)*. As an option, you can formulate a condition that must be fulfilled so that the **CALL ELECTROLYTE** command is executed.

Appearance

The command has the following appearance:



Parameters

The parameters for the **CALL ELECTROLYTE** command are set in the following dialog window:

- *CALL ELECTROLYTE*

Command variables

The following command variables are generated by the **CALL ELECTROLYTE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.2.8.2 CALL ELECTROLYTE - Properties

Dialog window: **Method ► CALL ELECTROLYTE ► Properties... ► CALL ELECTROLYTE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Call text

Freely editable text for the designation of the call; the text is displayed in the command depiction.

Entry	**50 characters**
Default value	**'empty'**

Track name

Selection of the VA track to be called up. All of the VA tracks available in the method are displayed.

Selection	**'Track name'** | **'empty'**
Default value	**'empty'**

Condition

on | off (Default value: **off**)

Expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*.

If this check box is activated, then the call is carried out only if the evaluation of the condition yields the result **1** (= true).

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.3 Automation commands

5.5.2.3.1 Automation commands - Overview

Menu item: **Method ▶ Insert ▶ New command... ▶ Automation**

Commands for the operation of sample changers.

The following automation commands can be selected:

- *HEATER*
  Control of the heater of the 089 Photometer.
- *LIFT*
  Moves to a lift position.
- *MAIN VALVE*
  Opening and closing the main valve of the 884 Professional VA for the inert gas.
- *MOVE*
  Moves to a rack position or an external position.
- *PUMP*
  Activates/deactivates the connected pumps.
- *RACK*
  Initializes the attached rack.
- *RLS DEV*
  Releases a device for use in other methods that run in parallel.
- *STIR*
  Controls a connected stirrer.
- *STIR & PURGE*
  Stirs and purges the measuring solution.
- *SWING*
  Swings the robotic arm (only with Swing Head).

5.5.2.3.2 HEATER

5.5.2.3.2.1 HEATER - Overview

Dialog window: **Method ▶ HEATER ▶ Properties... ▶ HEATER - 'Command name'**

Command for the **control of the heater**.

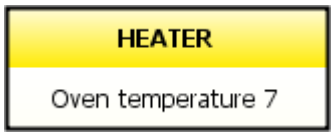
Instruments

This command can be executed with the following devices:

Photometer: 089

Appearance

The command has the following appearance:



Parameters

The parameters for the **HEATER** command are set in the following dialog window:

- *HEATER - Properties*

Command variables

The following command variables are generated by the **HEATER** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.3.2.2 HEATER - Properties

Dialog window: **Method ▶ HEATER ▶ Properties... ▶ HEATER - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**089 Photometer**
Default value	**089 Photometer**

Heater

Target temperature

Temperature to which the cuvette has to be heated.

Input range	**20 to 80 °C**
Selection	**Init. temp.** | **off**
Default value	**Init. temp.**

Init. temp.
With **Init. temp.**, the cuvette heater is activated at the same time as the instrument and the cuvette is heated up to this temperature. The initial temperature is entered and edited in the instrument configuration *(see chapter 7.7.3, page 944)*.

off
Switch off heater.

5.5.2.3.3 LIFT

5.5.2.3.3.1 LIFT - Overview

Dialog window: **Method ▶ LIFT ▶ Properties... ▶ LIFT - 'Command name'**

Command for **moving to predefined positions** at a sample changer.

Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:

Parameters

The parameters for the **LIFT** command are set in the following dialog window:

- *LIFT - Properties*

Command variables

The following command variables are generated by the **LIFT** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **LPO**

5.5.2.3.3.2 LIFT - Properties

Dialog window: **Method ▶ LIFT ▶ Properties... ▶ LIFT - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

Target

Tower

Selection of the tower on the sample changer for moving to the required lift position.

Selection	**1** | **2**
Default value	**1**

Lift position

Entering the desired lift position in mm or selection of one of the lift positions predefined for the rack. A lift height of 0 mm corresponds to **Home position**. Here the lift is moved to the uppermost stop.

Input range	**0 to 235 mm**
Selection	**Work position** | **Shift position** | **Rinse position** | **Special position** | **Home position**
Default value	**Work position**

NOTICE

Please take care that no lift positions exceed the maximum stroke path specified in the tower properties of the instrument.

Parameters

Lift rate

Selection of the speed for moving the lift.

Input range	**5 to 25 mm/s**
Default value	**25 mm/s**

5.5.2.3.4 MAIN VALVE

5.5.2.3.4.1 MAIN VALVE - Overview

Dialog window: **Method ► MAIN VALVE ► Properties... ► MAIN VALVE - 'Command name'**

Command for **opening and closing the main valve of the 884 Professional VA for the inert gas**.

Instruments

This command can be executed with the following device:

Voltammetry: 884

Appearance

The command has the following appearance:

Parameters

The parameters for the **MAIN VALVE** command are set in the following dialog window:

- *MAIN VALVE - Properties*

Command variables

The following command variables are generated by the **MAIN VALVE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.3.4.2 MAIN VALVE - Properties

Dialog window: **Method ► MAIN VALVE ► Properties... ► MAIN VALVE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA**
Default value	**884 Professional VA**

Action

Selection	**Open** | **Close**
Default value	**Close**

Open
Opens the main valve for the inert gas. The main valve remains open, even after the end of the command.

Close
Closes the main valve for the inert gas.

5.5.2.3.5 MOVE

5.5.2.3.5.1 MOVE - Overview

Dialog window: **Method ► MOVE ► Properties... ► MOVE - 'Command name'**

Command for **moving to the desired position** (sample position or special beaker).

Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:

Parameters

The parameters for the **MOVE** command are set in the following dialog window:

- *MOVE - Properties*

Command variables

The following command variables are generated by the **MOVE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **RAN** | **RPO** | **SAN**

5.5.2.3.5.2 MOVE - Properties

Dialog window: **Method ► MOVE ► Properties... ► MOVE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

Target

Tower

Selection of the tower on the sample changer for moving to the required position.

Selection	**1** | **2**
Default value	**1**

Move

Selecting the target position on the rack:

Selection	**Sample position** | **Rack position** | **Special beaker** | **Relative angle**
Default value	**Sample position**

Sample position
Position that is defined for the current determination in the **Run** subwindow of the **Workplace** program part as **Sample position** parameter.

Rack position
Absolute position on the rack.

Special beaker
Special position on the rack that is defined in the rack properties in the **Configuration** program part.

Relative angle
The sample rack can be rotated by a certain angle independent of the rack positions. This function can be used, for example, to remove vial caps automatically.

Number

Specification of the number of the rack position. This parameter is visible only when **Move** = **Rack position** or **Special beaker**. The position can, however, also be entered as a formula. The formula editor is opened with a right-click on the input field.

Move = Rack position

Input range	**1 to 999**
Default value	**1**

Move = Special beaker

Input range	**1 to 16**
Default value	**1**

Move angle

This parameter specifies the angle by which the sample rack is to be rotated relative to its momentary position. It is visible only when **Move** = **Relative angle**.

814, 815, 858

Input range	**–359.90 to 359.90 °**
Default value	**5.00 °**

Beaker test

Selection of the action to be carried out when the beaker sensor defined for the rack detects no beaker at the target position. If the robotic arm is selected as beaker sensor, then a Swing Head must be installed. A work position that is also defined in the rack data must be defined in such a way that a contact exists between beaker sensor and beaker. This work position will be automatically moved to for beaker recognition after the command **MOVE**. This section is not visible when **Move** = **Relative angle**.

Selection	**Display message** | **Cancel determination** | **Cancel determination and series**
Default value	**Display message**

Display message
A message is displayed, the determination is canceled and the next determination of the series is started after confirmation of the message. If an exit track is present, it will be called. No error track will be called.

Cancel determination
The determination is canceled and the next determination of the series is started. If an exit track is present, it will be called. No error track will be called.

Cancel determination and series
Both the determination and the series are stopped. If an exit track is present, it will not be called. An error track will be called.

Parameters

Shift rate

Selection of the rate at which the rack rotates.

Input range	**3 to 20 °/s**
Default value	**20 °/s**

Shift direction

Selection of the shift direction.

Selection	**auto** | **+** | **–**
Default value	**auto**

auto
The shift direction with the smallest rotation angle is selected automatically.

+
Rack rotates counterclockwise.

–
Rack rotates clockwise.

Swing rate

Selects the rate of the robotic arm when moving to a rack position or a special beaker (only with multiple row racks).

Input range	**10 to 55 °/s**
Default value	**55 °/s**

5.5.2.3.6 PUMP

5.5.2.3.6.1 PUMP - Overview

Dialog window: **Method ► PUMP ► Properties... ► PUMP - 'Command name'**

Command for the **control of the pumps** that are connected to or installed on the sample changer.

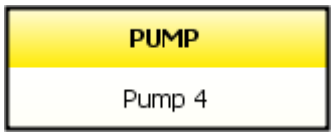
Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:



Parameters

The parameters for the **PUMP** command are set in the following dialog window:

- *PUMP - Properties*

Command variables

The following command variables are generated by the **PUMP** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.3.6.2 PUMP - Properties

Dialog window: **Method ► PUMP ► Properties... ► PUMP - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

Pumps

Tower

Selection of the tower at which the pumps are to be actuated. The choices are always Tower 1 and Tower 2, even if the sample changer only has one tower.

Selection	**1** | **2**
Default value	**1**

Pump(s)

Selection of the pumps that are to be actuated. These can be installed or connected externally. The two pumps of the selected tower are actuated simultaneously with **1+2**.

Selection	**1** | **2** | **1+2** | **Peristaltic**
Default value	**1**

1
Pump 1 is actuated.

2
Pump 2 is actuated.

1+2
The two pumps of the selected tower are actuated simultaneously.

Peristaltic
The peristaltic pump installed on the tower is actuated.

Rate

Speed at which the peristaltic pump is to be operated. This parameter is visible only when **Pump(s)** = **Peristaltic**.

Input range	**-15 to 15**
Default value	**10**

Actions

Selection	**Switch on** | **Switch off** | **Duration**
Default value	**Duration**

Switch on
Activation of the pump(s).

Switch off
Deactivation of the pump(s).

Duration
Activation of the pumps during a defined period.

Pump(s) = 1, 2, 1+2	
Input range	**0 to 9999.9**
Default value	**8.0**

Pump(s) = Peristaltic	
Input range	**0 to 9999.9**
Default value	**300.0**

Selection	**s** | **min**
Default value	**s**

5.5.2.3.7 RACK

5.5.2.3.7.1 RACK - Overview

Dialog window: **Method ▶ RACK ▶ Properties... ▶ RACK - 'Command name'**

Command for the **initialization of the sample rack in place**. The rack that is in place, the lift and the robotic arm (if present) are reset, the rack code is read out and the respective rack data is transferred to the sample changer.

Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:

Parameters

The parameters for the **RACK** command are set in the following dialog window:

- *RACK - Properties*

Command variables

The following command variables are generated by the **RACK** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.3.7.2 RACK - Properties

Dialog window: **Method ▶ RACK ▶ Properties... ▶ RACK - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

Rack test

on | off (Default value: **off**)

If this check box is activated, then a check will be made to determine whether the correct rack is in place. If this check box is not activated, then the only check made will be to determine whether any rack has been mounted.

Test rack

Selection of the rack name for the rack that needs to be mounted. You can thus ensure that the method can be executed only with this rack. If a different rack is detected when the command is executed, then a message will be displayed and the exit track (if available) will be called.

Selection	**all of the sample racks present in the configuration**

5.5.2.3.8 RLS DEV

5.5.2.3.8.1 RLS DEV - Overview

Dialog window: **Method ► RLS DEV ► Properties... ► RLS DEV - 'Command name'**

Command to **release an instrument** for using it in other parallel running methods. It removes the reservation made by the current method.

Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:

Parameters

The parameters for the **RLS DEV** command are set in the following dialog window:

- *RLS DEV - Properties*

Command variables

The following command variables are generated by the **RLS DEV** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.3.8.2 RLS DEV - Properties

Dialog window: **Method ► RLS DEV ► Properties... ► RLS DEV - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

5.5.2.3.9 STIR

5.5.2.3.9.1 STIR - Overview

Dialog window: **Method ► STIR ► Properties... ► STIR - 'Command name'**

Command for the **control of a connected stirrer**.

Instruments

This command can be executed with the following devices:

Voltammetry: 884, 894

Sample changers: 814, 815, 858, 919

Dosing Interface: 846

Appearance

The command has the following appearance:

Parameters

The parameters for the **STIR** command are set in the following dialog window:

- *STIR - Properties*

Command variables

The following command variables are generated by the **STIR** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **FIN** | **RPM** | **STY**

5.5.2.3.9.2 STIR - Properties

Dialog window: **Method ► STIR ► Properties... ► STIR - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**846 Dosing Interface** | **814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **884 Professional VA** | **894 Professional CVS** | **089 Photometer**
Default value	**894 Professional CVS**

Stirrer

Stirrer

Selection of the MSB stirrer (not displayed for 894 Professional CVS and 884 Professional VA).

846

Selection	**1** | **2** | **3** | **4**
Default value	**1**

814, 815, 858, 919

Selection	**1** | **2** | **3**
Default value	**1**

089

Selection	**1** | **off**
Default value	**1**

Stirrer type

Shows the stirrer type. **unknown** is displayed on devices to which no stirrer is connected or at which the stirrer type cannot be read out.

Stirring rate

Setting the stirring rate or rotational speed. The algebraic sign of the stirring rate changes the stirring direction. The default setting **8** corresponds to a rotational speed of 1000 rpm.

846, 815, 858, 919

Input range	**–15 to 15**
Default value	**8**

089

Input range	**0 to 15**
Default value	**8**

884, 894

Input range	**0 to 3000 min⁻¹**
Default value	**2500 min⁻¹**

Action

846, 815, 858, 919, 089

Selection	**Switch on** | **Switch off** | **Duration**
Default value	**Duration**

Switch on
Switches on the stirrer. The stirrer remains activated, even after the end of the command.

Switch off
Switches off the stirrer.

Duration
The stirrer can remain switched on for a specific time.

Input range	**0.0 to 9999.9 min**
Default value	**10.0 min**

Action

884, 894

Selection	**Switch on** | **Switch off** | **Duration**
Default value	**Duration**

Switch on
Switches on the stirrer. The stirrer remains activated, even after the end of the command.

Switch off
Switches off the stirrer.

Duration
The stirrer can remain switched on for a specific time.

Input range	**0 to 9999 s**
Default value	**300 s**

5.5.2.3.10 STIR & PURGE

5.5.2.3.10.1 STIR & PURGE - Overview

Dialog window: **Method ▶ STIR & PURGE ▶ Properties... ▶ STIR & PURGE - 'Command name'**

Command for **stirring and purging the measuring solution** and for **opening the inert gas main valve of the 884 Professional VA**.

Instruments

This command can be executed with the following device:

Voltammetry: 884

Appearance

The command has the following appearance:

Parameters

The parameters for the **STIR & PURGE** command are set in the following dialog window:

- *STIR & PURGE - Properties*

Command variables

The following command variables are generated by the **STIR & PURGE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **FIN** | **RPM** | **STY**

5.5.2.3.10.2 STIR & PURGE - Properties

Dialog window: **Method ► STIR & PURGE ► Properties... ► STIR & PURGE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA**
Default value	**884 Professional VA**

Stir

Stirring rate

Setting the stirring rate.

Input range	**0 to 3000 min^{-1}**
Default value	**2000 min^{-1}**

Selection	**Switch on** | **Switch off** | **Duration**
Default value	**Switch on**

Switch on
Switches on the stirrer. The stirrer remains activated, even after the end of the command.

Switch off
Switches off the stirrer.

Duration
Stirs the measuring solution during a defined period.

Purge

Selection	**Switch on** | **Switch off** | **Duration**
Default value	**Duration**

Switch on
Switches on the inert gas supply for purging the measuring solution.

Switch off
Switches off the inert gas supply.

Duration
Purges the measuring solution during a defined period.

Input range	**0 to 9999 s**
Default value	**300 s**

5.5.2.3.11 SWING

5.5.2.3.11.1 SWING - Overview

Dialog window: **Method ▶ SWING ▶ Properties... ▶ SWING - 'Command name'**

Command for **swinging the robotic arm**. This command cannot be executed unless the Sample Processor is equipped with a **786 Swing Head** with robotic arm.

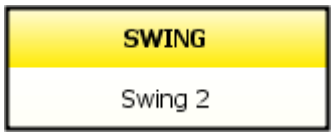
Instruments

This command can be executed with the following devices:

Sample changers: 814, 815, 858, 919

Appearance

The command has the following appearance:



Parameters

The parameters for the **SWING** command are set in the following dialog window:

- *SWING - Properties*

Command variables

The following command variables are generated by the **SWING** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **SAN** | **SPO**

5.5.2.3.11.2 SWING - Properties

Dialog window: **Method ▶ SWING ▶ Properties... ▶ SWING - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the instrument type. If an instrument is selected in the **Device name** field, the **Instrument type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**858.0020 Professional Sample Processor**

Target

Tower

Selection of the tower on the sample changer at which the robotic arm is to be moved to the required position.

Selection	**1** | **2**
Default value	**1**

Swing

Selecting the target position for the robotic arm.

Selection	**External position** | **Maximum angle** | **Relative angle**
Default value	**External position**

External position
Swinging to one of the 4 external positions available for each tower. They are defined in the tower properties of the Sample Processor.

Maximum angle
Swinging to the maximum permissible outward angle *(see chapter 7.1.8, page 902)*.

Relative angle
Swinging by the specified swing angle relative to the current position. This function can be used, for example, to remove vial caps automatically.

Number

Indicates the number of the external position which is to be swung to. This parameter is visible only when **Swing** = **External position**.

Input range	**1 to 4**
Default value	**1**

Swing angle

Angle by which the robotic arm is to be swung relative to the current position. This parameter is visible only when **Swing** = **Relative angle**.

Input range	**–180.0 to 180.0 °**
Default value	**10.0 °**

Parameters

Swing rate

Selection of the speed at which the robotic arm rotates.

Input range	**10 to 55 °/s**
Default value	**55 °/s**

5.5.2.4 Dosing commands

5.5.2.4.1 Dosing commands - Overview

Menu item: **Method ▶ Insert ▶ New command... ▶ Dosing**

Commands for the **dosing** of solutions.

The following dosing commands can be selected:

- *ADD AUX*
  Doses an auxiliary solution.
- *ADD STD*
  Doses a standard solution.
- *ADD SAMPLE*
  Doses the sample.
- *ADD SAMPLE DT*
  Doses the sample for the calibration method DT.
- *LQH*
  Extensive dosing possibilities with a Dosino.
- *PREP*
  Prepares a dosing unit.
- *EMPTY*
  Empties a dosing unit.

- *RLS DOS*
  Releases a dosing unit.
- *SET TOTAL VOLUME*
  Entry of the current total volume in the measuring vessel.

5.5.2.4.2 ADD AUX

5.5.2.4.2.1 ADD AUX - Overview

Dialog window: **Method ► ADD AUX ► Properties... ► ADD AUX - 'Command name'**

Command for the **addition of auxiliary solutions**.

Appearance

The command has the following appearance:

Parameters

The parameters for the **ADD AUX** command are set in the following dialog window:

- *ADD AUX - Properties*

Command variables

The following command variables are generated by the **ADD AUX** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **CYL** | **FIN** | **VOL**

5.5.2.4.2.2 ADD AUX - Properties

Dialog window: **Method ► ADD AUX ► Properties... ► ADD AUX - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Auxiliary solution

Solution

Entry of a solution name, selection of an auxiliary solution from the solution table or selection of a standard solution from the method or from the solution table. The selection of a solution from the solution table is necessary only if the solution is to be added automatically with a dosing device

or if the working life of the solution is to be checked at the start of the method.

Entry	**1– 25 characters**
Selection	**'Solution name'** | **'empty'**
Default value	**'empty'**

'Solution name'
The auxiliary solutions defined in the solution table (Configuration) appear first for selection, followed by the standard solutions defined in the method, and then the standard solutions present in the solution table (Configuration) (each time in alphabetical order).

Volume

Volume of the auxiliary solution that is to be dosed in.

Input range	**0.010 to 1000.000 mL** (Increment: **0.001**)
Default value	**5.000 mL**

Include volume in calculation

on | off (Default value: **on**)

If this check box is activated, then the volume added is allocated in the volume bookkeeping.

Addition

Selection of the addition mode for dosing auxiliary solutions.

Selection	**Add manually** | **Already added** | **Add with dosing device**
Default value	**Add manually**

Add manually
Manual addition of the solution, at which time the track is stopped. A message appears and an acoustic signal is emitted.

Already added
The solution is already in the measuring vessel or was channeled into the measuring vessel, for example with a peristaltic pump. The track is not stopped. No message appears and no acoustic signal is emitted.

Add with dosing device
Automatic addition of the solution with a dosing device (possible only with solutions from the solution table). The solution is added through the **Dosing port 1** defined in the configuration for the dosing unit *(see chapter 6.6.3.2, page 839)*.

Message

With manual addition, the running of the track in which the command is located is stopped and a message is displayed.

Only editable for **Addition** = **Add manually**, otherwise disabled (including text input field).

Selection	**Display standard message** | **Display message defined by the user**
Default value	**Display standard message**

Display standard message
If this check box is activated, then the standard message for additions will be displayed.

Display message defined by the user
If this check box is activated, then the message defined in the text field will be displayed.

Dosing device

Parameters for automatic dosing. This section is displayed only when **Addition** = **Add with dosing device**.

Dosing rate

Rate (volume per time unit) of ejection. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected dosing port.

Input range	**0.01 to 166.00 mL/min**
Default value	**2.00 mL/min**
Selection	**maximum**

CAUTION

The maximum permitted dosing rate of 4 mL/min must not be exceeded for capillaries with a diameter < 1 mm.

Filling rate

Rate (volume per time unit) of filling. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected fill port.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

5.5.2.4.3 ADD STD

5.5.2.4.3.1 ADD STD - Overview

Dialog window: **Method ► ADD STD ► Properties... ► ADD STD - 'Command name'**

Command for **addition of standard solutions**.

Appearance

The command has the following appearance:

Parameters

The parameters for the **ADD STD** command are set in the following dialog window:

- *ADD STD - Properties*

Command variables

The following command variables are generated by the **ADD STD** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

ACO | **BSY** | **CYL** | **FIN** | **VOL** | **VOLTOT**

5.5.2.4.3.2 ADD STD - Properties

Dialog window: **Method ► ADD STD ► Properties... ► ADD STD - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Standard

Solution

Entry of a solution name or selection of a standard solution from the method or from the solution table. The selection of a solution from the solution table is necessary only if the solution is to be added automatically with a dosing device or if the working life of the solution is to be checked at the start of the method.

Entry	**1– 25 characters**

Selection	**'Standard name'** | **'empty'**
Default value	**'empty'**

'Standard name'
The standard solutions defined in the method appear first for selection, followed by the standard solutions present in the solution table (Configuration) (each time in alphabetical order).

Addition increments

Number

Number of variable volume increments that are to be added. The first volume is added the first time the command is called, the second volume at the second time, etc. If the command is called more often than volumes were defined, then the last volume is added in each case.

Input range	**1 to 25** (Increment: **1**)
Default value	**1**

Addition volume

Size of the individual volume that is to be dosed in. The number of addition volumes is defined by the amount defined in **Number**. If the command is called more often than volumes were defined, then the last volume is added in each case.

Input range	**0.010 to 1000.000 mL** (Increment: **0.001**)
Default value	**0.100 mL**

Addition

Selection of the addition mode for dosing standard solutions.

Selection	**Add manually** | **Already added** | **Add with dosing device**
Default value	**Add manually**

Add manually
Manual addition of the solution, at which time the track is stopped. A message appears and an acoustic signal is emitted.

Already added
The solution is already in the measuring vessel or was channeled into the measuring vessel, for example with a peristaltic pump. The track is not stopped. No message appears and no acoustic signal is emitted.

Add with dosing device
Automatic addition of the solution with a dosing device (possible only with solutions from the solution table). The solution is added through the **Dosing port 1** defined in the configuration for the dosing unit *(see chapter 6.6.3.2, page 839)*.

Message

With manual addition, the running of the track in which the command is located is stopped and a message is displayed.

Only editable for **Addition** = **Add manually**, otherwise disabled (including text input field).

Selection	**Display standard message** | **Display message defined by the user**
Default value	**Display standard message**

Display standard message
If this check box is activated, then the standard message for additions will be displayed.

Display message defined by the user
If this check box is activated, then the message defined in the text field will be displayed.

Dosing device

Parameters for automatic dosing. This section is displayed only when **Addition** = **Add with dosing device**.

Dosing rate

Rate (volume per time unit) of ejection. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected dosing port.

Input range	**0.01 to 166.00 mL/min**
Default value	**2.00 mL/min**
Selection	**maximum**

CAUTION

The maximum permitted dosing rate of 4 mL/min must not be exceeded for capillaries with a diameter < 1 mm.

Filling rate

Rate (volume per time unit) of filling. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected fill port.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

5.5.2.4.4 ADD SAMPLE

5.5.2.4.4.1 ADD SAMPLE - Overview

Dialog window: **Method ► ADD AUX ► Properties... ► ADD SAMPLE - 'Command name'**

Command for the **addition of the sample**.

Appearance

The command has the following appearance:

Parameters

The parameters for the **ADD SAMPLE** command are set in the following dialog window:

- *ADD SAMPLE - Properties*

Command variables

The following command variables are generated by the **ADD SAMPLE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **CYL** | **FIN** | **VOL**

5.5.2.4.4.2 ADD SAMPLE - Properties

Dialog window: **Method ► ADD SAMPLE ► Properties... ► ADD SAMPLE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Addition

Selection of the addition mode for the sample.

Selection	**Add manually** | **Already added** | **Add with dosing device**
Default value	**Add manually**

Add manually
Manual addition of the sample, at which time the track is stopped. A message appears and an acoustic signal is emitted.

Already added
The sample is already in the measuring vessel or was channeled into the measuring vessel, for example with a peristaltic pump. The track is not stopped. No message appears and no acoustic signal is emitted.

Add with dosing device
Automatic addition of the solution with a dosing device. The **Sample amount** is added for undiluted samples, the **Analytical volume** for diluted ones. The sample is added through the **Dosing port 1** defined in the configuration for the dosing unit *(see chapter 6.6.3.2, page 839)*.

NOTICE

If the sample is to be added with a dosing device, then it is mandatory that either the **Sample amount** be entered as volume or that a **Analytical volume** be defined, otherwise an error message will appear in the run.

Message

With manual addition, the running of the track in which the command is located is stopped and a message is displayed.

Only editable for **Addition** = **Add manually**, otherwise disabled (including text input field).

Selection	**Display standard message** | **Display message defined by the user**
Default value	**Display standard message**

Display standard message
If this check box is activated, then the standard message for additions will be displayed.

Display message defined by the user
If this check box is activated, then the message defined in the text field will be displayed.

Dosing device

Parameters for automatic dosing. This section is displayed only when **Addition** = **Add with dosing device**.

Dosing unit

Selection of the dosing unit with which the sample solution is to be dosed in.

Selection	**'Name of dosing unit'** | **not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

Dosing rate

Rate (volume per time unit) of ejection. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected dosing port.

Input range	**0.01 to 166.00 mL/min**
Default value	**2.00 mL/min**
Selection	**maximum**

CAUTION

The maximum permitted dosing rate of 4 mL/min must not be exceeded for capillaries with a diameter < 1 mm.

Filling rate

Rate (volume per time unit) of filling. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected fill port.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

5.5.2.4.5 ADD SAMPLE DT

5.5.2.4.5.1 ADD SAMPLE DT - Overview

Dialog window: **Method ► ADD SAMPLE DT ► Properties... ► ADD SAMPLE DT - 'Command name'**

Command for the **addition of small sample volumes** for the calibration method **DT** (Dilution Titration) for the determination of suppressor in electroplating baths.

Appearance

The command has the following appearance:

Parameters

The parameters for the **ADD SAMPLE DT** command are set in the following dialog window:

- *ADD SAMPLE DT - Properties*

Command variables

The following command variables are generated by the **ADD SAMPLE DT** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

ACO | **BSY** | **CYL** | **FIN** | **VOL** | **VOLTOT**

5.5.2.4.5.2 ADD SAMPLE DT - Properties

Dialog window: **Method ► ADD SAMPLE DT ► Properties... ► ADD SAMPLE DT - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Addition increments

Number

Number of variable volume increments that are to be added.

This parameter can also be modified live after the first time the command has been executed.

Input range	**1 to 25**
Default value	**1**

Addition volume

Size of the individual volume of sample that is to be dosed in. The number of addition volumes is defined by the amount defined in **Number**.

This parameter can also be modified live after the first time the command has been executed.

Input range	**0.010 to 1000.000 mL** (Increment: **0.001**)
Default value	**0.010 mL**

Addition

Selection of the addition mode for the sample.

Selection	**Add manually** | **Add with dosing device**
Default value	**Add manually**

Add manually
Manual addition of the sample, at which time the track is stopped. A message appears and an acoustic signal is emitted.

Add with dosing device
Automatic addition of the solution with a dosing device. The sample is added through the **Dosing port 1** defined in the configuration for the dosing unit *(see chapter 6.6.3.2, page 839)*.

Message

With manual addition, the running of the track in which the command is located is stopped and a message is displayed.

Only editable for **Addition** = **Add manually**, otherwise disabled (including text input field).

Selection	**Display standard message** | **Display message defined by the user**
Default value	**Display standard message**

Display standard message
If this check box is activated, then the standard message for additions will be displayed.

Display message defined by the user
If this check box is activated, then the message defined in the text field will be displayed.

Dosing device

Parameters for automatic dosing. This section is displayed only when **Addition** = **Add with dosing device**.

Dosing unit

Selection of the dosing unit with which the sample solution is to be dosed in.

Selection	**'Name of dosing unit'** | **not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

Dosing rate

Rate (volume per time unit) of ejection. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected dosing port.

Input range	**0.01 to 166.00 mL/min**
Default value	**2.00 mL/min**
Selection	**maximum**

CAUTION

The maximum permitted dosing rate of 4 mL/min must not be exceeded for capillaries with a diameter < 1 mm.

Filling rate

Rate (volume per time unit) of filling. The maximum rate depends on the cylinder volume of the dosing unit used and on the diameter of the tubing at the selected fill port.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

5.5.2.4.6 LQH

5.5.2.4.6.1 LQH - Overview

Dialog window: **Method ▶ LQH ▶ Properties... ▶ LQH - 'Command name'**

Command for **complex dosing tasks** with a dosing device of the Dosino 800 type.

NOTICE

Volumes dosed into the measuring cell with the **LQH** command are not taken into account in the volume bookkeeping of a quantitative determination. The ADD commands must be used in such cases.

Appearance

The command has the following appearance:

Parameters

The parameters for the **LQH** command are set on the following tabs:

- *General/Hardware*
  Selection of a dosing unit.

- *Parameters*
  Parameters for setting the Liquid Handling function.

Command variables

The following command variables are generated by the **LQH** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **CYL** | **FIN** | **VOL**

5.5.2.4.6.2 LQH - General/Hardware

Tab: **Method ► LQH ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The dosing unit is selected on this tab.

Dosing device

Name of dosing unit

Selection of a dosing unit from the dosing units available in the table of dosing units.

Selection	**'Name of dosing unit'** | **not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

5.5.2.4.6.3 LQH - Parameters

Tab: **Method ► LQH ► Properties... ► Parameters**

Command name

Name of the command.

Entry	**25 characters**

The Liquid Handling function is defined on this tab.

Function

Selection of the Liquid Handling function that is to be carried out.

Selection	**Dosing** | **Fill** | **Aspirate** | **Eject to stop** | **Eject to end volume** | **Exchange position** | **Change port** | **Compensate**
Default value	**Dosing**

Dosing
The given volume is dosed. There is no automatic filling either beforehand or afterwards.

Fill
The filling of the cylinder can take place at a freely selected port. The valve disk then remains at the selected port.

Aspirate
With this function, liquid is aspirated from the specified port. As with dosing, here too the cylinder is not filled automatically beforehand or afterwards. It should be possible to reach the volume to be aspirated with a single piston stroke.

Eject to stop
With this function, the entire content of the cylinder is ejected through the specified port. The piston is pressed all the way down to the stop, i.e. beyond the maximum volume mark. This function should only be carried out to eject any air bubbles present.

Eject to end volume
The entire content of the cylinder is ejected through the specified port. In contrast to the **Eject to stop** function, the piston moves to the maximum volume mark, i.e. until it has executed 10,000 pulses. This command should be used for pipetting functions for emptying the cylinder.

Exchange position
With this function, the cylinder is first filled through the specified port. The valve disk is then rotated to **Port 2** and the dosing drive can be removed from the dosing unit.

Change port
With **Change port**, only a single rotation of the stopcock takes place at the specified port, but no piston movement.

Compensate
Because the dosing units are interchangeable, the coupling of the Dosino piston rod (spindle) exhibits a slight mechanical tolerance, which is noticeable when the piston changes its direction of movement. This tolerance can be compensated with the **Compensate** function. A short piston movement is first made in the same direction as the previous movement, which is then followed by a piston movement in the reverse direction.

Port

The port at which the function is to be carried out must be specified for every Liquid Handling command.

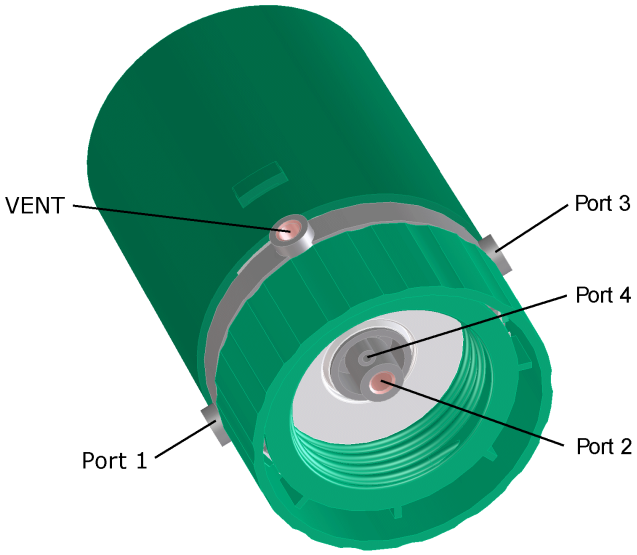
Selection	**1** | **2** | **3** | **4**

1
Default value for **Dosing** and **Aspirate**

2
Default value for **Fill**, **Exchange position** and **Change port**

3
Default value for **Dosing** and **Aspirate**

4
Default value for **Eject to stop**, **Eject to end volume** and **Compensate**



Volume

Volume to be transported. This parameter is available only for the **Dosing** or **Aspirate** functions.

Dosing

Input range	**0.00000 to 99999.9 mL**
Default value	**10.0000 mL**

Aspirate

Input range	**0.00000 to 50.0 mL**
Default value	**10.0000 mL**

Rate

Rate at which the functions **Dosing**, **Fill**, **Aspirate**, **Eject to stop**, **Eject to end volume** and **Exchange position** are carried out. The maximum rate depends on the cylinder volume of the dosing unit used. The aspiration and ejection of the sample should take place at a rate of < 10 mL/min.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

CAUTION

The maximum permitted dosing rate of 4 mL/min must not be exceeded for capillaries with a diameter < 1 mm.

5.5.2.4.7 PREP

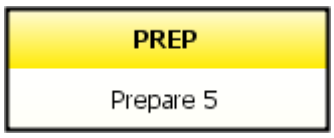
5.5.2.4.7.1 PREP - Overview

Dialog window: **Method ▶ PREP ▶ Properties... ▶ PREP - 'Command name'**

Command for **rinsing the cylinder and tubings** of a dosing unit.

Appearance

The command has the following appearance:



Parameters

The dosing unit is selected in the following dialog window:

- *PREP - Properties*

Command variables

The following command variables are generated by the **PREP** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **CYL** | **FIN**

5.5.2.4.7.2 PREP - Properties

Dialog window: **Method ▶ PREP ▶ Properties... ▶ PREP - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Dosing device

Name of dosing unit

Selection of a dosing unit from the dosing units available in the table of dosing units.

Selection	**'Name of dosing unit'** | **not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

5.5.2.4.8 EMPTY

5.5.2.4.8.1 EMPTY - Overview

Dialog window: **Method ▶ EMPTY ▶ Properties... ▶ EMPTY - 'Command name'**

Command for **emptying the cylinder and tubings** of a dosing unit.

Appearance

The command has the following appearance:

Parameters

The dosing unit is selected in the following dialog window:

- *EMPTY - Properties*

Command variables

The following command variables are generated by the **EMPTY** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | CYL | FIN

5.5.2.4.8.2 EMPTY - Properties

Dialog window: **Method ► EMPTY ► Properties... ► EMPTY - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Dosing device

Name of dosing unit

Selection of a dosing unit from the dosing units available in the table of dosing units.

Selection	**'Name of dosing unit' | not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

5.5.2.4.9 RLS DOS

5.5.2.4.9.1 RLS DOS - Overview

Dialog window: **Method ► RLS DOS ► Properties... ► RLS DOS - 'Command name'**

Command to **release a dosing device** for using it in other parallel running methods. It removes the reservation made by the current method.

Appearance

The command has the following appearance:

Parameters

The dosing unit is selected in the following dialog window:

- *RLS DOS - Properties*

Command variables

The following command variables are generated by the **RLS DOS** command in the method run and can be used in formulas under the designa-

tion **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.4.9.2 RLS DOS - Properties

Dialog window: **Method ▶ RLS DOS ▶ Properties... ▶ RLS DOS - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Dosing device

Dosing unit

Selection of a dosing unit from the dosing units available in the table of dosing units.

Selection	**'Name of dosing unit'** | **not defined**
Default value	**not defined**

'Name of dosing unit'
Alphabetically organized selection of the dosing units from the table of dosing units in the configuration.

not defined
The dosing unit must be assigned with **not defined** by the user at the start of the method.

5.5.2.4.10 SET TOTAL VOLUME

5.5.2.4.10.1 SET TOTAL VOLUME - Overview

Dialog window: **Method ▶ SET TOTAL VOLUME ▶ Properties... ▶ SET TOTAL VOLUME - 'Command name'**

Command for the **entry of the current total volume** in the measuring vessel.

Appearance

The command has the following appearance:

Parameters

The parameters for the **SET TOTAL VOLUME** command are set in the following dialog window:

- *SET TOTAL VOLUME - Properties*

Command variables

The following command variables are generated by the **SET TOTAL VOLUME** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.4.10.2 SET TOTAL VOLUME - Properties

Dialog window: **Method ► SET TOTAL VOLUME ► Properties... ► SET TOTAL VOLUME - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Total volume

Volume

Quantity of the current total volume in the measuring vessel, for example after automatic rinsing or a manual exchange of solution.

Input range	**0.000 to 1000.000 mL**
Default value	**0.000 mL**

5.5.2.5 Calibration commands

5.5.2.5.1 Calibration command - Overview

Menu item: **Method ► Insert ► New command... ► Calibration**

The following calibration commands can be selected:

Commands

- *CAL Spec*
  Measuring command for wavelength calibration.
- *CAL LOOP Opt*
  Loop command for the calibration of colorimetric sensors.
- *CAL MEAS Opt*
  Command for measuring standard solutions for the calibration of colorimetric sensors.

5.5.2.5.2 CAL Spec

5.5.2.5.2.1 CAL Spec - Overview

Dialog window: **Method ► CAL Spec ► Properties... ► CAL Spec - 'Command name'**

Command for **wavelength calibration**.

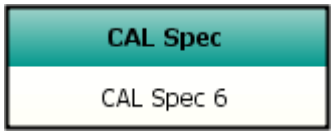
Instruments

This command can be executed with the following devices:

Spectrometer: Avantes

Appearance

The command has the following appearance:



Parameters

The parameters for the **CAL Spec** command are set on the following tabs:

- *General/Hardware*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.
- *Calibration wavelengths*
  Entry of the reference wavelengths, definition of the behavior of the calibration.

Command variables

The following command variables are generated by the **CAL Spec** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **C0** | **C1** | **C2** | **C3** | **CAL** | **CP{#}.MEA** | **CP{#}.REF** | **DBL** | **FIN** | **STY** | **TOL**

5.5.2.5.2.2 CAL Spec - General/Hardware

Tab: **Method ► CAL Spec ► Properties... ► CAL Spec - 'Command name' ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer**
Default value	**Avantes Spectrometer**

5.5.2.5.2.3 CAL Spec - Measuring parameters

Tab: **Method ▶ CAL Spec ▶ Properties... ▶ CAL Spec - 'Command name' ▶ Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Integration time

Integration time for the acquisition of the spectrum.

Input range	**0.01 to 600,000 ms**
Default value	**6 ms**

Averaged spectra

The number of spectra that are acquired and averaged.

Input range	**1 to 10,000**
Default value	**10**

5.5.2.5.2.4 CAL Spec - Calibration wavelengths

Tab: **Method ► CAL Spec ► Properties... ► CAL Spec - 'Command name' ► Calibration wavelengths**

Command name

Name of the command.

Entry	**25 characters**

The reference wavelengths with which the spectrometer is calibrated can be entered on this tab.

Tolerance

Tolerance for the preset wavelength when assigning the highest peak maximum found during the calibration measurement to the reference wavelength. If a peak is outside the range **Wavelength** +/- **Tolerance**, the calibration will be canceled. The existing calibration in the configuration remains in effect.

Input range	**0.1 to 1100.0 nm**
Default value	**0.5 nm**

[New]

Opens the **Calibration wavelength #** dialog window for entering wavelengths and tolerances *(see chapter 5.5.2.5.2.5, page 483)*.

[Properties]

Opens the **Calibration wavelength #** dialog window to edit the values selected in the table *(see chapter 5.5.2.5.2.5, page 483)*.

[Delete]

Deletes the selected line.

5.5.2.5.2.5 CAL Spec - Calibration wavelength

Tab: **Method ► CAL Spec ► Properties... ► CAL Spec - 'Command name' ► Calibration wavelengths ► [New] / [Properties] ► Calibration wavelength #**

Wavelength

Input range	**200.0 to 1100.0 nm**
Default value	**'empty' nm**

5.5.2.5.3 CAL LOOP Opt

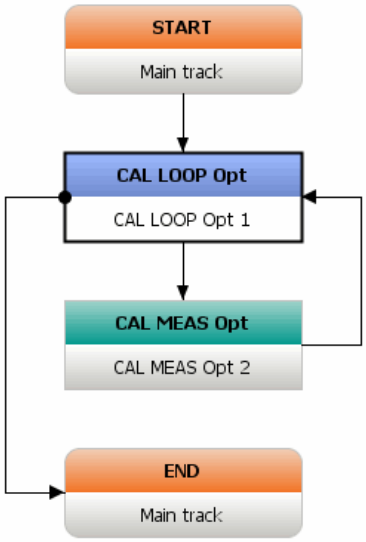
5.5.2.5.3.1 CAL LOOP Opt - Overview

Dialog window: **Method ► CAL LOOP Opt ► Properties... ► CAL LOOP Opt - 'Command name'**

General

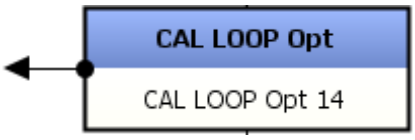
The two commands **CAL LOOP Opt** and **CAL MEAS Opt** are available for the **calibration of colorimetric sensors**. The quantity and type of the standard solutions that can be measured with the **CAL MEAS Opt** command are defined in the **CAL LOOP** loop command. Each time the loop is executed, the validity of the concentration measurement is checked, and at the end the calibration data for the colorimetric sensor is calculated.

The basic structure of a calibration method looks as follows:



Appearance

The command has the following appearance:



Parameters

The parameters for the **CAL LOOP Opt** command are set in the following dialog window:

- *CAL LOOP Opt - Properties*

Command variables

The following command variables are generated by the **CAL LOOP Opt** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **C0** | **C1** | **C2** | **C3** | **COD** | **FIN** | **LCO** | **LST** | **OUT** | **STC{x}**

5.5.2.5.3.2 CAL LOOP Opt - Properties

Dialog window: **Method ► CAL LOOP Opt ► Properties... ► CAL LOOP Opt - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Standards

Unit conc.

Selection of the concentration unit for the standards.

Selection	**mol/L** | **mmol/L** | **µmol/L** | **g/L** | **mg/L** | **µg/L** | **mg/mL** | **µg/mL** | **ppm** | **%** | **mEq/L**
Default value	**ppm**

The table must contain at least two but no more than 50 concentrations, and individual concentration values may appear repeatedly.

Conc. standard

Concentration of the standard.

Input range	**0.000 to 999999.999**
Default value	**1.000**

Moves the concentration upward (modifies sequence).

Moves the concentration downward (modifies sequence).

[New]

Add the concentration for the next standard.

[Properties]

Edit the concentration of the selected standard.

[Delete]

Deletes the selected concentration.

Request for standard exchange

on | off (Default value: **on**)

If this check box is activated, a request for manual solution exchange is displayed after each time the calibration loop is run through. This parameter must be disabled for automatic solution exchange when calibrating with a sample changer.

Calibration curve

Calibration function

Selection of the function with which the calibration curve is to be calculated out of the calibration points.

Selection	**Linear regression** | **Quadratic regression** | **cubic** | **automatic**
Default value	**Linear regression**

Confidence interval

Range within which the measured values for the determination of the calibration curve must lie. Values outside this range are called outliers; they are not integrated in the calculation of the calibration coefficient.

Selection	**99** | **98** | **95** | **off**
Default value	**98**

off
The confidence interval will not be checked.

5.5.2.5.4 CAL MEAS Opt

5.5.2.5.4.1 CAL MEAS Opt - Overview

Dialog window: **Method ▶ CAL MEAS Opt ▶ Properties... ▶ CAL MEAS Opt - 'Command name'**

Command for **measuring standard solutions for the calibration of colorimetric sensors**, used together with the **CAL LOOP Opt** command.

Instruments

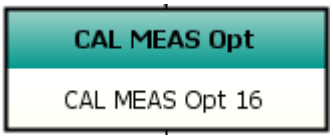
This command can be executed with the following devices:

Spectrometer: Avantes

Photometer: 089

Appearance

The command has the following appearance:



Parameters

The parameters for the **CAL MEAS Opt** command are set on the following tabs:

- *General/Hardware*
  Selection of device type and colorimetric sensor.
- *Measuring parameters*
  Parameters for setting the measurement procedure.

Command variables

The following command variables are generated by the **CAL MEAS Opt** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **EME** | **ETE** | **FIN** | **IME** | **ITE** | **LP.CNT** | **LP.MEA** | **LP.TEM** | **LP.TIM** | **LP.TRN** | **MTE** | **NMP** | **STY**

5.5.2.5.4.2 CAL MEAS Opt - General/Hardware

Tab: **Method ► CAL MEAS Opt ► Properties... ► CAL MEAS Opt - 'Command name' ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer** | **089 Photometer**
Default value	**Avantes Spectrometer**

Sensor

Colorimetric sensor

Selection of a colorimetric sensor from the table of colorimetric sensors. The calibration data for the colorimetric sensor will be adopted for the determination.

Selection	**'Name of the colorimetric sensor'** | **empty or 'first list entry'**
Default value	**empty or 'first list entry'**

Temperature measurement

Type of temperature measurement

Displayed only when **Device type** = **089 Photometer**.

Selection	**continuous** | **off**
Default value	**continuous**

continuous
A temperature sensor must be connected. The temperature will then be measured continuously.

off
The temperature will not be measured. The temperature entered manually under Temperature on the **Measuring parameters** tab will be used.

Stirrer

This section is displayed only when **Device type** = **089 Photometer**.

Stirrer

Selection of the stirrer.

Selection	**1** | **off**
Default value	**1**

off
Means that no stirrer will be used.

Stirring rate

Setting the stirring rate.

Input range	**0 to 15**
Default value	**3**

Switch off automatically

on | off (Default value: **on**)

If this check box is activated, the stirrer will be switched off automatically when the command has finished.

5.5.2.5.4.3 CAL MEAS Opt - Measuring parameters

Tab: **Method ► CAL MEAS Opt ► Properties... ► CAL MEAS Opt - 'Command name' ► Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The measuring parameters for the calibration are defined on this tab.

Parameters for the Avantes spectrometer

Wavelength

Wavelength at which the measured quantity (absorbance) is recorded.

Input range	**100.0 to 2000.0 nm**
Default value	**400.0 nm**

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**-1E+12 to 1E+12 (max. 10 digits) mAU**
Default value	**0 mAU**

Integration time

Integration time for absorbance measurement.

Input range	**0.01 to 600000 ms**
Default value	**6 ms**

Averaged spectra

The number of spectra that are acquired and averaged.

Input range	**1 to 10,000**
Default value	**10**

Smoothing

Number of neighboring pixels with which the value for each measurement pixel is determined.

Input range	**0 to 100 pixels**
Default value	**0 pixels**

Parameters for the 089 Photometer

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**-4000 to 4000 mAU**
Default value	**0 mAU**

Measurement

Two types of measurement can be selected, **Measurement with drift control** or **Measurement without drift control**.

Selection	**Measurement with drift control** | **Measurement without drift control**
Default value	**Measurement with drift control**

Measurement with drift control
The measurement is carried out drift-controlled if this option is selected. The measurement is canceled as soon as the defined **Signal drift** or the **Stop measured value** is reached or the **Max. waiting time** has elapsed. The corresponding parameters are not visible if this option is disabled.

Measurement without drift control
The measurement is carried out without drift control if this option is selected. Measurement is continued for as long as one of the two stop criteria **Max. waiting time** or **Stop measured value** is fulfilled. The corresponding parameters are not visible if this option is disabled.

NOTICE

A constant measured value is often only reached after a certain time, as mixing and possibly the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e., reaching a constant measured value takes longer and longer. **Drift-controlled measurement** is particularly advisable in such cases, as the measured values are not applied until equilibrium has almost been reached.

Measurement with drift control

If the **Measurement with drift control** option has been selected, then the following parameters will be displayed:

Signal drift

The measured value is only accepted if the signal drift defined here has been fallen short of.

Input range	**0.1 to 999000 mAU/min**
Default value	**1.0 mAU/min**

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The drift continues to be checked while the minimum waiting time is elapsing.

Input range	**0 to 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. If the waiting time has not been newly entered, then a waiting time that is suitable for the drift will be calculated automatically according to the following formula:

$$\text{Waiting time} = 150 / \sqrt{\text{Drift} + 0.01} + 5$$

Input range	**0 to 999999 s**
Default value	**154 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**

Selection	**off**
Default value	**off**

off
No stop.

Measurement without drift control

If the **Measurement without drift control** option has been selected, then the following parameters will be displayed:

Max. waiting time

Maximum period of time for measurement.

Input range	**0 to 999999 s**
Default value	**120 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**
Selection	**off**
Default value	**off**

off
No stop.

Temperature

This section is displayed only when **Device type** = **089 Photometer**.

Temperature

Measuring temperature, which can be entered manually. The temperature is measured continuously when **Temperature measurement** = **continuous** (tab **General/Hardware**).

Input range	**20.0 to 60 °C**
Default value	**25.0 °C**

5.5.2.6 Communication commands

5.5.2.6.1 Communication commands - Overview

Menu item: **Method ► Insert ► New command... ► Communication**

Commands for communication within the program or with external instruments.

The following communication commands can be selected:

- *CTRL*
  Setting remote output lines.
- *SCAN*
  Scanning remote input lines.
- *SEND*
  Sending event messages.
- *RECEIVE*
  Waiting for event messages or status messages.
- *TRANSFER*
  Data transfer via RS-232 to external instruments.

5.5.2.6.2 CTRL

5.5.2.6.2.1 CTRL - Overview

Dialog window: **Method ► CTRL ► Properties... ► CTRL - 'Command name'**

Command for **setting remote output lines**.

Instruments

This command can be executed with the following devices:

Voltammetry: 884, 894

Dosing Interface: 846

Sample changers: 814, 815, 858, 919

Spectrometer: Avantes

Appearance

The command has the following appearance:

Parameters

The parameters for the **CTRL** command are set in the following dialog window:

- *5.5.2.6.2.2CTRL - Properties*

Command variables

The following command variables are generated by the **CTRL** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.6.2.2 CTRL - Properties

Dialog window: **Method ► CTRL ► Properties... ► CTRL - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS** | **846 Dosing Interface** | **814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus** | **Avantes Spectrometer**
Default value	**884 Professional VA**

Remote Box

Selection of a Remote Box connected to the device.

846, 884 and 894

Selection	**1** | **2** | **3** | **4**
Default value	**1**

814, 815, 858, 919

Selection	**1** | **2** | **3**
Default value	**1**

Set lines

Output signal

Entry of the bit pattern for the output signal or selection of a predefined signal pattern.

It is possible to enter the following characters:

0 = line inactive

1 = line active

***** = any line status

p = set pulse (pulse duration = 1 s). If a pulse with a different length is to be output, then a corresponding template must be defined for this purpose.

Sample changers, 884, 894 and 846

Selection	**Bit pattern with exactly 14 characters (0, 1, *, p)** | ****************** | **Signal pattern**
Default value	******************

Avantes spectrometer

Selection	**Bit pattern with exactly 10 characters (0, 1, *, p)** | ************** | **Signal pattern**
Default value	**************

The bits are numbered from right to left:

Output	13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit	13 12 11 10 9 8 7 6 5 4 3 2 1 0

Example: Control of the 843 Pump Station via Remote Box

Output signal	Function
****p*********	Activating pump 1 for 1 s

p*******	Activating pump 2 for 1 s
****1*********	Switching on pump 1
1*******	Switching on pump 2
****0*********	Switching off pump 1
0*******	Switching off pump 2

NOTICE

We recommend masking the irrelevant output lines with an asterisk ***** so as not to modify these line statuses.

5.5.2.6.3 SCAN

5.5.2.6.3.1 SCAN - Overview

Dialog window: **Method ► SCAN ► Properties... ► SCAN - 'Command name'**

Command for **scanning remote input lines**.

Instruments

This command can be executed with the following devices:

Voltammetry: 884, 894

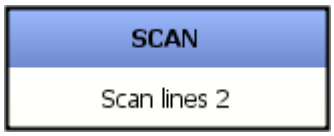
Dosing Interface: 846

Sample changers: 814, 815, 858, 919

Spectrometer: Avantes

Appearance

The command has the following appearance:



Parameters

The parameters for the **SCAN** command are set in the following dialog window:

- *SCAN - Properties*

Command variables

The following command variables are generated by the **SCAN** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **TOU**

5.5.2.6.3.2 SCAN - Properties

Dialog window: **Method ► SCAN ► Properties... ► SCAN - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS** | **846 Dosing Interface** | **814 USB Sample Processor** | **815 Robotic USB Sample Processor XL** | **858.0010 Professional Sample Processor** | **858.0020 Professional Sample Processor** | **858.0030 Professional Sample Processor** | **919.0020 IC Autosampler plus**
Default value	**884 Professional VA**

Remote Box

Selection of a Remote Box connected to the device.

846, 884 and 894

Selection	**1** | **2** | **3** | **4**
Default value	**1**

814, 815, 858, 919

Selection	**1** | **2** | **3**
Default value	**1**

Scan lines

Input signal

Entry of the bit pattern for the expected input signal or selection of a predefined signal pattern.

It is possible to enter a bit pattern of 8 characters. The following characters can be used:

Selection	**0** | **1** | ***** | **Signal pattern**
Default value	*****

0
Line is inactive.

1
Line is active.

*****
Any line status.

Signal pattern
Selection of a signal pattern predefined in the **Configuration** program part.

The input lines (inputs) are always numbered from right to left:

Input	7 6 5 4 3 2 1 0
Bit	7 6 5 4 3 2 1 0

Example:

*********1** expects an active input line 0 (**1** = set).

NOTICE

Input lines that are of no interest or for which no defined condition can be predicted should be masked with an asterisk *****.

Timeout

on | off (Default value: **off**)

If this check box is activated, then a maximum waiting time can be entered for the input signal.

Input range	**0.0 to 9999.9**
Default value	**10.0**

Selection	**min** | **s**
Default value	**min**

NOTICE

If the **Timeout** check box is not activated, then there will be an infinitely long wait for the input signal.

5.5.2.6.4 SEND

5.5.2.6.4.1 SEND - Overview

Dialog window: **Method ► SEND ► Properties... ► SEND - 'Command name'**

Command for **sending event messages** to commands, tracks or to **viva**.

Appearance

The command has the following appearance:

Parameters

The parameters for the **SEND** command are set in the following dialog window:

- *SEND - Properties*

Command variables

The following command variables are generated by the **SEND** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.6.4.2 SEND - Properties

Dialog window: **Method ► SEND ► Properties... ► SEND - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Send event messages

All of the defined event messages that are listed in the table are sent simultaneously. The table cannot be edited directly.

NOTICE

A maximum of 10 event messages can be entered.

[New]

Opens the **Send event message** dialog window for entering a new event message *(see chapter 5.5.2.6.4.3, page 500)*.

[Properties]

Opens the **Send event message** dialog window for editing the event message selected in the table *(see chapter 5.5.2.6.4.3, page 500)*.

[Delete]

Deletes the selected event message.

5.5.2.6.4.3 SEND - Sending the event message

Dialog window: **Method ▶ SEND ▶ Properties... ▶ [New]/ [Properties] ▶ Send event message**

Receiver

Selection of the receiver type.

Selection	**System** | **Command**
Default value	**System**

Selection

Selection of the recipient address. All of the command names already defined in the method are available when **Receiver** = **Command**. This field cannot be edited when **Receiver** = **System**.

Selection	**'Command name'** | **'first command'**
Default value	**'first command'**

Event message

Selection of the event message that is to be sent. The following event messages can be selected, depending on the recipient:

System

Selection	**Quit** | **Hold** | **Stop**
Default value	**Quit**

Command

Selection	**Quit** | **Hold** | **Continue**
Default value	**Quit**

Receiver	Selection	Event message	Meaning
System	-	**Hold**	Stop determination (all tracks). This corresponds to the **[Hold]** button in the **Run** dialog window in the **Workplace** program part.
System	-	**Quit**	Stop determination (series continues running).
System	-	**Stop**	Stop determination and series. This corresponds to the **[Stop]** button in the **Run** dialog window in the **Workplace** program part.
Command	All track commands	**Hold**	Interrupt selected track.
Command	All track commands	**Continue**	Continue selected track.
Command	All track commands	**Quit**	Cancel selected track.
Command	All commands	**Hold**	Interrupt selected command.
Command	All commands	**Continue**	Continue selected command.
Command	All commands	**Quit**	Cancel selected command.

NOTICE

In order for the event message sent by the **SEND** command to be able to be edited by a **RECEIVE** command, this command must be running and at the same time be in the position of being able to edit the sent message.

Comment

Comment on the event message

Entry	**250 characters**
Default value	**'empty'**

5.5.2.6.5 RECEIVE

5.5.2.6.5.1 RECEIVE - Overview

Dialog window: **Method ► RECEIVE ► Properties... ► RECEIVE - 'Command name'**

Command for **awaiting event messages or status messages** produced by commands.

Appearance

The command has the following appearance:

Parameters

The parameters for the **RECEIVE** command are set in the following dialog window:

- *RECEIVE - Properties*

Command variables

The following command variables are generated by the **RECEIVE** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **TOU**

5.5.2.6.5.2 RECEIVE - Properties

Dialog window: **Method ► RECEIVE ► Properties... ► RECEIVE - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Wait for event/status

Selection	**Wait until all conditions are met** | **Wait until one of the conditions is met**
Default value	**Wait until all conditions are met**

Wait until all conditions are met
A wait ensues until **all** of the conditions listed in the table are fulfilled.

Wait until one of the conditions is met
A wait ensues until **one** of the conditions listed in the table is fulfilled.

[New]

Opens the dialog window **Wait for event/status** for entering a new event message which is to be waited for *(see chapter 5.5.2.6.5.3, page 503)*.

NOTICE

A maximum of 10 event messages can be entered.

[Properties]

Opens the dialog window **Wait for event/status** for editing the event message selected in the table which is to be waited for *(see chapter 5.5.2.6.5.3, page 503)*.

[Delete]

Deletes the selected event message.

Timeout

on | off (Default value: **off**)

If this option is activated, then a maximum waiting time for event messages can be entered. If none of the conditions defined above are fulfilled after this time period, the command is canceled and the next command in the sequence is executed.

Value

Input range	**0 to 9999.9**
Default value	**0**

Unit

Selection	**min** | **s**
Default value	**s**

Message

The message defined here is displayed in the live window while waiting for the result. The text editor for entering or editing the message is opened with or by double-clicking on the text field.

5.5.2.6.5.3 RECEIVE - Wait for event/status

Dialog window: **Method ► RECEIVE ► Properties... ► [New]/[Properties] ► Wait for event/status**

Command

Name of the command whose event message or status is to be waited for.

Selection	**'Command name'**

Event message

Selection of the event message to be waited for, or of the status to be waited for. The following event messages and statuses can be selected.

Selection	**'Event message'** | **Start**
Default value	**Start**

The following event messages and statuses can be selected:

Event/ Status	Type	Meaning	Com-mands
Start	Event	The command has just now been started.	All
End	Event	The command has just now been ended.	All
Busy	Status	System is in status **BUSY**, **HOLD** or **ERROR**.	All
Finished	Status	The command is ended. In the event that the command is run through several times (e.g. within a LOOP), the status **Finished** will be set already after the first time the command is ended.	All

NOTICE

An event can only be received as such by the **RECEIVE** command if it has been activated at the moment of the event, i.e. it must have been started prior to the respective event. The occurrence of an event is sent as a system message that only "listeners" who are already active will receive, because it is not saved. A **status**, on the other hand, can be requested at any time.

Comment

Comment on the event message

Entry	**250 characters**
Default value	**'empty'**

5.5.2.6.6 TRANSFER

5.5.2.6.6.1 TRANSFER - Overview

Dialog window: **Method ► TRANSFER ► Properties... ► TRANSFER - 'Command name'**

Command for **data transfer via RS-232** to external instruments.

Appearance

The command has the following appearance:

Parameters

The parameters for the **TRANSFER** command are set in the following dialog window:

- *TRANSFER - Properties*

Command variables

The following command variables are generated by the **TRANSFER** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN** | **TOU**

5.5.2.6.6.2 TRANSFER - Properties

Dialog window: **Method ► TRANSFER ► Properties... ► TRANSFER - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**RS 232 device**
Default value	**RS 232 device**

Transfer commands

The directions defined in the **Transfer commands** dialog window are sent in the order in which they are listed. The table cannot be edited directly.

NOTICE

A maximum of 10 transfer commands can be entered.

Moves the selected command upward (modifies sequence).

Moves the selected command downward (modifies sequence).

[New]

Opens the **Transfer command** dialog window for entering a new transfer command *(see chapter 5.5.2.6.6.3, page 507)*.

[Properties]

Opens the **Transfer command** dialog window for editing the transfer command selected in the table *(see chapter 5.5.2.6.6.3, page 507)*.

[Delete]

Deletes the selected transfer command.

Timeout

on | off (Default value: **off**)

If this check box is activated, then a maximum waiting time can be entered. If not all transfer commands have finished after this time period, the command is canceled and the next command is started.

Input range	**0 to 9999.9**
Default value	**1**

Selection	**min** | **s**
Default value	**s**

5.5.2.6.6.3 TRANSFER - Transfer command

Dialog window: **Method ► TRANSFER ► Properties... ► Transfer command**

Name

Freely definable name for the transfer command.

Entry	**50 characters**

Action

Selection	**Read** | **Write** | **Wait for** | **Poll**
Default value	**Read**

Read
The character string (optional) defined in **Command** is sent to the instrument and the answer is expected and evaluated within the **Timeout** defined in the instrument settings.

Write
The character string defined in **Command** is sent to the instrument.

Wait for
The character string (optional) defined in **Command** is sent to the instrument and a waiting period ensues that is as long as it takes for a received character string to correspond to the regular expression in **Comparison**. If this does not take place within the **Timeout** defined in the command, the command will be canceled.

Poll
The character string (optional) defined in **Command** is sent to the instrument and an answer is expected and evaluated within the **Timeout** defined in the instrument settings. This action continues to be repeated until a character string received corresponds to the regular expression in the **Comparison**. If this does not take place within the **Timeout** defined in the command, the command will be canceled.

Command

Character string that is to be sent to the instrument. Details can be found in the technical documentation of the instrument in question.

Entry	**250 characters**

NOTICE

All ASCII characters can be entered with their two-digit hex code after backslash (e.g. **\1B** = **Escape**).

Variable

Selection of an available sample data variable under which the received data is to be saved for the actions **Read**, **Wait for** and **Poll**. Sample data variables that are not permitted to be assigned to one of the specified sample data variables must be defined for this purpose in the **START** command *(see chapter 5.5.2.8.2.5, page 549)*.

Selection	**Sample data variables**

NOTICE

Several indexed variables (e.g. **Input1**, **Input2**, etc.) can also be created in order to be able to store the substrings requested with regular expressions directly in various variables.

Example

Variable = **SD.Input1**

Comparison = **(\d+\.\d+),(\d+\.\d+)**

Two measured values (separated by a comma) are filtered out of a random receiving line and saved in the two variables **SD.Input1** and **SD.Input2**.

Comparison

Entry of a character string that is to be compared with the incoming data of the actions **Read**, **Wait for** and **Poll**. Here it is possible to enter so-called **regular expressions**. With the aid of these precisely defined search patterns, you can interpret received character strings and save certain contents from them in a sample data variable. Regular expressions are often used in computer science (operating systems UNIX or LINUX, script languages PERL, etc.) and have become largely standardized. **viva** makes full use of **Extended Regular Expressions** in accordance with **Java** (for details, see e.g. *http://en.wikipedia.org/wiki/Regular_expression*).

Entry	**100 characters**

Examples for Regular Expressions:

Expression	Meaning	Example
[abc]	OR function for individual characters	Receive **a** or **b** or **c**
[a-z0-9]	One character in the specified range	**m** or **5**
(hallo)	Substring	Character string contains **hallo**
^hallo	Start of line	**hallo** stands at the start of the line
hallo$	End of line	**hallo** stands at the end of the line
.	Any single character	**a** or **4** or **-** or …
\.	Period	**.**
\d	One digit	**3**
\d+	More than one digit	**324567**
\d{4}	Four digits	**3143**
\D	Not one digit	**A** or **!** or …
\w	One digit or one letter of the alphabet	**a** or **3**
\W	Neither digit nor letter of the alphabet	**!** or **.**
.*	Any character string	**abcd** or **41** or **-$=$** or …

Any combinations of regular expressions are possible.

NOTICE

In order to be able to save the received data in a variable, an opening bracket and a closing bracket must be set in each case in the **Comparison** field. The expression **(.*)** must thus be entered in the Comparison field in order to store a complete, random character string in a variable.

5.5.2.7 Measuring commands

5.5.2.7.1 Measuring commands - Overview

Menu item: **Method ▶ Insert ▶ New command... ▶ Measure**

The following measuring commands can be selected:

- *MEAS Ref*
  Measurement of a reference solution with the spectrometer.
- *MEAS Spec*
  Measurement of the sample solution.
- *MEAS Opt*
  Absorbance measurement.
- *MEAS Opt Conc*
  Measurement of standard solutions for the calibration of color reagents.
- *MEAS TMF*
  Measurement of a reference solution with the photometer.
- *MEAS T*
  Measurement of the sample solution temperature.

5.5.2.7.2 MEAS Ref

5.5.2.7.2.1 MEAS Ref - Overview

Dialog window: **Method ▶ MEAS Ref ▶ Properties... ▶ MEAS Ref - 'Command name'**

Command for the **measurement of a reference spectrum**.

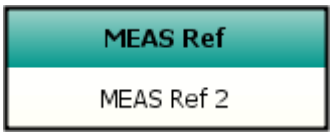
Instruments

This command can be executed with the following device:

Spectrometer: Avantes

Appearance

The command has the following appearance:



Parameters

The parameters for the **MEAS Ref** command are set on the following tabs:

- *General/Hardware*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.

Command variables

The following command variables are generated by the **MEAS Ref** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **FIN** | **STY**

5.5.2.7.2.2 MEAS Ref - General/Hardware

Tab: **Method ► MEAS Ref ► Properties... ► MEAS Ref - 'Command name' ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer**
Default value	**Avantes Spectrometer**

5.5.2.7.2.3 MEAS Ref - Measuring parameters

Tab: **Method ▶ MEAS Ref ▶ Properties... ▶ MEAS Ref - 'Command name' ▶ Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Start wavelength

Lower limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**400.0 nm**

End wavelength

Upper limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**1,000.0 nm**

Integration time

Integration time for the acquisition of the spectrum.

Input range	**0.01 to 600,000 ms**
Default value	**6 ms**

Averaged spectra

The number of spectra that are acquired and averaged.

Input range	**1 to 10,000**
Default value	**10**

Smoothing

Number of neighboring pixels with which the value for each measurement pixel is determined.

Input range	**0 to 100 pixels**
Default value	**0 pixels**

5.5.2.7.3 MEAS Spec

5.5.2.7.3.1 MEAS Spec - Overview

Dialog window: **Method ► MEAS Spec ► Properties... ► MEAS Spec - 'Command name'**

Command for the **measurement of a sample spectrum**.

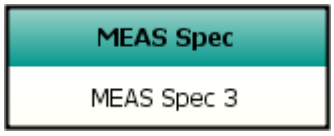
Instruments

This command can be executed with the following device:

Spectrometer: Avantes

Appearance

The command has the following appearance:



Parameters

The parameters for the **MEAS Spec** command are set on the following tabs:

- *General/Hardware*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.
- *Evaluations*
  Definition of evaluation results for the sample spectrum.

Command variables

The following command variables are generated by the **MEAS Spec** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **FIN** | **PK{#}.ABS** | **PK{#}.CND** | **PK{#}.CNR** | **PK{#}.CNT** | **PK{#}.SAT** | **PK{#}.TRN** | **PK{#}.WVL** | **STY**

5.5.2.7.3.2 MEAS Spec - General/Hardware

Tab: **Method ► MEAS Spec ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer**
Default value	**Avantes Spectrometer**

5.5.2.7.3.3 MEAS Spec - Measuring parameters

Tab: **Method ► MEAS Spec ► Properties... ► Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Start wavelength

Lower limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**400.0 nm**

End wavelength

Upper limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**1,000.0 nm**

Integration time

Integration time for the acquisition of the spectrum.

Input range	**0.01 to 600,000 ms**
Default value	**6 ms**

Averaged spectra

The number of spectra that are acquired and averaged.

Input range	**1 to 10,000**
Default value	**10**

Smoothing

Number of neighboring pixels with which the value for each measurement pixel is determined.

Input range	**0 to 100 pixels**
Default value	**0 pixels**

5.5.2.7.3.4 MEAS Spec - Evaluations

Tab: **Method ► MEAS Spec ► Properties... ► Evaluations**

Command name

Name of the command.

Entry	**25 characters**

The evaluation windows for the evaluation of measurement curves can be activated and defined on this tab.

[New]

Opens the **Evaluation window #** dialog window for entering the start and end wavelengths *(see chapter 5.5.2.7.3.5, page 515)*.

[Properties]

Opens the **Evaluation window #** dialog window for editing the start and end wavelengths selected in the table *(see chapter 5.5.2.7.3.5, page 515)*.

[Delete]

Deletes the selected line.

5.5.2.7.3.5 MEAS Spec - Evaluation window

Dialog window: **Method ► MEAS Spec ► Properties... ► Evaluations ► [New] / [Properties] ► Evaluation window #**

Start wavelength

Lower limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**400.0 nm**

End wavelength

Upper limit of the spectrum.

Input range	**100.0 to 2,000.0 nm**
Default value	**1,000.0 nm**

5.5.2.7.4 MEAS Opt

5.5.2.7.4.1 MEAS Opt - Overview

Dialog window: **Method ► MEAS Opt ► Properties... ► MEAS Opt - 'Command name'**

Command for **absorbance measurements**.

Instruments

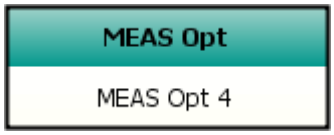
This command can be executed with the following devices:

Spectrometer: Avantes

Photometer: 089

Appearance

The command has the following appearance:



Parameters

The parameters for the **MEAS Opt** command are set on the following tabs:

- *General/Hardware*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.
- *Evaluations*
  Definition of evaluation results for absorbance measurements.
- *Additional measured values*
  Definition of additional measured values which can be saved as additional columns in the measuring point list.

Command variables

The following command variables are generated by the **MEAS Opt** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BP{#}.[MEA] | **BP{#}.CNT** | **BP{#}.TEM** | **BP{#}.TIM** | **BP{#}.TRN** | **BSY** | **DBL** | **EME** | **ETE** | **FIN** | **FP{#}.[MEA]** | **FP{#}.CNT** | **FP{#}.TEM** | **FP{#}.TIM** | **FP{#}.TRN** | **IME** | **ITE** | **LP.CAx** | **LP.CNT** | **LP.EXx** | **LP.MEA** | **LP.TEM** | **LP.TIM** | **LP.TRN** | **MA.[MEA]** | **MA.CNT** | **MA.TEM** | **MA.TIM** | **MA.TRN** | **MI.[MEA]** | **MI.CNT** | **MI.TEM** | **MI.TIM** | **MI.TRN** | **MTE** | **NMP** | **STY**

5.5.2.7.4.2 MEAS Opt - General/Hardware

Tab: **Method ▶ MEAS Opt ▶ Properties... ▶ MEAS Opt - 'Command name' ▶ General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer** | **089 Photometer**
Default value	**Avantes Spectrometer**

Sensor

This section is displayed only when **Device type** = **089 Photometer**.

Temperature measurement

Type of temperature measurement.

Selection	**continuous** | **off**
Default value	**continuous**

continuous
A temperature sensor must be connected. The temperature will then be measured continuously.

off
The temperature will not be measured. The temperature entered manually under Temperature on the **Measuring parameters** tab will be used.

Stirrer

This section is displayed only when **Device type** = **089 Photometer**.

Stirrer

Selection of the stirrer.

Selection	**1** | **off**
Default value	**1**

off
Means that no stirrer will be used.

Stirring rate

Setting the stirring rate.

Input range	**0 to 15**
Default value	**3**

Switch off automatically

on | off (Default value: **on**)

If this check box is activated, the stirrer will be switched off automatically when the command has finished.

5.5.2.7.4.3 MEAS Opt - Measuring parameters

Tab: **Method ▶ MEAS Opt ▶ Properties... ▶ MEAS Opt - 'Command name' ▶ Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Measuring parameters for the Avantes spectrometer

Wavelength

Wavelength at which the measured quantity (absorbance) is recorded.

Input range	**100.0 to 2000.0 nm**
Default value	**400.0 nm**

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**–1E+12 to 1E+12 (max. 10 digits) mAU**
Default value	**0 mAU**

Integration time

Integration time for absorbance measurement.

Input range	**0.01 to 600000 ms**
Default value	**6 ms**

Averaged spectra

The number of spectra that are acquired and averaged.

Input range	**1 to 10,000**
Default value	**10**

Smoothing

Number of neighboring pixels with which the value for each measurement pixel is determined.

Input range	**0 to 100 pixels**
Default value	**0 pixels**

Measuring parameters for the 089 Photometer

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**–4000 to 4000 mAU**
Default value	**0 mAU**

Measurement

Two types of measurement can be selected, **Measurement with drift control** or **Measurement without drift control**.

Selection	**Measurement with drift control** | **Measurement without drift control**
Default value	**Measurement with drift control**

Measurement with drift control
The measurement is carried out drift-controlled if this option is selected. The measurement is canceled as soon as the defined **Signal drift** or the **Stop measured value** is reached or the **Max. waiting time** has elapsed. The corresponding parameters are not visible if this option is disabled.

Measurement without drift control
The measurement is carried out without drift control if this option is selected. Measurement is continued for as long as one of the two stop criteria **Max. waiting time** or **Stop measured value** is fulfilled. The corresponding parameters are not visible if this option is disabled.

NOTICE

A constant measured value is often only reached after a certain time, as mixing and possibly the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e., reaching a constant measured value takes longer and longer. **Drift-controlled measurement** is particularly advisable in such cases, as the measured values are not applied until equilibrium has almost been reached.

Measurement with drift control

If the **Measurement with drift control** option has been selected, then the following parameters will be displayed:

Signal drift

The measured value is only accepted if the signal drift defined here has been fallen short of.

Input range	**0.1 to 999000 mAU/min**
Default value	**1.0 mAU/min**

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The drift continues to be checked while the minimum waiting time is elapsing.

Input range	**0 to 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. If the waiting time has not been newly entered, then a waiting time that is suitable for the drift will be calculated automatically according to the following formula:

$$\text{Waiting time} = 150 / \sqrt{\text{Drift} + 0.01} + 5$$

Input range	**0 to 999999 s**
Default value	**154 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**
Selection	**off**
Default value	**off**

off
No stop.

Measurement without drift control

If the **Measurement without drift control** option has been selected, then the following parameters will be displayed:

Max. waiting time

Maximum period of time for measurement.

Input range	**0 to 999999 s**
Default value	**120 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**
Selection	**off**
Default value	**off**

off
No stop.

Temperature

This section is displayed only when **Device type** = **089 Photometer**.

Temperature

Measuring temperature, which can be entered manually. The temperature is measured continuously when **Temperature measurement** = **continuous** (tab **General/Hardware**).

Input range	**20.0 to 60 °C**
Default value	**25.0 °C**

5.5.2.7.4.4 MEAS Opt - Evaluations

Tab: **Method ► MEAS Opt ► Properties... ► MEAS Opt - 'Command name' ► Evaluations**

Command name

Name of the command.

Entry	**25 characters**

The following additional methods for evaluation of measurement curves can be activated and defined on this tab.

Fixed point evaluation

Fixed point evaluation

on | off (Default value: **off**)

If this check box is activated, then the associated values for the other measured quantities will be interpolated with a fixed measured quantity

(**Measured value** or **Time**) for the fixed point from the measuring point list.

Moves the selected line upward (modifies sequence).

Moves the selected line downward (modifies sequence).

[New]

Opens the **Fixed point evaluation #** dialog window for entering a new fixed endpoint *(see chapter 5.5.2.7.4.6, page 526)*.

[Properties]

Opens the **Fixed point evaluation #** dialog window to edit the fixed point selected in the table *(see chapter 5.5.2.7.4.6, page 526)*.

[Delete]

Deletes the selected line.

Minimum evaluation

Minimum evaluation

on | off (Default value: **off**)

If this check box is activated, then additional parameters will be displayed for the minimum measured value from the measuring point list.

Threshold value

The evaluation of the minimum begins as soon as the absolute value of the slope of the curve exceeds the set threshold value.

Input range	**0.1 to 1000.0 mAU/s**
Default value	**20.0 mAU/s**

Maximum evaluation

Maximum evaluation

on | off (Default value: **off**)

If this check box is activated, then additional parameters will be displayed for the maximum measured value from the measuring point list.

Threshold value

The evaluation of the maximum begins as soon as the slope of the curve exceeds the set threshold value.

Input range	**0.1 to 1000.0 mAU/s**
Default value	**20.0 mAU/s**

Break point evaluation

Break point evaluation

on | off (Default value: **off**)

If this check box is activated, then sharp, almost 90° changes in directions in the measurement curve will be evaluated.

EP criterion

Measure of the minimum sharpness of the break point. The smaller the EP criterion set, the more break points will be found. As this is a relative value related to the total measured value change, even small changes in the measured value can be evaluated as a break point for a small measured value range.

Input range	**0.0 to 1.0**
Default value	**0.3**

Slope

Minimum difference between the slope before and after the break point. The smaller the difference, the more break points will be found.

Input range	**0.0 to 10.0**
Default value	**0.9**

Smoothing factor

The higher the smoothing factor, the fewer endpoints will be found.

Input range	**2 to 20**
Default value	**5**

Window

A range (window) can be defined on the measured value axis or on the time axis. The break point evaluation will only be carried out in the defined window. Only the first break point in the defined window will be recognized.

Selection	**Measured value** | **Time** | **off**
Default value	**off**

Lower limit

Measured value for the lower limit of the window.

Time for the lower limit of the window.

Window = Measured value

Input range	**0 to 4000 mAU**
Default value	**0 mAU**

Window = Time	
Input range	**0 to 999999 s**
Default value	**0 s**

Upper limit

Measured value for the upper limit of the window.

Time for the upper limit of the window.

Window = Measured value	
Input range	**0 to 4000 mAU**
Default value	**4000 mAU**

Window = Time	
Input range	**0 to 999999 s**
Default value	**999999 s**

5.5.2.7.4.5 MEAS Opt - Additional measured values

Tab: **Method ▶ MEAS Opt ▶ Properties... ▶ MEAS Opt - 'Command name' ▶ Additional measured values**

Command name

Name of the command.

Entry	**25 characters**

A maximum of 6 additional measured values can be defined on this tab. These values can then be saved together with the measured values present in the default settings in additional measured value columns.

Additional calculated measured values

Additional calculated measured values

on | off (Default value: **off**)

If this check box is activated, then a maximum of three new measured values can be calculated and saved from existing measured values that can also be displayed as curves under the designation **Calculated 1 - 3** and be used as variables **'Command name.CA1 - 3'** in formulas.

[New]

Opens the **Calc. measured value #** dialog window, in which the parameters for the additional measured value can be entered *(see chapter 5.5.2.7.8.1, page 544)*.

[Properties]

Opens the **Calc. measured value #** dialog window, in which the parameters for the additional measured value can be edited *(see chapter 5.5.2.7.8.1, page 544)*.

[Delete]

Deletes the calculated measured value selected in the table.

Additional external measured values

Additional external measured values

on | off (Default value: **off**)

If this check box is activated, then a maximum of three new measured values can be adopted from other measuring commands (e.g. **MEAS**) and saved that can also be displayed as curves under the designation **External 1 - 3** and be used as variables **'Command name.EX1 - 3'** in formulas.

[New]

Opens the **External measured value #** dialog window, in which the parameters for the external measured value can be entered *(see chapter 5.5.2.7.8.2, page 545)*.

[Properties]

Opens the **External measured value #** dialog window, in which the parameters for the external measured value can be edited *(see chapter 5.5.2.7.8.2, page 545)*.

[Delete]

Deletes the external measured value selected in the table.

5.5.2.7.4.6 MEAS Opt - Fixed point evaluation

Dialog window: **Method ► MEAS Opt ► Properties... ► Evaluations ► Fixed point evaluation #**

Measured quantity

Selection of the fixed measured quantity to which the associated values for the other quantities are to be interpolated from the list of measured points.

Selection	**Measured value** | **Time**
Default value	**Measured value**

Fixed value

Value of the fixed point.

Measured value

Input range	**0 to 4000 mAU**

Time

Input range	**0.0 to 999999.9 s**

5.5.2.7.5 MEAS Opt Conc

5.5.2.7.5.1 MEAS Opt Conc - Overview

Dialog window: **Method ► MEAS Opt Conc ► Properties... ► MEAS Opt Conc - 'Command name'**

Command for **concentration measurements (direct measurement)** with spectrometer or photometer.

Instruments

This command can be executed with the following devices:

Spectrometer: Avantes

Photometer: 089

Appearance

The command has the following appearance:

Parameters

The parameters for the **MEAS Opt Conc** command are set on the following tabs:

- *(see chapter 5.5.2.7.5.2, page 528)*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.
- *Additional measured values*
  Definition of additional measured values which can be saved as additional columns in the measuring point list.

Command variables

The following command variables are generated by the **MEAS Opt Conc** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **EME** | **ETE** | **FIN** | **IME** | **ITE** | **LP.CAx** | **LP.CNT** | **LP.EXx** | **LP.MEA** | **LP.TIM** | **LP.TRN** | **MTE** | **NMP** | **STY**

5.5.2.7.5.2 MEAS Opt Conc - General/Hardware

Tab: **Method ▶ MEAS Opt Conc ▶ Properties... ▶ MEAS Opt Conc - 'Command name' ▶ General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**Avantes Spectrometer** | **089 Photometer**
Default value	**Avantes Spectrometer**

Sensor

Colorimetric sensor

Selection of a colorimetric sensor from the table of colorimetric sensors. The calibration data for the colorimetric sensor will be adopted for the determination.

Selection	**'Name of the colorimetric sensor'** | **empty or 'first list entry'**
Default value	**empty or 'first list entry'**

Temperature measurement

Type of temperature measurement.

Displayed only when **Device type** = **089 Photometer**.

Selection	**continuous** | **off**
Default value	**continuous**

continuous
A temperature sensor must be connected. The temperature will then be measured continuously.

off
The temperature will not be measured. The temperature entered manually under Temperature on the Measuring parameters tab will be used.

Stirrer

This section is displayed only when **Device type** = **089 Photometer**.

Stirrer

Selection of the stirrer.

Selection	**1** | **off**
Default value	**1**

off
Means that no stirrer will be used.

Stirring rate

Setting the stirring rate.

Input range	**0 to 15**
Default value	**3**

Switch off automatically

on | off (Default value: **on**)

If this check box is activated, the stirrer will be switched off automatically when the command has finished.

5.5.2.7.5.3 MEAS Opt Conc - Measuring parameters

Tab: **Method ▶ MEAS Opt Conc ▶ Properties... ▶ MEAS Opt Conc - 'Command name' ▶ Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Tab for Avantes spectrometer

Wavelength

Wavelength at which the measured quantity (absorbance) is recorded.

Input range	**100.0 to 2000.0 nm**
Default value	**400.0 nm**

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**–1E+12 to 1E+12 (max. 10 digits)**
Default value	**0.0**

Entry	**1 - 10 characters**
Selection	**mol/L** | **mmol/L** | **µmol/L** | **g/L** | **mg/L** | **µg/L** | **mg/mL** | **µg/mL** | **ppm** | **%** | **mEq/L**
Default value	**ppm**

Integration time

Integration time for absorbance measurement.

Input range	**0.01 to 600000 ms**
Default value	**6 ms**

Averaged spectra

Number of spectra that are recorded and averaged.

Input range	**1 to 10000**
Default value	**10**

Smoothing

Number of neighboring pixels with which the light intensity of each measurement pixel is averaged.

Input range	**0 to 100 pixels**
Default value	**0 pixels**

Tab for the 089 Photometer

Blank value

Value by which the measured quantity (absorbance) is corrected. Here an expression can also be entered through the formula editor (e.g. xx.EME from other measuring command) by which every measured absorbance value can then be corrected.

Input range	**–1E+12 to 1E+12 (max. 10 digits)**
Default value	**0.0**

Entry	**1 - 10 characters**
Selection	**mol/L** | **mmol/L** | **µmol/L** | **g/L** | **mg/L** | **µg/L** | **mg/mL** | **µg/mL** | **ppm** | **%** | **mEq/L**
Default value	**ppm**

Measurement

Two types of measurement can be selected, **Measurement with drift control** or **Measurement without drift control**.

Selection	**Measurement with drift control** | **Measurement without drift control**
Default value	**Measurement with drift control**

Measurement with drift control
The measurement is carried out drift-controlled if this option is selected. The measurement is canceled as soon as the defined **Signal drift** or the **Stop measured value** is reached or the **Max. waiting time** has elapsed. The corresponding parameters are not visible if this option is disabled.

Measurement without drift control
The measurement is carried out without drift control if this option is selected. Measurement is continued for as long as one of the two stop criteria **Max. waiting time** or **Stop measured value** is fulfilled. The corresponding parameters are not visible if this option is disabled.

NOTICE

A constant measured value is often only reached after a certain time, as mixing and possibly the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e., reaching a constant measured value takes longer and longer. **Drift-controlled measurement** is particularly advisable in such cases, as the measured values are not applied until equilibrium has almost been reached.

Measurement with drift control

If the **Measurement with drift control** option has been selected, then the following parameters will be displayed:

Signal drift

The measured value is only accepted if the signal drift defined here has been fallen short of.

Input range	**0.1 to 999000 mAU/min**
Default value	**1.0 mAU/min**

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The drift continues to be checked while the minimum waiting time is elapsing.

Input range	**0 to 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. If the waiting time has not been newly entered, then a waiting time that is suitable for the drift will be calculated automatically according to the following formula:

$$\text{Waiting time} = 150 / \sqrt{\text{Drift} + 0.01} + 5$$

Input range	**0 to 999999 s**
Default value	**154 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 1E+10 (max. 10 digits)**
Default value	**0.0**
Selection	**off**
Default value	**off**

off
No stop.

Measurement without drift control

If the **Measurement without drift control** option has been selected, then the following parameters will be displayed:

Max. waiting time

Maximum period of time for measurement.

Input range	**0 to 999999 s**
Default value	**120 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Avantes spectrometer

Input range	**0.1 to 999999.0 s** (Increment: **0.1**)
Default value	**2.0 s**

089 Photometer

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.0 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 1E+10 (max. 10 digits)**
Default value	**0.0**
Selection	**off**
Default value	**off**

off
No stop.

Temperature

This section is displayed only when **Device type** = **089 Photometer**.

Temperature

Measuring temperature, which can be entered manually. The temperature is measured continuously when **Temperature measurement** = **continuous** (tab **General/Hardware**).

Input range	**20.0 to 60 °C**
Default value	**25.0 °C**

5.5.2.7.5.4 MEAS Opt Conc - Additional measured values

Tab: **Method ▶ MEAS Opt Conc ▶ Properties... ▶ MEAS Opt Conc - 'Command name' ▶ Additional measured values**

Command name

Name of the command.

Entry	**25 characters**

A maximum of 6 additional measured values can be defined on this tab. These values can then be saved together with the measured values present in the default settings in additional measured value columns.

Additional calculated measured values

Additional calculated measured values

on | off (Default value: **off**)

If this check box is activated, then a maximum of three new measured values can be calculated and saved from existing measured values that can also be displayed as curves under the designation **Calculated 1 - 3** and be used as variables **'Command name.CA1 - 3'** in formulas.

[New]

Opens the **Calc. measured value #** dialog window, in which the parameters for the additional measured value can be entered *(see chapter 5.5.2.7.8.1, page 544)*.

[Properties]

Opens the **Calc. measured value #** dialog window, in which the parameters for the additional measured value can be edited *(see chapter 5.5.2.7.8.1, page 544)*.

[Delete]

Deletes the calculated measured value selected in the table.

Additional external measured values

Additional external measured values

on | off (Default value: **off**)

If this check box is activated, then a maximum of three new measured values can be adopted from other measuring commands (e.g. **MEAS**) and saved that can also be displayed as curves under the designation **External 1 - 3** and be used as variables **'Command name.EX1 - 3'** in formulas.

[New]

Opens the **External measured value #** dialog window, in which the parameters for the external measured value can be entered *(see chapter 5.5.2.7.8.2, page 545)*.

[Properties]

Opens the **External measured value #** dialog window, in which the parameters for the external measured value can be edited *(see chapter 5.5.2.7.8.2, page 545)*.

[Delete]

Deletes the external measured value selected in the table.

5.5.2.7.6 MEAS TMF

5.5.2.7.6.1 MEAS TMF - Overview

Dialog window: **Method ► MEAS TMF ► Properties... ► MEAS TMF - 'Command name'**

Command for the **determination of the transmission factor** of a measurement configuration.

Instruments

This command can be executed with the following device:

Photometer: 089

Appearance

The command has the following appearance:

Parameters

The parameters for the **MEAS TMF** command are set on the following tabs:

- *General/Hardware*
  Parameters for device.
- *Measuring parameters*
  Parameters for setting the measurement procedure.

Command variables

The following command variables are generated by the **MEAS TMF** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **EME** | **ETE** | **FIN** | **IME** | **ITE** | | **LP.CNT** | **LP.MEA** | **LP.TEM** | **LP.TIM** | **MTE** | **NMP** | **STY** | **TMF**

5.5.2.7.6.2 MEAS TMF - General/Hardware

Tab: **Method ▶ MEAS TMF ▶ Properties... ▶ General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

The general parameters for the device are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**089 Photometer**
Default value	**089 Photometer**

Sensor

Temperature measurement

Type of temperature measurement

Selection	**continuous** | **off**
Default value	**continuous**

continuous
A temperature sensor must be connected. The temperature will then be measured continuously.

off
The temperature will not be measured. The temperature entered manually under Temperature on the **Measuring parameters** tab will be used.

Stirrer

Stirrer

Selection of the stirrer.

Selection	**1** | **off**
Default value	**1**

off
Means that no stirrer will be used.

Stirring rate

Setting the stirring rate.

Input range	**0 to 15**
Default value	**3**

Switch off automatically

on | off (Default value: **on**)

If this check box is activated, the stirrer will be switched off automatically when the command has finished.

5.5.2.7.6.3 MEAS TMF - Measuring parameters

Tab: **Method ► MEAS TMF ► Properties... ► Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

Measurement

Two types of measurement can be selected, **Measurement with drift control** or **Measurement without drift control**.

Selection	**Measurement with drift control** | **Measurement without drift control**
Default value	**Measurement with drift control**

Measurement with drift control
The measurement is carried out drift-controlled if this option is selected. The measurement is canceled as soon as the defined **Signal drift** or the **Stop measured value** is reached or the **Max. waiting time** has elapsed. The corresponding parameters are not visible if this option is disabled.

Measurement without drift control
The measurement is carried out without drift control if this option is selected. Measurement is continued for as long as one of the two stop criteria **Max. waiting time** or **Stop measured value** is fulfilled. The corresponding parameters are not visible if this option is disabled.

NOTICE

A constant measured value is often only reached after a certain time, as mixing and possibly the reaction itself require a certain time. The response time of an electrode can also increase with time, i.e., reaching a constant measured value takes longer and longer. **Drift-controlled measurement** is particularly advisable in such cases, as the measured values are not applied until equilibrium has almost been reached.

Measurement with drift control

If the **Measurement with drift control** option has been selected, then the following parameters will be displayed:

Signal drift

The measured value is only accepted if the signal drift defined here has been fallen short of.

Input range	**0.1 to 999000 mAU/min**
Default value	**1.0 mAU/min**

Min. waiting time

The measured value is not accepted until the minimum waiting time has elapsed, even if the signal drift has already been reached. The drift continues to be checked while the minimum waiting time is elapsing.

Input range	**0 to 999999 s**
Default value	**0 s**

Max. waiting time

If the signal drift has not yet been reached, then the measured value will be accepted when the maximum waiting time has elapsed. If the waiting time has not been newly entered, then a waiting time that is suitable for the drift will be calculated automatically according to the following formula:

$$\text{Waiting time} = 150 / \sqrt{\text{Drift} + 0.01} + 5$$

Input range	**0 to 999999 s**
Default value	**154 s**

Measuring interval

Time interval for entering a measured value in the measuring point list.

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.00 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**
Selection	**off**
Default value	**off**

off
No stop.

Measurement without drift control

If the **Measurement without drift control** option has been selected, then the following parameters will be displayed:

Max. waiting time

Maximum period of time for measurement.

Input range	**0 to 999999 s**
Default value	**120 s**

Measuring interval

Time interval for entering a measuring point in the measuring point list.

Input range	**0.25 to 999999.00 s** (Increment: **0.25**)
Default value	**2.00 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0 to 4000 mAU**
Selection	**off**
Default value	**off**

off
No stop.

Temperature

Temperature

Measuring temperature, which can be entered manually. The temperature is measured continuously when **Temperature measurement** = **continuous** (tab **General/Hardware**).

Input range	**20.0 to 60 °C**
Default value	**25.0 °C**

5.5.2.7.7 MEAS T

5.5.2.7.7.1 MEAS T - Overview

Dialog window: **Method ► MEAS T ► Properties... ► MEAS T - 'Command name'**

Command for **temperature measurements**.

Devices

This command can be executed with the following devices:

Voltammetry: 884, 894

Appearance

The command has the following appearance:

Parameters

The parameters for the **MEAS T** command are set on the following tabs:

- *General/Hardware*
  Parameters for devices, sensors and stirrers.
- *Measuring parameters*
  Parameters for setting the measurement procedure.

Command variables

The following command variables are generated by the **MEAS T** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ETE** | **FIN** | **ITE** | **NMP** | **STY**

5.5.2.7.7.2 MEAS T - General/Hardware

Tab: **Method ▶ MEAS T ▶ Properties... ▶ General/Hardware**

Command name

Name of the command.

Entry	**1 - 25 characters**

The general parameters for the device, the sensor and the stirrer are defined on this tab.

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensor

Sensor

Selection of a sensor of the type **Temperature sensor** from the list of sensors available in the sensor table.

Selection	**'Sensor name'** | **Temperature sensor**
Default value	**Temperature sensor**

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min⁻¹** (Increment: **100**)
Default value	**2500 min⁻¹**

Switch off automatically

on | off (Default value: **on**)

If this check box is activated, the stirrer will be switched off automatically when the command has finished.

5.5.2.7.7.3 MEAS T - Measuring parameters

Tab: **Method ► MEAS T ► Properties... ► Measuring parameters**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the measuring procedure can be defined on this tab.

Measurement

Two types of measurement can be selected, **Measurement with drift control** or **Measurement without drift control**.

Selection	**Measurement with drift control** | **Measurement without drift control**
Default value	**Measurement with drift control**

Measurement with drift control
The measurement is carried out drift-controlled if this option is selected. The measurement is canceled as soon as the defined **Signal drift** or the **Stop measured value** is reached or the **Max. waiting time** has elapsed. The corresponding parameters are not visible if this option is disabled.

Measurement without drift control
The measurement is carried out without drift control if this option is selected. Measurement is continued for as long as one of the two stop criteria **Max. waiting time** or **Stop measured value** is fulfilled. The corresponding parameters are not visible if this option is disabled.

NOTICE

A constant measured value is often only reached after a certain time, when a thermal equilibrium has been reached as a result of the mixing of the solution. Drift-controlled measurement is particularly advisable when a thermostat or a cryostat is used for controlling the solution's temperature, as the measured values are only applied after the equilibrium has been reached.

Measurement with drift control

If the **Measurement with drift control** option has been selected, then the following parameters will be displayed:

Measuring interval

Time interval for entering a measuring point in the measuring point list.

Input range	**0.1 to 600.0 s** (Increment: **0.1**)
Default value	**1.0 s**

Signal drift

The measurement is canceled if the value has fallen below the signal drift defined here.

Input range	**0.1 to 999.0 °C/min**
Default value	**0.1 °C/min**

Min. waiting time

The signal drift is only checked after the minimum waiting time defined here has been exceeded.

Input range	**0 to 6,500 s**
Default value	**0 s**

Max. waiting time

The measurement is canceled as soon as the maximum waiting time defined here has been exceeded. If the waiting time has not been newly entered, then a waiting time that is suitable for the drift will be calculated automatically according to the following formula:

$$\text{Waiting time} = 150 / \sqrt{\text{Drift} + 0.01} + 5$$

Input range	**0 to 6500 s**
Default value	**457 s**

Stop measured value

The measurement is canceled when the specified measured value since the start of the measurement is reached.

The measurement is also canceled if the **Min. waiting time** has not yet been exceeded.

It will also be canceled if the value has not yet fallen below the **Signal drift**.

Input range	**0.0 to 100.0 °C**
Selection	**off**
Default value	**off**

off
No stop.

Measurement without drift control

If the **Measurement without drift control** option has been selected, then the following parameters will be displayed:

Measuring interval

Time interval for entering a measuring point in the measuring point list.

Input range	**0.1 to 600.0 s** (Increment: **0.1**)
Default value	**1.0 s**

Max. waiting time

Maximum period of time for measurement.

Input range	**1 to 6500 s**
Default value	**600 s**

Stop measured value

Stop when the entered measured value has been reached since the start of the measurement.

Input range	**0.0 to 100.0 °C**
Selection	**off**
Default value	**off**

off
No stop.

5.5.2.7.8 Additional measured values

5.5.2.7.8.1 Calculated measured value

Dialog window: **Method ▶ MEAS ▶ Properties... ▶ Additional measured values ▶ [New]/[Properties] ▶ Calculated measured value**

With the **Additional calculated measured values** option, a maximum of three new measured values can be calculated and saved from existing measured values that can also be displayed as curves under the designation **Calculated 1 - 3** and be used as variables ***.CA1 - 3** in formulas.

Name

Designation of the calculated measured value. This name is used for the axis labeling.

Entry	**25 characters**
Default value	**Calculated measured value #**

Formula

Calculation formula for the calculated measured value that can be created with the formula editor after pressing .

Entry	**1,000 characters**
Default value	**'empty'**

Unit

Unit of the calculated measured value.

Selection	**'empty'** | **ppm** | **%** | **g/L** | **mg/L** | **mg/mL** | **mg/100 g** | **mol/L** | **mmol/L** | **mL** | **g** | **mg** | **µg** | **°C** | **µL** | **s** | **mS/cm**
Default value	**'empty'**

Digits

Number of decimal places with which the calculated measured value is to be displayed.

Input range	**0 to 5**
Default value	**2**

Comment

Comment regarding calculated measured value.

Entry	**250 characters**
Default value	**'empty'**

5.5.2.7.8.2 External measured value

Dialog window: **Method ► MEAS ► Properties... ► Additional measured values ► [New]/[Properties] ► External measured value**

With the **Additional external measured values** option, a maximum of three new measured values can be adopted and saved from additional measuring commands running simultaneously in other tracks (e.g. **MEAS**) that can also be displayed as curves under the designation **External 1 - 3** and be used as variables ***.EX1 - 3** in formulas.

Command

Selection of the command from which the additional measured value is to be adopted.

Selection	**Selection from existing measuring commands**

Quantity

Selection of the measured quantity from the measuring command that is to be adopted as additional measured value.

Selection	**Selection from existing measured quantities**

Unit

Shows the unit of the external measured value.

Comment

Comment regarding external measured value.

Entry	**250 characters**
Default value	**'empty'**

5.5.2.8 Track commands

5.5.2.8.1 Track commands - Overview

Menu item: **Method ▶ Insert ▶ New track...**

The following track commands exist for the various tracks:

- *START*
  Start command for main track *(see chapter 5.5.1.2.1, page 410)*.
- *TRACK*
  Start command for normal track *(see chapter 5.5.1.2.2, page 411)*.
- *VA TRACK*
  Start command for VA track *(see chapter 5.5.1.2.3, page 412)*.
- *SERIES START*
  Start command for series start track *(see chapter 5.5.1.2.4, page 413)*.
- *SERIES END*
  Start command for series end track *(see chapter 5.5.1.2.5, page 413)*.
- *EXIT*
  Start command for exit track *(see chapter 5.5.1.2.6, page 414)*.
- *ERROR*
  Start command for error track *(see chapter 5.5.1.2.7, page 415)*.

5.5.2.8.2 START

5.5.2.8.2.1 START - Overview

Dialog window: **Method ▶ START ▶ Properties... ▶ START - 'Command name'**

Start command for the main track.

Appearance

The command has the following appearance:

Parameters

The parameters for the **START** command are set on the following three tabs:

- *General*
  General settings for the method run.
- *Application note*
  Possibility of creating an application note to be displayed at the start of the determination.
- *Sample data variables*
  Specification of sample data variables that are to be available for the method.

Command variables

No command variables are generated in the method run by the **START** command.

Sample data variables

The following sample data variables are defined in the **START** command and can be used in formulas under the designation **'SD.Variable name.Variable identification'**: *(see chapter 2.3.3.2, page 20)*

5.5.2.8.2.2 START - General

Tab: **Method ► START ► Properties... ► START - 'Command name' ► General**

Command name

Name of the command.

Entry	**25 characters**

Workplace view

Selection	**Current view** | **View**
Default value	**Current view**

Current view
If this option is enabled, then the view selected on the workplace remains open when the determination is started.

View
If this option is enabled, the selected workplace view is automatically opened when the determination is started.

If the **View** option is selected, then an existing workplace view can be chosen from the selection list.

Selection	**'Workplace view'**

NOTICE

The selected workplace view is only opened when a single determination or the first determination of a series is started, but not when a new method is loaded within a determination series.

Track view for live window

Live display 1

Selection of the track to be displayed in the **Live display 1** subwindow.

Selection	**Main track** | **Selection from existing tracks**
Default value	**Main track**

Live display 2

Selection of the track to be displayed in the **Live display 1** subwindow.

Selection	**Main track** | **Selection from existing tracks**
Default value	**Main track**

Electrode test for voltammetry commands

Electrode check

on | off (Default value: **on**)

If this check box is activated, then an electrode test will be performed for the reference electrode, auxiliary electrode and working electrode when the first voltammetry command is carried out. This test checks whether an electrode is connected and ready for operation. An electrode test is performed only once for each determination.

5.5.2.8.2.3 START - Application note

Tab: **Method ► START ► Properties... ► START - 'Command name' ► Application note**

Command name

Name of the command.

Entry	**25 characters**

The application note defined in the text window is displayed on the **Application note** tab in the **Live display** subwindow of the **Workplace** program part. The tab opens automatically when the method is loaded.

The text editor to create or modify the application note is started with or by double-clicking on the text field *(see chapter 2.4.2, page 81)*.

5.5.2.8.2.4 START - Sample data variables (table)

Tab: **Method ▶ START ▶ Properties... ▶ START - 'Command name' ▶ Sample data variables**

Command name

Name of the command.

Entry	**25 characters**

Here you have to specify the sample data variables that are to be available within the method under the designation **SD.'Variable name'**. By default, the sample data variables **ID1**, **ID2**, **ID3**, **Sample type**, **Sample position**, **Sample amount**, **Sample amount unit**, **Analytical volume** and **Dilution volume** are entered.

New sample data variables can be assigned to one of the still available sample data variables (entry in the **Assignment** field) or a fixed value can be determined for them (entry in the **Fixed value** field).

The overview table shows all specified sample data variables and cannot itself be directly edited. The table can be sorted according to the selected column in ascending or descending order by clicking on the column title (**Name**, **Type**, **Assignment**, **Fixed value** column).

For the meaning of the columns, *see Sample data variables (details), page 549*.

[New]

Opens the **Sample data variable - New** dialog window, where a new sample data variable can be entered *(see chapter 5.5.2.8.2.5, page 549)*.

[Properties]

Opens the **Sample data variable - 'Name'** dialog window, where the sample data variable selected in the table can be edited *(see chapter 5.5.2.8.2.5, page 549)*.

[Delete]

Deletes the sample data variable selected in the table.

5.5.2.8.2.5 START - Sample data variables (properties)

Dialog window: **Method ▶ START ▶ Properties... ▶ START - 'Command name' ▶ Sample data variables ▶ [Properties...] ▶ Sample data variable - 'Name'**

Definition of the sample data variables

Name

Freely definable name for the sample data variable, which has to be unique within the method.

Entry	**50 characters**

Type

Selection of the variable type (only editable for the variables **ID1– ID16** or for variables with fixed value assignment).

Selection	**Text** | **Number** | **Date/Time**
Default value	**Text**

Assignment

on | off (Default value: **on**)

If this check box is activated, then one of the preset sample data variables that is to be given a freely selectable name can be selected. Only those sample data variables which have not already been assigned are available. No formulas can be entered in this field. The selected sample data variable can only be displayed in the database's determination overview via this assignment.

Selection	**Sample type** | **Sample position** | **Sample amount** | **Sample amount unit** | **Analytical volume** | **Dilution volume** | **ID1 - ID16**

NOTICE

The sample data variables **Analytical volume** and **Dilution volume** must both be either present (sample dilution) or absent (no sample dilution) as variables in the **START** command.

Fixed value

on | off (Default value: **off**)

If this check box is activated, the sample data variable can be assigned a fixed value. For variables of the **Date/Time** type, the date has to be entered in the *2.4.1Selecting the date* dialog window. No formulas can be entered in this field.

Type = Number

Input range	**–1.0E+99 to 1.0E+99**

Type = Text

Entry	**100 characters**

Type = Date/Time

Selection	**'Date'**

NOTICE

Variables of the **Text** type with activated fixed value assignment can be used for saving data received with a **TRANSFER** command in these variables *(see chapter 5.5.2.6.6.3, page 507)*.

Check at start

on | off (Default value: **on**)

If this check box is activated, whether the sample data variable is valid and whether the limit values are maintained with activated monitoring is checked during the start test.

NOTICE

Check at start always has to be activated for the sample data variables **Sample amount**, **Analytical volume** and **Dilution volume** in order for a determination to run.

NOTICE

Disabling this option may be advisable in cases where the sample data variables are still invalid at the start of the method and are only defined with a **REQUEST** command in the run.

Comment

Freely selectable comment on the sample data variables.

Entry	**1000 characters**

Variable monitoring

NOTICE

Is only displayed for sample data variables of the **Number** or **Date/Time** type.

on | off (Default value: **off**)

If this check box is activated, then the limit values for the variable will be monitored throughout the entire determination.

Lower limit

Lower limit value for the variable.

Type = Number	
Entry	**10 digits**

Type = Date/Time	
Selection	**'Date'**

Upper limit

Upper limit value for the variable.

Type = Number	
Entry	**10 digits**

Type = Date/Time	
Selection	**'Date'**

Message

NOTICE

Is only displayed for sample data variables of the **Number** or **Date/Time** type.

The message defined here can be simultaneously output to various targets if the lower or upper limit value is breached. The text editor for entering or changing the message is opened with or by double-clicking on the text field *(see chapter 2.4.2, page 81)*. The formula editor can also be opened within the text field *(see chapter 2.3, page 14)*.

Entry	**Text (unlimited)**

Display message

on | off (Default value: **on**)

If this check box is activated, then all active tracks will be stopped and the message defined in the text field will be displayed if the limit value is breached.

Record message

on | off (Default value: **on**)

If this check box is activated, then the message defined in the text field will be documented in the determination.

Message by e-mail

on | off (Default value: **off**)

If this check box is activated, then the message defined in the text field will be output to the address defined under **[E-mail...]** if the limit value is breached.

[E-mail...]

Opens the **Send e-mail** window for defining the e-mail parameters *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message if the limit value is breached.

Action

NOTICE

Is only displayed for sample data variables of the **Number** or **Date/Time** type.

Action

on | off (Default value: **off**)

If this option is enabled, then one of the two following actions will automatically be executed if the limit values are breached.

Selection	**Cancel determination** | **Cancel determination and series**
Default value	**Cancel determination**

Cancel determination
If this option is selected, then the ongoing determination will be canceled (with no entry in the database). The next determination of the series will then be started. If an exit track is present, it will be executed. If an error track is present, it will *not* be executed.

Cancel determination and series
If this option is selected, then the ongoing determination will be canceled (with no entry in the database). The next determination of the series will not be started. If an exit track is present, it will be executed. If an error track is present, it will *not* be executed.

5.5.2.8.3 TRACK

Dialog window: **Method ▶ TRACK ▶ Properties... ▶ TRACK - 'Command name'**

Start command for normal track.

Appearance

The command has the following appearance:

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**Track %1**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Return immediately

on | off (Default value: **off**)

If this check box is activated, then the program does not wait for this track to be completed, but rather this track responds immediately to the track with the call command. From now on, both tracks will be running simultaneously.

Delete old data

on | off (Default value: **off**)

If this check box is activated, then the data previously generated by this track will be deleted each time this track is started.

Command variables

The following command variables are generated by the **TRACK** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.4 VA TRACK

Dialog window: **Method ▶ TRACK ▶ Properties... ▶ VA TRACK - 'Command name'**

Start command for VA track.

Appearance

The command has the following appearance:

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**VA track #**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Return immediately

on | off (Default value: **off**)

If this check box is activated, then the program does not wait for this track to be completed, but rather this track responds immediately to the track with the call command. From now on, both tracks will be running simultaneously.

Command variables

The following command variables are generated by the **VA TRACK** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.5 SERIES START

Dialog window: **Method ▶ SERIES START ▶ Properties... ▶ SERIES START - 'Command name'**

Start command for the series start track.

Appearance

The command has the following appearance:

Parameters

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**Series start track**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Command variables

The following command variables are generated by the **SERIES START** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.6 SERIES END

Dialog window: **Method ▶ SERIES END ▶ Properties... ▶ SERIES END - 'Command name'**

Start command for the series end track.

Appearance

The command has the following appearance:

Parameters

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**Series end track**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Command variables

The following command variables are generated by the **SERIES END** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.7 EXIT

Dialog window: **Method ► EXIT ► Properties... ► EXIT - 'Command name'**

Start command for the exit track.

Appearance

The command has the following appearance:

Parameters

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**Exit track**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Command variables

The following command variables are generated by the **EXIT** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.8 ERROR

Dialog window: **Method ▶ ERROR ▶ Properties... ▶ ERROR - 'Command name'**

Start command for the error track.

Appearance

The command has the following appearance:

Parameters

Command name

Name of the command.

Entry	**1 - 25 characters**
Default value	**Error track**

Live display

on | off (Default value: **on**)

If this check box is activated, then the track will be displayed in the live display.

Command variables

The following command variables are generated by the **ERROR** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.8.9 END

Dialog window: **Method ▶ END ▶ END - 'Command name'**

End command for all tracks.

Appearance

The command has the following appearance:

Parameters

The **END** command has no parameters. It is generated automatically at the end of the track when a track is inserted.

Command variables

No command variables are generated in the method run by the **END** command.

5.5.2.9 Various commands

5.5.2.9.1 Various commands - Overview

Menu item: **Method ► Insert ► New command... ► Miscellaneous**

Various commands that can be used independently of the connected devices.

The following commands can be selected:

- *REQUEST*
  Scans sample data.
- *LOOP*
  Multiple execution of method parts.
- *WAIT*
  Stops the method run.
- *SEQUENCE*
  Combines several commands to one command.
- *CALC*
  Calculating results and assigning common variables and global variables.

5.5.2.9.2 REQUEST

5.5.2.9.2.1 REQUEST - Overview

Dialog window: **Method ► REQUEST ► Properties... ► REQUEST - 'Command name'**

Command for a **sample data query** in the method run. The data can either be entered manually or adopted from an input device (barcode reader).

Appearance

The command has the following appearance:

Parameters

The parameters for the **REQUEST** command are set in the following dialog window:

- *REQUEST*

Command variables

The following command variables are generated by the **REQUEST** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.9.2.2 REQUEST - Properties

Dialog window: **Method ▶ REQUEST ▶ Properties... ▶ REQUEST - Data input #**

Command name

Name of the command.

Entry	**25 characters**

Sample data request

The sample data that is to be entered not earlier than during the determination can be selected in the **REQUEST - data entry #** dialog window. The **Sample data request** dialog window, in which the sample parameters selected in the command are requested, appears in the method run during the processing of this command. The run continues to be stopped until the entry is confirmed.

NOTICE

If the **run is not to be stopped**, the **REQUEST** command can be inserted in a normal track for which the **Return immediately** check box is activated.

ID1–ID16

on | off (Default value: **off**)

If a check box is activated, then the respective sample identifications **ID1 - ID16** will be requested. If other names are assigned for these variables in the **START** command, then these names will be displayed in the **Sample data request** dialog window as field titles.

NOTICE

Text is selected as the default type for the sample identifications **ID1 - ID16**. If you wish to enter numbers for these method variables that are to be used for later calculations, then these variables must be switched to the **Number** type on the **Sample data variables** tab in the **START** command *(see chapter 5.5.2.8.2.4, page 549)*.

Sample type

on | off (Default value: **off**)

If this check box is activated, then the Sample type will be requested.

Sample position

on | off (Default value: **off**)

If this check box is activated, then the position of the sample on the rack will be requested.

Sample amount

on | off (Default value: **off**)

If this check box is activated, then the Sample amount will be requested *(see glossary, page 1072)*.

Sample amount unit

on | off (Default value: **off**)

If this check box is activated, then the Sample amount unit will be requested.

Analytical volume

on | off (Default value: **off**)

If this check box is activated, then the Analytical volume will be requested *(see glossary, page 1051)*.

Dilution volume

on | off (Default value: **off**)

If this check box is activated, then the Dilution volume will be requested *(see glossary, page 1059)*.

Message

on | off (Default value: **off**)

If this check box is activated, then the message defined here appears in the **Sample data request** dialog window, in which the sample data is requested at the moment of the method run *(see chapter 5.5.2.9.2.3, page 562)*. The text editor for entering or changing the message is opened with or by double-clicking on the text field *(see chapter 2.4.2, page 81)*.

Entry	**Text (unlimited)**

5.5.2.9.2.3 REQUEST - Sample data request

Dialog window: **Workplace ▶ [START] ▶ Sample data request**

Entry of sample data for the sample data variables defined in the **REQUEST** command. The data in this window can be entered manually. By pressing **[Enter]**, you can complete the data input for one field and jump to the next one.

If fixed values are defined for sample data variables in the **START** command, then these will be entered in the respective parameter fields. The fixed values displayed in italics cannot be edited.

Message

Shows the message defined in the **REQUEST** command.

ID1–ID16

Sample identifications.

Type = Number	
Input range	**-1.0E-99 to 1.0E+99**

Type = Text	
Entry	**max. 100 characters**

Type = Date/Time	
Selection	**'YYYY-MM-DD' or 'YYYY-MM-DD hh:mm:ss'**

NOTICE

If the sample identifications are still invalid at the start of the method and are to wait for the **REQUEST** command before being entered in the run, then the **Check at start** option in the **START** command must be **disabled** for these sample data variables.

Sample type

Sample type.

Selection	**Sample** | **Standard** | **Intercept**
Default value	**Sample**

Sample position

Position of the sample on the sample changer rack. This number can be used to move to the sample position with a **MOVE** command when **Target position** = **Sample position**.

Input range	**1 to 999**
Default value	**1**

Sample amount

Numerical value for the sample amount for which the standard result is calculated *(see glossary, page 1072)*.

Entry	**Number with 10 digits at most**
Default value	**1.0**

Sample amount unit

Unit of the sample amount. Any text can be entered into this field.

Entry	**16 characters**
Selection	**L** | **mL** | **µL** | **g** | **mg** | **µg** | **pieces**
Default value	**mL**

Analytical volume

Volume portion (aliquot) of the diluted sample's dilution volume used for the determination *(see glossary, page 1051)*. This volume is added to the measuring vessel with the **ADD SAMPLE** command.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

Dilution volume

Maximum filling volume used for dilution of the sample *(see glossary, page 1059)*.

Input range	**-1E+99 to 1E+99 (max. 10 places) mL**
Default value	**'empty' mL**

NOTICE

Sample data can also be loaded directly from a **barcode reader**. To accomplish this, **Data import** must be enabled in the run window in which the determination is started (**Single determination** or **Determination series**) and the respective devices must be defined. The **Sample data request** dialog window closes automatically after the data is received from these devices.

5.5.2.9.3 LOOP

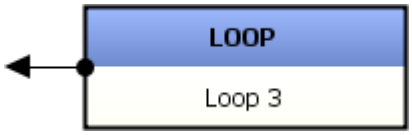
5.5.2.9.3.1 LOOP - Overview

Dialog window: **Method ► LOOP ► Properties... ► LOOP - 'Command name'**

Command for the **repeated execution of method parts**. The loop can be ended after the fulfillment of various stop criteria.

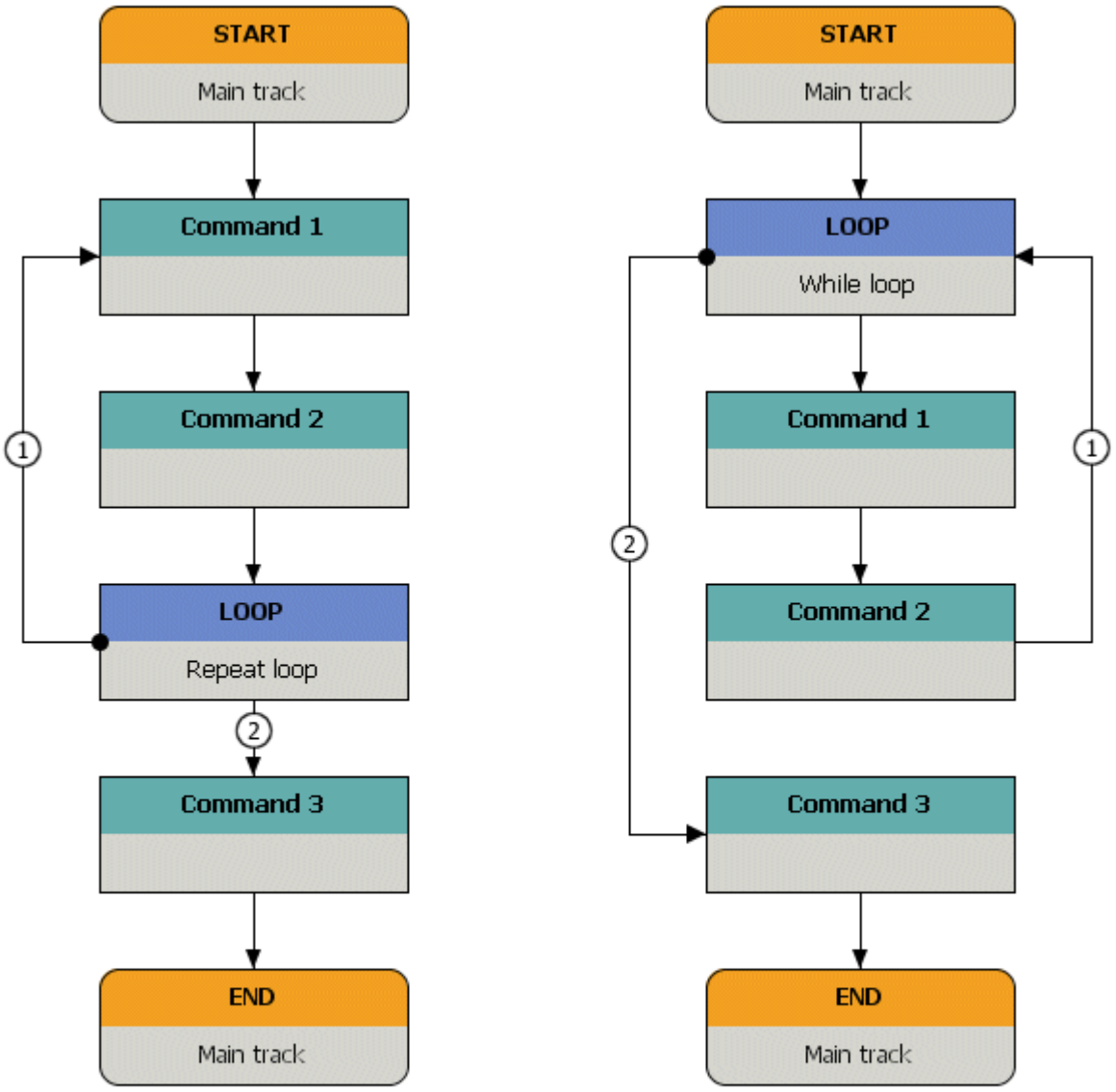
Appearance

The command has the following appearance:



A newly inserted loop command has an arrow on the left side that can be dragged with the mouse to the desired command in the same track in order to generate a loop. **Two different types of loops** result, depending on whether the arrow is dragged upwards or downwards:

Repeat loop **While loop**



In the case of **Repeat loops**, the loop command stands at the end of the loop. If a stop criterion is fulfilled (Case 2), then the next command after the loop command is executed. If no stop criterion is fulfilled (Case 1), then the loop is carried out once more. The loop is thus run through at least once in any case.

In the case of **While loops**, the loop command stands at the beginning of the loop. If the loop arrow is dragged on a command under the loop command, then an arrow back to the loop command is created automatically from the previous command. If a stop criterion is fulfilled (Case 2),

then the next command after the loop will be executed. If no stop criterion is fulfilled (Case 1), then the loop is carried out. If the stop criteria are set accordingly, it is thus possible that the loop will never be run through.

NOTICE

Nested or overlapping loops are not permitted.

Parameters

The parameters for the **LOOP** command are set in the following dialog window:

- *LOOP*

Command variables

The following command variables are generated by the **LOOP** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **FIN** | **LCO** | **LST** | **SRAT** | **STY**

5.5.2.9.3.2 LOOP - Properties

Dialog window: **Method ► LOOP ► Properties... ► LOOP - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Stop criteria

Definition of 3 possible stop criteria. The stop criterion that is reached first leads to the cancellation of the loop.

Max. run number

on | off (Default value: **on**)

If this check box is activated, the maximum number of runs is used as a stop criterion for Repeat loops and While loops. If the maximum number of runs has been reached, the loop will be canceled the next time the loop command is called.

Input range	**0 to 999**
Default value	**2**

Maximum run time

on | off (Default value: **off**)

If this check box is activated, the maximum run time is used as a stop criterion for Repeat loops and While loops. The starting point for the run time is the first start of the loop command, i.e., the run time for While loops does not start until after the first loop run has been started. If the maximum run time has been reached, the loop will be canceled the next time the loop command is called.

Input range	**0 to 999.9**
Default value	**0**
Selection	**min** | **s**
Default value	**min**

NOTICE

The run time is also stopped if the method is interrupted with **[HOLD]**.

Signal assessment for DT

on | off (Default value: **off**)

If this check box is activated, then the loop will be canceled at the moment the loop command is called again if the ratio of the current signal to the output signal of the pure basic solution is less than the specified value.

Voltammetry command

Selection of the voltammetry command whose signal is to be checked.

Selection	**'Command name'**

Substance

Selection of the substance for which the signal is to be checked.

Selection	**'Substance'**

Signal ratio Q/Q(0)

Specification of the ratio of the current signal to the output signal of the VMS basic solution. If this value is not reached, the loop will be canceled the next time the loop command is called.

For **Evaluation quantity** = **Area**, the **Signal ratio Q/Q(0)** is defined as follows: **VAR{x}.AREA.MNV / VMS.AREA.MNV**.

For **Evaluation quantity** = **Height**, the **Signal ratio Q/Q(0)** is defined as follows: **VAR{x}.HGT.MNV / VMS.HGT.MNV**.

For **Evaluation quantity** = **Measured value**, the **Signal ratio Q/Q(0)** is defined as follows: **VAR{x}.MVAL.MNV / VMS.MVAL.MNV**.

Input range	**0.01 to 1.00**
Default value	**0.45**

Condition

on | off (Default value: **off**)

If this check box is activated, the condition defined here will be used as a stop criterion for Repeat loops and While loops.

The input field contains the expression for the condition(s) that can be created or edited with the formula editor after clicking on or by double-clicking in the text field *(see chapter 2.3, page 14)*. If the condition is fulfilled (evaluation of the formula yields the result **1** = true), then the loop will be canceled when the loop command is called.

Entry	**1000 characters**
Default value	**'empty'**

5.5.2.9.4 WAIT

5.5.2.9.4.1 WAIT - Overview

Dialog window: **Method ► WAIT ► Properties... ► WAIT - 'Command name'**

Command for interrupting the program sequence in order to output **messages**.

Appearance

The command has the following appearance:

Parameters

The parameters for the **WAIT** command are set in the following dialog window:

- *WAIT*

Command variables

The following command variables are generated by the **WAIT** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.9.4.2 WAIT - Properties

Dialog window: **Method ▶ WAIT ▶ Properties... ▶ WAIT - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Wait

Selection of the following options:

Selection	**Stop track and waiting for [Continue]** | **Stop all tracks and waiting for [Continue]** | **Waiting time**
Default value	**Stop track and waiting for [Continue]**

Stop track and waiting for [Continue]
If this option is selected, then the track in which the **WAIT** command is located is stopped and a message is displayed. The method run can be continued only by pressing **[Continue]**.

Stop all tracks and waiting for [Continue]
If this option is selected, then all active tracks are stopped and a message is displayed. The method run can be continued only by pressing **[Continue]**.

Waiting time
If this option is selected, then the method run will be continued automatically after the waiting time expires. The message text defined under **Message** appears during the waiting time.

Waiting time

This parameter can be edited only if **Wait** = **Waiting time.**

Input range	**0 to 9999.9**
Default value	**0**
Selection	**s** | **min**
Default value	**s**

Message

The message defined here is displayed with tracks stopped or during the waiting time. The text editor for entering or changing the message is opened with or by double-clicking on the text field *(see chapter 2.4.2, page 81)*. The formula editor can also be opened within the text field *(see chapter 2.3, page 14)*.

Entry	**Text (unlimited)**

Record message

on | off (Default value: **off**)

If this check box is activated, then the message defined in the text field will be documented in the determination.

Message by e-mail

on | off (Default value: **off**)

If this check box is activated, then the message defined in the text field will be sent to the address defined under **[E-mail...]**.

[E-mail...]

Opens the **Send e-mail** dialog window for defining the e-mail parameters *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

5.5.2.9.5 SEQUENCE

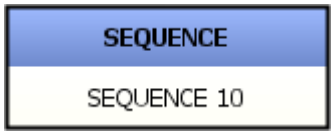
5.5.2.9.5.1 SEQUENCE - Overview

Dialog window: **Method ► SEQUENCE ► Properties... ► SEQUENCE - 'Command name'**

Command for combining a sequence of individual commands into a single command. This command is used only for the more readily comprehensible structuring of methods.

Appearance

The command has the following appearance:



Parameters

The parameters for the **SEQUENCE** command are set in the following dialog window:

- *SEQUENCE*

Command variables

The following command variables are generated by the **SEQUENCE** command in the method run and can be used in formulas under the designa-

tion **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

5.5.2.9.5.2 SEQUENCE - Properties

Dialog window: **Method ► SEQUENCE ► Properties... ► SEQUENCE - Sequence #**

Command name

Name of the command.

Entry	**25 characters**

There is no limit to the number of commands that can be added to a **SEQUENCE** command; these are displayed in the command table. It contains information regarding **Command type** and **Command name**. The table itself cannot be edited. The individual lines of the table can be edited with a context-sensitive menu.

Moves the selected command upward (modifies sequence).

Moves the selected command downward (modifies sequence).

[New]

Opens the **New command** dialog window for the selection of the desired command that is to be inserted at the end of the table *(see chapter 5.2.4.2.1, page 394)*.

[Properties]

Opens the dialog window of the selected command *(see chapter 5.2.4.2.8, page 397)*.

[Delete]

Deletes the selected command.

Copy	Copies the commands selected in the table to the clipboard.
Cut	Deletes the commands selected in the table and copies them to the clipboard.
Paste	Inserts the commands that were copied to the clipboard at the end of the table.

5.5.2.9.6 CALC

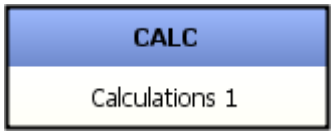
5.5.2.9.6.1 CALC - Overview

Dialog window: **Method ► CALC ► Properties... ► CALC - 'Command name'**

Command for the calculation of end results and intermediate results and the assignment of common variables and global variables.

Appearance

The command has the following appearance:



Parameters

The parameters for the **CALC** command are set in the following dialog window:

- *CALC*

Calculation overview

All defined results are displayed in a table in the properties window of the command **CALC**.

Result parameters

The parameters for the individual results are configured on the following 3 tabs:

- *Definition*
  Entering the formula and assigning the unit.
- *Monitoring*
  Settings for result monitoring.
- *Options*
  Save the result as common variable or as global variable.

Command variables

The following command variables are generated by the **CALC** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **FIN**

Result variables

The following result variables are defined in the **CALC** command and can be used in formulas under the designation **'RS.ResultName.Variable designation'**:

- Result variables CALC *(see "Result variables CALC", page 44)*

5.5.2.9.6.2 CALC - Properties

Dialog window: **Method ► CALC ► Properties... ► CALC - Calculations #**

Command name

Name of the command.

Entry	**25 characters**

Up to 25 results can be defined in the **CALC** command which are displayed in the calculation overview. The table itself cannot be edited. The individual lines of the table can be edited with a context-sensitive menu.

Moves the selected result upward (changes the sequence).

Moves the selected result downward (changes the sequence).

[New]

Opens the **New result** dialog window in order to select a new template.

[Properties]

Opens the dialog window of the selected result .

[Delete]

Deletes the result selected in the table.

[Templates]

Opens the **Manage templates** dialog window in order to delete or rename result templates *(see chapter 5.5.2.9.6.6, page 581)*.

Copy	Copies the results selected in the table to the clipboard.
Cut	Deletes the results selected in the table and copies them to the clipboard.
Paste	Inserts the results that were copied to the clipboard at the end of the table.

Table

he overview table contains the following information about the results:

Result name

Name of the result.

Formula

Calculation formula of the result.

Unit

Result unit.

Decimal places

Number of decimal places of the result.

Assignment

Assignment of the result to one of the 25 result columns in the determination overview.

Result monitoring

Display whether the monitoring for the result is switched on or off.

5.5.2.9.6.3 CALC - New result

Dialog window: **Method ► CALC ► New ► New result**

A template for the new result can be selected in this dialog window.

Templates

Selection of a result template as the basis for a new result.

Selection	**'Result template'** | **Empty**
Default value	**Empty**

'Result template'
Loads a saved result template.

Empty
Loads an empty result template.

Description

Displaying the description of the selected result template.

5.5.2.9.6.4 CALC - Formula editor

Dialog window: **Method ► CALC ► New ► New result ► Formula editor**

Existing calculation templates can be adapted quickly in this dialog window to the required command identifications.

Formula

Display of the calculation formula of the result. In this formula, only the variable identifications themselves will be listed for command variables, and not the command designations.

Selecting a command

All of the variables of the formula template will be listed which are generated by a command.

'Variable'

Assignment of the command to variables.

Selection	**'Command name'**

'Command name'
Selection of a command suitable for the variable which is already present in the method.

[Filling command variables]

Transfer of command names of the selected variable to all command variables. Command names that were already entered will be overwritten.

Selecting a method variable

All of the method variables of the formula template will be listed.

'Variable'

Selection of the method variable.

Selection	**'Method variable'**

'Method variable'
Selection of a method variable defined in the method.

Selecting a common variable

All of the common variables of the formula template will be listed.

'Variable'

Selection of the common variable.

Selection	**'Common variable'**

'Common variable'
Selection of one of the common variables defined in the configuration.

Selecting a global variable

All of the global variables of the formula template will be listed.

'Variable'

Selection of the global variable.

Selection	**'Global variable'**

'Global variable'
Selection of one of the global variables defined in the configuration.

Selecting a result variable

All of the result variables of the formula template will be listed.

'Variable'

Selection of the result variable.

Selection	**'Result variable'**

'Result variable'
Selection of a result variable defined in the method.

Entering a constant

All of the constants of the formula template will be listed.

'Constant'

Entering the constants.

Input range	**-1.0E+99 to 1.0E+99 (max. 15 places)**
Default value	**'empty'**

Open the molar mass calculator for entering molar masses *(see chapter 2.3.5, page 80)*.

5.5.2.9.6.5 CALC - Result properties

5.5.2.9.6.5.1 Result - Definition

Tab: **Method ▶ CALC ▶ Properties... ▶ [New] ▶ [Next] ▶ Result - Definition**

The result calculation is defined on this tab.

Result name

Name of the result. This name will be shown in the result view as well as in the report. The result name can be used in further calculations as variable **RS.Result name.VAL**.

Entry	**50 characters**
Default value	**Res01 ... Res025**

Formula

Display of the calculation formula of the result. The formula editor to enter the calculation formula is opened with a click on or by double-clicking in the window in which the formula can be entered *(see chapter 2.3, page 14)*. The result of the calculation formula defines the result type (**Number**, **Text** or **Date/time**).

Entry	**1000 characters**

Unit

Unit of the result for the output (text only). The unit can be used in further calculations as variable **'RS.Result name.UNI'**.

Entry	**16 characters**
Selection	**empty** | **g/L** | **mg/L** | **µg/L** | **ng/L** | **mol/L** | **mmol/L** | **µmol/L** | **nmol/L** | **pmol/L** | **mL/L** | **µL/L** | **nL/L**
Default value	**empty**

Decimal places

Number of decimal places for the output of the calculated result. This parameter is ignored for results of the type **text** or **date/time**.

Input range	**0 to 6**
Default value	**2**

Assignment

Assigns the result to one of the 25 possible result columns **RS01 ... RS25** in the determination overview in which the result is entered.

Selection	**RS01 ... RS25** | **first unallocated result variable** | **none**
Default value	**none**

none
The result will be assigned to no result column and displayed only in the subwindow **Results** .

NOTICE

The assignments **RS01 ... RS25** can be used repeatedly in various **CALC** commands. If this is the case, then only the last result calculated will be entered in the assigned result column. By doing this it is possible either to display alternative results calculated in different **CALC** commands in the same result column or to use the same report template.

CAUTION

If the same **Assignment** is reused in several CALC commands with different **Result names**, then only the most recently calculated result will be saved in the determination. All other results are either no longer available or invalid if used in other formulas!

Description

Freely selectable entry of a description of the result.

Entry	**1024 characters**

[Save as template]

Open the dialog window **Save result template** in order to save the result parameters as template for the creation of new results *(see chapter 5.5.2.9.6.6, page 581)*.

5.5.2.9.6.5.2 Result - Monitoring

Tab: **Method ▶ CALC ▶ Properties... ▶ [New] ▶ [Next] ▶ Result - Monitoring**

The parameters for monitoring the result are defined on this tab.

Result monitoring

Result monitoring

on | off (Default value: **off**)

The question of whether the result is within the defined limit values is monitored while calculating the result during the determination if this option is enabled.

Lower limit

Lower limit for the result.

Entry	**10 digits**

Upper limit

Upper limit for the result.

Entry	**10 digits**

Message

Message

The message defined here can be put out to different targets if the upper limit is exceeded or if the lower limit is not reached. The text editor for entering or changing the message is opened with or by double-clicking into the text field *(see chapter 2.4, page 81)*. The formula editor can also be called up inside the text field *(see chapter 5.5.2.9.6.4, page 574)*.

Entry	**Text (unlimited)**

Display message

on | off (Default value: **on**)

If this option is enabled, all active tracks are stopped and the message defined in the text box will be displayed in the event that the limits are exceeded. You can select whether you want to continue the stopped tracks with **[Continue]** or - if defined - to execute the **Action** listed below.

Record message

on | off (Default value: **on**)

If this option is enabled, the message defined in the text box will be documented in the determination if the limits are exceeded. The run will not be stopped.

Message by e-mail

on | off (Default value: **off**)

If this option is enabled, the message defined in the text box will be sent to the address defined under **[E-mail]** in the event that the result limits are exceeded.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this option is enabled, an acoustic signal will be emitted in addition to the message defined above when a limit is exceeded.

Action

Action

on | off (Default value: **off**)

If this option is enabled, one of the following actions will be executed in the event that limit values are exceeded.

Selection	**Cancel determination** | **Cancel determination and series**
Default value	**Cancel determination**

Cancel determination
The determination is stopped and the next determination of the series is started.

Cancel determination and series
Both the determination and the series are stopped.

[Save as template]

Open the dialog window **Save result template** in order to save the result parameters as template for the creation of new results *(see chapter 5.5.2.9.6.6, page 581)*.

5.5.2.9.6.5.3 Result - Options

Tab: **Method ► CALC ► Properties... ► [New] ► [Next] ► Result- Options**

The assignment of the result to a common variable, a global variable or a titer can be activated on this tab.

Save result as common variable

on | off (Default value: **off**)

The result will be saved under the selected name as common variable if this option is activated. In all cases, only the single value for this result will be saved as a common variable, even if the statistics are enabled for this result. *(see chapter 6.10, page 867)*

Common variable

The result is saved as new value for this common variable.

Selection	**List of all the common variables defined**

NOTICE

As long as no common variable has been defined, the list box will be empty. The creation of common variables is described in the configuration *(see chapter 6.10, page 867)*.

NOTICE

If common variables are used in a **CALC** command, then they will only be requested at the start of the determination. This means that it is not possible to write Common variables during a determination and then use the modified value in a different formula. For this you should use Method variables *(see chapter 2.3.3, page 17)*.

Save result as global variable

on | off (Default value: **off**)

The result will be saved under the selected name as global variable if this option is activated. In all cases, only the single value for this result will be saved as a global variable, even if the statistics are enabled for this result. *(see chapter 6.11, page 876)*.

Global variable

The result is saved as new value for this global variable.

Selection	**List of all the global variables defined**

NOTICE

If no global variables have been defined, then the selection box will be empty. The creation of global variables is described in the configuration *(see chapter 6.11, page 876)*.

NOTICE

For global variables which are newly calculated during a determination in a **CALC** command and which are saved in the configuration, the current values are available for additional calculations in the same determinations from this instant. This is not the case for determinations running at the same time on other workplaces; here, the values available at the start of the determination are applied.

[Save as template]

Open the dialog window **Save result template** in order to save the result parameters as template for the creation of new results *(see chapter 5.5.2.9.6.6, page 581)*.

5.5.2.9.6.6 CALC - Result templates

5.5.2.9.6.6.1 Manage result templates

Dialog window: **Method ► CALC ► Properties... ► [Templates]**

Result templates can be renamed and deleted in the **Managing templates** dialog window.

Templates

A result template can be renamed or deleted.

Selection	**'Result templates'** | **'empty'**
Default value	**'empty'**

Description

Displaying the description of the selected result template.

[Rename]

Renames the selected result template.

[Delete]

Deletes the selected result template.

5.5.2.9.6.6.2 Save result template

Dialog window: **Method ► CALC ► Properties... ► [New] ► [Next] ► [Save as template] ► Save result template**

Name of result template

The result template is saved under this name in the configuration database.

Entry	**100 characters**
Default value	**'Result name'**

Description

Freely definable description of the result template. This description is displayed in the dialog windows **New result** and **Manage templates**.

Entry	**1000 characters**

5.5.2.9.6.6.3 Rename result template

Dialog window: **Method ► CALC ► Properties... ► [Vorlagen] ► [Rename] ► Rename result template**

Name of result template

New name under which the result template is saved globally in the configuration database.

Entry	**100 characters**
Default value	**'Name of result template'**

Description

Freely definable description of the result template. This description is displayed in the dialog windows **New result** and **Manage templates**.

Entry	**1000 characters**

5.5.2.10 Voltammetry commands

5.5.2.10.1 Voltammetry commands - Overview

Menu item: **Method ► Insert ► New command... ► Voltammetry**

The following voltammetry commands can be selected:

- *CVS*
  Electroplating bath analysis with CVS (Cyclic Voltammetric Stripping).
- *CPVS*
  Electroplating bath analysis with CPVS (Cyclic Pulse Voltammetric Stripping).

- *CP*
  Electroplating bath analysis with CP (chronopotentiometry or open-circuit potential measurements).
- *LSV*
  Electroplating bath analysis and trace analysis with LSV (Linear Sweep Voltammetry).
- *DP*
  Trace analysis with DP (differential pulse measuring mode).
- *SQW*
  Trace analysis with SQW (square-wave measuring mode).
- *CV*
  Basic experiments in electrochemistry using CV (Cyclic Voltammetry).
- *ELECTRODE TEST*
  Electrode test.

5.5.2.10.2 CVS

5.5.2.10.2.1 CVS - Overview

Dialog window: **Method ▶ CVS ▶ Properties... ▶ CVS - 'Command name'**

The **CVS** command is a voltammetry command for the electroplating bath analysis with *CVS (Cyclic Voltammetric Stripping)*. It can be inserted only in VA tracks.

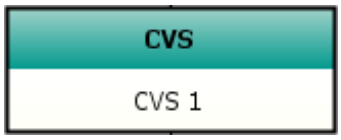
Instruments

This command can be executed with the following devices:

Voltammetry: 884, 894

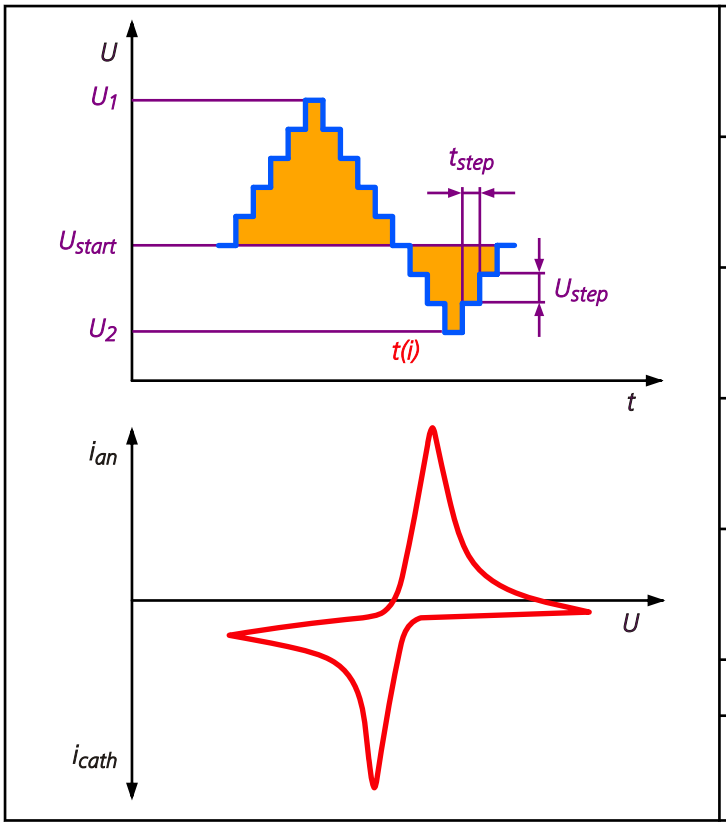
Appearance

The command has the following appearance:



Principle

In the **CVS** measuring mode (Cyclic Voltammetric Stripping), the potential is changed once or more from the start potential to the 1st vertex potential, then to the 2nd vertex potential and back to the start potential again at a constant potential sweep rate. The current *i* is measured as a function of the potential *U* in this process.



U_{step}	**Potential step** *(see chapter 5.5.2.10.2.4, page 592)*
t_{step}	**Potential step time** *(see chapter 5.5.2.10.2.4, page 592)*
U_{start}	**Start potential** *(see chapter 5.5.2.10.2.4, page 592)*
U_1	**1st vertex potential** *(see chapter 5.5.2.10.2.4, page 592)*
U_2	**2nd vertex potential** *(see chapter 5.5.2.10.2.4, page 592)*
i_{an}	Anodic current
i_{cath}	Cathodic current

Sequence of individual steps

In the **CVS** command, the following individual steps are successively executed in the method run for the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep

1 Start potential

The **Start potential** defined in the sweep is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Sweep

The sweep is executed in accordance with the defined sweep parameters.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **CVS** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **CVS** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **CVS** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.2.2 CVS - General/Hardware

Tab: **Method ► CVS ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the **RDE/SSE** sensor type available in the electrode table.

Selection	**RDE** | **'Electrode name'**
Default value	**RDE**

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

'Electrode name'
Electrode of the **RDE/SSE** sensor type from the electrode table.

Sensor type

Shows the type of working electrode (**RDE/SSE**).

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test for the reference electrode, auxiliary electrode and working electrode can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2500 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **on**)

If this check box is activated, then stirring will continue during the sweep.

5.5.2.10.2.3 CVS - Pretreatment

Tab: **Method ► CVS ► Properties... ► Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**0.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Equilibration time

Waiting time before the sweep during which the **Start potential** is applied to the electrodes.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

5.5.2.10.2.4 CVS - Sweep

Tab: **Method ▶ CVS ▶ Properties... ▶ Sweep**

Command name

Name of the command.

Entry	**25 characters**

Start potential

Start potential for the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

1st vertex potential

First inflection point for the sweep.

*Condition:***1st vertex potential** ≠ **Start potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.175 V**

2nd vertex potential

Second inflection point for the sweep.

Condition 1: **2nd vertex potential** ≠ **1st vertex potential**

Condition 2 (for anodic sweeps): **1st vertex potential** > **Start potential** ≥ **2nd vertex potential**

Condition 2 (for cathodic sweeps): **1st vertex potential** < **Start potential** ≤ **2nd vertex potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

Potential step

Potential step for the DC potential ramp.

Condition 1: **Potential step** ≤ (|**2nd vertex potential** – **1st vertex potential**|) / n_{min}

n_{min} (minimum number of measuring points for the evaluation) depends on the **Potential step** itself as follows:

- **Potential step** ≥ 0.0095 V: n_{min} = 16
- **Potential step** < 0.0095 V and ≥ 0.0075 V: n_{min} = 20
- **Potential step** < 0.0075 V and ≥ 0.0055 V: n_{min} = 24
- **Potential step** < 0.0055 V and ≥ 0.0035 V: n_{min} = 32
- **Potential step** < 0.0035 V : n_{min} = 52

Condition 2: **Potential step** ≥ (|**2nd vertex potential** − **1st vertex potential**|) / 32767

Input range	**0.00016 to 5.00000 V** (Increment: **0.00016**)
Default value	**0.006 V**

Potential step time

Shows the time that has to expire before the potential is changed by the amount of **Potential step**.

Calculation: **Potential step** / **Sweep rate**

Sweep rate

Potential sweep rate for the sweep.

Condition 1: **Sweep rate** ≥ **Potential step** / 10 s

Condition 2: **Sweep rate** ≤ **Potential step** / 0.001 s

Input range	**0.001 to 10.000 V/s** (Increment: **0.001**)
Default value	**0.100 V/s**

Preparation cycles

Number of cycles without current measurement that are run through before the measuring cycles.

Input range	**0 to 200** (Increment: **1**)
Default value	**1**

Measuring cycles

Number of cycles with current measurement.

Input range	**1 to 50**
Default value	**2**

Sweep duration

Shows the duration of the sweep in s.

Calculation: (**Preparation cycles** + **Measuring cycles**) · [2 ·|(**2nd vertex potential** − **1st vertex potential**|) / **Potential step**] · **Potential step time**

NOTICE

The actual current measurement takes place at the end of the **Potential step time**. The measuring time is defined as follows:

- **Potential step time** < 0.080 s => measuring time = **Potential step time** / 4 s
- **Potential step time** > 0.080 s => measuring time = 0.02 s (at a line frequency of 50 Hz)
- **Potential step time** > 0.080 s => measuring time = 0.01667 s (at a line frequency of 60 Hz)

5.5.2.10.2.5 CVS - Post-treatment

Tab: **Method ▶ CVS ▶ Properties... ▶ Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Only editable for **Cleaning potential** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined,

then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.2.6 CVS - Potentiostat

Tab: **Method ▶ CVS ▶ Properties... ▶ Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**224 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**20 µA**

NOTICE

If the **Potential step time** is < **4 ms**, the automatic switching of the current measuring range will no longer function optimally. If this is the case, either increase the **Potential step time** or set the highest and lowest current measuring ranges to the same value.

5.5.2.10.3 CPVS

5.5.2.10.3.1 CPVS - Overview

Dialog window: **Method ▶ CPVS ▶ Properties... ▶ CPVS - 'Command name'**

The **CPVS** command is a voltammetry command for the electroplating bath analysis with *CPVS (Cyclic Pulse Voltammetric Stripping)*. It is mainly used for the determination of various organic additives in electroplating baths. The **CPVS** command can be inserted only in VA tracks.

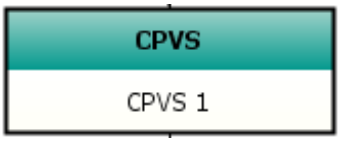
Devices

This command can be executed with the following devices:

Voltammetry: 884, 894

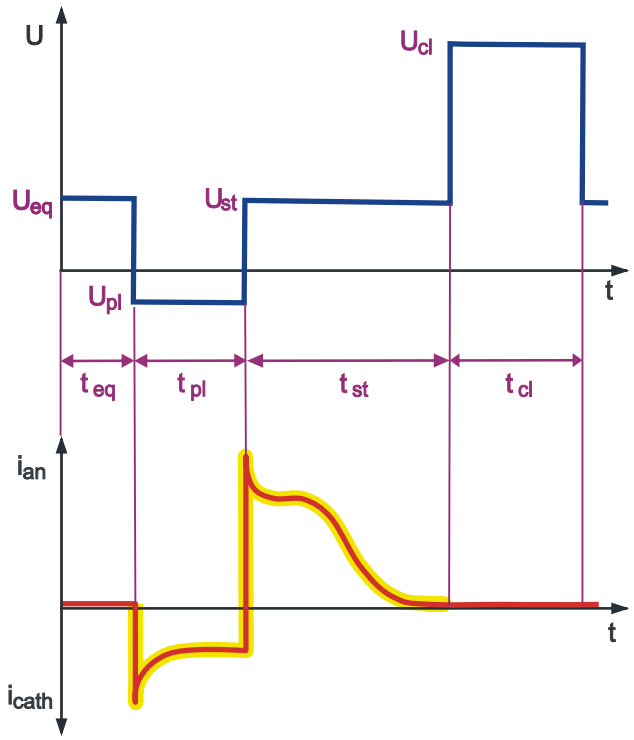
Appearance

The command has the following appearance:



Principle

In the **CPVS** measuring mode (Cyclic Pulse Voltammetric Stripping), the potential of an RDE/SSE (e.g. Pt) is changed between different potentials in pulsed discrete steps. The current *I* is measured as a function of the time *t*.



U_{eq}	**Equilibration potential** *(see chapter 5.5.2.10.3.4, page 606)*
t_{eq}	**Equilibration time** *(see chapter 5.5.2.10.3.4, page 606)*
U_{pl}	**Plating potential** *(see chapter 5.5.2.10.3.4, page 606)*
t_{pl}	**Plating time** *(see chapter 5.5.2.10.3.4, page 606)*
U_{st}	**Stripping potential** *(see chapter 5.5.2.10.3.4, page 606)*
t_{st}	**Stripping time** *(see chapter 5.5.2.10.3.4, page 606)*
U_{cl}	**Cleaning potential** *(see chapter 5.5.2.10.3.4, page 606)*
t_{cl}	**Cleaning time** *(see chapter 5.5.2.10.3.4, page 606)*
	Curve display
	Measured value display

Sequence of individual steps

In the **CPVS** command, the following individual steps are successively executed in the method run for the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep

The following steps are repeated with the specified number of preparation cycles and measuring cycles.

1 Equilibration potential

Equilibration potential is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Plating potential

Plating potential is applied to the electrodes.

4 Plating time

Idle until the period defined in the **Plating time** parameter has expired.

5 Stripping potential 1

Stripping potential 1 is applied to the electrodes.

6 Stripping time 1

Idle until the period defined in the **Stripping time 1** parameter has expired.

7 Stripping potential 2

Stripping potential 2 is applied to the electrodes.

8 Stripping time 2

Idle until the period defined in the **Stripping time 2** parameter has expired.

9 Stripping potential 3

Stripping potential 3 is applied to the electrodes.

10 Stripping time 3

Idle until the period defined in the **Stripping time 3** parameter has expired.

11 Stripping potential 4

Stripping potential 4 is applied to the electrodes.

12 Stripping time 4

Idle until the period defined in the **Stripping time 4** parameter has expired.

13 Stripping potential 5

Stripping potential 5 is applied to the electrodes.

14 Stripping time 5

Idle until the period defined in the **Stripping time 5** parameter has expired.

15 Cleaning potential

Cleaning potential is applied to the electrodes.

16 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

Post-treatment

only for Hydrodynamic measurement = on

1 Stirrer off

The stirrer is switched off.

only for Standby potential = off

2 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

3 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **CPVS** command are set on the following tabs:

- *General/Hardware*

- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **CPVS** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **CPVS** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.3.2 CPVS - General/Hardware

Tab: **Method ► CPVS ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If an instrument is selected in the **Device name** field, the **Device type** field can no longer be edited and the instrument type belonging to the instrument is displayed.

If the **not defined** option is selected in the **Device name** field, all instrument types or groups with which the command can be executed can be selected, regardless of the instruments present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the **RDE/SSE** sensor type available in the electrode table.

Selection	**RDE** | **'Electrode name'**
Default value	**RDE**

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

'Electrode name'
Electrode of the **RDE/SSE** sensor type from the electrode table.

Sensor type

Shows the type of working electrode (**RDE/SSE**).

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test for the reference electrode, auxiliary electrode and working electrode can be activated or deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min⁻¹** (Increment: **100**)
Default value	**2500 min⁻¹**

Hydrodynamic measurement

on | off (Default value: **on**)

If this check box is activated, then stirring will continue during the sweep.

5.5.2.10.3.3 CPVS - Pretreatment

Tab: **Method ► CPVS ► Properties... ► Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**0.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. for the cleaning potential for electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

5.5.2.10.3.4 CPVS - Sweep

Tab: **Method ► CPVS ► Properties... ► Sweep**

Command name

Name of the command.

Entry	**25 characters**

Equilibration potential

Potential applied during the **Equilibration time**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**0.450 V**

Equilibration time

Time during which the **Equilibration potential** is applied to the electrodes.

Input range	**0.0 to 3600.0 s** (Increment: **0.1**)
Default value	**5.0 s**

Plating potential

Potential applied during the **Plating time**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.175 V**

Plating time

Time during which the **Plating potential** is applied to the electrodes.

Input range	**0.0 to 3600.0 s** (Increment: **0.1**)
Default value	**4.0 s**

Stripping

In this table, you can define up to 5 stripping potentials, which are successively applied during the corresponding stripping time. By default, 3 stripping potentials are specified.

Stripping potential

Potential applied during the **Stripping time**.

Stripping time

Time during which the **Stripping potential** is applied to the electrodes.

[New]

Opens the **Stripping** dialog window, in which the stripping potential and the stripping time of a potential step can be entered (*(see chapter 5.5.2.10.3.7, page 609)*).

[Properties]

Opens the **Stripping** dialog window, in which the stripping potential and the stripping time of a potential step can be edited *(see chapter 5.5.2.10.3.7, page 609)*.

[Delete]

The selected potential step is deleted.

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Input range	**0.0 to 3600.0 s** (Increment: **0.1**)
Default value	**5.0 s**

Measuring interval

Measuring interval for data acquisition during plating and stripping.

Selection	**1.28 ms** | **2.56 ms** | **5.12 ms** | **10.24 ms** | **20.48 ms** | **40.96 ms** | **81.92 ms** | **245.76 ms** | **491.52 ms** | **983.04 ms** | **2539.52 ms** | **4997.12 ms** | **9994.24 ms**
Default value	**5.12 ms**

Preparation cycles

Number of cycles without current measurement that are run through before the measuring cycles.

Input range	**0 to 200** (Increment: **1**)
Default value	**2**

Measuring cycles

Number of cycles with current measurement.

Input range	**1 to 50**
Default value	**2**

Sweep duration

Shows the duration of the sweep in s.

Calculation: (**Preparation cycles** + **Measuring cycles**) · (**Equilibration time** + **Plating time** + **Stripping time 1 - 5** + **Cleaning time**)

NOTICE

The actual current measurement takes place during the last quarter of the measuring interval.

5.5.2.10.3.5 CPVS - Post-treatment

Tab: **Method** ▶ **CPVS** ▶ **Properties...** ▶ **Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined, then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.3.6 CPVS - Potentiostat

Tab: **Method** ▶ **CPVS** ▶ **Properties...** ▶ **Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**224 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**200 µA**

5.5.2.10.3.7 Editing stripping

Dialog window: **Method ► CPVS ► Sweep ► [New] / [Properties] ► Stripping #**

You can enter or edit the stripping potential and the stripping time of a potential step in the **Stripping** # dialog window.

Stripping potential

Potential applied during the **Stripping time**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**0.25 (1), 1.125 (2), 1.475 (3) V**

Stripping time

Time during which the **Stripping potential** is applied to the electrodes.

Input range	**0.01 to 3600.0 s** (Increment: **0.01 (Stripping time ≤ 9.99), 0.1 (Stripping time ≥ 10.0)**)
Default value	**3.0 (1), 1.0 (2), 1.0 (3) s**

5.5.2.10.4 CP

5.5.2.10.4.1 CP - Overview

Dialog window: **Method ► CP ► Properties... ► CP - 'Command name'**

The **CP** command is a voltammetry command for the electroplating bath analysis with *CP (chronopotentiometry)*. It is used for galvanostatic film deposition as well as for measuring the *OCP (open-circuit potential)* in electroplating baths. The **CP** command can be inserted only in VA tracks.

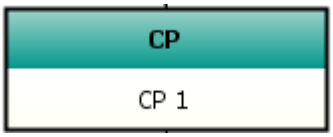
Devices

This command can be executed with the following devices:

Voltammetry: 884, 894

Appearance

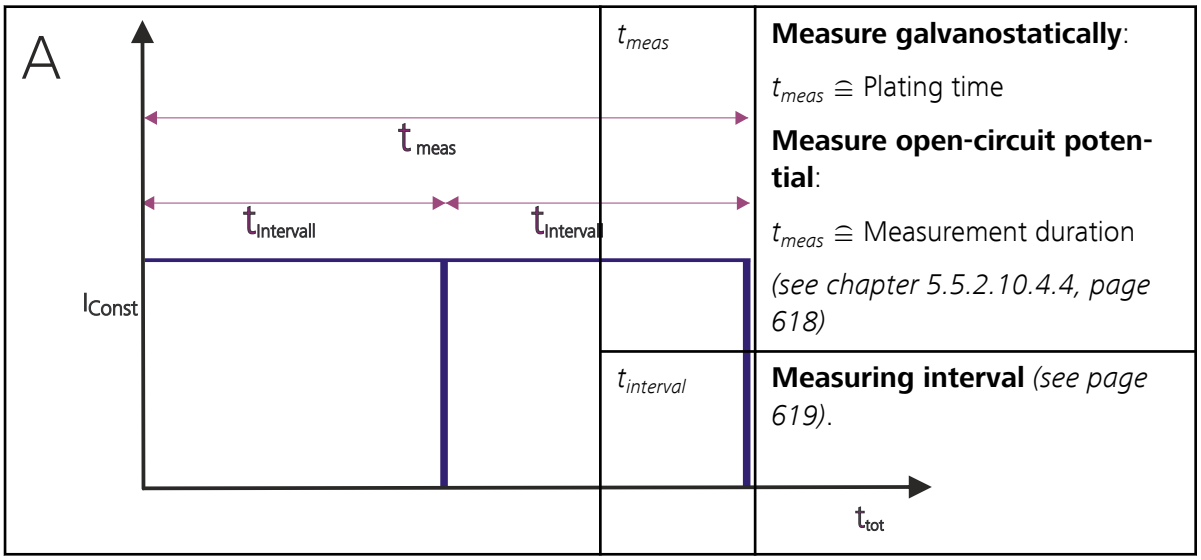
The command has the following appearance:

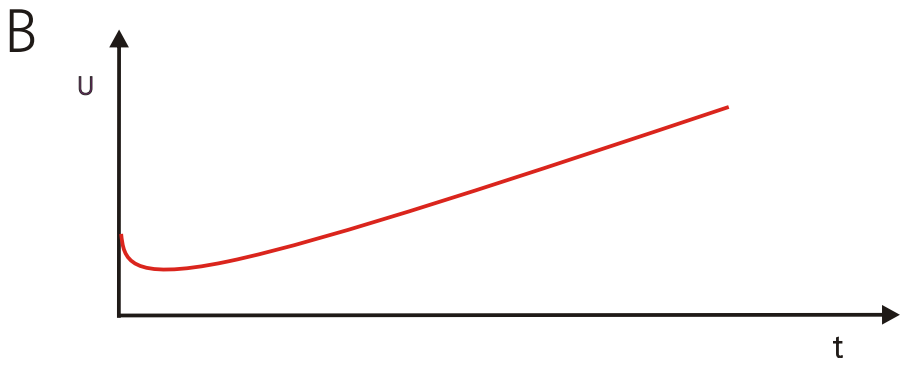


Principle

In the **CP** measuring mode with the option **Measure galvanostatically** *(see glossary, page 1054)*, a constant current is applied to the working electrode (see A) and the diffusion-controlled change in the electrode potential over time is measured (see B).

In the **CP** measuring mode with the option **Measure open-circuit potential** *(see glossary, page 1067)*, the circuit is opened and the potential between the working electrode and the reference electrode is measured during the indicated measurement duration (see B).





Sequence of individual steps

In the **CP** command, the following individual steps are successively executed in the method run for the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep (measure galvanostatically)

1 Plating current

The plating current defined in the sweep is applied to the electrodes.

2 Plating time

Idle until the period defined in the Plating time parameter has expired.

Sweep (measure open-circuit potential)

1 Measurement duration

The circuit is opened and the potential between the working electrode and the reference electrode is measured for the indicated measurement duration.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **CP** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Galvanostat*

Command variables

The following command variables are generated by the **CP** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

- Result variables if called by CALL VA
  - Result variables per variation *(see table , page 43)*
  - Result variables per variation and replication *(see table , page 43)*
  - Result variables per variation, replication and fixed point *(see table , page 43)*

5.5.2.10.4.2 CP - General/Hardware

Tab: **Method ► CP ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the **RDE/SSE** sensor type available in the electrode table.

Selection	**RDE** | **'Electrode name'**
Default value	**RDE**

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

'Electrode name'
Electrode of the **RDE/SSE** sensor type from the electrode table.

Sensor type

Shows the type of working electrode (**RDE/SSE**).

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test for the reference electrode, auxiliary electrode and working electrode can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2500 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **on**)

If this check box is activated, then stirring will continue during the sweep.

5.5.2.10.4.3 CP - Pretreatment

Tab: **Method ▶ CP ▶ Properties... ▶ Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**0.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**1.625 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

5.5.2.10.4.4 CP - Sweep

Tab: **Method ▶ CP ▶ Properties... ▶ Sweep**

Command name

Name of the command.

Entry	**25 characters**

Measure galvanostatically

Plating current

Current applied during the plating time.

Input range	**–10.000 to 10.000 mA** (Increment: **0.001**)
Default value	**–1.000 mA**

Plating time

Time during which the **Plating current** is applied to the electrodes.

Input range	**1.0 to 3600.0 s** (Increment: **0.1**)
Default value	**180.0 s**

Measure open-circuit potential

Measurement duration

Period during which the open-circuit potential *(see glossary, page 1067)* is measured.

Input range	**1.0 to 3600.0 s** (Increment: **0.1**)
Default value	**600.0 s**

Measuring interval

Measuring interval for data recording during plating or during the OCP measurement *(see glossary, page 1067)*.

Input range	**0.1 to 60.0 s** (Increment: **0.1**)
Default value	**1.0 s**

Number of measuring points

Shows the number of measuring points.

NOTICE

The actual potential measurement takes place during the last 100 ms of the measuring interval.

5.5.2.10.4.5 CP - Post-treatment

Tab: **Method** ▶ **CP** ▶ **Properties...** ▶ **Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the cleaning time. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the cleaning potential is applied to the electrodes. The field can only be edited for **Cleaning potential** ≠ **off**.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined, then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.4.6 CP - Galvanostat

Tab: **Method ▶ CP ▶ Properties... ▶ Galvanostat**

Command name

Name of the command.

Entry	**25 characters**

Potential measuring range

Highest range

Limitation of the highest potential measuring range.

Selection	**5 V** | **5 mV** | **50 mV** | **500 mV**
Default value	**5 V**

Lowest range

Limitation of the lowest potential measuring range.

Selection	**5 mV** | **50 mV** | **500 mV** | **5 V**
Default value	**50 mV**

5.5.2.10.5 LSV

5.5.2.10.5.1 LSV - Overview

Dialog window: **Method ▶ LSV ▶ Properties... ▶ LSV - 'Command name'**

The **LSV** command is a voltammetry command for the electroplating bath analysis and trace analysis with *LSV (Linear Sweep Voltammetry)*. It can be inserted only in VA tracks.

Instruments

This command can be executed with the following devices:

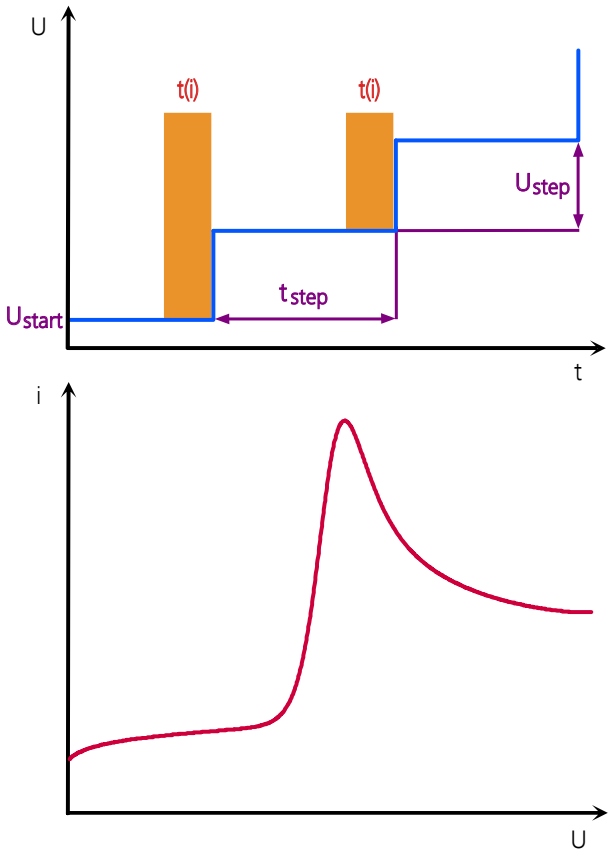
Voltammetry: 884, 894

Appearance

The command has the following appearance:

Principle

In the **LSV** measuring mode (Linear Sweep Voltammetry), the potential is changed from the start potential to the end potential at a constant potential sweep rate. The current *i* is measured as a function of the potential *U* in this process.



U	**Potential**
t	**Time**
t(i)	Measuring time (current is measured immediately before potential change)
U_{step}	**Potential step** *(see chapter 5.5.2.10.5.4, page 630)*
t_{step}	**Potential step time** *(see chapter 5.5.2.10.5.4, page 630)*
U_{start}	**Start potential** *(see chapter 5.5.2.10.5.4, page 630)*
i	Current

Sequence of individual steps

In the **LSV** command, the following individual steps are successively executed in the method run for the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Special case if stirring time = 0 s:

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **MME**

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep

1 Start potential

The **Start potential** defined in the sweep is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Sweep

The sweep is executed in accordance with the defined sweep parameters.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **LSV** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **LSV** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **LSV** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL COND *(see "Result variables if called by CALL COND", page 34)*

- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.5.2 LSV - General/Hardware

Tab: **Method ► LSV ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** available in the electrode table.

Selection	**MME** | **RDE** | **scTRACE Gold** | **'Electrode name'**
Default value	**RDE**

MME
Standard electrode of the **MME** sensor type (Multi-Mode Electrode), which cannot be deleted.

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

scTRACE Gold
Standard electrode of the **scTRACE Gold** sensor type, which cannot be deleted.

'Electrode name'
Electrode of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** from the electrode table.

Sensor type

Shows the type of working electrode (**MME**, **RDE/SSE** or **scTRACE Gold**).

Operating mode

Is displayed only for sensor type = **MME**.

Selection of an operating mode for the Multi-Mode Electrode.

Selection	**HMDE**
Default value	**HMDE**

HMDE
HMDE (Hanging Mercury Drop Electrode) is an operation mode of the **Multi-Mode Electrode** *(see glossary, page 1063)*.

Drop size

Setting of the size of the mercury drop for the **HMDE** operating mode. The surface of the drop is approx. 0.15 mm^2 (≙ 1) to 0.60 mm^2 (≙ 9).

only for sensor type = MME and operating mode = HMDE

Input range	**1 to 9**
Default value	**4**

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test for the reference electrode, auxiliary electrode and working electrode can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2000 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **off**)

If this check box is activated, then stirring will continue during the sweep.

Only editable for **Sensor type** = **RDE/SSE** and **scTRACE Gold**, otherwise disabled.

5.5.2.10.5.3 LSV - Pretreatment

Tab: **Method ▶ LSV ▶ Properties... ▶ Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-1.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-0.1 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)

Selection	**off**
Default value	**off**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition in stripping voltammetry.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Equilibration time

Waiting time before the sweep during which the **Start potential** is applied to the electrodes.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

5.5.2.10.5.4 LSV - Sweep

Tab: **Method ► LSV ► Properties... ► Sweep**

Command name

Name of the command.

Entry	**25 characters**

Start potential

Start potential for the sweep.

Condition:

Start potential ≠ **End potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.900 V**

End potential

End potential for the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.100 V**

Potential step

Potential step for the DC potential ramp.

Condition:

Potential step ≤ (|**End potential** – **Start potential**|) / n_{min}

n_{min} (minimum number of measuring points for the evaluation) depends on the **Potential step** itself as follows:

- **Potential step** ≥ 0.0095 V: n_{min} = 16
- **Potential step** < 0.0095 V and ≥ 0.0075 V: n_{min} = 20
- **Potential step** < 0.0075 V and ≥ 0.0055 V: n_{min} = 24
- **Potential step** < 0.0055 V and ≥ 0.0035 V: n_{min} = 32
- **Potential step** < 0.0035 V : n_{min} = 52

Input range	**0.00016 to 5.00000 V** (Increment: **0.00016**)
Default value	**0.006 V**

Potential step time

Shows the time that has to expire before the potential is changed by the amount of **Potential step**.

Calculation: **Potential step** / **Sweep rate**

Sweep rate

Potential sweep rate for the sweep.

Condition 1: **Sweep rate** ≥ **Potential step** / 10 s

Condition 2: **Sweep rate** ≤ **Potential step** / 0.001 s

Input range	**0.001 to 10.000 V/s** (Increment: **0.001**)
Default value	**0.100 V/s**

Sweep duration

Shows the duration of the sweep in s.

Calculation: (|**End potential** – **Start potential**|) / **Sweep rate**

NOTICE

The actual current measurement takes place at the end of the **Potential step time**. The measuring time is defined as follows:

- **Potential step time** < 0.080 s => measuring time = **Potential step time** / 4 s
- **Potential step time** > 0.080 s => measuring time = 0.02 s (at a line frequency of 50 Hz)
- **Potential step time** > 0.080 s => measuring time = 0.01667 s (at a line frequency of 60 Hz)

5.5.2.10.5.5 LSV - Post-treatment

Tab: **Method ▶ LSV ▶ Properties... ▶ Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Only editable for **Cleaning potential** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined,

then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.5.6 LSV - Potentiostat

Tab: **Method** ▶ **LSV** ▶ **Properties...** ▶ **Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range. This current measuring range indicates the maximum current that can be measured.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**224 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**20 µA**

NOTICE

If the **Potential step time** is < **4 ms**, the automatic switching of the current measuring range will no longer function optimally. If this is the case, either increase the **Potential step time** or set the highest and lowest current measuring ranges to the same value.

5.5.2.10.6 DP

5.5.2.10.6.1 DP - Overview

Dialog window: **Method ► DP ► Properties... ► DP - 'Command name'**

The **DP** command is a voltammetry command for trace analysis with the *DP (differential pulse measuring mode)*, which can be inserted only in VA tracks.

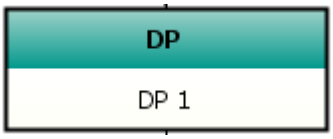
Instruments

This command can be executed with the following device:

Voltammetry: 884

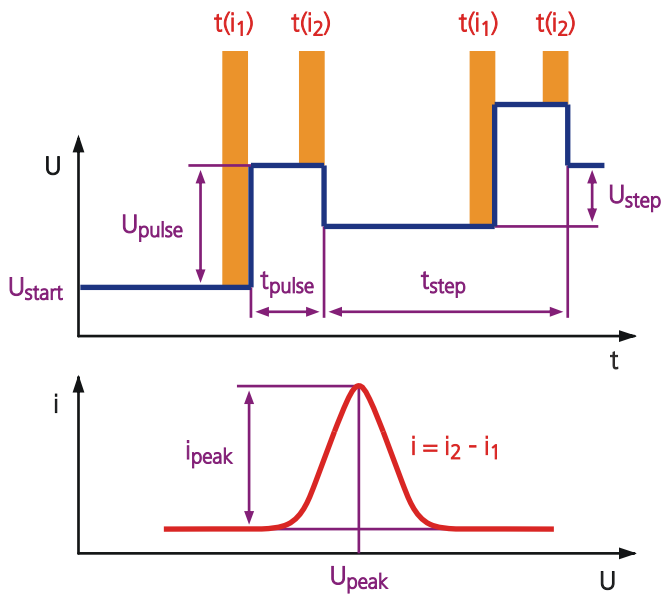
Appearance

The command has the following appearance:



Principle

In the differential pulse measuring mode, a gradually increasing DC potential ramp is overlaid with rectangular pulses. If the pulse amplitude has a positive value, for each potential step a rectangular pulse is applied in sweep direction. If the pulse amplitude has a negative value, then the pulse is applied contrary to the sweep direction. The current *i* is measured immediately before the pulse and at the end of the pulse. The difference between the two measured currents is plotted as a function of the potential of the potential step $U + (U_{pulse} / 2)$. This results in a peak-shaped curve.



U	**Potential**
t	**Time**
U_{start}	**Start potential** *(see page 645)*
U_{pulse}	**Pulse amplitude** *(see page 646)*
U_{step}	**Potential step** *(see page 645)*
t_{pulse}	**Pulse time** *(see page 646)*
t_{step}	**Potential step time** *(see page 645)*
$t(i_1)$	**Measuring time** *(see chapter 5.5.2.10.6.4, page 645)* (Current measurement immediately before pulse start)
$t(i_2)$	**Measuring time** *(see page 646)* (Current measurement immediately before pulse end)
i	Current
i_{peak}	Peak height
$i = i_2 - i_1$	Difference between the two current measurements
U_{peak}	Peak potential

Sequence of individual steps

In the **DP** command, the following individual steps are successively executed in the method run with the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Special cases when stirring time = 0 s:

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **MME**
- Operating mode = **HMDE**

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and **switched on** for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **RDE** or **scTRACE Gold**

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep

1 Start potential

The **Start potential** defined in the sweep is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Sweep

The sweep is executed in accordance with the defined sweep parameters.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **DP** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **DP** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **DP** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL COND *(see "Result variables if called by CALL COND", page 34)*

- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.6.2 DP - General/Hardware

Tab: **Method ► DP ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** available in the electrode table.

Selection	**MME** | **RDE** | **scTRACE Gold** | **'Electrode name'**
Default value	**MME**

MME
Standard electrode of the **MME** sensor type (Multi-Mode Electrode), which cannot be deleted.

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

scTRACE Gold
Standard electrode of the **scTRACE Gold** sensor type, which cannot be deleted.

'Electrode name'
Electrode of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** from the electrode table.

Sensor type

Shows the type of working electrode (**MME**, **RDE/SSE** or **scTRACE Gold**).

Operating mode

Is displayed only for sensor type = **MME**.

Selection of an operating mode for the Multi-Mode Electrode.

Selection	**HMDE** | **SMDE** | **DME**
Default value	**HMDE**

HMDE
HMDE (Hanging Mercury Drop Electrode) is an operation mode of the **Multi-Mode Electrode** *(see glossary, page 1063)*.

SMDE
SMDE (Static Mercury Drop Electrode) is an operation mode of the **Multi-Mode Electrode** *(see glossary, page 1071)*.

DME
DME (Dropping Mercury Electrode) is an operating mode of the **Multi-Mode Electrode** *(see glossary, page 1057)*.

Drop size

Setting of the size of the mercury drop for the **HMDE** and **SMDE**. The surface of the drop is approx. 0.15 mm^2 (≙ 1) to 0.60 mm^2 (≙ 9).

only for sensor type = MME and operating mode = HMDE or SMDE

Input range	**1 to 9**
Default value	**4**

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*. When adding a new voltammetry command to the method, it automatically adopts the setting chosen in the START command. If the setting is changed later on, it is adopted by all voltammetry commands.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2000 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **off**)

If this check box is activated, then stirring will continue during the sweep.

Only editable for **Sensor type** = **RDE/SSE** and **scTRACE Gold**, otherwise disabled.

5.5.2.10.6.3 DP - Pretreatment

Tab: **Method** ▶ **DP** ▶ **Properties...** ▶ **Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

NOTICE

If an **MME** in the **DME** or **SMDE** operating mode serves as working electrode, then only the two parameters **Stirring time** and **Equilibration time** are shown.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-1.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-0.1 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)

Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-0.9 V**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**60.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition in stripping voltammetry.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)

Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Equilibration time

Waiting time before the sweep during which the **Start potential** is applied to the electrodes.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

5.5.2.10.6.4 DP - Sweep

Tab: **Method** ▶ **DP** ▶ **Properties...** ▶ **Sweep**

Command name

Name of the command.

Entry	**25 characters**

Start potential

Start potential for the sweep.

Condition:

Start potential ≠ **End potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.900 V**

End potential

End potential for the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.100 V**

Potential step

Potential step for the DC potential ramp.

Condition:

Potential step ≤ (|**End potential** – **Start potential**|) / n_{min}

n_{min} (minimum number of measuring points for the evaluation) depends on the **Potential step** itself as follows:

- **Potential step** ≥ 0.0095 V: n_{min} = 16
- **Potential step** < 0.0095 V and ≥ 0.0075 V: n_{min} = 20
- **Potential step** < 0.0075 V and ≥ 0.0055 V: n_{min} = 24
- **Potential step** < 0.0055 V and ≥ 0.0035 V: n_{min} = 32
- **Potential step** < 0.0035 V : n_{min} = 52

Input range	**0.00016 to 5.00000 V** (Increment: **0.00016**)
Default value	**0.006 V**

Potential step time

Shows the time that has to expire before the potential is changed by the amount of **Potential step**.

Calculation: **Potential step** / **Sweep rate**

Condition (RDE/SSE, MME HMDE, scTRACE Gold):

Potential step time ≥ **Pulse time** + **Measuring time** + 2 ms

Condition (MME SMDE):

Potential step time ≥ **Drop size** · 40 ms + **Pulse time** + **Measuring time** + 20 ms

Condition (MME DME):

Potential step time ≥ **Pulse time** + **Measuring time** + 20 ms

Input range	**0.100 to 10.00 s** (Increment: **0.001**)
Default value	**0.400 s**

Sweep rate

Shows the potential sweep rate for the sweep in V/s.

Calculation: **Sweep rate** = **Potential step** / **Potential step time**

Pulse amplitude

Amplitude of the potential pulse added to the DC potential (positive values = pulse application in sweep direction; negative values = pulse application contrary to sweep direction).

Input range	**–1.000 to 1.000 V** (Increment: **0.001**)
Default value	**0.050 V**

Pulse time

Time interval during which a potential pulse is added to the DC potential.

Condition (RDE/SSE, MME HMDE, scTRACE Gold):

Pulse time ≥ **Measuring time** + 2 ms

Condition (MME SMDE, MME DME):

Pulse time ≥ **Measuring time**

Input range	**0.001 to 10.00 s** (Increment: **0.001**)
Default value	**0.040 s**

Measuring time

Time period during which the current is measured.

Condition:

Measuring time ≥ **Potential step time** / 500

Input range	**0.001 to 10.00 s** (Increment: **0.001**)
Default value	**0.020 s**

Sweep duration

Shows the duration of the sweep in s.

Calculation: [(|**End potential** – **Start potential**|) / **Potential step**] · **Potential step time**

NOTICE

Metrohm recommends setting the measuring time to half of the pulse time. For slow sweeps, the measuring time should additionally correspond to the cycle period of the line frequency or to a whole-number multiple of the cycle period (line frequency 50 Hz -> measuring time n·20 ms; line frequency 60 Hz -> measuring time n·16.67 ms) in order to keep the noise level low.

5.5.2.10.6.5 DP - Post-treatment

Tab: **Method** ▶ **DP** ▶ **Properties...** ▶ **Post-treatment**

NOTICE

If an **MME** in the **DME** or **SMDE** operating mode serves as working electrode, then this tab is deactivated.

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Only editable for **Cleaning potential** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined, then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.6.6 DP - Potentiostat

Tab: **Method ▶ DP ▶ Properties... ▶ Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range. This current measuring range indicates the maximum current that can be measured.

Selection	**200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**2 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**20 µA**

Automatically select optimum current measuring range

on | off (Default value: **on**)

With this option, the optimum current measuring range is automatically determined immediately before the sweep. If this option is deactivated, then the set highest current measuring range is used at the start of the sweep. Metrohm recommends activating this option.

Remarks on the current measuring range

When selecting these parameters, make sure that the currents during the measuring time $t(i_1)$ immediately before the pulse start and the currents during the measuring time $t(i_2)$ immediately before the pulse end are in the selected range *(see chapter 5.5.2.10.6.1, page 634)*.

In the **Curves** subwindow, only the difference between the two single measurements is shown. This current value is clearly below the values of the single measurement, which is why the **Lowest range** needs to be set wide enough.

The potentiostat automatically chooses a suitable sensitivity for optimum current measurements in each current measuring range. The following table shows the maximum sensitivity that can be selected by the potentiostat and the resulting maximum resolution:

Current measuring range	Maximum sensitivity	Maximum resolution
224 mA	100	68.4 nA
20 mA	100	6.8 nA
2 mA	100	683.6 pA
200 µA	100	61 pA
20 µA	100	6.1 pA
2 µA	100	610 fA
200 nA	1000	6.1 fA

5.5.2.10.7 SQW

5.5.2.10.7.1 SQW - Overview

Dialog window: **Method ► SQW ► Properties... ► SQW - 'Command name'**

The **SQW** command is a voltammetry command for measurements using *SQW (square-wave measuring mode)* according to Osteryoung (*see "SQW - Sweep - Note"*), which can be inserted only in VA tracks.

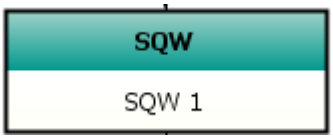
Instruments

This command can be executed with the following device:

Voltammetry: 884

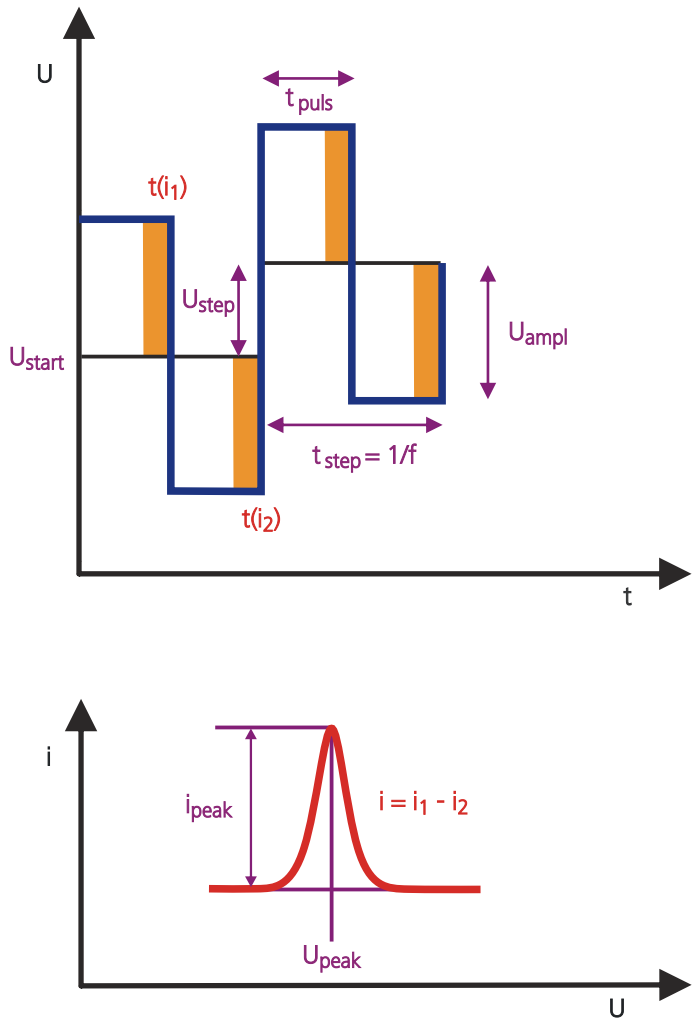
Appearance

The command has the following appearance:



Principle

In the square-wave measuring mode, a gradually increasing DC potential ramp is overlaid with rectangular AC potentials with a constant amplitude. For each potential step a rectangular pulse is applied in sweep direction and another one contrary to the sweep direction. The current *i* is measured at the end of each pulse during the measuring time. The difference between the two measured currents is plotted as a function of the potential *U* of the potential step. This results in a peak-shaped curve.



U	**Potential**
t	**Time**
U_{start}	**Start potential** *(see page 660)*
U_{ampl}	Amplitude
U_{step}	**Potential step** *(see page 661)*
$t_{step} = 1/f$ f = Frequency	**Potential step time** *(see page 661)*
$t(i_1)$	Measuring time (current measurement at the end of the pulse in sweep direction *see "SQW - Sweep - Note"*)
$t(i_2)$	Measuring time (current measurement at the end of the pulse contrary to sweep direction *see "SQW - Sweep - Note"*)
t_{pulse}	Pulse time *see "SQW - Sweep - Note"*
i	Current
i_{peak}	Peak height
$i = i_1 - i_2$	Difference between the two current measurements
U_{peak}	Peak potential

Sequence of individual steps

In the **SQW** command, the following individual steps are successively executed in the method run with the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Special cases when stirring time = 0 s:

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **MME**

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and **switched on** for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **RDE** or **scTRACE Gold**

Potentiostatic pretreatment

3 Potential 1

Potential 1 is applied to the electrodes.

4 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

5 Potential 2

Potential 2 is applied to the electrodes.

6 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

7 Potential 3

Potential 3 is applied to the electrodes.

8 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

9 Potential 4

Potential 4 is applied to the electrodes.

10 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

11 Potential 5

Potential 5 is applied to the electrodes.

12 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

Sweep

1 Start potential

The **Start potential** defined in the sweep is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Sweep

The sweep is executed in accordance with the defined sweep parameters.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **SQW** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*
- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **SQW** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **SQW** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL COND *(see "Result variables if called by CALL COND", page 34)*
- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.7.2 SQW - General/Hardware

Tab: **Method ► SQW ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the sensor types **MME**, **RDE/SSE** and **scTRACE Gold** available in the electrode table.

Selection	**MME** | **RDE** | **scTRACE Gold** | **'Electrode name'**
Default value	**scTRACE Gold**

MME
Standard electrode of the **MME** sensor type (Multi-Mode Electrode), which cannot be deleted.

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

scTRACE Gold
Standard electrode of the **scTRACE Gold** sensor type, which cannot be deleted.

'Electrode name'
Electrode of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** from the electrode table.

Sensor type

Shows the type of working electrode (**MME**, **RDE/SSE** or **scTRACE Gold**).

Operating mode

Is displayed only for sensor type = **MME**.

Selection of an operating mode for the Multi-Mode Electrode.

Selection	**HMDE**
Default value	**HMDE**

HMDE
HMDE (Hanging Mercury Drop Electrode) is an operation mode of the **Multi-Mode Electrode**. Four mercury drops of a defined size are formed one after the other at the **MME**. The last drop remains suspended and thereby forms the **HMDE**, where a sweep is carried out - usually after deposition (stripping technique).

Drop size

Is displayed only for sensor type = **MME** and operating mode = **HMDE**.

Setting of the size of the mercury drop for the **HMDE**. The surface of the drop is approx. 0.15 mm^2 (≙ 1) to 0.60 mm^2 (≙ 9).

Input range	**1 to 9**
Default value	**4**

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*. When adding a new voltammetry command to the method, it automatically adopts the setting chosen in the **START** command. If the setting is changed later on, it is adopted by all voltammetry commands.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2000 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **off**)

If this check box is activated, then stirring will continue during the sweep.

Only editable for **Sensor type** = **RDE/SSE** and **scTRACE Gold**, otherwise disabled.

5.5.2.10.7.3 SQW - Pretreatment

Tab: **Method ► SQW ► Properties... ► Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-1.2 V**

Vertex potential

Vertex potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-0.1 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-0.9 V**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**60.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition in stripping voltammetry.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Equilibration time

Waiting time before the sweep during which the **Start potential** is applied to the electrodes.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

5.5.2.10.7.4 SQW - Sweep

Tab: **Method ► SQW ► Properties... ► Sweep**

Command name

Name of the command.

Entry	**25 characters**

Start potential

Start potential for the sweep.

Condition:

Start potential ≠ **End potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.900 V**

End potential

End potential for the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.100 V**

Potential step

Potential step for the DC potential ramp.

Condition 1:

Potential step ≤ (|**End potential** − **Start potential**|) / n_{min}

n_{min} (minimum number of measuring points for the evaluation) depends on the **Potential step** itself as follows:

- **Potential step** ≥ 0.0095 V: n_{min} = 16
- **Potential step** < 0.0095 V and ≥ 0.0075 V: n_{min} = 20
- **Potential step** < 0.0075 V and ≥ 0.0055 V: n_{min} = 24
- **Potential step** < 0.0055 V and ≥ 0.0035 V: n_{min} = 32
- **Potential step** < 0.0035 V: n_{min} = 52

Input range	**0.00016 to 5.00000 V** (Increment: **0.00016**)
Default value	**0.006 V**

Frequency

Frequency of the overlaid potential pulses.

Condition 1: ***highest current measuring range ≠ lowest current measuring range***

If the highest current measuring range is ≤ 2 mA, the highest selectable frequency is 250 Hz.

Condition 2: ***highest current measuring range = lowest current measuring range***

All frequencies between 1 and 1000 Hz can be selected.

Input range	**1 to 1000 Hz** (Increment: **1**)
Default value	**50 Hz**

Potential step time

Shows the time that has to expire before the potential is changed by the amount of **Potential step**. The potential step time is defined by the frequency.

Calculation: **Potential step time** = **1/Frequency**.

Sweep rate

Shows the potential sweep rate for the sweep in V / s.

Calculation: **Sweep rate** = **Potential step** / **Potential step time** = **Potential step** · **Frequency**.

Pulse amplitude

Pulse amplitude of the potential pulse added to the DC potential.

Input range	**0.001 to 0.500 V** (Increment: **0.001**)
Default value	**0.020 V**

Sweep duration

Shows the duration of the sweep in s.

Calculation: **Sweep duration** = [(|**End potential** – **Start potential**|) / **Potential step**] · **Potential step time**

or

Sweep duration = (|**End potential** – **Start potential**|) / (**Potential step** · **Frequency**)

NOTICE

For sweeps with a frequency > 12.5 Hz (corresponds to a potential step time < 0.08 s), the current measurement takes place over the second half of the pulse time. In the square-wave measuring mode according to J. G. Osteryoung[1], the pulse time corresponds to half of the potential step time (or 1/(2·frequency)). The measuring time is accordingly 1/(4·frequency).

For sweeps with a frequency ≤ 12.5 Hz (corresponds to potential step time ≥ 0.08 s), the measuring time corresponds to a cycle period of the line frequency (line frequency 50 Hz → measuring time 20 ms; line frequency 60 Hz → measuring time 16.67 ms). The dependency on the line frequency helps to keep the noise level low.

[1] J. G. Osteryoung, R. A. Osteryoung, *Anal. Chem.* **1985**, 57, 101A; E. J. Zachowski, M. Wojciechowski, J. Osteryoung, *Anal. Chim. Acta* **1986**, 183, 47

5.5.2.10.7.5 SQW - Post-treatment

Tab: **Method ▶ SQW ▶ Properties... ▶ Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Only editable for **Cleaning potential** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined, then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.7.6 SQW - Potentiostat

Tab: **Method ► SQW ► Properties... ► Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range. This current measuring range indicates the maximum current that can be measured.

Selection	**200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**2 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**20 µA**

Automatically select optimum current measuring range

on | off (Default value: **on**)

With this option, the optimum current measuring range is automatically determined immediately before the sweep. If this option is deactivated, then the set highest current measuring range is used at the start of the sweep. Metrohm recommends activating this option.

Remarks on the current measuring range

When selecting these parameters, make sure that the currents during the measuring time $t(i_1)$ immediately before the pulse start and the currents during the measuring time $t(i_2)$ immediately before the pulse end are in the selected range *(see chapter 5.5.2.10.7.1, page 649)*.

In the **Curves** subwindow, only the difference between the two single measurements is shown. This current value is clearly below the values of the single measurement, which is why the **Lowest range** needs to be set wide enough.

The potentiostat automatically chooses a suitable sensitivity for optimum current measurements in each current measuring range. The following table shows the maximum sensitivity that can be selected by the potentiostat and the resulting maximum resolution:

Current measuring range	Maximum sensitivity	Maximum resolution
224 mA	100	68.4 nA
20 mA	100	6.8 nA
2 mA	100	683.6 pA
200 µA	100	61 pA
20 µA	100	6.1 pA
2 µA	100	610 fA
200 nA	1000	6.1 fA

5.5.2.10.8 CV

5.5.2.10.8.1 CV - Overview

Dialog window: **Method ► CV ► Properties... ► CV - 'Command name'**

The **CV** command is a voltammetry command for basic experiments in electrochemistry with *CV (Cyclic Voltammetry)*. It can be inserted only in VA tracks.

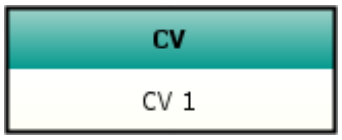
Instruments

This command can be executed with the following devices:

Voltammetry: 884

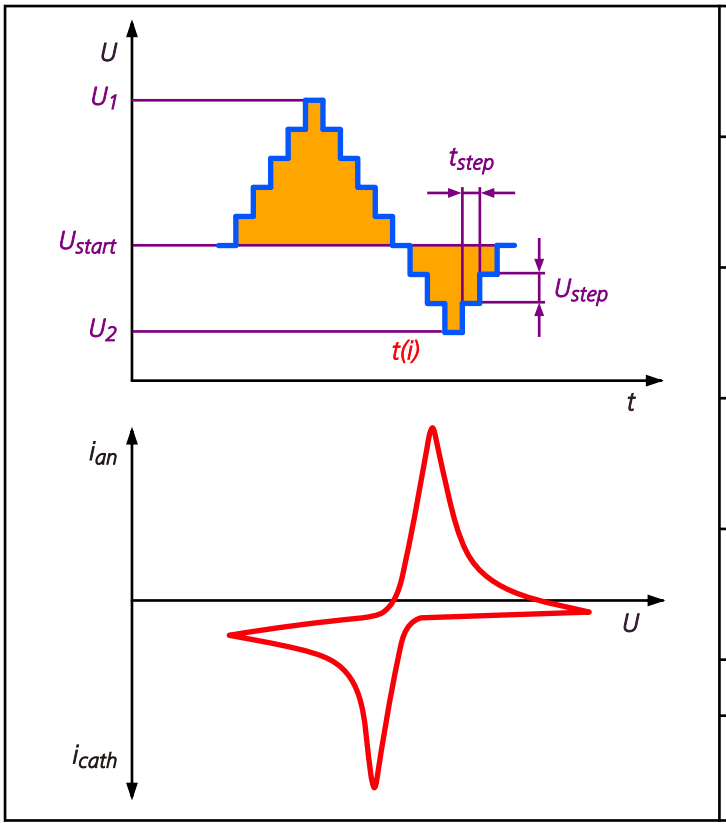
Appearance

The command has the following appearance:



Principle

In the **CV** measuring mode (Cyclic Voltammetry), the potential is changed once or more from the start potential to the 1st vertex potential, then to the 2nd vertex potential and back to the start potential again at a constant potential sweep rate. The current *i* is measured as a function of the potential *U* in this process.



U_{step}	**Potential step** *(see chapter 5.5.2.10.2.4, page 592)*
t_{step}	**Potential step time** *(see chapter 5.5.2.10.2.4, page 592)*
U_{start}	**Start potential** *(see chapter 5.5.2.10.2.4, page 592)*
U_1	**1st vertex potential** *(see chapter 5.5.2.10.2.4, page 592)*
U_2	**2nd vertex potential** *(see chapter 5.5.2.10.2.4, page 592)*
i_{an}	Anodic current
i_{cath}	Cathodic current

Sequence of individual steps

In the **CV** command, the following individual steps are successively executed in the method run for the device defined in the command:

Pretreatment

1 Stirrer on

The stirrer is switched on with the defined **Stirring rate**.

2 Stirring time

Idle until the period defined in the **Stirring time** parameter has expired.

Special case if stirring time = 0 s:

If the following conditions are met, then the stirrer is **switched off** for cyclovoltammetric pretreatment and for potentiostatic pretreatment.

- The stirrer is **switched off** at the start of the measuring command.
- Stirring time = **0 s**
- Working electrode = **MME**

Cyclovoltammetric pretreatment

3 Sweep

The cyclic sweep is executed in accordance with the defined sweep parameters.

Potentiostatic pretreatment

4 Potential 1

Potential 1 is applied to the electrodes.

5 Waiting time 1

Idle until the period defined in the **Waiting time 1** parameter has expired.

6 Potential 2

Potential 2 is applied to the electrodes.

7 Waiting time 2

Idle until the period defined in the **Waiting time 2** parameter has expired.

8 Potential 3

Potential 3 is applied to the electrodes.

9 Waiting time 3

Idle until the period defined in the **Waiting time 3** parameter has expired.

10 Potential 4

Potential 4 is applied to the electrodes.

11 Waiting time 4

Idle until the period defined in the **Waiting time 4** parameter has expired.

12 Potential 5

Potential 5 is applied to the electrodes.

13 Waiting time 5

Idle until the period defined in the **Waiting time 5** parameter has expired.

only for Hydrodynamic measurement = off

14 Stirrer off

The stirrer is switched off.

Sweep

1 Start potential

The **Start potential** defined in the sweep is applied to the electrodes.

2 Equilibration time

Idle until the period defined in the **Equilibration time** parameter has expired.

3 Sweep

The sweep is executed in accordance with the defined sweep parameters.

Post-treatment

1 Cleaning potential

Cleaning potential is applied to the electrodes.

2 Cleaning time

Idle until the period defined in the **Cleaning time** parameter has expired.

only for Hydrodynamic measurement = on

3 Stirrer off

The stirrer is switched off.

only for Standby potential = off

4 Potential off

The potential applied to the electrodes is switched off.

only for Standby potential ≠ off

5 Standby potential on

Standby potential is applied to the electrodes.

Parameters

The parameters for the **CV** command are set on the following tabs:

- *General/Hardware*
- *Pretreatment*

- *Sweep*
- *Post-treatment*
- *Potentiostat*

Command variables

The following command variables are generated by the **CV** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **HR** | **LR** | **NMP** | **RPM** | **STY**

Result variables

The following result variables are generated in the method run when a **CV** command is called and can be used in formulas:

- Result variables in general *(see "Result variables in general", page 31)*
- Result variables if called by CALL BLANK *(see "Result variables if called by CALL BLANK", page 32)*
- Result variables if called by CALL COND *(see "Result variables if called by CALL COND", page 34)*
- Result variables if called by CALL VMS *(see "Result variables if called by CALL VMS", page 36)*
- Result variables if called by CALL INTERCEPT *(see "Result variables if called by CALL INTERCEPT", page 37)*
- Result variables if called by CALL ELECTROLYTE *(see "Result variables if called by CALL ELECTROLYTE", page 39)*
- Result variables if called by CALL VA *(see "Result variables if called by CALL VA", page 40)*

5.5.2.10.8.2 CV - General/Hardware

Tab: **Method ► CV ► Properties... ► General/Hardware**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** available in the electrode table.

Selection	**MME** | **RDE** | **scTRACE Gold** | **'Electrode name'**
Default value	**RDE**

MME
Standard electrode of the **MME** sensor type (Multi-Mode Electrode), which cannot be deleted.

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

scTRACE Gold
Standard electrode of the **scTRACE Gold** sensor type, which cannot be deleted.

'Electrode name'
Electrode of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** from the electrode table.

Sensor type

Shows the type of working electrode (**MME**, **RDE/SSE** or **scTRACE Gold**).

Operating mode

Is displayed only for sensor type = **MME**.

Selection of an operating mode for the Multi-Mode Electrode.

Selection	**HMDE**
Default value	**HMDE**

HMDE
HMDE (Hanging Mercury Drop Electrode) is an operation mode of the **Multi-Mode Electrode** *(see glossary, page 1063)*.

Drop size

Setting of the size of the mercury drop for the **HMDE** operating mode. The surface of the drop is approx. 0.15 mm^2 (≙ 1) to 0.60 mm^2 (≙ 9).

only for sensor type = MME and operating mode = HMDE

Input range	**1 to 9**
Default value	**4**

Reference electrode

Selection of an electrode of the **Reference electrode** type from the electrodes available in the electrode table.

Selection	**Reference electrode** | **'Electrode name'**
Default value	**Reference electrode**

Reference electrode
Standard electrode of the **Reference electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Reference electrode** type from the electrode table.

Auxiliary electrode

Selection of an electrode of the **Auxiliary electrode** type from the electrodes available in the electrode table.

Selection	**Auxiliary electrode** | **'Electrode name'**
Default value	**Auxiliary electrode**

Auxiliary electrode
Standard electrode of the **Auxiliary electrode** type, which cannot be deleted.

'Electrode name'
Electrode of the **Auxiliary electrode** type from the electrode table.

Electrode check

The electrode test for the reference electrode, auxiliary electrode and working electrode can be activated and deactivated only in the **START** command *(see "Electrode test for voltammetry commands", page 548)*.

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min^{-1}** (Increment: **100**)
Default value	**2000 min^{-1}**

Hydrodynamic measurement

on | off (Default value: **off**)

If this check box is activated, then stirring will continue during the sweep.

Only editable for **Sensor type** = **RDE/SSE** and **scTRACE Gold**, otherwise disabled.

5.5.2.10.8.3 CV - Pretreatment

Tab: **Method ► CV ► Properties... ► Pretreatment**

Command name

Name of the command.

Entry	**25 characters**

The parameters for the pretreatment can be set on this tab.

Stirring time

Waiting time during which the solution is stirred in the measuring cell.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

Cyclovoltammetric pretreatment

Start potential

Potential for the cyclic sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**-1.2 V**

End potential

End potential for the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.100 V**

Sweep rate

Potential sweep rate for the sweep.

Input range	**1 to 50 V/s** (Increment: **1**)
Default value	**1 V/s**

Cycles

Number of cycles for the cyclic sweep. With **off**, no cyclovoltammetric pretreatment is carried out.

Input range	**1 to 100** (Increment: **1**)
Selection	**off**
Default value	**off**

Duration

Shows the duration of the cyclovoltammetric pretreatment in s.

Calculation: [2 · (|(**Vertex potential** – **Start potential**|) / **Sweep rate**] · **Cycles**

Potentiostatic pretreatment

Potential 1

Potential that is applied to the electrodes during the **Waiting time 1**. This potential can be used e.g. as cleaning potential for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 1

Waiting time during which the **Potential 1** is applied to the electrodes.

Only editable for **Potential 1** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 2

Potential that is applied to the electrodes during the **Waiting time 2**. This potential can be used e.g. as deposition potential for the electrochemical deposition in stripping voltammetry.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 2

Waiting time during which the **Potential 2** is applied to the electrodes.

Only editable for **Potential 2** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 3

Potential that is applied to the electrodes during the **Waiting time 3**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 3

Waiting time during which the **Potential 3** is applied to the electrodes.

Only editable for **Potential 3** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 4

Potential that is applied to the electrodes during the **Waiting time 4**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 4

Waiting time during which the **Potential 4** is applied to the electrodes.

Only editable for **Potential 4** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Potential 5

Potential that is applied to the electrodes during the **Waiting time 5**.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Waiting time 5

Waiting time during which the **Potential 5** is applied to the electrodes.

Only editable for **Potential 5** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Equilibration time

Waiting time before the sweep during which the **Start potential** is applied to the electrodes.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**5.0 s**

5.5.2.10.8.4 CV - Sweep

Tab: **Method ▶ CV ▶ Properties... ▶ Sweep**

Command name

Name of the command.

Entry	**25 characters**

Start potential

Start potential for the sweep.

Condition:

Start potential ≠ **End potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.1 V**

1st vertex potential

First inflection point for the sweep.

*Condition:***1st vertex potential** ≠ **Start potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.9 V**

2nd vertex potential

Second inflection point for the sweep.

Condition 1: **2nd vertex potential** ≠ **1st vertex potential**

Condition 2 (for anodic sweeps): **1st vertex potential** > **Start potential** ≥ **2nd vertex potential**

Condition 2 (for cathodic sweeps): **1st vertex potential** < **Start potential** ≤ **2nd vertex potential**

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Default value	**–0.1 V**

Potential step

Potential step for the DC potential ramp.

Condition:

Potential step ≤ (|**End potential** – **Start potential**|) / n_{min}

n_{min} (minimum number of measuring points for the evaluation) depends on the **Potential step** itself as follows:

- **Potential step** ≥ 0.0095 V: n_{min} = 16
- **Potential step** < 0.0095 V and ≥ 0.0075 V: n_{min} = 20
- **Potential step** < 0.0075 V and ≥ 0.0055 V: n_{min} = 24

- **Potential step** < 0.0055 V and ≥ 0.0035 V: n_{min} = 32
- **Potential step** < 0.0035 V : n_{min} = 52

Input range	**0.00016 to 5.00000 V** (Increment: **0.00016**)
Default value	**0.006 V**

Potential step time

Shows the time that has to expire before the potential is changed by the amount of **Potential step**.

Calculation: **Potential step** / **Sweep rate**

Sweep rate

Potential sweep rate for the sweep.

Condition 1: **Sweep rate** ≥ **Potential step** / 10 s

Condition 2: **Sweep rate** ≤ **Potential step** / 0.001 s

Input range	**0.001 to 10.000 V/s** (Increment: **0.001**)
Default value	**0.1 V/s**

Preparation cycles

Number of cycles without current measurement that are run through before the measuring cycles.

Input range	**0 to 200** (Increment: **1**)
Default value	**1**

Measuring cycles

Number of cycles with current measurement.

Input range	**1 to 50**
Default value	**1**

Sweep duration

Shows the duration of the sweep in s.

Calculation: (**Preparation cycles** + **Measuring cycles**) · [2 ·|(**2nd vertex potential** – **1st vertex potential**|) / **Potential step**] · **Potential step time**

NOTICE

The actual current measurement takes place at the end of the **Potential step time**. The measuring time is defined as follows:

- **Potential step time** < 0.080 s => measuring time = **Potential step time** / 4 s
- **Potential step time** > 0.080 s => measuring time = 0.02 s (at a line frequency of 50 Hz)
- **Potential step time** > 0.080 s => measuring time = 0.01667 s (at a line frequency of 60 Hz)

5.5.2.10.8.5 CV - Post-treatment

Tab: **Method ▶ CV ▶ Properties... ▶ Post-treatment**

Command name

Name of the command.

Entry	**25 characters**

Cleaning

Cleaning potential

Potential that is applied to the electrodes during the **Cleaning time**. This potential can be used e.g. for the electrochemical cleaning of solid-state electrode surfaces that have been contaminated with reaction products of electrode redox processes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Cleaning time

Waiting time during which the **Cleaning potential** is applied to the electrodes.

Only editable for **Cleaning potential** ≠ **off**, otherwise inactive.

Input range	**0.0 to 9999.9 s** (Increment: **0.1**)
Default value	**0.0 s**

Standby potential

Standby potential

The standby potential is applied to the electrodes after completion of the sweep. It remains in effect until it is switched off manually or until a new potential is applied to the electrodes. If no standby potential is defined,

then the potential applied to the electrodes is automatically switched off after completion of the sweep.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

5.5.2.10.8.6 CV - Potentiostat

Tab: **Method** ▶ **CV** ▶ **Properties...** ▶ **Potentiostat**

Command name

Name of the command.

Entry	**25 characters**

Current measuring range

Highest range

Limitation of the highest current measuring range. This current measuring range indicates the maximum current that can be measured.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**224 mA**

Lowest range

Limitation of the lowest current measuring range.

Selection	**200 pA** | **2 nA** | **20 nA** | **200 nA** | **2 µA** | **20 µA** | **200 µA** | **2 mA** | **20 mA** | **224 mA**
Default value	**20 µA**

NOTICE

If the **Potential step time** is < **4 ms**, the automatic switching of the current measuring range will no longer function optimally. If this is the case, either increase the **Potential step time** or set the highest and lowest current measuring ranges to the same value.

5.5.2.10.9 ELECTRODE TEST

5.5.2.10.9.1 ELECTRODE TEST - Overview

Dialog window: **Method ► ELECTRODE TEST ► Properties... ► ELECTRODE TEST - 'Command name'**

The **ELECTRODE TEST** command performs the electrode test irrespective of a voltammetry command in the method run.

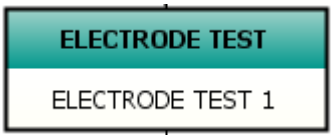
Devices

This command can be executed with the following devices:

Voltammetry: 884, 894

Appearance

The command has the following appearance:



Parameters

The parameters for the **ELECTRODE TEST** command are set in the following dialog window:

- *ELECTRODE TEST - Properties*

Command variables

The following command variables are generated by the **ELECTRODE TEST** command in the method run and can be used in formulas under the designation **'Command name.Variable identification'** *(see chapter 2.3.3.4, page 23)*:

BSY | **DBL** | **ELT** | **FIN** | **RPM** | **STY**

5.5.2.10.9.2 ELECTRODE TEST - Properties

Dialog window: **Method ► ELECTRODE TEST ► Properties... ► ELECTRODE TEST - 'Command name'**

Command name

Name of the command.

Entry	**25 characters**

Device

Device name

Selection of a device from those available in the device table. Only devices with which the command can be executed are available.

Selection	**'Device name'** | **not defined**
Default value	**not defined**

not defined
In this case, the device name must be assigned by the user at the start of the method.

Device type

Display or selection of the device type. If a device is selected in the **Device name** field, the **Device type** field can no longer be edited and the device type belonging to the device is displayed.

If the **not defined** option is selected in the **Device name** field, all device types or groups with which the command can be executed can be selected, regardless of the devices present in the device table.

Selection	**884 Professional VA** | **894 Professional CVS**
Default value	**884 Professional VA**

Sensors/Electrodes

Working electrode

Selection of an electrode of the **Working electrode** type from the electrodes of the sensor type **MME**, **RDE/SSE** and **scTRACE Gold** available in the electrode table.

Selection	**MME** | **RDE** | **scTRACE Gold** | **'Electrode name'**
Default value	**MME**

MME
Standard electrode of the **MME** sensor type (Multi-Mode Electrode), which cannot be deleted.

RDE
Standard electrode of the **RDE/SSE** sensor type (rotating disk electrode / solid-state electrode), which cannot be deleted.

scTRACE Gold
Standard electrode of the **scTRACE Gold** sensor type, which cannot be deleted.

'Electrode name'
Electrode of the sensor type **MME**, **RDE/SSE** or **scTRACE Gold** from the electrode table.

Sensor type

Shows the type of working electrode (**MME**, **RDE/SSE** or **scTRACE Gold**).

Stirrer

Stirring rate

Number of revolutions per minute of the stirrer.

Input range	**0 to 3000 min⁻¹** (Increment: **100**)
Default value	**2000 min⁻¹**

5.6 Evaluation subwindow

5.6.1 Evaluation - General

Evaluation subwindow

In the **Evaluation** subwindow, you can define how the concentrations, peak potentials and other parameters and results of the individual substances are to be calculated from the measured raw data. The evaluation is part of the method. Each voltammetry command with data acquisition possesses an evaluation of its own. The evaluation can be subdivided into **Data processing** and **Calibration**.

- **Data processing**
  Data processing calculates the evaluation quantities (peak potential, height, area, etc.) for the peaks found from the raw data of the measured quantities and the evaluation parameters or the values for the current (measured value) for a defined potential. The peaks or measured values are assigned to certain substances with the help of the substances table.
- **Calibration**
  The calibration determines how the concentrations of the substances are calculated from their evaluation quantities.

Evaluation sections

The **Evaluation** subwindow is comprised of five sections that can be selected with the following symbols on the left-hand toolbar:

The parameters valid for the editing of the acquired data for each command for all substances are defined in the **General** section *(see chapter 5.6.2, page 682)*.

The substances that are to be identified in the sample are defined in the **Substances** section. They are specific for the selected command *(see chapter 5.6.3, page 686)*.

The standard solutions are defined in the **Standards** section *(see chapter 5.6.4, page 697)*. They apply globally for the entire method.

The calibration method and additional parameters for calibration are defined in the **Calibration** section *(see chapter 5.6.5, page 700)*. These parameters apply globally for the entire method.

Results and result outputs are defined in the **Results** section *(see chapter 5.6.6, page 724)*.

5.6.2 Evaluation - General

5.6.2.1 General - General

Subwindow section: **Method ▶ Evaluation ▶ General**

Application

The parameters that are to be used for the processing of the acquired data are defined in the **General** section. These parameters must be set separately for each voltammetry command.

Selection of the measuring command

Measuring command

Selection list with all voltammetry commands with data acquisition defined in the method.

Selection	**'Voltammetry command'**

Tabs

- *Data processing*
- *Curve evaluation*

5.6.2.2 General - Data processing

Tab: **Method ▶ Evaluation ▶ General ▶ Data processing**

Smoothing

Measure for the curve smoothing used for the data processing. The higher the smoothing that is selected, the more the measurement curves will be smoothed.

CVS, CP, LSV, DP, SQW, CV

Input range	**1 to 40**
Default value	**1**

CPVS

Input range	**1 to 40**
Default value	**10**

Reversed peaks

on | off (Default value: **off**)

Reversed peaks are evaluated only if this check box is activated. Peaks that exhibit a positive signal during measurement in cathodic direction or a negative signal during measurement in anodic direction are referred to as reversed peaks.

NOTICE

The parameter **Reversed peaks** is disabled in the **CP** command, because there is no peak evaluation for the **CP** command.

5.6.2.3 General - Curve evaluation

Tab: **Method ▶ Evaluation ▶ General ▶ Curve evaluation**

Fixed point evaluation

on | off (Default value: **off**)

If this check box is activated, then the associated values for the other measured quantities will be interpolated with a fixed measured quantity (or an independent variable) for the fixed point from the measuring point list. These values can then be accessed via the formula editor and be output as user-defined results.

Table

NOTICE

The table has ten lines at most.

The table on the **Curve evaluation** tab contains an overview of the parameters defining the fixed point evaluation. The table contains the following columns:

FP

Number of the fixed point for the assignment of the fixed point FP {z} in the result variables in the formula editor *(see chapter 2.3, page 14)*.

Measured quantity

Measured quantity (or independent variable) to which the associated values for the other quantities will be interpolated from the measuring point list.

Fixed value

Fixed value of the corresponding number of the selected line in the table.

Unit

Unit of the measured quantity (or the independent variable).

Sweep direction

NOTICE

This parameter is displayed only for the voltammetry commands **CVS** and **CV**.

Selection of the cyclic voltammogram's sweep direction, whose associated measuring points are to be used for the determination of the fixed value.

Table view

The table cannot be edited directly. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width

Edit menu

New...	Adds a new line *(see chapter 5.6.2.4, page 684)*.
Properties...	Edit the selected line in the table *(see chapter 5.6.2.4, page 684)*.
Copy	Copies the selected line(s) in the table.
Paste	Pastes the copied line(s) in the table.
Cut	Cuts the selected line(s) in the table.
Delete	Deletes the selected line(s) in the table.

5.6.2.4 Define fixed point

Tab: **Method ▶ Evaluation ▶ General ▶ Curve evaluation ▶ Edit ▶ New... / Properties... ▶ Define fixed point**

Measured quantity

Measured quantity (or independent variable) to which the associated values for the other quantities will be interpolated from the measuring point list.

Selection	**Potential** | **Time**

Fixed value

Fixed value of the corresponding number of the selected line in the table.

Measured quantity = Potential

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**Last measuring point; CVS = 1.125 and 1.475**
Default value	**Last measuring point; CVS = 1.125 and 1.475**

Measured quantity = Time

Input range	**0.000 to 3600.000 s** (Increment: **0.001**)
Selection	**Last measuring point**
Default value	**Last measuring point**

Unit

Unit of the measured quantity (or the independent variable).

Sweep direction

NOTICE

This parameter is displayed only for the voltammetry commands **CVS** and **CV**.

Selection of the cyclic voltammogram's sweep direction, whose associated measuring points are to be used for the determination of the fixed value.

Selection	**anodic** | **cathodic**
Default value	**anodic**

Navigation

Shows the number of the currently selected fixed point FP{z} in the table *Parameters for fixed point evaluation* with the following functions:

Jump to the first line in the table.

Jump to the previous line in the table.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Jump to the next line in the table. If the end of the table has been reached, then a new line will be inserted automatically and the program will jump to it.

The same function can also be triggered by pressing the **[Enter]** key.

Jump to the last line in the table.

Jump to a new, empty line.

5.6.3 Evaluation - Substances

5.6.3.1 Substances - General

Subwindow section: **Method ► Evaluation ► Substances**

Application

The parameters of the substances that are to be determined are defined in the **Substances** section. These are specific for each measuring command with which substances are to be determined. The measuring command is selected in the upper area of the dialog. Settings that have already been made are retained when switching between different measuring commands.

Selection of the measuring command

Measuring command

Selection list with all voltammetry commands with data acquisition defined in the method.

Selection	**'Voltammetry command'**

Tabs

- *Recognition*
- *Baselines*

5.6.3.2 Substances - Recognition

Tab: **Method** ▶ **Evaluation** ▶ **Substances** ▶ **Recognition**

NOTICE

The **Recognition** tab is disabled in the **CP** command, because there is no peak evaluation for the **CP** command.

Table

The table on the **Recognition** tab can have a maximum of eight lines and contains an overview of the parameters that define the assignment of the substances to the peaks/steps that are found. The table cannot be edited directly and contains the following columns:

Voltammetry command = **CPVS**:

Substance

Name of the substance.

Active

Shows whether the evaluation for this substance is active or not active.

Potential step

Selection of the potential steps (plating potential and stripping potentials) defined in the CPVS command *(see chapter 5.5.2.10.3.4, page 606)*.

Characteristic potential

Verification potential for the assignment of a peak to a substance.

Voltammetry command = **CVS**, **LSV**, **DP**, **SQW**, **CV**:

Substance

Name of the substance.

Active

Shows whether the evaluation for this substance is active or not active.

Characteristic potential

Verification potential for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the characteristic potential is the potential at which the corresponding current value is read out.

Tolerance

Tolerance of the characteristic potential for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the **Tolerance** has no effect.

Min. width

Minimum peak width for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the **Min. width** has no effect.

Max. width

Maximum peak width for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the **Max. width** has no effect.

Min. measured quantity

Minimum measured quantity for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the **Min. measured quantity** has no effect.

Sweep direction

NOTICE

This parameter is displayed only for the voltammetry commands **CVS** and **CV**.

Shows whether the substance is to be evaluated during forward or reverse movement of the cyclical sweep.

Modifies the sequence of displayed substances by moving the selected line upward.

Modifies the sequence of displayed substances by moving the selected line downward.

Edit menu

New...	Selects the empty line marked with the asterisk and opens the **Substances - Recognition** dialog window *(see chapter 5.6.3.3, page 689)*.
Properties...	Edit the selected line *(see chapter 5.6.3.3, page 689)*.
Copy	Copies the selected lines to the clipboard.
Paste	Inserts all lines from the clipboard above the line marked with the asterisk.
Cut	Copies the selected lines to the clipboard and deletes them.
Delete	Deletes the selected lines.

5.6.3.3 Editing recognition

Dialog window: **Method ► Evaluation ► Substances ► Recognition ► [Edit] ► New... / Properties... ► Substances - Recognition**

Measuring command

Shows the voltammetry command for which the substances can be defined.

Substance

Name of the substance that must be unambiguous within the same table for each measuring command. The same substance name can however also be used for a different measuring command.

Entry	**1 - 50 characters**
Default value	**'empty'**

Active

on | off (Default value: **on**)

If this check box is activated, then this substance will be evaluated; if it is deactivated, then no evaluation will take place. Parameter data from inactive substances will also continue to be listed in other tables, but have no effect on the determination.

Potential step

Selection of the potential steps (plating potential and stripping potentials) defined in the CPVS command *(see chapter 5.5.2.10.3.4, page 606)*.

CPVS

Selection	**Plating** | **Stripping 1** | **Stripping 2** | **Stripping 3**
Default value	**Stripping 1**

Characteristic potential

Verification potential for the assignment of a peak to a substance.

If the **Measured value** baseline type was selected, then the characteristic potential is the potential at which the corresponding current value is read out.

CVS, LSV, DP, SQW, CV

Input range	**–5.000 to 5.000 V**
Default value	**'empty' V** The peak potential determined must be within the range **Characteristic potential** ± **Tolerance** so that the substance is recognized.

Characteristic potential (CPVS)

Shows the potential value defined in the CPVS command for the selected potential step *(see chapter 5.5.2.10.3.4, page 606)*. The characteristic potential will be used for the assignment of a peak to a substance.

Tolerance

Tolerance of the verification potential for the assignment of a peak to a substance. The peak potential determined must be within the range **Characteristic potential** ± **Tolerance** so that the substance is recognized.

CVS

Input range	**0.001 to 1.000 V**
Default value	**0.200 V**

LSV, DP, SQW, CV

Input range	**0.001 to 1.000 V**
Default value	**0.050 V**

Min. width

Minimum peak width for the assignment of a peak to a substance. The calculated peak width must be bigger than **Min. width** in order for the substance to be recognized.

CVS, LSV, DP, SQW, CV

Input range	**0.001 to (Max. width) V**
Default value	**0.010 V**

Max. width

Maximum peak width for the assignment of a peak to a substance. The calculated peak width must be smaller than **Max. width** in order for the substance to be recognized.

CVS, LSV, DP, SQW, CV

Input range	**(Min. width) to 1.000 V**
Default value	**0.500 V**

Min. measured quantity

Minimum measured quantity for the assignment of a peak to a substance. The measured quantity must be greater than **Min. measured quantity** in order for the substance to be recognized. Value and unit can be entered or selected separately.

CVS, LSV, DP, SQW, CV

Input range	**1 to 999**
Default value	**200**
Selection	**mA** | **µA** | **nA** | **pA**
Default value	**pA**

Sweep direction

NOTICE

This parameter is displayed only for the voltammetry commands **CVS** and **CV**.

Specification as to whether the substance is to be evaluated during forward or reverse movement of the cyclical sweep.

CVS, CV

Selection	**anodic** | **cathodic**
Default value	**anodic**

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

Jump to a new, empty substance, at which time the line number is increased by **+1**. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

5.6.3.4 Substances - Baselines

Tab: **Method** ▶ **Evaluation** ▶ **Substances** ▶ **Baselines**

NOTICE

The **Baselines** tab is disabled in the **CP** command, because there is no peak evaluation for the **CP** command.

Table

The table on the **Baselines** tab contains an overview of the parameters that define the evaluation with the help of baselines of the peaks/steps that are assigned to the substances. The table cannot be edited directly and contains the following columns:

Substance

Name of the substance.

Baseline type

Shows the baseline type with which the evaluation is carried out.

Start base point

Shows the start base point at which the baseline begins.

End base point

Shows the end base point at which the baseline ends.

Modifies the sequence of displayed substances by moving the selected line upward.

Modifies the sequence of displayed substances by moving the selected line downward.

Edit menu

Properties...	Edit baseline parameters of the selected substance (same action as double-click on the line). The properties window opens for entering the baseline parameters *(see chapter 5.6.3.5, page 693)*.

5.6.3.5 Editing baselines

Dialog window: **Method ▶ Evaluation ▶ Substances ▶ Baseline ▶ [Edit] ▶ Properties... ▶ Substances - Baseline**

Measuring command

Shows the measuring command for the substances of which the baselines can be defined.

Substance

Shows the substance name.

Baseline

Baseline type

Selection of the baseline type with which the evaluation should be carried out *(see glossary, page 1051)*.

CVS

Selection	**Horizontal** | **Horizontal through 0** | **Measured value**
Default value	**Horizontal**

Horizontal
Horizontal baseline starting from the automatically determined or manually specified start base point. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.

Horizontal through 0
Horizontal baseline along the x-axis (y = 0), starting from the automatically determined or manually specified start base point to the intersection point with the curve. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.

Measured value
No baseline is used for the measured value evaluation. If the **Measured value** baseline type is selected, then it is mandatory to select the evaluation quantity **Measured value** in the **Evaluation - Calibration** area. For the base point determination, only the option **Automatically** is possible.

CPVS

Selection	**Horizontal** | **Horizontal through 0**
Default value	**Horizontal**

Horizontal
Horizontal baseline starting from the automatically determined or manually specified start base point. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.

Horizontal through 0
Horizontal baseline along the x-axis (y = 0), starting from the automatically determined or manually specified start base point to the intersection point with the curve. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.

LSV, DP, SQW, CV

Selection	**Linear** | **Horizontal start** | **Horizontal end** | **Exponential** | **Polynomial** | **Measured value**
Default value	**Linear**

Linear
Linear baseline between two automatically determined or manually specified base points.

Horizontal start
Horizontal baseline starting from the automatically determined or manually specified start base point. The evaluation of the first peak half is used for asymmetric peaks.

Horizontal end
Horizontal baseline starting from the automatically determined or manually specified end base point. The evaluation of the second peak half is used for asymmetric peaks.

Exponential
Curved baseline for peaks that are located in the ascending or descending part of another peak or of the background current. The base points can be determined automatically or specified manually.

Polynomial
Curved baseline for peaks that are located in a valley between two ascending curve parts. The base points can be determined automatically or specified manually.

Measured value
No baseline is used for the measured value evaluation. If the **Measured value** baseline type is selected, then it is mandatory to select the evaluation quantity **Measured value** in the **Evaluation - Calibration** area. For the base point determination, only the option **Automatically** is possible.

Base point evaluation

Selection of the method for determining the base points.

CVS, LSV, DP, SQW, CV

Selection	**Automatically** | **Manual**
Default value	**Automatically**

Automatically
If this option is selected, then the base points are determined automatically for the baseline calculation. For the **Measured value** baseline type, the determination of the base point is always automatic.

Manual
If this option is selected, then the base points can be specified manually for the baseline calculation.

CPVS

Selection	**Automatically** | **Manual**
Default value	**Manual**

Automatically
If this option is selected, then the base points are determined automatically for the baseline calculation.

Manual
If this option is selected, then the base points can be specified manually for the baseline calculation.

Start base point

Manually specified start base point at which the baseline is to begin.

CVS, LSV, DP, SQW, CV	
Input range	**–5.000 to 5.000 V**
Default value	**0.0 V**

CPVS	
Input range	**0 to t s**
Default value	**3.9 s** t is the total duration of data recording until the start of the curve evaluation. When choosing the start base point, take into account the plating time as well as previous stripping times, if applicable.

End base point

Manually specified end base point at which the baseline is to end.

CVS, LSV, DP, SQW, CV	
Input range	**–5.000 to 5.000 V**
Default value	**0.0 V**

CPVS	
Input range	**0 to t s**
Default value	**6.5 s** t is the total duration of data recording until the end of the curve evaluation. When choosing the end base point, take into account the plating time as well as previous stripping times, if applicable.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance. Altered data is adopted.

Jump to the last substance. Altered data is adopted.

5

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

5.6.4 Evaluation - Standards

5.6.4.1 Standards - General

Subwindow section: **Method ► Evaluation ► Standards**

Application

The standard solutions for the calibration are defined in the **Evaluation - Standards** section of the evaluation subwindow. The term **Standards** designates all calibration solutions and spiking solutions for calibration methods. The solutions defined here are defined globally for the entire method; they are not specific to a command.

Tabs

- *Standards*

5.6.4.2 Standards - Standards

Tab: **Method ► Evaluation ► Standards ► Standards**

Table

The table of standard solutions contains the standards defined for the method with the corresponding concentrations for the substances. If a substance is defined in more than one command, it is only listed once.

The table cannot be edited and contains the following columns:

Substance

Name of the substance.

'Standard name'

Name of the standard.

Modifies the sequence of displayed substances by moving the selected line upward.

Modifies the sequence of displayed substances by moving the selected line downward.

Edit menu

New...	Selects the empty column marked with the asterisk and opens the **Standard** dialog window *(see chapter 5.6.4.3, page 698)*.
Apply from ADD STD	Applies standards from the **ADD STD** commands.
Properties...	Edit the selected column *(see chapter 5.6.4.3, page 698)*.
Copy	Copies the selected column to the clipboard.
Paste	Inserts the new column from the clipboard after the last column.
Cut	Copies the selected column to the clipboard and deletes it.
Delete	Deletes the selected column.

5.6.4.3 Editing the standard

Dialog window: **Method ► Evaluation ► Standards ► Standards ► [Edit] ► New.../ Properties... ► Standard**

The standard selected in the table can be edited in the **Standard** dialog window.

Standard

Name of the standard.

Entry	**25 characters**

'Substance' (value)

Concentration value of the substance in the selected standard.

Input range	**0.000 to 9,999.999**
Default value	**1.0**

'Substance' (unit)

Concentration unit of the substance in the selected standard.

Selection	**g/L** | **mg/L** | **µg/L** | **ng/L** | **mol/L** | **mmol/L** | **µmol/L** | **nmol/L** | **pmol/L** | **mL/L** | **µL/L** | **nL/L**
Default value	**mg/L**

Applies the field content of the selected substance (value or unit) for all subsequent substances.

Navigation bar

Navigation bar for changing the displayed standard with the following functions:

Jump to the first standard solution. Altered data is adopted.

Jump to the previous standard solution. Altered data is adopted.

Jump to the next standard solution. Altered data is adopted.

Jump to the last standard solution. Altered data is adopted.

Jump to a new, empty standard solution, at which time the column number is increased by +1. Altered data is adopted.

Option of entering the desired column number to which the program jumps when you press **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed standard solution is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed standard solution is adopted and the dialog window is closed.

5.6.5 Evaluation - Calibration

5.6.5.1 Calibration - Overview

Subwindow section: **Method ▶ Evaluation - Calibration ▶**

Application

The way that the sample content for the substances is determined from the peak data is defined in the **Evaluation - Calibration** section of the evaluation. Only one calibration method can be selected for each method; this calibration method is then valid for all available voltammetry commands.

Tabs

- *General*
- *Calibration curves*

5.6.5.2 Calibration - General

Tab: **Method ▶ Evaluation - Calibration ▶ General**

This tab contains the basic settings for the calibration.

Calibration method

Selection of the method with which calibration is to take place *(see chapter 5.6.5.9, page 716)*.

Selection	**no calibration** | **MLAT** | **DT** | **RC** | **LAT** | **Standard addition** | **External calibration**
Default value	**no calibration**

MLAT

MLAT (Modified Linear Approximation Technique) is the default calibration method for the determination of brightener in electroplating baths. Only the **Linear regression** curve type is permitted for this calibration method *(see glossary, page 1066)*.

DT

DT (Dilution Titration) is a calibration method for the determination of suppressor in electroplating baths. The analysis is based on the fact that galvanic metal plating is reduced by the addition of suppressor to a VMS (Virgin Make-up Solution) *(see glossary, page 1058)*.

RC

The response curve is a standardized calibration curve for electroplating bath additives with a suppressing effect. It involves a two-stage process, in which a calibration curve is first recorded with a standard solution before the sample solution is measured *(see glossary, page 1069)*.

LAT
LAT (Linear Approximation Technique) is a calibration method for the determination of brightener in electroplating baths. This calibration technique can be used to determine brightener-type additives, which increase the plating rate of metals only slightly. Only the **Linear regression** curve type is permitted for this calibration method *(see glossary, page 1064)*.

Standard addition
Standard addition is a calibration method for trace analysis, in which the analyte is determined while taking matrix influences into account. Only the **Linear regression** curve type is permitted for this calibration method *(see glossary, page 1073)*.

External calibration
External calibration is a calibration method in which the analyte is determined on the basis of a calibration curve obtained by measuring different external standard solutions *(see glossary, page 1062)*.

Blank value correction with evaluation quantity

on | off (Default value: **off**)

If this check box is activated, then the blank value measured with the **CALL BLANK** command will be subtracted from the evaluation quantity determined for the substance. This parameter is active only when **Calibration method** = **Standard addition** or **External calibration**.

5.6.5.3 Calibration - Calibration curves

Tab: **Method ► Evaluation - Calibration ► Calibration curves**

NOTICE

The **Calibration curves** tab is disabled in the **CP** command, because there is no substance evaluation for the **CP** command.

Selection of the measuring command

Measuring command

Selection list with all voltammetry commands with data acquisition defined in the method.

Selection	**'Voltammetry command'**

Table

The type of calibration curve is defined in the table of calibration curves for each substance. The table cannot be edited directly and contains the following columns:

Calibration method LAT, MLAT, Standard addition, External calibration

Substance

Name of the substance. Substances can neither be added nor deleted here; this must be done in the substance table *(see chapter 5.6.3, page 686)*.

Evaluation quantity

Shows the evaluation quantity for creating the calibration curve.

Curve type

Curve type for the evaluation of the calibration curve.

Weighting

Indication whether the points of the calibration curve are to be weighted.

Calibration method DT

Substance

Name of the substance. Substances can neither be added nor deleted here; this must be done in the substance table *(see chapter 5.6.3, page 686)*.

Evaluation quantity

Shows the evaluation quantity for creating the calibration curve.

Evaluation ratio

Evaluation ratio Q/Q(0) with which the calibration factor is calculated.

Curve type for standard

Curve type for the evaluation of the calibration curve.

Begin of evaluation standard

Evaluation ratio Q/Q(0) with which the calculation of the regression for the standard solutions is to be started.

Curve type for sample

Curve type for the evaluation of the calibration curve.

Begin of evaluation sample

Evaluation ratio Q/Q(0) with which the calculation of the regression for the samples is to be started.

Weighting

Indication whether the points of the calibration curve are to be weighted.

Calibration method RC

Substance

Name of the substance. Substances can neither be added nor deleted here; this must be done in the substance table *(see chapter 5.6.3, page 686)*.

Evaluation quantity

Measured quantity for the creation of the calibration curve.

Curve type

Curve type for the evaluation of the calibration curve.

Evaluation start

Evaluation ratio Q/Q(0) with which the calculation of the regression for the standard solutions is to be started.

Weighting

Indication whether the points of the calibration curve are to be weighted.

Edit menu

Properties...	Opens the **Properties calibration** dialog window in order to edit the data of the highlighted line.
Apply settings for all substances	The settings of the highlighted line are adopted for all substances.

5.6.5.4 LAT/MLAT calibration curve properties

Dialog window: **Method ► Evaluation - Calibration ► Calibration curves ► [Edit] ► Properties... ► Properties calibration**

The calibration curve parameters for the substance selected in the table can be edited in the **Properties calibration** dialog window.

Measuring command

Shows the selected measuring command.

Substance

Shows the selected substance.

Evaluation quantity

Selection of the quantity according to which the substance is to be evaluated.

CVS

Selection	**Area** | **Height** | **Measured value**
Default value	**Area**

Measured value
If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

CPVS

Selection	**Area** | **Height**
Default value	**Area**

LSV, DP, SQW, CV

Selection	**Area** | **Height** | **Measured value**
Default value	**Height**

Area
For the measured quantity **Current**, the area is output as charge *Q* (unit C = A · s).

Height
For the measured quantity **Current**, the height is output as current *i* (unit A).

Measured value
For the measured quantity **Current**, the measured value is output as current *i* (unit A). If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

Curve type

Only the curve type **Linear regression** is permitted for the calibration methods **LAT** and **MLAT**. At least 2 calibration points of different concentrations are required for determining the line *(see chapter 5.6.5.9, page 716)*.

Selection	**Linear regression** | **Quadratic regression** | **Non-linear regression** | **Linear interpolation**
Default value	**Linear regression**

Weighting

on | off (Default value: **on**)

If this check box is activated, then the points on the calibration curve are weighted in accordance with the formula **1/evaluation quantity²**.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

5.6.5.5 DT calibration curve properties

Dialog window: **Method ► Evaluation - Calibration ► Calibration curves ► [Edit] ► Properties... ► Properties calibration**

The calibration curve parameters for the substance selected in the table can be edited in the **Properties calibration** dialog window.

Measuring command

Shows the selected measuring command.

Substance

Shows the selected substance.

Evaluation quantity

Selection of the quantity according to which the substance is to be evaluated.

CVS

Selection	**Area** | **Height** | **Measured value**
Default value	**Area**

Measured value
If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

CPVS

Selection	**Area** | **Height**
Default value	**Area**

LSV, DP, SQW, CV

Selection	**Area** | **Height** | **Measured value**
Default value	**Height**

Area
For the measured quantity **Current**, the area is output as charge *Q* (unit C = A · s).

Height
For the measured quantity **Current**, the height is output as current *i* (unit A).

Measured value
For the measured quantity **Current**, the measured value is output as current *i* (unit A). If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

Evaluation ratio

Evaluation ratio Q/Q(0) with which the calibration factor is calculated.

Input range	**0.01 to 1.10**
Default value	**0.50**

Evaluation parameters for standard

Curve type

Curve type for the evaluation of the calibration curve. Determines the mathematical model according to which the calibration curve is to be adjusted. A minimum number **p** of different effective addition volumes must exist for the standard solution for the various curve types so that it is possible to adjust this calibration curve. The minimum number **p** corre-

sponds to the number of terms in the calibration function *(see chapter 5.6.5.9, page 716)*.

Selection	**Linear regression** | **Quadratic regression** | **Nonlinear regression** | **Linear interpolation**
Default value	**Linear regression**

A suitable curve fit of the linear, quadratic or nonlinear type must be placed on the points so that the DT curve can be calculated or is available in the curve display. 2 points are required to calculate a linear regression. At least 3 points are required to generate a nonlinear or quadratic regression. Additionally, the calculated curve must intersect with the line with the evaluation ratio. Fig. 1 *(see figure 1, page 707)* shows an example where the first 3 points of a DT measurement lie upon a line that is parallel to the evaluation ratio. The number of measuring points would be sufficient for calculating a nonlinear curve fit, but this calculation does not result in an intersection point with the evaluation ratio. Thus, the curve is not displayed yet.

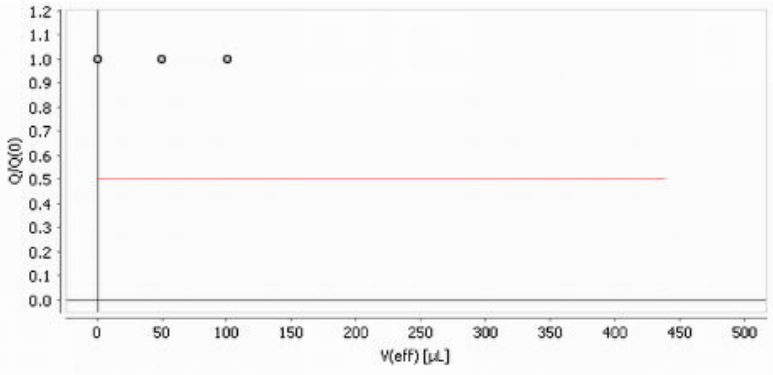


Figure 1 Example for the first 3 points of a DT curve, for which no intersection point with the evaluation ratio can be calculated yet.

Only an additional point on the DT curve, which is lower than the preceding points *(see figure 2, page 708)*, causes the curve fit to be displayed. As soon as an intersection point with the evaluation ratio can be calculated, the volume to be expected is extrapolated based on the function of the regression. However, this is only an estimate. An actual result can only be calculated after a point below the evaluation ratio has been measured.

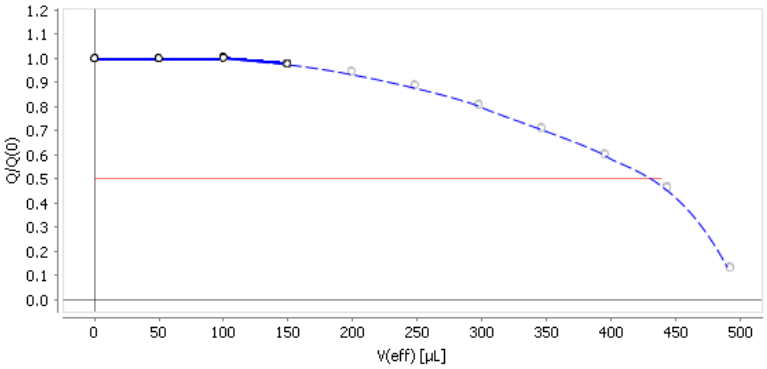


Figure 2 Example for a DT curve that intersects with the evaluation ratio.

NOTICE

The curve type for the standard solutions and the curve type for the sample need not be identical.

Evaluation start

Evaluation ratio Q/Q(0) with which the calculation of the regression for the standard solutions is to be started.

Input range	**0.01 to 1.10**
Default value	**1.10**

Evaluation parameters for sample

Curve type

Curve type for the evaluation of the calibration curve. Determines the type according to which the calibration curve is to be adjusted. A minimum number **p** of different effective addition volumes must exist for the sample solution for the various curve types so that it is possible to adjust this calibration curve. The minimum number **p** corresponds to the number of terms in the calibration function *(see "Evaluation parameters for standard", page 706)*, *(see chapter 5.6.5.3, page 701)*.

Selection	**Linear regression** | **Quadratic regression** | **Non-linear regression** | **Linear interpolation**
Default value	**Linear regression**

NOTICE

The curve type for the standard solutions and the curve type for the sample need not be identical.

Evaluation start

Evaluation ratio Q/Q(0) with which the calculation of the regression for the samples is to be started.

Input range	**0.01 to 1.10**
Default value	**1.10**

Weighting

on | off (Default value: **on**)

If this check box is activated, then the points on the calibration curve will be weighted in accordance with the formula **1/evaluation quantity²**.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

5.6.5.6 RC calibration curve properties

Dialog window: **Method ▶ Evaluation - Calibration ▶ Calibration curves ▶ [Edit] ▶ Properties... ▶ Properties calibration**

The calibration curve parameters for the substance selected in the table can be edited in the **Properties calibration** dialog window.

Measuring command

Shows the selected measuring command.

Substance

Shows the selected substance.

Evaluation quantity

Selection of the quantity according to which the substance is to be evaluated.

CVS

Selection	**Area** | **Height** | **Measured value**
Default value	**Area**

Measured value
If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

CPVS

Selection	**Area** | **Height**
Default value	**Area**

LSV, DP, SQW, CV

Selection	**Area** | **Height** | **Measured value**
Default value	**Height**

Area
For the measured quantity **Current**, the area is output as charge *Q* (unit C = A · s).

Height
For the measured quantity **Current**, the height is output as current *i* (unit A).

Measured value
For the measured quantity **Current**, the measured value is output as current *i* (unit A). If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

Evaluation parameters for standard

Curve type

Curve type for the evaluation of the calibration curve. Determines the type according to which the calibration curve is to be adjusted. A minimum number **p** of different concentrations must exist for the various curve types so that it is possible to adjust this calibration curve. The minimum number **p** corresponds to the number of terms in the calibration function *(see chapter 5.6.5.9, page 716)*.

Selection	**Linear regression** | **Quadratic regression** | **Non-linear regression** | **Linear interpolation**
Default value	**Linear regression**

At least 3 points are required for being able to generate a nonlinear or quadratic calibration. In order for the calibration curve to be available in the curve display and the calibration curve to be calculated, it has to be possible to place a suitable curve fit on the points.

Evaluation start

Evaluation ratio Q/Q(0) with which the calculation of the regression is to be started.

Input range	**0.01 to 1.10**
Default value	**1.10**

Weighting

on | off (Default value: **on**)

If this check box is activated, then the points on the calibration curve will be weighted in accordance with the formula **1/evaluation quantity²**.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

5.6.5.7 Standard addition calibration curve properties

Dialog window: **Method ▶ Evaluation - Calibration ▶ Calibration curves ▶ [Edit] ▶ Properties... ▶ Properties calibration**

The calibration curve parameters for the substance selected in the table can be edited in the **Properties calibration** dialog window.

Measuring command

Shows the selected measuring command.

Substance

Shows the selected substance.

Evaluation quantity

Selection of the quantity according to which the substance is to be evaluated.

CVS

Selection	**Area** | **Height** | **Measured value**
Default value	**Area**

Measured value
If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

CPVS

Selection	**Area** | **Height**
Default value	**Area**

LSV, DP, SQW, CV

Selection	**Area** | **Height** | **Measured value**
Default value	**Height**

Area
For the measured quantity **Current**, the area is output as charge *Q* (unit C = A · s).

Height
For the measured quantity **Current**, the height is output as current *i* (unit A).

Measured value
For the measured quantity **Current**, the measured value is output as current *i* (unit A). If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

Curve type

Only the curve type **Linear regression** is permitted for the calibration method **Standard addition**. At least 2 calibration points of different concentrations are required for determining the line *(see chapter 5.6.5.9, page 716)*.

Selection	**Linear regression** | **Quadratic regression** | **Non-linear regression** | **Linear interpolation**
Default value	**Linear regression**

Weighting

on | off (Default value: **on**)

If this check box is activated, then the points on the calibration curve are weighted in accordance with the formula **1/evaluation quantity²**.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[OK]

With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

5.6.5.8 External calibration calibration curve properties

Dialog window: **Method ► Evaluation - Calibration ► Calibration curves ► [Edit] ► Properties... ► Properties calibration**

The calibration curve parameters for the substance selected in the table can be edited in the **Properties calibration** dialog window.

Measuring command

Shows the selected measuring command.

Substance

Shows the selected substance.

Evaluation quantity

Selection of the quantity according to which the substance is to be evaluated.

CVS

Selection	**Area** | **Height** | **Measured value**
Default value	**Area**

CPVS

Selection	**Area** | **Height**
Default value	**Area**

CVS, LSV, DP, SQW, CV

Selection	**Area** | **Height** | **Measured value**
Default value	**Height**

Area
For the measured quantity **Current**, the area is output as charge *Q* (unit C = A · s).

Height
For the measured quantity **Current**, the height is output as current *i* (unit A).

Measured value
For the measured quantity **Current**, the measured value is output as current *i* (unit A). If the **Measured value** baseline type was selected in the **Evaluation - Substances** area, then it is mandatory to select the evaluation quantity **Measured value**.

Curve type

Curve type for the evaluation of the calibration curve. Determines the type according to which the calibration curve is to be adjusted. A minimum number **p** of different determinations must exist for the various curve types so that it is possible to adjust this calibration curve. The minimum number **p** corresponds to the number of terms in the calibration function *(see chapter 5.6.5.9, page 716)*.

Selection	**Linear regression** | **Linear regression through 0** | **Quadratic regression** | **Quadratic regression through 0** | **Nonlinear regression** | **Nonlinear regression through 0** | **Linear interpolation**
Default value	**Linear regression**

Weighting

on | off (Default value: **on**)

If this check box is activated, then the points on the calibration curve are weighted in accordance with the formula **1/evaluation quantity²**.

Navigation bar

Navigation bar for changing the displayed substances with the following functions:

Jump to the first substance. Altered data is adopted.

Jump to the previous substance. Altered data is adopted.

Jump to the next substance (in the case of the last substance, jump to a new, empty substance). Altered data is adopted.

Jump to the last substance. Altered data is adopted.

5

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[OK]

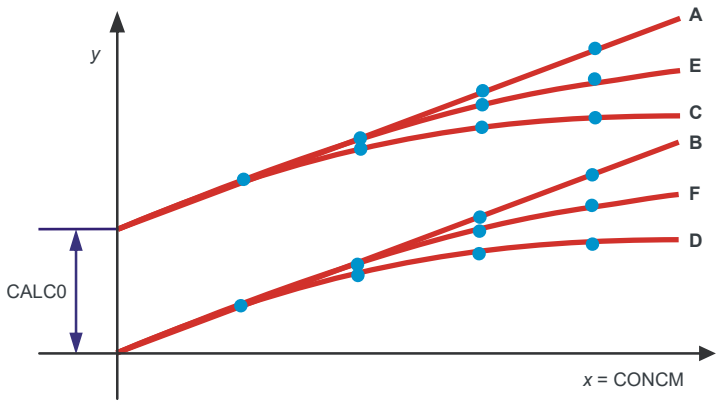
With this button, the data modified in the dialog window for the displayed substance is adopted and the dialog window is closed.

[Close]

With this button, the data modified in the dialog window for the displayed substance is not adopted and the dialog window is closed.

5.6.5.9 Rules for calibration curves - General

Curve type for the evaluation of the calibration curve. Determines the mathematical model according to which the calibration curve is to be adjusted. A minimum number **p** of different concentrations must exist for the various models so that it is possible to calculate this calibration curve. The minimum number **p** corresponds to the number of terms in the calibration function. Various model functions are available, depending on the calibration method:



Selected curve type	Calibration function	**p**	Calibration methods
A Linear regression	$y = CALC0 + CALC1 \cdot x$	≥ 2	LAT, MLAT, DT, RC, Standard addition, External calibration
B Linear regression through 0	$y = CALC1 \cdot x$	≥ 1	External calibration
C Quadratic regression	$y = CALC0 + CALC1 \cdot x + CALC2 \cdot x^2$	≥ 3	DT, RC, External calibration
D Quadratic regression through 0	$y = CALC1 \cdot x + CALC2 \cdot x^2$	≥ 2	External calibration
E Nonlinear regression	$y = CALC0 + CALC1 \cdot x + CALC4 \cdot x^4$	≥ 3	DT, RC, External calibration
F Nonlinear regression through 0	$y = CALC1 \cdot x + CALC4 \cdot x^4$	≥ 2	External calibration
A Linear interpolation	$y = CALC0 + CALC1 \cdot x$	≥ 2	DT, RC, External calibration

The parameters *CALC0*, *CALC1*, *CALC2* and *CALC4* of the regression curve are determined by weighted least squares with *y* = evaluation quantity and *x* = **CONCM**. The parameters are displayed in the **Curves** subwindow and have the following meaning:

CALC0 = zero-order polynomial coefficient (x^0, axis intercept)
CALC1 = first-order polynomial coefficient (x^1, linear part)
CALC2 = second-order polynomial coefficient (x^2, quadratic part)
CALC4 = fourth-order polynomial coefficient (x^4, fourth-order nonlinear part)

5.6.5.10 Rules for the standard addition

Standard addition is the usual calibration method for voltammetric determinations. Its advantage is the high accuracy, as the calibration in the sample takes place under real matrix conditions and all measuring parameters remain unchanged. The following rules should be followed to ensure optimum trueness and minimized scattering:

- **Check linearity range**
  The linearity range should be checked for each substance when developing a method. To do so, spike several times over a big concentration range. From the calibration curve displayed in the **Curves** subwindow you can determine in which range the standard addition is linear and in which it is nonlinear.

- **Spiking procedure**
  If the substance content is in the linear range, then repeated spiking only makes sense if you want to check the linearity during each determination. In order to minimize scattering, it is better to spike only once but select the highest possible number of replications.
- **Spiking ratio 1:1 to 1:5**
  The optimum spiking ratio for the entire spiking procedure is 1:1 to 1:5, i.e., the sum of all spiking amounts should be one to five times the sample amount present in the measuring vessel. It is easy to later check this with the help of the result variable **AMOUNT**.
- **Keep spiking volume low**
  Every spiking dilutes the measuring solution and thereby reduces the sample signal. The software corrects the resulting error. Nevertheless, the volumes used for the standard addition should be as small as possible. At the end of the determination the volume of all added standard solutions should not be more than 10% of the total volume.
  50 to 200 µL standard solution are usually added per spiking for 10 mL of measuring solution.
- **Evaluation quantity has to be monotonously ascending**
  A regression is only calculated for the standard addition if the evaluation quantity **Peak area**, **Peak height** or **Measured value** gets bigger with each spiking (monotonously ascending). If the evaluation quantity gets smaller with each spiking (monotonously descending) or the function is not monotonous, i.e. the peak gets bigger after one spiking and smaller after another, no regression and no result will be calculated.

5.6.5.11 Calculation of the standard addition

With the standard addition procedure (also known as spiking technique), a known amount of the substance(s) to be determined is added to the sample once or more. This addition can be carried out manually or automatically with a dosing device. The following procedure is used to calculate the substance concentration in the measuring vessel **CONCM**:

1 Measurement of the sample solution

The sample solution with the unknown substance concentration **CONCM** is measured once or more (defined by the number of replications **y**). This results in:

- the evaluation quantity *y* (**Peak area**, **Peak height** or **Measured value**) with the variables **VAR{1}.REP{y}.AREA**, **VAR{1}.REP{y}.HGT** or **VAR{1}.REP{y}.MVAL**
- the mean value of all replications of the evaluation quantity *y* for the sample with the variables **VAR{1}.AREA.MNV**, **VAR{1}.HGT.MNV** or **VAR{1}.MVAL.MNV**

- the absolute standard deviation of all replications of the evaluation quantity *y* for the sample with the variables **VAR{1}.AREA.ASD**, **VAR{1}.HGT.ASD** or **VAR{1}.MVAL.ASD**

2 Measurement of the spiked sample solutions

The sample solution is spiked n times with a standard solution with a known substance concentration. Each of these spiked solutions is measured once or more (defined by the number of replications **y**). This results in:

- the evaluation quantity *y*(n) of a single measurement for the spiked sample n with the variables **VAR{x}.REP{y}.AREA**, **VAR{x}.REP{y}.HGT** or **VAR{x}.REP{y}.MVAL** (**x** = 2–n+1)
- the mean value of all replications of the evaluation quantity *y*(n) for the spiked sample n with the variables **VAR{x}.AREA.MNV**, **VAR{x}.HGT.MNV** or **VAR{x}.MVAL.MNV** (**x** = 2–n+1)
- the absolute standard deviation of all replications of the evaluation quantity *y*(*n*) for the spiked samples with the variables **VAR{x}.AREA.ASD**, **VAR{x}.HGT.ASD** or **VAR{x}.MVAL.ASD** (**x** = 2–n+1)
- the difference *x*(n) between the substance concentration *c*(n) in the spiked sample n and the substance concentration **CONCM** in the original sample solution

3 Calculation of the standard addition curve

For the calculation of the linear standard addition curve, the parameters **CALC0** and **CALC1** of the following linear regression curve are determined by weighted least squares:

$y(n) = \mathbf{CALC0} + \mathbf{CALC1} \cdot x(n)$

with *y*(s) = evaluation quantity (**Peak area**, **Peak height** or **Measured value**)

and $x(n) = c(n) - \mathbf{CONCM}$

The calibration results **CALC0** and **CALC1** are displayed in the **Curves** subwindow. They have the following meaning:

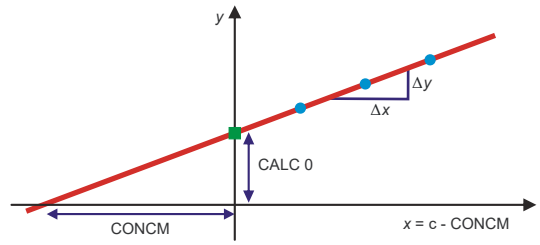
- **CALC0** = y-intercept of the standard addition curve
- **CALC1** = slope of the standard addition curve

4 Calculation of the substance concentration CONCM

A prerequisite for the application of the standard addition is that for $c = 0$, the evaluation quantity y is also = 0. If 0 is entered in the calibration function for these 2 quantities, the substance concentration **CONCM** can be calculated using the following equation:

$$CONCM = \frac{CALC0}{CALC1}$$

In the graphical display of the standard addition curve, the substance concentration **CONCM** is set by the distance from the point of origin to the intersection point with the regression line.



y = evaluation quantity (**Peak area**, **Peak height** or **Measured value**)
x = *c* - **CONCM**
Δ*y* / Δ*x* = **CALC1** = slope
CALC0 = y-intercept
CONCM = the unknown substance concentration
■ = sample
● = spiking

5 Calculation of the total error of the concentration calculation of CONCM

The total error **CONCM.ASD** of the result **CONCM** is determined with a linear error calculation *(see chapter 5.6.7.2, page 748)*. Irrespective of the number of measurements, the total error is always calculated so that **CONCM** ± **CONCM.ASD** indicates the area in which the true value of **CONCM** may be expected with a probability of 68.3%.

6 Calculation of the substance concentration in the sample CONC

Taking the dilution of the sample by the added auxiliary solutions into account, the substance concentration in the sample is calculated as follows:

$$CONC = \frac{CONCM \cdot VAR\{1\}.VTOT}{SAMPLEAMOUNT} \cdot \frac{VDILUTION}{VANALYSIS}$$

Variable	Description
CONC	Substance concentration in the sample.
CONCM	Substance concentration in the measuring vessel *(see chapter 5.6.7.7.15, page 775)*.

Variable	Description
VTOT	Total volume in the measuring vessel at the moment of the sample measurement *(see chapter 5.6.7.5.1, page 766)*.
SAMPLEA-MOUNT	Sample amount *(see page 99)*.
VDILUTION	Volume after dilution of the sample in an external vessel *(see page 100)*.
VANALYSIS	Volume that is removed from the diluted sample solution (the dilution volume) and used for analysis in the measuring vessel *(see page 100)*.

5.6.5.12 Rules for the external calibration

Determining results using external calibration is more time-efficient than using standard addition. However, it is only permissible if the following conditions are fulfilled:

- The matrix of all samples and calibration solutions is identical or does not influence the measurement.
- All measuring parameters (capillary, temperature, etc.) remain unchanged during the measurements.
- The trueness of the single results is verified regularly using the standard addition procedure.

The following rules should be followed to ensure optimum trueness and minimized scattering.

- **Check linearity range**
  When developing a method, the linearity range of the calibration curve should be checked for each substance by recording it over a big concentration range. To do so, spike several times over a big concentration range. From the calibration curve displayed in the **Curves** subwindow you can determine in which range the calibration curve is linear and in which it is nonlinear.
- **Work in the linear range**
  For the external calibration, we also recommend working in the linear range to ensure a high reproducibility and trueness.
- **Check intercept**
  The size of the intercept is an indication of a possible systematic error or blank value. In order to convert this error into the substance concentration, **CALC0** has to be divided by **CALC1**.
- **Determine working range**
  The calibration curve is only defined for the range between the calibration solutions with the lowest and the highest concentration. Extrapolations beyond this range are not permitted.

- **Calibration curve statistics**
  The external calibration should be recorded with 5-10 concentrations within the working range. The concentrations should be equidistant. A bigger number of replications (3-5) decreases the statistical error of the calibration curve.
- **Keep temperature constant**
  As the measured values are highly temperature-dependent (≥ 2%/°C), we recommend working with a thermostatted measuring vessel (e.g. 6.1418.220).
- **Take blank values into account**
  Blank values can be determined separately with the **CALL BLANK** command and subtracted with the **Blank value correction with evaluation quantity** function in the **Evaluation** subwindow of the method.

5.6.5.13 Calculation of the external calibration

In the external calibration, the substance content in a sample is determined in two steps:

- First, the correlation between the substance concentration in the measuring vessel **CONCM** and the evaluation quantity is determined by measuring different standard solutions.
- Then the sample is measured and the substance concentration in the measuring cell **CONCM** as well as the substance concentration in the sample **CONC** are calculated on the basis of the recorded calibration curve while taking the dilution into account.

The following procedure is used to calculate the substance concentration in the sample **CONC**:

1 Measurement of the standard solutions

The n standard solutions with known concentration *c*(n) are measured once or better several times (defined by the number of replications **y**). This results in:

- the evaluation quantity *y*(n) (**Peak area**, **Peak height** or **Measured value**) with the variables **VAR{x}.REP{y}.AREA**, **VAR{x}.REP{y}.HGT** or **VAR{x}.REP{y}.MVAL** (**x** = 1–n)
- the mean value of all replications of the evaluation quantity *y*(n) for the standard solution with the variables **VAR{x}.AREA.MNV**, **VAR{x}.HGT.MNV** or **VAR{x}.MVAL.MNV** (**x** = 1–n)
- the absolute standard deviation of all replications of the evaluation quantity *y*(n) for the standard solution with the variables **VAR{x}.AREA.ASD**, **VAR{x}.HGT.ASD** or **VAR{x}.MVAL.ASD** (**x** = 1–n)

2 Calculation of the calibration curve

7 model functions are available for the calculation of the calibration curve, which can be selected under **Curve type** *(see chapter 5.6.5.3, page 701)*.

3 Measurement of the sample solution

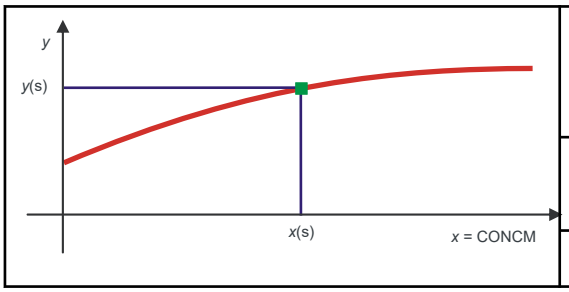
The sample solution (sample that has usually been diluted by the addition of auxiliary solution) with unknown substance concentration in the measuring vessel **CONCM** is measured once or better several times (defined by the number of replications **y**). This results in:

y(s) = evaluation quantity (**Peak area**, **Peak height** or **Measured value**)

4 Calculation of the substance concentration in the measuring vessel

The substance concentration in the measuring vessel **CONCM** is calculated by entering the measured evaluation quantity *y*(s) into the previously determined calibration function:

$$y(s) = CALC4\ x(s)^4 + CALC2\ x(s)^2 + CALC1\ x(s) - CALC0$$



y(s) = evaluation quantity (**Peak area**, **Peak height** or **measured value**) for the substance in the measuring vessel
x(s) = substance concentration in measuring vessel
■ = sample

5 Calculation of the total error of the concentration calculation of CONCM

The total error **CONCM.ASD** of the result **CONCM** is determined with a linear error calculation *(see chapter 5.6.7.2, page 748)*. Irrespective of the number of measurements, the total error is always calculated so that **CONCM** ± **CONCM.ASD** indicates the area in which the true value of **CONCM** may be expected with a probability of 68.3%.

6 Calculation of the substance concentration in the sample CONC

Taking the dilution of the sample by the added auxiliary solutions into account, the substance concentration in the sample is calculated as follows:

$$CONC = \frac{CONCM \cdot VAR\{1\}.VTOT}{SAMPLEAMOUNT} \cdot \frac{VDILUTION}{VANALYSIS}$$

Variable	Description
CONC	Substance concentration in the sample.
CONCM	Substance concentration in the measuring vessel *(see chapter 5.6.7.7.15, page 775)*.
VTOT	Total volume in the measuring vessel at the moment of the sample measurement *(see chapter 5.6.7.5.1, page 766)*.
SAMPLEA-MOUNT	Sample amount *(see page 99)*.
VDILUTION	Volume after dilution of the sample in an external vessel *(see page 100)*.
VANALYSIS	Volume that is removed from the diluted sample solution (the dilution volume) and used for analysis in the measuring vessel *(see page 100)*.

5.6.6 Evaluation - Results

5.6.6.1 Results - General

Subwindow section: **Method ► Evaluation ► Results**

Application

The output and the export of the results are defined in the **Results** section. Additional results can be defined by the user.

Tabs

- *Results*
- *User-defined results*
- *Monitoring*
- *Variable assignment*
- *Report*
- *Database*
- *Export*

5.6.6.2 Results - Results

Tab: **Method** ▶ **Evaluation** ▶ **Results** ▶ **Results**

NOTICE

The **Results** tab is disabled in the **CP** command, because there is no peak and substance evaluation for the **CP** command.

Substance concentration in the sample

Measuring command

Selection of the voltammetry command for which the associated substances are to be displayed.

Selection	**'Voltammetry command'**

Table

The parameter decimal places and the assignment for those substances that have been defined for the selected voltammetry command in the substance table are displayed in this table.

The table cannot be edited directly and is comprised of the following columns:

Substance

Substances that are defined for the selected voltammetry command in the substance table *(see chapter 5.6.3, page 686)*.

Decimal places

Number of decimal places with which the result is to be displayed in the report and in the result view of the database.

Assignment

Assignment of the result to one of the 25 possible result columns **RS01** - **RS25** in the determination overview in which the result is entered.

Edit menu

Properties...	Opens the **Define decimal places and assignment** dialog window *(see chapter 5.6.6.3, page 726)*.
Apply decimal places	Applies decimal places of the selected lines for all substances.

Additional results

[Define decimal places]

The Define decimal places dialog window opens in which the decimal places and units of results can be defined *(see chapter 5.6.6.4, page 727)*.

5.6.6.3 Define decimal places and assignment

Dialog window: **Method ▶ Evaluation ▶ Results ▶ Results ▶ Edit ▶ Define decimal places and assignment**

Measuring command

Shows the selected voltammetry command.

Substance

Shows the selected substance that was defined in the substance table.

Decimal places

Selection of the number of decimal places with which the result is to be displayed in the report and in the result view of the database.

Input range	**0 to 6**
Default value	**3**

Assignment

Assignment of the result to one of the 25 possible result columns RS01 - RS25 in the determination overview in which the result is entered. The only columns available for selection are those that have not been used yet.

Input range	**RS01 to RS25**

[OK]

The entered values are saved.

[Close]

The dialog window closes. The entered values are not saved.

Navigation

Shows the currently selected line in the table with the following functions:

Jump to the first line in the table.

Jump to the previous line in the table.

5

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Jump to the next line in the table. If the end of the table has been reached, then a new line will be inserted automatically and the program will jump to it.

The same function can also be triggered by pressing the **[Enter]** key.

Jump to the last line in the table.

Jump to a new, empty line.

5.6.6.4 Define decimal places

Dialog window: **Method ► Evaluation ► Results ► Results ► Edit ► Define decimal places**

NOTICE

Calculations are made in the software with SI units and derived SI units *(see chapter 5.6.7.1, page 747)*. Numerical values are shown in the display and in the reports with decimal prefixes in order to avoid numbers with many decimal places. By selecting **#**, the prefix for the unit is selected automatically in such a way that a number between 1 and 999 results for the integer value.

Peak potential

Number of decimal places for the peak potential (**V**).

Input range	**0 to 6**
Default value	**3**

Height

Number of decimal places and prefix selection for the peak height (**A**).

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the heights of all replications

Number of decimal places for the relative standard deviation of the peak heights of all replications for the variation **X** (**%**).

Input range	**0 to 6**
Default value	**1**

Area

Number of decimal places and prefix selection for the peak area (**C**).

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the areas of all replications

Number of decimal places for the relative standard deviation of the peak areas of all replications for the variation **X** (**%**).

Input range	**0 to 6**
Default value	**1**

Start base point

Number of decimal places for the start base point at which the peak evaluation baseline begins (for CVS, LSV, DP, SQW CV = potential (**V**), for CPVS = time (**s**)).

Input range	**0 to 6**
Default value	**3**

End base point

Number of decimal places for the end base point at which the peak evaluation baseline ends (for CVS, LSV, DP, SQW, CV = potential (**V**), for CPVS = time (**s**)).

Input range	**0 to 6**
Default value	**3**

Standardized area

Number of decimal places for the standardized peak area.

Only for the calibration methods **DT** and **RC**! This result is not calculated if the measuring command is called by a **CALL COND**!

Input range	**0 to 6**
Default value	**3**

Standardized height

Number of decimal places for the standardized peak height.

Only for the calibration methods **DT** and **RC**! This result is not calculated if the measuring command is called by a **CALL COND**!

Input range	**0 to 6**
Default value	**3**

Total volume

Number of decimal places and prefix selection for the current total volume in the measuring vessel (**L**).

Input range	**0 to 6**
Default value	**3**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

Zero-order coefficient

Number of decimal places for the zero-order coefficient of the calibration curve or standard addition curve.

Input range	**0 to 6**
Default value	**3**

First-order coefficient

Number of decimal places for the first-order coefficient of the calibration curve or standard addition curve.

Input range	**0 to 6**
Default value	**3**

Second-order coefficient

Number of decimal places for the second-order coefficient of the calibration curve or standard addition curve.

Input range	**0 to 6**
Default value	**3**

Fourth-order coefficient

Number of decimal places for the fourth-order coefficient of the calibration curve or standard addition curve.

Input range	**0 to 6**
Default value	**3**

Coefficient of determination

Number of decimal places for the coefficient of determination.

Input range	**0 to 6**
Default value	**5**

Substance concentration in measuring vessel

Number of decimal places for the concentration of the substance in the measuring vessel. The unit corresponds to the substance concentration of the added standard solution (**g/L**, **mol/L** or **L/L**).

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the substance concentration in measuring vessel

Number of decimal places for the relative standard deviation of the substance concentration in the measuring vessel (**%**).

Input range	**0 to 6**
Default value	**1**

Amount of substance

Number of decimal places for the mass, amount of substance or volume of a substance in the measuring vessel. The unit corresponds to the unit of the counter of the substance concentration of the added standard solution (**g**, **mol** or **L**).

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the substance concentration in the sample

Number of decimal places for the relative standard deviation of the substance concentration in the sample (**%**).

Input range	**0 to 6**
Default value	**1**

Effective addition volume of the standard solution for the evaluation ratio

Number of decimal places for the effective addition volume of the added standard solution for the evaluation ratio (**L**).

This result exists only for the calibration method **DT** and the sample type = **Standard**.

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the effective addition volume of the standard solution for the evaluation ratio

Number of decimal places for the relative standard deviation of the effective addition volume of the added standard solution for the evaluation ratio (**%**).

This result exists only for the calibration method **DT** and the sample type = **Standard**.

Input range	**0 to 6**
Default value	**1**

Calibration factor DT

Number of decimal places and prefix selection for the calibration factor DT (**g/L**, **L/L**, **mol/L**). The calibration factor DT corresponds to the concentration of the standard in the measuring vessel for the evaluation ratio.

This result exists only for the calibration method = **DT** and the sample type = **Standard**.

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the calibration factor DT

Number of decimal places for the relative standard deviation of the calibration factor DT (**%**).

This result exists only for the calibration method = **DT** and the sample type = **Standard**.

Input range	**0 to 6**
Default value	**1**

Effective addition volume of the sample solution for the evaluation ratio

Number of decimal places and prefix selection for the effective addition volume of the sample solution for the evaluation ratio (**L**).

This result exists only for the calibration method **DT** and the sample type = **Sample**.

Input range	**0 to 6**
Default value	**2**
Selection	**#** | **m** | **µ** | **n** | **p**
Default value	**#**

RSD of the effective addition volume of the sample solution for the evaluation ratio

Number of decimal places for the relative standard deviation of the effective addition volume of the sample solution for the evaluation ratio (**%**).

This result exists only for the calibration method **DT** and the sample type = **Sample**.

Input range	**0 to 6**
Default value	**1**

[Basic setting]

Restore default values for the number of decimal places and the prefix.

5.6.6.5 Results - User-defined results

Tab: **Method ► Evaluation ► Results ► User-defined results**

Table

Additional user-defined results can be defined in this table which are automatically included in the calculation. The main properties of a highlighted result are displayed in the right-hand part of the tab. The results are calculated in the order in which they appear in the table. They can be moved with the arrow keys in order to change the sequence in which they appear.

The table cannot be edited directly and is comprised of the following columns:

Result name

Name of the user-defined result.

Unit

Unit of the user-defined result.

Decimal places

Decimal places of the user-defined result.

Assignment

Assignment of the result to one of the 25 possible result columns.

Edit menu

New...	Opens the **Define result** dialog window *(see chapter 5.6.6.6, page 733)*.
Properties...	Opens the **Define result** dialog window *(see chapter 5.6.6.6, page 733)*.
Copy	Copies the selected lines to the clipboard.
Paste	Inserts all lines from the clipboard above the line marked with the asterisk.
Cut	Copies the selected lines to the clipboard and deletes them.

Delete	Deletes the highlighted lines.

Result type

Displays the result type for the selected result.

Formula

Displays the formula for the selected result.

Description

Displays the description for the selected result.

Modifies the sequence of displayed lines by moving the selected line upward.

Modifies the sequence of displayed lines by moving the selected line downward.

5.6.6.6 Defining the result

Dialog window: **Method ► Evaluation ► Results ► User-defined results ► [Edit] ► New... / Properties... ► Define result**

Result type

Selecting the type of user-defined result.

Selection	**Single result** | **Multiple result**
Default value	**Single result**

Single result
User-defined single result that is automatically calculated.

Multiple result
User-defined multiple result that is automatically also calculated from an automatically generated result with the help of the specified formula for all substances of the selected measuring command. A corresponding result variable is generated for each substance. User-defined multiple results appear automatically in the result table of a voltammetry command with the other default results of this command.

Result name

Name of the user-defined result. The result can be reused under the designation **RS.'Command name'.'Substance name'.'Result name'[.VAL]** (single result) or **RS.'Command name'.ASU.'Result name'[.VAL]** (**ASU** = All substances; multiple result).

Entry	**40 characters**
Default value	**'empty'**

Properties

Formula

Field for the calculation formula that can either be edited directly or be created with the formula editor by clicking on the icon. The formula defines the type (**Number**, **Text** or **Date/Time**) of the result.

After the formula has been defined, it is mandatory that the suitable unit be selected for the result.

Unit

Unit of the calculated result for the output (text only) that can be reused under the designation**RS.'Command name'.'Substance name'.'Result name'.UNI** (single result) or **RS.'Command name'.ASU. 'Result name'.UNI** (**ASU** = all substances; multiple result).

Entry	**60 characters**
Selection	**g/L** | **mg/L** | **µg/L** | **ng/L** | **mol/L** | **mmol/L** | **µmol/L** | **nmol/L** | **pmol/L** | **mL/L** | **µL/L** | **nL/L**

Decimal places

Number of decimal places for the output of the calculated result. This parameter is ignored for results of the **Text** or **Date/Time** type.

Input range	**0 to 6**
Default value	**3**

Assignment

Assignment of the result to one of the 25 possible result columns.

Selection	**RS01 - RS25** | **none**

RS01 - RS25
Assignment of the single result to one of the 25 possible result columns RS01–RS25 in the determination overview.

none
The result is not assigned to a result column and is displayed only in the Results subwindow.

NOTICE

The assignments **RS01 ... RS25** can be used repeatedly in various **CALC** commands. If this is the case, then only the last result calculated will be entered in the assigned result column. By doing this it is possible either to display alternative results calculated in different **CALC** commands in the same result column or to use the same report template.

CAUTION

If the same **Assignment** is reused in several CALC commands with different **Result names**, then only the most recently calculated result will be saved in the determination. All other results are either no longer available or invalid if used in other formulas!

Description

Optional description of the result.

Entry	**1000 characters**

Navigation bar

Navigation bar for changing the displayed user-defined results with the following functions:

Jump to the first user-defined result. Altered data is adopted.

Jump to the previous user-defined result. Altered data is adopted.

Jump to the next user-defined result. Altered data is adopted.

Jump to the last user-defined result. Altered data is adopted.

Jump to a new, empty user-defined result. The number of lines is increased by +1 at this time. Altered data is adopted.

5

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed user-defined result is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed user-defined result is adopted and the dialog window is closed.

5.6.6.7 Results - Assignment of variables

Tab: **Method ► Evaluation ► Results ► Assignment of variables**

Table

Common variables and **global variables** can be assigned in this table in order to be able to use them in the following determinations. Assigned result and description of a highlighted result are displayed in the right-hand part of the tab. The variables are calculated in the order in which they appear in the table. They are stored in the data set of the determination and can be output in a report, but they will not be presented in the overview of results.

The table cannot be edited and it contains the following columns:

Name

Name of the variable.

Edit menu

New...	Opens the **Assign variable** dialog window *(see chapter 5.6.6.8, page 737)*.
Properties...	Opens the **Assign variable** dialog window *(see chapter 5.6.6.8, page 737)*.
Delete	Deletes the highlighted lines.

Assigned result

Displays the result assigned to the variable.

Description

Displays the description for the variable.

5.6.6.8 Assign variable

Dialog window: **Method ► Evaluation ► Results ► Assignment of variables ► [Edit] ► New... / Properties... ► Assign variable**

Name

Selection of the variables to which a result can be assigned.

Using the … symbol opens the **Select variable** dialog window in which the desired common variable or global variable can be selected *(see chapter 5.6.6.9, page 737)*.

Selection	**'Common Variables'** | **'Global Variables'**

'Common Variables'
There is no limit to how often a common variable can be assigned. The result for the most recently assigned common variable is written in the table in the **Configuration** program part.

'Global Variables'
There is no limit to how often a global variable can be assigned. The result for the most recently assigned global variable is written in the table in the **Configuration** program part.

Assigned result

Name of the result to be assigned to the variable.

Using the … symbol opens the **Select result** dialog window where the desired result can be selected *(see chapter 5.6.6.10, page 738)*.

Description

Optional description of the variable.

Entry	**1000 characters**

5.6.6.9 Select variable

Dialog window: **Method ► Evaluation ► Results ► Assignment of variables ► [Edit] ► New... / Properties... ► Select variable**

The variable to which a result is to be assigned can be selected in the **Select variable** dialog window.

Variables

Selection of the desired common variable or global variable.

Description

Description of the variable selected under **Variables**.

5.6.6.10 Select result

Dialog window: **Method ▶ Evaluation ▶ Results ▶ Assignment of variables ▶ [Edit] ▶ New... / Properties... ▶ Select result**

The result variables can be selected in the **Select result** dialog window.

Variables

Selection of the desired result variables from all of the automatically calculated results and from the user-defined results.

Description

Description of the result variables selected under **Variables**.

5.6.6.11 Results - Report

Tab: **Method ▶ Evaluation ▶ Results ▶ Report**

Table

You can define in the report table which report template is used to generate the reports for the determinations in this method and whether they are to be printed or saved as a PDF file. The report output takes place as soon as the determination is complete. The table cannot be edited directly and is comprised of the following columns:

Report template

Displays the names of the report templates for the reports.

Output

Displays the output target for the reports.

Edit menu

New...	Insert an empty line above the highlighted line and open the **Define report** dialog window *(see chapter 5.6.6.12, page 739)*.
Properties...	Opens the **Define report** dialog window *(see chapter 5.6.6.12, page 739)*.
Copy	Copies the highlighted lines to the clipboard.
Paste	Inserts all lines from the clipboard above the highlighted line in the report table.
Cut	Copies the highlighted lines to the clipboard and deletes them.
Delete	Deletes the highlighted lines.

5.6.6.12 Define report

Dialog window: **Method ▶ Evaluation ▶ Results ▶ Report ▶ [Edit] ▶ New... / Properties... ▶ Define report**

Report template

Report template

Selection of the report template with which the report is to be generated.

Selection	**'Report templates'**

Report output

Definition of targets for the report output.

Printer

on | off (Default value: **off**)

If this check box is activated, the report is printed out on the selected printer.

Selection	**Default printer** | **All of the printers configured in Windows**
Default value	**Default printer**

Default printer
Printout on the printer defined as standard printer in Windows.

PDF file

on | off (Default value: **off**)

If this check box is activated, the report is saved as a PDF file.

The desired directory can be selected and a name for the PDF file can be entered by means of the ... icon.

Send e-mail

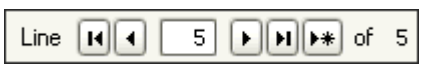
on | off (Default value: **off**)

If this check box is activated, then the report is output not only as a PDF file but also as an attachment to the address defined under **[E-mail...]**.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Navigation bar



Navigation bar for changing the displayed reports with the following functions:

Jump to the first report. Altered data is adopted.

Jump to previous report. Altered data is adopted.

Jump to the next user-defined report. Altered data is adopted.

Jump to the last user-defined report. Altered data is adopted.

Jump to a new, empty user-defined report. The number of lines is increased by +1 at this time. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed report is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed report is adopted and the dialog window is closed.

5.6.6.13 Results - Database

Tab: **Method ► Evaluation ► Results ► Database**

Database

This table defines which database the determination data is to be saved in.

Name database

Name of the database in which the determination is to be stored.

Edit menu

New...	Opens the **Select database** dialog window *(see chapter 5.6.6.14, page 741)*.
Properties...	Opens the **Select database** dialog window *(see chapter 5.6.6.14, page 741)*.

Delete	Deletes the highlighted lines.

5.6.6.14 Select database

Dialog window: **Method ► Evaluation ► Results ► Database ► [Edit] ► New... / Properties... ► Select database**

Database

Name of the database in which the determination is to be stored.

Selection	**'Database name'**

Navigation bar

Navigation bar for changing the displayed databases with the following functions:

Jump to the first database. Altered data is adopted.

Jump to the previous database. Altered data is adopted.

Jump to the next database. Altered data is adopted.

Jump to the last database. Altered data is adopted.

Jump to a new, empty database, at which time the column number is increased by +1. Altered data is applied at this time. Altered data is adopted.

Option of entering the desired column number to which the program jumps when you press **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed database is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed database is adopted and the dialog window is closed.

5.6.6.15 Results - Export

Tab: **Method ▶ Evaluation ▶ Results ▶ Export**

Export

An export template is selected in this table. The export templates are defined in the **Database** program part.

Export template

Name of the export template with which the results of the determination are to be exported.

Edit menu

New...	Opens the **Select export template** dialog window *(see chapter 5.6.6.16, page 742)*.
Properties...	Opens the **Select export template** dialog window *(see chapter 5.6.6.16, page 742)*.
Delete	Deletes the highlighted lines.

5.6.6.16 Selecting an export template

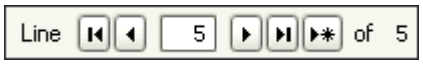
Dialog window: **Method ▶ Evaluation ▶ Results ▶ Export ▶ [Edit] ▶ New... / Properties... ▶ Select export template**

Export template

Name of the export template with which the determination is to be exported.

Selection	**'Export template'**

Navigation bar



Navigation bar for changing the displayed export templates with the following functions:

Jump to the first export template. Altered data is adopted.

Jump to the previous export template. Altered data is adopted.

Jump to the next export template. Altered data is adopted.

Jump to the last export template. Altered data is adopted.

Jump to a new, empty export template, at which time the column number is increased by +1. Altered data is applied at this time. Altered data is adopted.

Option of entering the desired column number to which the program jumps when you press **[Enter]**.

Buttons

[Close]

With this button, the data modified in the dialog window for the displayed export is not adopted and the dialog window is closed.

[OK]

With this button, the data modified in the dialog window for the displayed export is adopted and the dialog window is closed.

5.6.6.17 Results - Monitoring

Tab: **Method ▶ Evaluation ▶ Results ▶ Monitoring**

Rules for monitoring results

- Each result can only be monitored once.
- Only results of the **number** type can be monitored.
- The results are always monitored after evaluation. The determination does not need to be complete. As soon as the results of a determination are recalculated in a run (e.g. due to modified calibration), the newly calculated results are monitored.

Table

This table defines which results are to be monitored. The monitoring settings of a highlighted result are displayed in the right-hand part of the tab.

Edit menu

New	Opens **Define monitoring** dialog window *(see chapter 5.6.6.18, page 744)*.
Edit	Opens **Define monitoring** dialog window *(see chapter 5.6.6.18, page 744)*.

Copy	Copies the highlighted lines to the clipboard.
Insert	Inserts all lines from the clipboard above the highlighted line in the table.
Cut	Copies the highlighted lines to the clipboard and deletes them.
Delete	Deletes the highlighted lines.

Limit

Lower limit

Displays the lower limit value for the selected result.

Upper limit

Displays the upper limit value for the selected result.

Message

Displays the message to be sent when the limit values for the selected result are exceeded.

Action

Displays the action to be triggered automatically when the limit values for the selected result are exceeded.

5.6.6.18 Defining monitoring

Dialog window: **Method ► Evaluation ► Results ► Monitoring ► [Edit] ► New / Edit ► Define monitoring**

Result

Name of the result to be monitored.

With the … icon you open the **Select result** dialog window, in which the desired result can be selected.

Validity

In this section, the type of determinations to be monitored is defined and how the monitoring should react if a result to be monitored is not at all present.

Sample

on | off (Default value: **on**)

If this option is enabled, all the determinations with sample type **Sample** are monitored.

Intercept

on | off (Default value: **off**)

If this option is enabled, all the determinations with sample type **Intercept** are monitored.

Standard

on | off (Default value: **off**)

If this option is enabled, all the determinations with sample type **Standard** are monitored.

Monitor invalid results

on | off (Default value: **off**)

If this option is enabled, the result is always monitored even if it is not available or invalid. If this option is disabled, an unavailable or invalid result will be ignored by the monitoring.

Limit

Lower limit

Lower limit value for the result. It is possible to enter a formula with .

Input range	**-1.000E99 to 1.000E99**

Upper limit

Upper limit value for the result. It is possible to enter a formula with .

Input range	**-1.000E99 to 1.000E99**

Message

The text editor for entering or editing the message is opened with or by double-clicking on the text field. The message defined here is output in the message window of the **Live display** in the **Workplace** program part if the lower limit value is not reached or if the upper limit value is exceeded.

Selection	**Text (unlimited)**

Message by e-mail

on | off (Default value: **off**)

If this option is enabled, the message is sent to the address defined under **[E-mail]**. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this option is enabled, an acoustic signal will be emitted in addition to the message defined above.

Action

If the lower limit value is not reached or if the upper limit value is exceeded for the monitored result, then one of the following actions will be executed automatically:

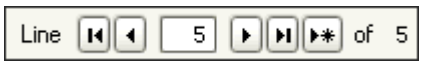
Selection	**Document message** | **Display message** | **Cancel determination series**
Default value	**Display message**

Document message
The message that the result is outside the limit values is saved automatically in the determination.

Display message
After the determination is ended, a message is displayed and you can select whether you want to continue the determination or cancel it. The message that the result is outside the limit values is saved automatically in the determination.

Cancel determination series
The determination series is canceled and a message is displayed. The message that the result is outside the limit values is saved automatically in the determination.

Navigation bar



Navigation bar for changing the monitored results with the following functions:

Jump to the first result. Altered data is adopted.

Jump to previous result. Altered data is adopted.

Jump to the next result. Altered data is adopted.

Jump to the last result. Altered data is adopted.

Jump to a new, empty line. The number of lines is increased by +1 at this time. Altered data is adopted.

Option of entering the desired line number to which the program jumps when pressing **[Enter]**.

5.6.7 Evaluation - Calculated results

5.6.7.1 General

If prerequisites necessary for the calculation have been fulfilled, then the results described in this chapter for each voltammetry command will be calculated automatically and are available as result variables in the formula editor.

If a result cannot be calculated or if the result is faulty, then the respective variable will have the value **invalid**.

All of the results are stored in the software with the following units and with a maximum number of decimal places. The **#** with the unit stands for an automatic selection of a prefix for display or in the result report.

Units for results

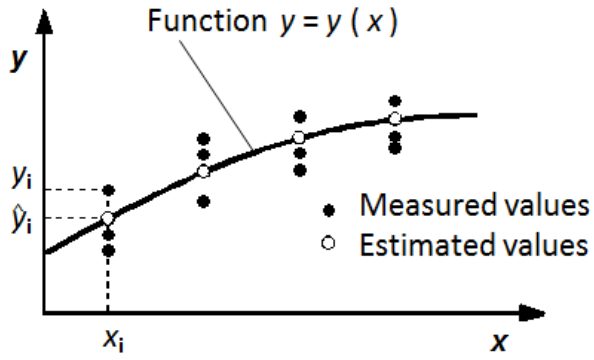
Name	Symbol	Unit
Dimensions	*m*	g
Volume	*D*	L
Mass concentration	*c*	g/L
Volume concentration	*c*	L/L
Substance concentration	*c*	mol/L
Time	*t*	s
Current	*i*	A
Amount of substance	*n*	mol
Electrical charge	*Q*	C = As
Electrical potential	*U*	$V = WA^{-1}$

5.6.7.2 Result calculation from calibration curves and error calculation

For all possible calibration methods, the concentration (e.g. a mass concentration, a volume concentration or a molar concentration) in the measuring vessel must be determined with the help of a calibration curve. This calibration curve itself must be determined by the measurement of solutions for which the concentrations are known. The parameters for a specified linear or nonlinear curve function are then calculated from the value pairs **Evaluation quantity / Concentration**. Because, as a general principle, the calculations of the calibration curves and the results based on them as well as the associated error calculation remain the same for all calibration methods, the calculation procedure that is applied is described in general terms below.

The connection between the variables x and y are sought on the basis of the measured values x_i, y_i, for which it is assumed that the following prerequisites apply:

- The variable x is error-free.
- The variable y is dependent on x and can be described by the function $y = y(x)$.
- The error with the measurement of y is distributed normally and is sufficiently small to be able to apply linear error calculation.



Depending on the calibration method selected, the following model functions are available for the calculation of the **calibration curve** $y = y(x)$:

Selected curve type	Calibration function	Description
Linear regression	$y = a + bx$	Line
Linear regression through 0	$y = bx$	Line through the point of origin
Quadratic regression	$y = a + bx + cx^2$	Nonlinear curve of the 2nd degree

Selected curve type	Calibration function	Description
Quadratic regression through 0	$y = bx + cx^2$	Nonlinear curve of the 2nd degree through the point of origin
Nonlinear regression	$y = a + bx + dx^4$	Nonlinear curve of the 4th degree
Nonlinear regression through 0	$y = bx + dx^4$	Nonlinear curve of the 4th degree through the point of origin
Linear interpolation	$y = a + bx$	Line for which all replications of the two standard solutions which are closest in size to the measured value of the sample are taken into account by the calibration curve.

To calculate the parameters *a*, *b*, *c* and *d*, the Least Squares Fit method is applied, for which the sum of the squared deviations of the measured values y_i from the estimates $\hat{y}_i$ is minimized. The scatter $\sigma_{y,i}$ of the measured values is usually not constant, however, but rather dependent on their values. Therefore, the deviations can be weighted with the factor g_i. Extremely scattered values should be given less weight, more precisely measured values should be given more weight. It is known from statistics that, under the conditions listed, weighting 1/variance = 1/standard deviation^2 = $1/(\sigma_{y,i})^2$ yields the best results. In practice, however, the number of repeated measurements is too low to allow estimates from the measured values σ to be made. A general fact is of help here:

In the case of most measuring instruments, the scatter is comprised of a constant basic part and of a part proportional to the measured quantity. Influences that change over time also exist, however, e.g. the electrode status or the temperature. These usually change only slowly, which is why they can be regarded as constant during the measurement. One can therefore take their influence into account by means of an (unknown) factor *p*, which is multiplied against the basic scatter. Because of the fact that a constant factor has no influence over curve fitting, however, it can be ignored.

$$\sum_{i=1}^{n} g_i (y_i - \hat{y}_i)^2 = Minimum$$

with

$$g_i = \frac{1}{(\sigma_{y,i})^2} = \frac{1}{(p\,\sigma_{0,i})^2}$$

The weighting must adopt a constant value for small measured values in the vicinity of the instrument noise in order to exclude the possibility that small measured values are over-weighted.

The weighting is also appropriate if a calibration curve is acquired across a wide concentration range. Without weighting, the wide scatter of the values with a high concentration would falsify the calibration curve for the small values.

The calculated calibration curve is used with subsequent measurements to determine the associated **result** x_M from the mean value $\bar{y}_M$. The mean value $\bar{y}_M$ and the scattering $\sigma_{y,M}$ of the individual values are defined thereby as follows:

$$\bar{y}_M = \frac{1}{m} \sum_{i=1}^{m} y_{M,i} \qquad \sigma_{y,M} = \sqrt{\frac{\sum_{i=1}^{m} (y_{M,i} - \bar{y}_M)^2}{m - 1}}$$

The estimation of the total error σ_x of the result x_M is carried out with a linear **error calculation** that takes into account not only the error amount from the measurement but also that from the calibration. Because of the fact that the two amounts are statistically independent of one another, it is not the individual errors σ that are added but rather their variances σ^2 (with t = Student factor):

$$(\sigma_x)^2 = t \left[(\sigma_{x,M})^2 + (\sigma_{x,C})^2 \right]$$

The error amount from the measurement itself is calculated from the derivative of the calibration function resolved in accordance with x in accordance with y and the measured scattering $\sigma_{y,M}$ as follows:

$$(\sigma_{x,M})^2 = \left(\frac{\partial x}{\partial y} \right)^2 (\sigma_{y,M})^2$$

The errors of the individual parameters $p_i = a, b, c, d$ of the calibration function used are determining for the calculation of the error amount from the calibration. Because of the fact that these parameters are statistically dependent on one another, all covariances $cov(p_i, p_j)$ must be taken into account here:

$$(\sigma_{x,C})^2 = \sum_{i,j} \frac{\partial x}{\partial p_i} \frac{\partial x}{\partial p_j} cov\,(p_i, p_j)$$

Statistically speaking, only small random samples (<10) are determined for voltammetric measurements from a population with Gaussian distribution. These random samples indicate a Student distribution that is taken into account with the Student factor *t*. If the variance is made up of a number of partial variances, then the Student factor is calculated by means of Welch-Satterthwaite formula approximation. The variance acquired with this procedure is multiplied by t^2; the resulting square root yields the standard deviation of the result.

The Student factor *t* depends on the number of measurements *n*, or, to be more precise, on the number of degrees of freedom $n - f$, for which *n* is the number of measuring points and *f* is the number of estimated parameters. The Student factor *t* is defined as follows for a probability of 68.3%:

$n - f$	t	$n - f$	t	$n - f$	t	Curve type	f
1	1.837	6	1.091	15	1.035	$y = bx$	1
2	1.321	7	1.077	20	1.026	$y = a + bx$	2
3	1.197	8	1.067	30	1.017	$y = bx + cx^2$	2
4	1.142	9	1.059	50	1.010	$y = bx + dx^4$	2
5	1.111	10	1.053	100	1.005	$y = a + bx + cx^2$	3
						$y = a + bx + dx^4$	3

Even though probabilities of 90% and more are usual in statistics, we select 68.3% in order to ensure compatibility with the conventional specification of normally distributed measured values *Mean value* ± *Standard deviation*. With normally distributed values, a standard deviation corresponds to a probability of 68.3%.

The total error **CONCM.ASD** of the result **CONCM** consequently indicates the **CONCM** ± **CONCM.ASD** area in which the true value of **CONCM** may be expected with a probability of 68.3%.

5.6.7.3 Curve results

5.6.7.3.1 Substance name

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.SUBST** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.SUBST** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTRO-LYTE.REP{y}.SUBST** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.SUBST** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.SUBST** (if the voltammetry command is called by **CALL COND**)
Description	Substance name.
Decimal places	–
Unit	–
Remarks	This variable can be used if the substance name is to appear in a message (e.g. in the commands **WAIT** or **REQUEST**).

5.6.7.3.2 Peak potential of a substance

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.POT** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.POT** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.POT** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.POT** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Peak potential.
Decimal places	**0–3–5**
Unit	**V**

5.6.7.3.3 Area

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.AREA** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.AREA** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.AREA** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.AREA** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTRO-LYTE.REP{y}.AREA** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Peak area.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.4 Mean value of the areas of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.AREA.MNV** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.AREA.MNV** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.AREA.MNV** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.AREA.MNV** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTRO-LYTE.AREA.MNV** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Mean value of the peak areas of all replications.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.5 Absolute standard deviation of the areas of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.AREA.ASD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.AREA.ASD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.AREA.ASD** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.AREA.ASD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.AREA.ASD** (if the voltammetry command is called by **CALL COND**)
Description	Absolute standard deviation of the peak areas of all replications.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.6 Relative standard deviation of the areas of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.AREA.RSD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.AREA.RSD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.AREA.RSD** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.AREA.RSD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.AREA.RSD** (if the voltammetry command is called by **CALL COND**)
Description	Relative standard deviation of the peak areas of all replications.
Decimal places	**0–1–6**
Unit	**%**

5.6.7.3.7 Delta of the mean values of the areas of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.AREA.MNVDELTA** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.CALL COND{x}.AREA.MNVDELTA** (if the voltammetry command is called by **CALL COND**)
Description	Difference between the mean value of the peak areas of all replications for the variation **{x}** and the mean value of the peak areas of all replications for the variation **{x-1}**.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.8 Height

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.HGT** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.HGT** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.HGT** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.HGT** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.HGT** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Peak height.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.9 Mean value of the heights of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.HGT.MNV** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.HGT.MNV** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.HGT.MNV** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.HGT.MNV** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTROLYTE.HGT.MNV** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Mean value of the peak heights of all replications.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.10 Absolute standard deviation of the heights of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.HGT.ASD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.HGT.ASD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.HGT.ASD** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.HGT.ASD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.HGT.ASD** (if the voltammetry command is called by **CALL COND**)
Description	Mean value of the peak heights of all replications.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.11 Relative standard deviation of the heights of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.HGT.RSD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.HGT.RSD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.HGT.RSD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.HGT.RSD** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTROLYTE.HGT.RSD** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Mean value of the peak heights of all replications.
Decimal places	**0–1–6**
Unit	**%**

5.6.7.3.12 Delta of the mean values of the heights of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.HGT.MNVDELTA** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.CALL COND{x}.HGT.MNVDELTA** (if the voltammetry command is called by **CALL COND**)
Description	Difference between the mean value of the peak heights of all replications for the variation **{x}** and the mean value of the peak heights of all replications for the variation **{x-1}**.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.13 Measured value

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.MVAL** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.MVAL** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.MVAL** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.MVAL** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTRO-LYTE.REP{y}.MVAL** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Measured value.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.14 Mean value of the measured values of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.MVAL.MNV** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.MVAL.MNV** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.MVAL.MNV** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.MVAL.MNV** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTRO-LYTE.MVAL.MNV** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Mean value of the measured values of all replications.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.15 Absolute standard deviation of the measured values of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.MVAL.ASD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.MVAL.ASD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.MVAL.ASD** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.MVAL.ASD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.MVAL.ASD** (if the voltammetry command is called by **CALL COND**)
Description	Mean value of the measured values of all replications.
Decimal places	**0–2–6**
Unit	**#A**

5.6.7.3.16 Relative standard deviation of the measured values of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.MVAL.RSD** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.MVAL.RSD** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.INTERCEPT.MVAL.RSD** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.MVAL.RSD** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.'Substance name'.ELECTROLYTE.MVAL.RSD** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Mean value of the measured values of all replications.
Decimal places	**0–1–6**
Unit	**%**

5.6.7.3.17 Delta of the mean values of the measured values of all replications

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.MVAL.MNVDELTA** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.CALL COND{x}.MNVDELTA** (if the voltammetry command is called by **CALL COND**)
Description	Difference between the mean value of the measured values of all replications for the variation **{x}** and the mean value of the measured values of all replications for the variation **{x-1}**.
Decimal places	**0–2–6**
Unit	**#C**

5.6.7.3.18 Start base point of the baseline

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.START** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.START** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.START** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.START** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.START** (if the voltammetry command is called by **CALL COND**)
Description	Start base point, where the peak evaluation baseline begins.
Decimal places	**0–3–6**
Unit	**V**

5.6.7.3.19 End base point of the baseline

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.END** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.'Substance name'.VMS.REP{y}.END** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.END** (if the voltammetry command is called by **CALL ELECTROLYTE**) **RS.'Command name'.'Substance name'.INTERCEPT.REP{y}.END** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.'Substance name'.CALL COND{x}.REP{y}.END** (if the voltammetry command is called by **CALL COND**)
Description	End base point, where the peak evaluation baseline ends.
Decimal places	**0–3–6**
Unit	**V**

5.6.7.3.20 Potential of a fixed point

Variable name	**RS.'Command name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL VA**) **RS.'Command name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL VMS**) **RS.'Command name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL INTERCEPT**) **RS.'Command name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL COND**) **RS.'Command name'.VAR{x}.REP{y}.POT** (if the voltammetry command is called by **CALL ELECTROLYTE**)
Description	Potential of a fixed point.
Decimal places	**0–3–5**
Unit	**V**

5.6.7.4 Calibration curve results

Standard results of the calibration curve calculation are referred to as **calibration curve results**. They are created once per substance.

The results of the regression (**CALC0** to **CALC4** and **R2**) are calculated as soon as a sufficient number of calibration points of different concentrations is available for the selected calibration curve type. The variables will

be recalculated once again and their old value will be overwritten as soon as another calibration point is added.

5.6.7.4.1 Coefficient CALC 0

Variable name	**RS.'Command name'.'Substance name'.CALC0**	
Description	Zero-order coefficient of the calibration curve or standard addition curve.	
Decimal places	**0–3–6**	
Unit	**Calibration method DT**:	
		dimensionless
	Calibration method RC:	
		dimensionless
	Additional calibration methods:	
		C (for **Evaluation quantity** = **Area**) **A** (for **Evaluation quantity** = **Height** or **Measured value**)
Remarks	The units of the coefficients are dependent on the units of the x and y axes of the corresponding calibration curve.	

5.6.7.4.2 Coefficient CALC 1

Variable name	**RS.'Command name'.'Substance name'.CALC1**
Description	First-order coefficient of the calibration curve or standard addition curve.
Decimal places	**0–3–6**

Unit	**Calibration method DT**:	
		L^{-1}
	Calibration method RC:	
	Concentration unit of the standard solution = **#g/L**	**L · g^{-1}**
	Concentration unit of the standard solution = **#L/L**	dimensionless
	Concentration unit of the standard solution = **#mol/L**	**L · mol^{-1}**
	Additional calibration methods:	
	Concentration unit of the standard solution = **#g/L**	**A · L · g^{-1}** (for **Evaluation quantity** = **Height** or **Measured value**) **C · L · g^{-1}** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = **#L/L**	**A** (for **Evaluation quantity** = **Height** or **Measured value**) **C** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = **#mol/L**	**A · L · mol^{-1}** (for **Evaluation quantity** = **Height** or **Measured value**) **C · L · mol^{-1}** (for **Evaluation quantity** = **Area**)
Remarks	The units of the coefficients are dependent on the units of the x and y axes of the corresponding calibration curve.	

5.6.7.4.3 Coefficient CALC 2

Variable name	**RS.'Command name'.'Substance name'.CALC2**
Description	Second-order coefficient of the calibration curve or standard addition curve.
Decimal places	**0–3–6**

Unit	**Calibration method DT**:	
		L^{-2}
	Calibration method RC:	
	Concentration unit of the standard solution = **#g/L**	**$L^2 \cdot g^{-2}$**
	Concentration unit of the standard solution = **#L/L**	dimensionless
	Concentration unit of the standard solution = **#mol/L**	**$L^2 \cdot mol^{-2}$**
	Additional calibration methods:	
	Concentration unit of the standard solution = **#g/L**	**A** · **L^2** · **g^{-2}** (for **Evaluation quantity** = **Height** or **Measured value**) **C** · **L^2** · **g^{-2}** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = **#L/L**	**A** (for **Evaluation quantity** = **Height** or **Measured value**) **C** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = **#mol/L**	**A** · **L^2** · **mol^{-2}** (for **Evaluation quantity** = **Height** or **Measured value**) **C** · **L^2** · **mol^{-2}** (for **Evaluation quantity** = **Area**)
Remarks	The units of the coefficients are dependent on the units of the x and y axes of the corresponding calibration curve.	

5.6.7.4.4 Coefficient CALC 4

Variable name	**RS.'Command name'.'Substance name'.CALC4**
Description	Fourth-order coefficient of the calibration curve or standard addition curve.
Decimal places	**0–3–6**

Unit	**Calibration method DT**:	
		L^{-4}
	Calibration method RC:	
	Concentration unit of the standard solution = #g/L	**$L^4 \cdot g^{-4}$**
	Concentration unit of the standard solution = #L/L	dimensionless
	Concentration unit of the standard solution = #mol/L	**$L^4 \cdot mol^{-4}$**
	Additional calibration methods:	
	Concentration unit of the standard solution = #g/L	**A** · **L^4** · **g^{-4}** (for **Evaluation quantity** = **Height** or **Measured value**) **C** · **L^4** · **g^{-4}** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = #L/L	**A** (for **Evaluation quantity** = **Height** or **Measured value**) **C** (for **Evaluation quantity** = **Area**)
	Concentration unit of the standard solution = #mol/L	**A** · **L^4** · **mol^{-4}** (for **Evaluation quantity** = **Height** or **Measured value**) **C** · **L^4** · **mol^{-4}** (for **Evaluation quantity** = **Area**)
Remarks	The units of the coefficients are dependent on the units of the x and y axes of the corresponding calibration curve.	

5.6.7.4.5 Coefficient of determination R^2

Variable name	**RS.'Command name'.'Substance name'.R2**
Description	Coefficient of determination R^2.
Decimal places	**0–5–6**
Unit	–

Calculation

$$R^2 = \frac{\sum_{i=1}^{n}(y_i - \bar{y})^2 - \sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$$

Variable	Description
R^2	Coefficient of determination.
y_i	y value of calibration point *i*.
$\bar{y}$	Mean value of all y values of the calibration points.
$\hat{y}_i$	The y value of calibration point *i* calculated with the calibration curve.

5.6.7.5 Volume results

5.6.7.5.1 Total volume

Variable name	**RS.VTOT**
Description	Current total volume in the measuring vessel.
Decimal places	**0–3–6**
Unit	**#L**
Remarks	The value of these variables is automatically set to **0** at the start of a determination. The respective defined addition volume for the **RS.VTOT** variable is added with each command **ADD AUX** (only if the option **Include volume in calculation** is activated), **ADD STD**, **ADD SAMPLE** and **ADD SAMPLE DT**. With the **SET TOTAL VOLUME** command, any value can be manually entered for the total volume in the measuring vessel (e.g. after automatic rinsing or a manual exchange of solution).

5.6.7.5.2 Total volume per variation

Variable name	**RS.'Command name'.VAR{x}.VTOT**
Description	Current total volume in the measuring vessel for variation **{x}**.
Decimal places	**0–3–6**
Unit	**#L**

5.6.7.6 Concentration results

5.6.7.6.1 Substance concentration in the sample

Variable name	**RS.'Command name'.'Substance name'.CONC**
Description	Substance concentration in the sample.
Decimal places	**0–2–6**

Unit	Sample amount unit	Unit of standard solution		
		#g/L	#mol/L	#L/L
	#L	#g/L	#mol/L	#L/L
	#g	#g/g	#mol/g	#L/g
	Text	#g/Text	#mol/Text	#L/Text

Calculation

$$CONC = \frac{CONCM \cdot VAR\{1\}.VTOT}{SAMPLEAMOUNT} \cdot \frac{VDILUTION}{VANALYSIS}$$

Variable	Description
CONC	Substance concentration in the sample.
CONCM	Substance concentration in the measuring vessel *(see chapter 5.6.7.7.15, page 775)*.
VTOT	Total volume in the measuring vessel at the moment of the sample measurement *(see chapter 5.6.7.5.1, page 766)*.
SAMPLEA-MOUNT	Sample amount *(see page 99)*.
VDILUTION	Volume after dilution of the sample in an external vessel *(see page 100)*.
VANALYSIS	Volume that is removed from the diluted sample solution (the dilution volume) and used for analysis in the measuring vessel *(see page 100)*.

5.6.7.6.2 Unit of the concentration of the substance in the sample

Variable name	RS.'Command name'.'Substance name'.CONC.UNI
Description	Unit of the concentration of the substance in the sample.
Decimal places	0–2–6
Unit	*(see chapter 5.6.7.6.1, page 766)*

5.6.7.6.3 Absolute standard deviation of the concentration of the substance in the sample

Variable name	**RS.'Command name'.'Substance name'.CONC.ASD**
Description	Absolute standard deviation of the substance concentration in the sample.
Decimal places	**0–2–6**
Unit	same as for substance concentration in the sample *(see chapter 5.6.7.6.1, page 766)*

5.6.7.6.4 Relative standard deviation of the concentration of the substance in the sample

Variable name	**RS.'Command name'.'Substance name'.CONC.RSD**
Description	Relative standard deviation of the substance concentration in the sample.
Decimal places	**0–1–6**
Unit	**%**

5.6.7.7 Special results for DT, MLAT, LAT and RC

5.6.7.7.1 Standardized area

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.AREANORM** (with call-up of the command by **CALL VA**) Calibration method **DT**: **RS.'Command name'.'Substance name'.VMS.REP{y}.AREANORM** (with call-up of the command by **CALL VMS**) Calibration method **RC**: **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.AREANORM** (if the command is called by **CALL ELECTROLYTE**)
Description	Standardized area of a peak.
Data type	Number
Decimal places	**0–2–6**
Unit	**–**
Remark	Only for **Calibration method** = **DT**, **RC**.

Calculation

$$AREANORM = \frac{AREA}{AREA.MNV}$$

Variable	Description
AREANORM	Standardized area.
AREA	Peak area = **RS.'Command name'.'Substance name'.VAR{x}.REP{y}.AREA**.
AREA.MNV	Mean value of the peak areas of all replications for VMS = **RS.'Command name'.'Substance name'.VMS.AREA.MNV** (for **Calibration method** = **DT**). Mean value of the peak areas of all replications for ELECTROLYTE = **RS.'Command name'.'Substance name'.ELECTROLYTE.AREA.MNV** (for **Calibration method** = **RC**).

5.6.7.7.2 Standardized height

Variable name	**RS.'Command name'.'Substance name'.VAR{x}.REP{y}.HGTNORM** (with call-up of the command by **CALL VA**) Calibration method **DT**: **RS.'Command name'.'Substance name'.VMS.REP{y}.HGTNORM** (with call-up of the command by **CALL VMS**) Calibration method **RC**: **RS.'Command name'.'Substance name'.ELECTROLYTE.REP{y}.HGTNORM** (if the command is called by **CALL ELECTROLYTE**)
Description	Standardized height of a peak.
Data type	Number
Decimal places	**0–2–6**
Unit	**–**
Remark	Only for **Calibration method** = **DT**, **RC**.

Calculation

$$HGTNORM = \frac{HGT}{HGT.MNV}$$

Variable	Description
HGTNORM	Standardized height.
HGT	Peak height = **RS.'Command name'.'Substance name'.VAR{x}.REP{y}.HGT**.
HGT.MNV	Mean value of the peak heights of all replications for VMS = **RS.'Command name'.'Substance name'.VMS.HGT.MNV** (for **Calibration method** = **DT**). Mean value of the peak heights of all replications for ELECTROLYTE = **RS.'Command name'.'Substance name'.ELECTROLYTE.HGT.MNV** (for **Calibration method** = **RC**).

5.6.7.7.3 Effective addition volume of the standard solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSTD
Description	Effective addition volume of the added standard solution for the evaluation ratio *(see glossary, page 1059)*.
Decimal places	**0–2–6**
Unit	**#L**
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**. This value is required as x value for the creation of the calibration curve.

Calculation

$$VEFFSTD = \frac{VOL(STD) * VTOT(VMS, Cal)}{VTOT(VMS, Cal) + VOL(STD)}$$

Variable	Description
VEFFSTD	Effective addition volume of the added standard solution for the evaluation ratio.
VOL(STD)	Uncorrected addition volume of the standard solution for the evaluation ratio.
VTOT(VMS, Cal)	Total volume in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the command **CALL VMS** at the moment of calibration.

5.6.7.7.4 Unit of the effective addition volume of the standard solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSTD.UNI
Description	Unit of the effective addition volume of the added standard solution for the evaluation ratio.
Decimal places	–
Unit	**g/L**, **L/L** or **mol/L** (depending on the unit of the standard solution)
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

5.6.7.7.5 Absolute standard deviation of the effective addition volume of the standard solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSTD.ASD
Description	Absolute standard deviation of the effective addition volume of the added standard solution for the evaluation ratio.
Decimal places	**0–2–6**
Unit	**#L**
Remarks	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

5.6.7.7.6 Relative standard deviation of the effective addition volume of the standard solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSTD.RSD
Description	Relative standard deviation of the effective addition volume of the added standard solution for the evaluation ratio.
Decimal places	**0–1–6**
Unit	**%**
Remarks	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

5.6.7.7.7 Effective addition volume of the sample solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSMPL
Description	Effective addition volume of the added sample solution for the evaluation ratio.
Decimal places	**0–2–6**
Unit	**#L**

Remarks	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

Calculation

$$VEFF(SMPL) = \frac{VOL(SMPL) * VTOT(VMS, SMPL)}{VTOT(VMS, SMPL) + VOL(SMPL)}$$

Variable	Description
VEFF(SMPL)	Effective addition volume of the added sample solution for the evaluation ratio.
VOL(SMPL)	Uncorrected addition volume of the sample for the evaluation ratio.
VTOT(VMS,SMPL)	Total volume in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the command **CALL VMS** at the moment of calibration.

5.6.7.7.8 Unit of the effective addition volume of the sample solution for the evaluation ratio

Variable name	**RS.'Command name'.'Substance name'.VEFFSMPL.UNI**
Description	Unit of the effective addition volume of the added sample solution for the evaluation ratio.
Decimal places	–
Unit	**g/L**, **L/L** or **mol/L** (depending on the unit of the standard solution)
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

5.6.7.7.9 Absolute standard deviation of the effective addition volume of the sample solution for the evaluation ratio

Variable name	**RS.'Command name'.'Substance name'.VEFFSMPL.ASD**
Description	Absolute standard deviation of the effective addition volume of the added sample solution for the evaluation ratio.
Decimal places	**0–2–6**
Unit	**#L**
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

5.6.7.7.10 Relative standard deviation of the effective addition volume of the sample solution for the evaluation ratio

Variable name	RS.'Command name'.'Substance name'.VEFFSTD.RSD
Description	Relative standard deviation of the effective addition volume of the added sample solution for the evaluation ratio.
Data type	Number
Decimal places	0–1–6
Unit	%
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

5.6.7.7.11 Calibration factor DT

Variable name	RS.'Command name'.'Substance name'.CALFACT
Description	The calibration factor DT corresponds to the concentration of the standard solution in the measuring vessel for the evaluation ratio.
Decimal places	0–2–6
Unit	#g/L, #L/L, #mol/L The unit corresponds to the added standard solution.
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

Calculation

$$CALFACT = \frac{CONC(STD) \cdot VOL(STD)}{VTOT(VMS, Cal) + VOL(STD)} = \frac{CONC(STD) \cdot VEFFSTD}{VTOT(VMS, Cal)}$$

Variable	Description
CALFACT	Calibration factor DT.
CONC(STD)	Concentration of the standard solution for creating the calibration curve.
VOL(STD)	Uncorrected addition volume of the standard solution for the evaluation ratio.
VTOT(VMS, Cal)	Total volume in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the command **CALL VMS** at the moment of calibration.

Variable	Description
VEFFSTD	Effective addition volume of the added standard solution for the evaluation ratio.

5.6.7.7.12 Unit of the calibration factor DT

Variable name	RS.'Command name'.'Substance name'.CALFACT.UNI
Description	Unit of the calibration factor DT.
Decimal places	–
Unit	**g/L**, **L/L** or **mol/L** (depending on the unit of the standard solution)
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

5.6.7.7.13 Absolute standard deviation of the calibration factor DT

Variable name	RS.'Command name'.'Substance name'.CALFACT.ASD
Description	Absolute standard deviation of the calibration factor DT.
Decimal places	0–2–6
Unit	#g/L, #L/L, #mol/L
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

Calculation

$$CALFACT.ASD = \frac{CONC(STD) * VEFFSTD.ASD}{VTOT(VMS, Cal)}$$

Variable	Description
CALFACT.ASD	Absolute standard deviation of the calibration factor DT.
CONC(STD)	Concentration of the standard solution for creating the calibration curve.
VEFFSTD.ASD	Absolute standard deviation of the effective addition volume of the standard solution for the evaluation ratio.

Variable	Description
VTOT(VMS, Cal)	Total volume in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the command **CALL VMS** at the moment of calibration.

5.6.7.7.14 Relative standard deviation of the calibration factor DT

Variable name	**RS.'Command name'.'Substance name'.CALFACT.RSD**
Description	Relative standard deviation of the calibration factor DT.
Decimal places	**0–1–6**
Unit	**%**
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Standard**.

5.6.7.7.15 Concentration of the substance in the measuring vessel

Variable name	**RS.'Command name'.'Substance name'.CONCM**
Description	Substance concentration in the measuring vessel.
Decimal places	**0– 2– 6**
Unit	**g/L**, **L/L** or **mol/L** (depending on the unit of the standard solution)
Remark	For all calibration methods except **DT**.

5.6.7.7.16 Unit of the substance concentration in the measuring vessel

Variable name	**RS.'Command name'.'Substance name'.CONCM.UNI**
Description	Unit of the substance concentration in the measuring vessel.
Decimal places	**0– 2– 6**
Unit	**g/L**, **L/L** or **mol/L** (depending on the unit of the standard solution)
Remark	For all calibration methods except **DT**.

5.6.7.7.17 Absolute standard deviation of the substance concentration in the measuring vessel

Variable name	**RS.'Command name'.'Substance name'.CONCM.ASD**
Description	Absolute standard deviation of the substance concentration in the measuring vessel.
Decimal places	**0–2–6**

Unit	The unit corresponds to the *Unit of the substance concentration in the measuring vessel*.
Remark	For all calibration methods except **DT**.

5.6.7.7.18 Relative standard deviation of the substance concentration in the measuring vessel

Variable name	**RS.'Command name'.'Substance name'.CONCM.RSD**
Description	Relative standard deviation of the substance concentration in the measuring vessel.
Decimal places	**0–1–6**
Unit	**%**
Remark	For all calibration methods except **DT**.

5.6.7.7.19 Substance quantity

Variable name	**RS.'Command name'.'Substance name'.AMOUNT**
Description	Mass, amount or volume of a substance that has entered the measuring vessel via the sample amount.
Decimal places	**0– 2– 6**
Unit	The unit corresponds to the dividend of the *Unit of the substance concentration in the measuring vessel*.
Remark	For all calibration methods except **DT**.

Calculation

$$AMOUNT = CONCM * VAR\{1\}.VTOT$$

Variable	Description
CONCM	Substance concentration in the measuring vessel.
VAR{1}.VTOT	Total volume in the measuring vessel at the moment of the sample measurement.

5.6.7.7.20 Suppressor concentration in the sample

Variable name	**RS.'Command name'.'Substance name'.CONC**
Description	Concentration of suppressor in the sample.
Unit	Results from the unit of the suppressor standard solution used **#g/L**, **#mol/L** or **#L/L**.

Calculation

The following condition applies for the evaluation ratio for the **DT** calibration method:

$$\frac{CONC(STD)*VEFFSTD}{VTOT(VMS,Cal)+VEFFSTD}=\frac{CONC(SMPL)*VEFFSMPL}{VTOT(VMS,SMPL)+VEFFSMPL}$$

$$CONC(SMPL)=\frac{CONC(STD)*VEFFSTD}{VTOT(VMS,Cal)+VEFFSTD}*\frac{VTOT(VMS,SMPL)+VEFFSMPL}{VEFFSMPL}$$

Calibration factor

$$CALFACT=\frac{CONC(STD)*VEFFSTD}{VTOT(VMS,Cal)+VEFFSTD}$$

Suppressor concentration in the sample solution without dilution:

$$CONC(SMPL)=CALFACT*\frac{VTOT(VMS,SMPL)+VEFFSMPL}{VEFFSMPL}$$

Suppressor concentration in the sample solution with dilution:

$$CONC(SMPL)=CALFACT*\frac{VTOT(VMS,SMPL)+VEFFSMPL}{VEFFSMPL}*\frac{Dilution\ \ Volume}{Analysis\ \ Volume}$$

Variable	Description
$CONC(STD)$	Concentration of the suppressor standard solution for creating the calibration curve.
$VEFFSTD$	Effective addition volume of the suppressor standard solution on the evaluation criterion.
$VTOT(VMS,Cal)$	Total volume (calibration) in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the **CALL VMS** command during a calibration.

Variable	Description
CONC (SMPL)	Suppressor concentration in the sample solution.
VEFFSMPL	Effective addition volume of the sample solution on the evaluation criterion.
VTOT (VMS, SMPL)	Total volume (sample solution) in the measuring vessel at the moment of the measurement of the VMS by calling the measuring command via the **CALL VMS** command during a sample determination.
CALFACT	Calibration factor DT. It corresponds to the concentration of the standard solution in the measuring vessel for the evaluation ratio.

5.6.7.7.21 Absolute standard deviation of the concentration of suppressor in the sample

Variable name	RS.'Command name'.'Substance name'.CONC.ASD
Description	Absolute standard deviation of the concentration of suppressor in the sample.
Decimal places	0– 2– 6
Unit	same as for substance concentration in the sample *(see chapter 5.6.7.7.20, page 776)*
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

5.6.7.7.22 Relative standard deviation of the concentration of suppressor in the sample

Variable name	RS.'Command name'.'Substance name'.CONC.RSD
Description	Relative standard deviation of the concentration of suppressor in the sample.
Decimal places	0–1–6
Unit	%
Remark	Only for **Calibration method** = **DT** and **Sample type** = **Sample**.

6 Configuration

6.1 Configuration - General

6.1.1 Configuration - Definition

Program part: **Configuration**

Definition

The term **Configuration** is used in ***viva*** to refer to all settings that apply to all methods, i.e. settings for devices, solutions, dosing units, sensors, common variables, global variables and rack data. The configuration also includes methods, security settings, user administration, program administration and templates.

Organization

All configuration data is saved in the **configuration database**. In the case of local server systems (**viva full**), this is found in the program directory of the computer on which the program was installed. In the case of client/server systems (**viva multi**), the configuration database is saved centrally on the server and contains all configuration data of all computers (clients) which are connected to this server.

6.1.2 Configuration - User interface

Program part: **Configuration**

Configuration icon

Clicking on the configuration symbol in the vertical bar at the left opens the **Configuration** program part; the database symbol is shown in color at the same time.

Elements

The user interface of the **Configuration** program part comprises the following elements:

- Configuration-specific menu bar.
- Configuration-specific toolbar.
- Main window, in which up to six subwindows can be displayed.

6.1.3 Configuration - Menu bar

6.1.3.1 Configuration - Main menus

Program part: **Configuration**

The menu bar in the **Configuration** program part contains the following main menu items:

- *File*
  Exporting, importing, backing up and restoring configuration data.
- *View*
  Changing layout, loading views, saving views, quick access to subwindows.
- *Tools*
  User administration, security settings, program administration, templates, options.
- *Help*
  Opening program help, displaying program information.

6.1.3.2 Configuration - File menu

Program part: **Configuration**

Export...	Export configuration data *(see chapter 6.3.1.1, page 805)*.
Import...	Import configuration data *(see chapter 6.3.1.2, page 807)*.
Backup ▶	
Automatically	Back up configuration data automatically *(see chapter 6.3.2.1, page 810)*.
Manually	Back up configuration data manually *(see chapter 6.3.2.2, page 811)*.
Print (PDF)... ▶	
User administration	Outputs the user administration data as PDF file *(see chapter 6.2.1.1, page 787)*.
Security settings	Outputs the security settings as PDF file *(see chapter 6.2.2.1, page 794)*.
Logout...	Logs out user *(see chapter 2.2.3, page 13)*
Exit	Exits the program.

6.1.3.3 Configuration - View menu

Program part: **Configuration**

Change layout...	Modify layout of loaded configuration view *(see chapter 3.1.7.2, page 91)*.
Load view...	Load a saved configuration view *(see chapter 3.1.7.3, page 92)*.
Save view...	Save current configuration view *(see chapter 3.1.7.4, page 92)*.
Quick access	Open a subwindow not contained in the current configuration view.
Toolbar	Activates/deactivates the toolbar display.

6.1.3.4 Configuration - Tools menu

Program part: **Configuration**

User administration...	Manage users and user groups with access permissions and options *(see chapter 6.2.1, page 787)*.
Security settings...	Options for login and password protection *(see chapter 6.2.2, page 794)*.
Program administration...	General settings for local server and client/server settings *(see chapter 6.2.3, page 800)*.
Templates ►	
Input lines...	Generate templates for scanning remote lines *(see chapter 6.3.3.1, page 812)*.
Output lines...	Generate templates for setting remote lines *(see chapter 6.3.3.2, page 814)*.
E-mail templates...	Create templates for sending e-mails *(see chapter 6.3.3.3, page 816)*.
Options...	Set program options *(see chapter 6.3.4, page 818)*.

6.1.3.5 Help menu

Program part: **Workplace / Database / Method / Configuration**

viva Help	Opens viva Help.
About	Displays information about the program and the installation.

6.1.4 Configuration - Toolbar

Program part: **Configuration**

	Modify layout of loaded configuration view *(see chapter 3.1.7.2, page 91)*.
	Load a saved configuration view *(see chapter 3.1.7.3, page 92)*.
	Save current configuration view *(see chapter 3.1.7.4, page 92)*.
	Manage users and user groups with access permissions and options *(see chapter 6.2.1, page 787)*.
	Options for login and password protection *(see chapter 6.2.2, page 794)*.
	Logs out user *Login / password protection*
	Opens viva Help.

6.1.5 Configuration - Subwindows

Program part: **Configuration**

Selection

The following subwindows can be displayed in the main window:

- *Devices*
  Shows the automatically recognized and manually added devices.
- *Solutions*
  Shows the auxiliary and standard solutions.
- *Dosing units*
  Shows the automatically recognized dosing units.
- *Sensors/electrodes*
  Shows the data for all defined sensors and electrodes.
- *Colorimetric sensors*
  Shows the data for all defined colorimetric sensors.
- *Common variables*
  Shows the data for all defined common variables.
- *Global variables*
  Shows the data for all defined global variables.
- *Rack data*
  Shows the data for all Metrohm sample racks.

Display

The subwindows can be enlarged or made smaller to suit by dragging the separating bar between the windows.

By clicking on the ❑ button above at the right, the subwindows can be maximized so that only one subwindow is displayed in the main window. The original view of all subwindows is restored by clicking on the ❑ button in the maximized subwindow once again.

Those subwindows that are not contained in the current view can be displayed as single windows using the **View ► Quick access** menu item.

6.1.6 Configuration - Functions

Program part: **Configuration**

The following functions can be carried out in the **Configuration** program part:

Views

- *Changing the layout of the configuration view*
- *Loading configuration view*
- *Saving configuration view*
- *Renaming configuration view*
- *Deleting configuration view*

User administration

- *User groups*
- *Access permissions*
- *Options*
- *Users*

Security settings

- *Login / password protection*

Program administration

- *Backup directories*
- *Clients*
- *Licenses*

Export/import of configuration data

- *Exporting configuration data*
- *Importing configuration data*

Backing up / restoring configuration data

- *Backing up configuration data automatically*
- *Backing up configuration data manually*
- *Restoring configuration data*

Templates

- *E-mail templates*

Options

- *General program properties*

6.1.7 Views

6.1.7.1 Views - General

Program part: **Workplace / Database / Configuration**

Definition

The contents and design of the main window in the **Workplace**, **Database** and **Configuration** program parts is called a **View**. The following elements belong to a view:

- Number, arrangement, sequence and size of the subwindows.
- Representation within the individual subwindows, i.e. column sequence, column width, sorting and filter.

Functions

The following functions are possible for views:

- *Changing the layout*
  Defining the number, arrangement and sequence of the subwindows for the current view.
- *Saving a view*
  Saving the current view.
- *Loading a view*
  Loading a saved view.
- *Renaming a view*
  Renaming a saved view.
- *Deleting a view*
  Deleting a saved view.

Saving automatically

The current view will be saved automatically when the program is closed if the corresponding option is activated under **Save on closing** in the **Configuration** program part under **Tools ► Options...** on the **Save** tab.

Loading automatically

By default, the view that is saved when the program is closed will be loaded automatically the next time that the program is opened. As an alternative, a default view that is loaded automatically the first time that the program part is opened can be defined for each user group.

By default, views are opened with the following subwindows with the very first program start:

- **Workplace**
  Run, **Method**, **Live display 1**, **Curves 1**
- **Database**
  Determination overview, **Curves 1**, **Information**, **Results**
- **Configuration**
  Devices, **Solutions**, **Dosing units**, **Sensors/Electrodes**

Export/import

Views can also be exported and imported. In this way these views can be exchanged between different client/server systems.

6.1.7.2 Changing the layout

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Change layout... ▶ Change layout**

The **Change layout** dialog window is opened with the symbol or the **View ▶ Change layout...** menu item.

Select layout

Selection of a graphical symbol for the number and arrangement of the subwindows.

Selection	**'Selection of the possible combinations'**

Available subwindows

Display of the subwindows that are still available for being displayed in the view.

Selection	**'Selection of the subwindows'**

Displayed subwindows

Display of the subwindows that are shown in the view.

Selection	**'Subwindow'**

Adds the selected subwindow to the view.

Removes the selected subwindow from the view.

Moves the selected subwindow upward (modifies sequence).

Moves the selected subwindow downward (modifies sequence).

6.1.7.3 Loading a view

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Load view... ▶ Load view**

The **Load view** dialog window is opened with the symbol or the **View ▶ Load view...** menu item.

Name

Name of the view to be loaded.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Load]

Loads the selected view.

6.1.7.4 Saving a view

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Save view... ▶ Save view**

The **Save view** dialog window is opened with the symbol or the **View ▶ Save view...** menu item.

Name

Name under which the view is to be saved.

[Rename]

Rename the selected view.

[Delete]

Deletes the selected view.

[Save]

Saves the view under the given name. The saved views are globally valid and available for client/server systems.

6.1.7.5 Renaming a view

Dialog window: **Workplace / Database / Configuration ▶ View ▶ Load view... ▶ Load view ▶ [Rename] ▶ Rename view**

To be able to rename a view, either open the **Load view** or the **Save view** dialog window and click on the **[Rename]** button. The **Rename view** window opens afterwards.

Rename view 'Name' to

Entry of a new name for the view.

Entry	**50 characters**

6.1.7.6 Deleting a view

Function: **Workplace / Database / Configuration ► View ► Load/save view… ► [Delete]**

To delete a view, open either the **Load view** or **Save view** dialog window and press the **[Delete]** button. The delete procedure must then be confirmed.

6.2 Administration

6.2.1 User administration

6.2.1.1 User administration

Dialog window: **Configuration ► Tools ► User administration...**

Overview

User groups and their members can be managed in the **User administration** dialog window. Access permissions for menu items and functions and default views for the individual program parts can be defined for each user group. In the case of client/server systems, the user administration is globally valid for all connected clients (central user administration).

The three user groups **Administrators** (with the user **Admin1**), **Users** and **Removed users** (each without any users) are automatically created at the time of installation. All groups can be renamed; the **Administrators** group is the only group that cannot be deleted.

The user administration data can be exported and imported. In this way this data can be exchanged between different client/server systems.

The user administration data can be output as a PDF file with the **File ► Print (PDF)... ► User administration** menu item.

Structure

The **User administration** dialog window is divided into two parts, the size of which can be modified with the mouse. The user groups with their assigned users are listed in a tree in the left-hand part; the right-hand side shows details of the selected items.

Each user group, with the exception of the **Removed users** group, contains the following items:

- *Access permissions*
  Assignment of access permissions to the four program parts and their menu bars.
- *Options*
  Definition of the view for the individual program parts.

- *Users*
  Details regarding the user.

Functions

The following functions can be carried out in the **User administration** dialog window:

- *Adding user groups*
- *Copying user groups*
- *Renaming user groups*
- *Deleting user groups*
- *Defining access permissions for user groups*
- *Defining options for user groups*
- *Adding users*
- *Setting start password for new user*
- *Deactivating users*
- *Activating users*
- *Removing users*

6.2.1.2 User groups

6.2.1.2.1 User groups - Details

Dialog window: **Configuration ► Tools ► User administration...**

If a user group is selected in the left-hand side of the **User administration** dialog window, then details on this user group will be shown on the right-hand side together with a table containing all its members.

Group data

Group name

Shows the name of the user group.

Description

Description of the user group.

Entry	**256 characters**

[Rename group]

Rename the selected user group.

[Delete group]

Deletes the selected user group.

[Copy group]

Copy the selected user group.

[Add group]

Add a new user group.

Group members

The table showing the group members contains information about all members of the selected user group. The table cannot be edited or sorted.

User

Short name of the user.

Full name

Full name of the user.

Status

Current user status.

Selection	**enabled** | **disabled**

enabled
The user can log in as usual.

disabled
The user can no longer log in. The administrator must first assign him or her the status **enabled** and provide him or her with a new start password.

[Add user]

Add a new user to the user group.

6.2.1.2.2 User administration - Access permissions

Dialog window: **Configuration ► Tools ► User administration...**

If the **Access rights** item is highlighted for a user group in the left-hand part of the **User administration** dialog window, then the access permissions of this group for program parts, menu items and functions will be shown as a tree in the right-hand side of the window and can be modified there. If one item is deactivated, then all the subitems belonging to it will also be automatically deactivated. If a subitem, e.g. the **Tools** menu, is deactivated in the configuration, then the box for the configuration is colored gray. Blocked functions are deactivated for the particular users, i.e. shown in gray.

Meaning of the symbols:

	Expand view	P	Program part
	Collapse view	M	Menu item
	Full access to function(s)	F	Function
	Limited access to function(s)		
☐	No access to function(s)		

NOTICE

All access permissions are switched on by default for the **Administrators** group and cannot be modified.

6.2.1.2.3 User administration - Options

Dialog window: **Configuration ► Tools ► User administration...**

If the **Options** item is highlighted for a user group in the left-hand part of the **User administration** dialog window, then options for this group will be shown in the right-hand part and can be modified there.

Default workplace view

Selection of the view that will open in the **Workplace** program part as the default setting when the user logs in.

Selection	**Selection of the defined workplace views**

Default database view

Selection of the view that will open in the **Database** program part as the default setting when the user logs in.

Selection	**Selection of the defined database views**

Default configuration view

Selection of the view that will open in the **Configuration** program part as the default setting when the user logs in.

Selection	**Selection of the defined configuration views**

Default method group

Selection of the method group to be opened as the default setting for opening and saving methods.

Selection	**Selection of the defined method groups**

6.2.1.2.4 Adding a user group

Dialog window: **Configuration ► Tools ► User administration... ► [Add group] ► Add group**

In order to add a new user group with default settings, select an existing group and click on either the context-sensitive **Add group** menu item or the **[Add group]** button. Afterwards, the **Add group** dialog window opens.

Group name

Name of the new group.

Entry	**24 characters**

A new group with default settings containing no users is created under this name with **[OK]**. The **Description** field and the table of group members are empty.

6.2.1.2.5 Copying a user group

Dialog window: **Configuration ▶ Tools ▶ User administration... ▶ [Copy group] ▶ Copy group**

Dialog window:

In order to copy a user group and save it under a new name, select an existing group and click on either the context-sensitive menu item **Copy group** or the **[Copy group]** button. Afterwards, the **Copy group** dialog window opens.

Group name

Name of the new group.

Entry	**24 characters**

Clicking on **[OK]** creates a new group under this name that has the same properties as the selected group; however, it does not contain any users. The **Description** field and the table of group members are empty.

6.2.1.2.6 Renaming a user group

Dialog window: **Configuration ▶ Tools ▶ User administration... ▶ [Rename group] ▶ Rename group**

In order to rename a selected user group, click on either the context-sensitive **Rename group** menu item or the **[Rename group]** button. Afterwards, the **Rename group** dialog window opens.

Group name

Entry of the new group name.

Entry	**24 characters**

6.2.1.2.7 Deleting a user group

Function: **Configuration ▶ Tools ▶ User administration... ▶ [Delete group]**

In order to delete a selected user group, click on either the context-sensitive **Delete group** menu item or the **[Delete group]** button. The group is then deleted.

NOTICE

Deleting user groups is only possible if the group no longer contains any users.

6.2.1.3 User

6.2.1.3.1 User - Details

Dialog window: **Configuration ► Tools ► User administration...**

If a user in a user group is selected in the left-hand side of the **User administration** dialog window, then details on this user will be shown on the right-hand side.

User

Shows the short name of the user that must be entered in the **User** field at the time of login. This name is defined when a new user is created and cannot be subsequently modified.

Entry	**24 characters**

Full name

Full name of the user.

Entry	**256 characters**

Status

Shows the current status of the user. Only users of the **Administrators** group can modify the status.

Selection	**enabled** | **disabled** | **removed**

enabled
Users with the **enabled** status can log in as usual. An exception is the first login after the change in status from **disabled** or **removed** to **enabled**. If this is the case, then a **Start password** must be assigned with which this user can log in again.

disabled
Users with the **disabled** status can no longer log in. They will be automatically set to this status as soon as the number of login attempts defined in the **Security settings** has been exceeded.

removed
Users with the **removed** status can no longer log in. If the set status of a user is changed from **enabled** or **disabled** to **removed**, then the user will automatically be moved to the **Removed users** group. If the status of a removed user is changed back to **enabled** or **disabled**, then a dialog window will appear for selecting the group to which the user is to be assigned.

Start password

The invisible start password is displayed with six ***** characters which must be entered by a new user the first time that new user logs in or after a change in status from **disabled** or **removed** to **enabled**. The administra-

tor must assign a new start password when adding a new user or when changing the status to **enabled**. If the user has logged in with the start password and then entered a new password afterwards, then the start password will be deleted again.

Entry	**50 characters**

[Set start password]

Opens the **Start password** dialog window. This button is active only for users with **enabled** status. If a user has forgotten his or her password, then the administrator can assign a new start password here.

User group

Current user group. The administrator can modify the group assignment of the user. The user is automatically moved to the new group. A user can also be moved to a new group with drag and drop.

Selection	**Selection of the defined user groups**

Remarks

Possibility of entering additional user information (e.g. function, address).

Entry	**1,000 characters**

6.2.1.3.2 Adding a user

Dialog window: **Configuration ▶ Tools ▶ User administration... ▶ [Add user] ▶ Add user**

There are two possible ways to add a new user:

- Select a user group and then the context-sensitive **Add user** menu item.
- Select a user group and click on the **[Add user]** button.

The **Add user** dialog window is then opened in both cases.

User

Short name of the new user that must be used to log in at program start. After the name has been entered, a **Start password** must be issued for the user to be entered in the user list.

Entry	**24 characters**

6.2.1.3.3 Setting a start password

Dialog window: **Configuration ▶ Tools ▶ User administration... ▶ [Set start password] ▶ Start password**

A start password can be assigned for the selected user with the **[Set start password]** button in the **User administration** dialog window. It is

active only for newly created users or for those who have had their status set to **enabled** again. The **Start password** dialog window opens.

Start password

Entry of a new start password. Password options are not used for the start password.

Entry	**50 characters**

Confirm password

Confirmation of the start password.

Entry	**50 characters**

6.2.2 Security settings

6.2.2.1 Security settings

Dialog window: **Configuration ► Tools ► Security settings**

Overview

With client/server systems, the security settings are globally valid for all connected clients.

Security settings can be exported and imported. This means that these settings can be exchanged between different client/server systems.

The security settings can be output as a PDF file with the **File ► Print (PDF)... ► Security settings** menu item.

Login policies

Enforce login with user name

on | off (Default value: **off**)

If this check box is **activated**, then each time the program starts the login window will appear, in which the user must enter his or her user name. If this check box is **deactivated**, no login is necessary and the user logged in under Windows will be adopted as the user name. If this is the case, then all subsequent parameters are deactivated.

Enforce login with password

on | off (Default value: **off**)

If this check box is **activated**, then each time the program starts the login window will appear, in which the user must enter not only his or her user name but also a password. If this option is **disabled**, then all of the subsequent parameters will be deactivated.

Password monitoring by viva

on | off (Default value: **on**)

If this option is **enabled**, then the password will be monitored by **viva** in accordance with the subsequent parameters.

Password monitoring by Windows

on | off (Default value: **off**)

If this option is **enabled**, then the password will be monitored in accordance with the parameters defined in Windows. The parameters for password protection are deactivated in this case.

CAUTION

In order to prevent an unwanted login by means of the **Guest** user category that is defined by default in Windows when performing password monitoring with Windows, it is imperative that this user also be assigned a password or (even better) be deactivated.

CAUTION

If this option is enabled, then the user names in **Windows** and **viva** must necessarily match, because otherwise the user will no longer be able to log in to **viva**. In order to ensure this, once this selection has been made, the **Test login** dialog window *(see chapter 6.2.2.2, page 798)* appears in which the logged-in user must log in with his or her Windows password. If this test login fails, then the **Security settings** dialog window will remain open.

Maximum number of login attempts

on | off (Default value: **off**)

If this check box is **activated**, then a user will be set to the **disabled** status as soon as the number of login attempts defined here has been exceeded. A user with the status **disabled** can no longer start the program. The counter for login attempts is reset to zero for all users with each restart.

Input range	**2 to 5**
Default value	**3**

Message by e-mail

on | off (Default value: **off**)

If this check box is **activated**, then an e-mail will be sent to the address defined under **[E-mail...]** as soon as the defined number of login attempts has been exceeded.

[E-mail...]

This button opens the **Send e-mail** window *(see chapter 6.2.2.3, page 798)* for defining the e-mail parameters.

Logout policies

New login only for same user

on | off (Default value: **off**)

If this check box is **activated**, then only the same user can log in again after a manual logout. Users with administrator rights can always log in. If this option is enabled, then the following option is automatically enabled and inactive.

NOTICE

If the automatic logout is enabled (see below), then only the same user or a user with administrator rights can log on again, no matter what the setting for this option is.

No editing of workplaces in 'BUSY' status

on | off (Default value: **off**)

If this check box is **activated**, then, after a user has logged out manually, a newly logged-in user can neither edit data nor trigger actions on the workplaces still open with running determinations. These workplaces will only be available again when all determinations are finished. The old user name still applies for the ongoing determinations. Exceptions are the cancellation of a determination with **[Stop]** and the emergency stop, which are always possible for all running determinations and series.

If this check box is **deactivated**, then the newly logged-in user has all of the rights for the opened workplaces which he or she has on the basis of his or her group membership. The new user name is valid with immediate effect for the ongoing determinations.

Automatic logout after

on | off (Default value: **off**)

If this check box is **activated**, then the user will be logged out automatically when no operating functions have been carried out with the keyboard or the mouse within this time. After this automatic logout, only a user belonging to the same user group as the previously logged-out user or a user with administrator rights can log in again.

Input range	**1 to 60 min**
Default value	**10 min**

NOTICE

The immediate stop of all ongoing determinations at all active workplaces with the **emergency stop button** remains possible even after an automatic logout.

Password policies

NOTICE

If the **Password monitoring by Windows** option is enabled, then the parameters for password protection are deactivated.

Enforce unique password

on | off (Default value: **off**)

Activating this check box ensures that a user can use a given password only once.

Enforce use of special characters

on | off (Default value: **off**)

Activating this check box ensures that the password must contain at least one special character (@, #, ~, etc.).

Minimum password length

on | off (Default value: **off**)

Activating this check box ensures that the password must contain at least the indicated number of characters.

Input range	**1 to 10 characters**
Default value	**6 characters**

Passwords expire every

on | off (Default value: **off**)

Activating this check box ensures that the user must enter a new password before the validity period expires. When a user logs in whose password will expire within the next 10 days, a corresponding message will appear. If the validity period has expired, the user can only log in if he or she changes the password.

Input range	**1 to 999 days**
Default value	**365 days**

6.2.2.2 Test login for password monitoring by Windows

Tab: **Configuration ► Tools ► Security settings ► Login/Password protection ► Test login**

If the **Password monitoring by Windows** option *(see chapter 6.2.2.1, page 794)* is activated, then the Windows password of the user must be entered in this dialog window. The test login is used to check whether the user name matches the Windows user name.

User

Shows the current user name.

Password

Entry of the Windows password.

It is only when the test login is successful that the **Password monitoring by Windows** can be used.

6.2.2.3 Sending e-mail

Dialog window: **Configuration ► Tools ► Security settings ► Login/Password protection ► [E-mail...] ► Send e-mail**

Mail to

E-mail address of the recipient.

Entry	**200 characters**

Subject

Title for describing the message.

Entry	**200 characters**

Message

The message defined here is sent as an e-mail when the maximum permitted number of login attempts has been exceeded.

The text editor for entering or editing the message is opened with or by double-clicking on the text field.

Selection	**Text (unlimited)**

Sender

Mail from

E-mail address of the sender.

Entry	**200 characters**

SMTP Server

Address of the SMTP mail server.

Entry	**200 characters**

Port

Port number of the SMTP mail server.

Input range	**1 to 65,536**
Default value	**25**

Authentication

on | off (Default value: **off**)

Check box for activating the authentication of the sender when sending the e-mail and for selecting the authentication method.

Selection	**SMTP** | **SMTP after POP**
Default value	**SMTP**

POP server

Address of the POP mail server.

Entry	**200 characters**

Port

Port number of the POP mail server.

Input range	**1 to 65,536**
Default value	**110**

User

Name of the user for accessing the mail server. The name need not match the Windows user name.

Entry	**200 characters**

Password

Password for accessing the mail server. This password need not match the Windows password.

Entry	**200 characters**

6.2.2.4 Printing configuration report (PDF)

Dialog window: **Configuration ► ► File ► Print (PDF)... ► Security settings/User administration ► Print configuration report (PDF)**

Orientation

Printing orientation for the configuration report.

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

6.2.3 Program administration

6.2.3.1 Program administration

Dialog window: **Configuration ► Tools ► Program administration**

Overview

Backup directories and licenses can be managed in the **Program administration** dialog window.

Tabs

The parameters for program administration are defined on the following tabs:

- *Backup directories*
  List of the defined backup directories.
- *Clients*
  List of computers on which **viva** is installed.
- *Licenses*
  List of installed licenses with number of clients. This tab is only shown on the server of a client/server installation.

6.2.3.2 Backup directories

6.2.3.2.1 Backup directories

Tab: **Configuration ► Tools ► Program administration ► Backup directories**

Table with the defined backup directories. Click on the column title to sort the table according to the selected column in either ascending or descending order. The **Default backup directory** directory is created during installation.

NOTICE

The following buttons are only active when **viva** is running on the server; they are inactive for the individual clients.

[New]

Add a new backup directory *(see chapter 6.2.3.2.2, page 801)*.

[Edit]

Edit the selected backup directory *(see chapter 6.2.3.2.3, page 802)*.

[Delete]

Delete the selected backup directory.

NOTICE

The **Default backup directory** cannot be deleted.

6.2.3.2.2 New backup directory

Dialog window: **Configuration ▶ Tools ▶ Program administration ▶ Backup directories ▶ [New] ▶ New backup directory**

Name

Name for the backup directory.

Entry	**50 characters**

Directory

Entry or selection (with ...) of the path for the backup directory.

Entry	**1,000 characters**

NOTICE

If the backup directory is on a network drive, the backup date should be added manually to the backup name when backing up because the backup date information is not available when the data is restored.

NOTICE

Make sure that you have read and write permission for the selected directory.

6.2.3.2.3 Editing the backup directory

Dialog window: **Configuration ▶ Tools ▶ Program administration ▶ Backup directories ▶ [Edit] ▶ Edit backup directory**

Name

Name for the backup directory.

Entry	**50 characters**

NOTICE

The **Default backup directory** created during installation cannot be renamed.

Directory

Entry or selection (with …) of the path for the backup directory.

Entry	**1,000 characters**

NOTICE

If the backup directory is on a network drive, the backup date should be added manually to the backup name when backing up because the backup date information is not available when the data is restored.

NOTICE

Make sure that you have read and write permission for the selected directory.

6.2.3.3 Clients

Tab: **Configuration ▶ Tools ▶ Program administration ▶ Clients**

Table with information about the computers on which **viva** is installed. The table cannot be edited. Click on the column title to sort the table according to the selected column in either ascending or descending order.

Client ID

Shows the ID for the client that was entered during the client/server installation.

Computer name

Shows the name of the computer on which the client is installed.

Status

Shows whether **viva** has been started on the client (**active**) or not (**inactive**).

NOTICE

The content of the **Clients** tab can also be displayed via the Clients shortcut in the **..\Metrohm\viva\bin** directory (only available on the server) if **viva** is not running.

6.2.3.4 Licenses

Tab: **Configuration ▶ Tools ▶ Program administration ▶ Licenses**

Table with the licenses which are installed on the server (for **viva multi**) or the local server (for **viva full**). The table cannot be edited. Click on the column title to sort the table according to the selected column in either ascending or descending order.

NOTICE

In client/server systems, this tab is visible only on the server and only for members of the **Administrators** user group.

License code

Shows the entered license code.

Number of clients

Shows the number of clients that have been enabled with the license code.

[Add licenses]

Add new, additional licenses *(see chapter 6.2.3.5, page 804)*.

NOTICE

Starting with Windows Vista, Microsoft has introduced the UAC (User Account Control), which permits running tasks either as a non-administrator or as an administrator (without changes of user, deactivation or similar). This function can, however, cause difficulties with client/server installations of **viva** on computers with Windows Vista or Windows 7. Therefore, to add additional licenses, proceed as follows:

- **For new installations**
  To enter additional licenses, you must start the program as an administrator (position the mouse on the Program icon and click the right mouse button – select **Run as administrator** there). If you then add the license code for additional licenses in the usual way, then the **license.mlic** file in the **C:\Program Files\Metrohm\'Program name'\bin** directory will contain both license codes.
- **For existing installations**
  First of all, the **license.mlic** file in the **C:\Users\'User'\AppData\Local\VirtualStore\Program Files\Metrohm\'Program name'\bin** directory must be deleted. This file must not be present in the **VirtualStore** of any user – you must check to make sure of this, and any such files which may be found must be deleted. Afterwards, you must start the program as an administrator (position the mouse on the Program icon and click the right mouse button – select **Run as administrator** there). If you then add the license code for additional licenses in the usual way, then the **license.mlic** file in the **C:\Program Files\Metrohm\'Program name'\bin** directory will contain both license codes.

Additional information on this topic can be found in the installation manual, which is saved in the **C:\Program Files\Metrohm\viva\doc** directory.

6.2.3.5 Adding licenses

Dialog window: **Configuration ▶ Tools ▶ Program administration ▶ Licenses ▶ [Add licenses] ▶ Add licenses**

The **Tools ▶ Program administration ▶ Licenses ▶ [Add licenses]** menu in the **Configuration** program part opens the **Add licenses** dialog window, in which the new license code can be entered.

License code

Entry of the license code.

6.3 Configuration data

6.3.1 Export/import

6.3.1.1 Exporting configuration data

Dialog window: **Configuration ► File ► Export... ► Export configuration data**

File ► Export... opens the **Export configuration data** dialog window, in which the following parts of the configuration database can be selected for export:

Devices

on | off (Default value: **on**)

Exporting configuration data for devices *(see chapter 6.4, page 821)*.

Dosing units

Exporting configuration data for dosing units *(see chapter 6.6, page 835)*.

Solutions

on | off (Default value: **on**)

Exporting configuration data for solutions *(see chapter 6.5, page 827)*.

Sensors

on | off (Default value: **on**)

Exporting configuration data for sensors *(see chapter 6.7, page 846)*.

Common Variables

on | off (Default value: **on**)

Exporting configuration data for common variables *(see chapter 6.10.1, page 867)*.

Global Variables

on | off (Default value: **on**)

Exporting configuration data for global variables *(see chapter 6.11.1, page 876)*.

Rack data

on | off (Default value: **on**)

Exporting configuration data for sample changer racks *(see chapter 6.12.1, page 885)*.

Colorimetric sensors

on | off (Default value: **on**)

Exporting configuration data for colorimetric sensors *(see chapter 6.8.1, page 853)*.

Configuration views

on | off (Default value: **on**)

Exporting saved configuration views *(see chapter 3.1.7, page 90)*.

Workplace views

on | off (Default value: **on**)

Exporting saved workplace views *(see chapter 3.1.7.1, page 90)*.

Database views

on | off (Default value: **on**)

Exporting saved database views *(see chapter 3.1.7, page 90)*.

Result templates

on | off (Default value: **on**)

Exporting saved result templates *(see chapter 5.5.2.9.6.6, page 581)*

Export templates

on | off (Default value: **on**)

Exporting saved export templates *(see chapter 4.4.3.1, page 266)*.

Control chart templates

on | off (Default value: **on**)

Exporting saved control chart templates *(see chapter 4.4.2.1, page 262)*.

Output signals

on | off (Default value: **on**)

Exporting saved templates for output lines *(see chapter 6.3.3.2.2, page 814)*.

Input signals

on | off (Default value: **on**)

Exporting saved templates for input lines *(see chapter 6.3.3.1.2, page 813)*.

E-mail templates

on | off (Default value: **on**)

Exporting saved e-mail templates *(see chapter 6.3.3.3, page 816)*.

Text templates

on | off (Default value: **on**)

Exporting saved text templates *(see chapter 3.5, page 119)*.

Sample assignment table

on | off (Default value: **on**)

Exporting the saved sample assignment table *(see chapter 3.4, page 117)*.

Security settings

on | off (Default value: **on**)

Exporting security settings *(see chapter 6.2.2.1, page 794)*.

User administration

on | off (Default value: **on**)

Exporting user administration *(see chapter 6.2.1.1, page 787)*.

Select/deselect all

on | off (Default value: **on**)

If this check box is activated, then all configuration data will be selected for the export. If the check box is deactivated, then the configuration data can be individually selected for the export.

[OK]

The **Save** dialog window for saving data, in which the name and directory for the export file must be entered, opens. The selected configuration data is then saved in a file with the extension **.mcfg**.

6.3.1.2 Importing configuration data

Dialog window: **Configuration ► File ► Import... ► Import configuration data**

The **Import configuration data** dialog window, in which the following parts of the configuration database can be selected for import, is opened with **File ► Import...** after selection of the ***.mcfg** file to be imported:

NOTICE

Data that is not present in the export file cannot be selected.

Devices

on | off (Default value: **on**)

Importing configuration data for devices *(see chapter 6.4, page 821)*.

Dosing units

Importing configuration data for dosing units *(see chapter 6.6, page 835)*.

Solutions

on | off (Default value: **on**)

Importing configuration data for solutions *(see chapter 6.5, page 827)*.

Sensors

on | off (Default value: **on**)

Importing configuration data for sensors *(see chapter 6.7, page 846)*.

Common Variables

on | off (Default value: **on**)

Importing configuration data for common variables *(see chapter 6.10.1, page 867)*.

Global Variables

on | off (Default value: **on**)

Importing configuration data for global variables *(see chapter 6.11.1, page 876)*.

Rack data

on | off (Default value: **on**)

Importing configuration data for sample changer racks *(see chapter 6.12.1, page 885)*.

Colorimetric sensors

on | off (Default value: **on**)

Importing configuration data for colorimetric sensors *(see chapter 6.8.1, page 853)*.

Configuration views

on | off (Default value: **on**)

Importing saved configuration views *(see chapter 3.1.7, page 90)*.

Workplace views

on | off (Default value: **on**)

Importing saved workplace views *(see chapter 3.1.7.1, page 90)*.

Database views

on | off (Default value: **on**)

Importing saved database views *(see chapter 3.1.7, page 90)*.

Export templates

on | off (Default value: **on**)

Importing saved export templates *(see chapter 4.4.3.1, page 266)*.

Control chart templates

on | off (Default value: **on**)

Importing saved control chart templates *(see chapter 4.4.2.1, page 262)*.

E-mail templates

on | off (Default value: **on**)

Importing saved e-mail templates *(see chapter 6.3.3.3, page 816)*.

Text templates

on | off (Default value: **on**)

Importing saved text templates *(see chapter 3.5, page 119)*.

Sample assignment table

on | off (Default value: **on**)

Importing a saved sample assignment table *(see chapter 3.4, page 117)*.

Security settings

on | off (Default value: **on**)

Importing security settings *(see chapter 6.2.2.1, page 794)*.

User administration

on | off (Default value: **on**)

Importing user administration *(see chapter 6.2.1.1, page 787)*.

[OK]

The selected data is imported.

6.3.2 Back up/restore

6.3.2.1 Backing up configuration data automatically

Dialog window: **Configuration ► File ► Backup ► Automatically ► Backup configuration data automatically**

Automatic backup

on | off (Default value: **off**)

If this check box is activated, then the configuration database is saved automatically to the defined backup directory at the desired time interval. The entire configuration database (including method groups and methods) is saved at this time.

If this check box is deactivated, then the following parameters cannot be edited.

Last backup

Shows date and time of the last configuration data backup.

Next backup

Date and time at which the next backup is to be carried out. … opens the **Next backup** window to select the date *(see chapter 2.4.1, page 81)*.

Default value	**Last backup + 1 month**

Interval

Entry of the time interval after which an automatic backup will take place. With each automatic or manual backup, the interval entered here will be added to the date of **Last backup** and entered in the **Next backup** field.

Input range	**1 to 999**
Default value	**1**
Selection	**day(s)** | **week(s)** | **month(s)** | **year(s)**
Default value	**month(s)**

Backup directory

Selection of a predefined backup directory *(see chapter 6.2.3.2.1, page 800)*.

NOTICE

Make sure that you have read and write permission for the selected directory.

6.3.2.2 Backing up configuration data manually

Dialog window: **Configuration ► File ► Backup ► Manually ► Backup configuration data manually**

Backup target

Backup directory

Selection of a predefined backup directory *(see chapter 6.2.3.2.1, page 800)*.

NOTICE

Make sure that you have read and write permission for the selected directory.

Backup name

Selection of an already existing name or entry of a new name for the backup file. If an existing backup file is selected, it will be overwritten.

Entry	**50 characters**
Selection	**'Backup name'**

NOTICE

If the backup directory is on a network drive, then the date of the backup should be added to the **Backup name**, because the backup date information is not available when the data is restored.

[Start]

Starts the manual backup of the complete configuration database (including method groups and methods).

6.3.2.3 Restoring configuration data

Dialog window: **Restore configuration data**

Dialog window "Restore configuration data"

Backup directory

Selection of a directory predefined in the program administration that contains the backed-up configuration database.

Selection	**'Backup directories'**

Backup name

Selection of a backup file.

Selection	**'Backup files'**

Backup date

Shows the time at which the configuration database was backed up. This information is not available if the backup file is located on a network drive.

Database name

Shows the name of the configuration database. This information is not available if the backup file is located on a network drive.

Size

Shows the size of the configuration database in KB.

Save as

Shows the name under which the configuration database will be restored.

[Start]

Starts restoration of the configuration database. After the start, a progress bar appears in the window. The dialog window closes automatically once the backup has been completed.

6.3.3 Templates

6.3.3.1 Templates - Input lines

6.3.3.1.1 Managing templates for input lines

Dialog window: **Configuration ► Tools ► Templates ► Input lines... ► Templates for input lines**

Client-specific bit patterns for scanning remote input signals can be defined in the **Templates for input lines** dialog window and selected with the **SCAN** command and in manual control. The table with the defined templates cannot be edited, but it can be sorted according to the

selected column in ascending or descending order by clicking on the column title.

The **[Edit]** menu below the list of templates or a right-click on the table opens a menu with the following menu items:

New...	Create a new template *(see chapter 6.3.3.1.2, page 813)*.
Properties...	Edit the selected template *(see chapter 6.3.3.1.2, page 813)*.
Delete	Deletes the selected template.

6.3.3.1.2 Editing templates for input lines

Dialog window: **Configuration ▶ Tools ▶ Templates ▶ Input lines... ▶ Templates for input lines ▶ New... / Properties... ▶ New template / Edit template**

Signal name

Name of the template for the input signal.

Entry	**25 characters**

Input signal

Entry of the bit pattern for the input signal with exactly 8 characters. It is possible to enter the characters

0 = Line inactive,

1 = Line active and

***** = Any line status.

Selection	**Bit pattern with 8 characters (0, 1, *)** | ********
Default value	********

The input lines and bits are numbered from right to left:

Input	7 6 5 4 3 2 1 0
Bit	7 6 5 4 3 2 1 0

Example: *******1 expects an active input line 0 (**1** = set).

NOTICE

We recommend masking the irrelevant input lines with an asterisk ***** so as not to modify these line statuses.

6.3.3.2 Templates - Output lines

6.3.3.2.1 Managing templates for output lines

Dialog window: **Configuration ► Tools ► Templates ► Output lines... ► Templates for output lines**

Client-specific bit patterns for setting remote output signals can be defined in the **Templates for output lines** dialog window and selected with the **CTRL** command and in manual operation. The table with the defined templates cannot be edited, but it can be sorted according to the selected column in ascending or descending order by clicking on the column title.

The **[Edit]** menu below the list of templates or a right-click on the table opens a menu with the following menu items:

New...	Create a new template *(see chapter 6.3.3.2.2, page 814)*.
Properties...	Edit the selected template *(see chapter 6.3.3.2.2, page 814)*.
Delete	Deletes the selected template.

6.3.3.2.2 Editing templates for output lines

Dialog window: **Configuration ► Tools ► Templates ► Output lines... ► Templates for output lines ► New... / Properties... ► New template / Edit template**

Signal name

Name of the template for the output signal.

Entry	**25 characters**

Output signal

Entry of the bit pattern for the output signal with exactly 14 characters.

It is possible to enter the characters

0 = Line inactive,

1 = Line active,

***** = Any line status and

p = Set pulse

Selection	**Bit pattern with exactly 14 characters (0, 1, *, p)** | ******************
Default value	******************

The output lines and bits are numbered from right to left:

Output	13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit	13 12 11 10 9 8 7 6 5 4 3 2 1 0

NOTICE

We recommend masking the irrelevant output lines with an asterisk ***** so as not to modify these line statuses.

Pulse length

Duration of the transmitted pulse.

Input range	**1 to 999 s**
Default value	**1 s**

Templates for controlling the 843 Pump Station via Remote Box

The following templates for controlling the 843 Pump Station for draining and rinsing the measuring vessel are already present and can be neither edited nor deleted:

Signal name	Output signal	Pulse length	Function
Drain	******p***********	**25 s**	Switching on pump 1 for 25 s (draining)
Drain off	******0***********	**1 s**	Switching off pump 1 (draining off)
Drain on	******1***********	**1 s**	Switching on pump 1 (draining on)
Rinse	*****p************	**8 s**	Switching on pump 2 for 8 s (rinsing)
Rinse off	*****0************	**1 s**	Switching off pump 2 (rinsing off)
Rinse on	*****1************	**1 s**	Switching on pump 2 (rinsing on)

These templates for the output lines can be copied and pasted again. Templates created by the user can be edited and deleted.

6.3.3.3 Templates - E-mail

6.3.3.3.1 Managing e-mail templates

Dialog window: **Configuration ► Tools ► Templates ► E-mail templates... ► E-mail templates**

The saved e-mail templates are displayed in a table in the **E-mail templates** dialog window. The table cannot be edited, but it can be sorted according to the selected column in either ascending or descending order by clicking on the column title.

Name

Name of the e-mail template.

Recipient

E-mail address of the recipient.

The **[Edit]** menu below the list of e-mail templates or a right-click on the table opens a menu with the following menu items:

New...	Creates a new template. The **Edit e-mail template** window opens, in which a new template can be defined *(see chapter 6.3.3.3.2, page 816)*.
Properties...	Edit the selected template. The **Edit e-mail template** window opens, in which the template can be edited *(see chapter 6.3.3.3.2, page 816)*.
Copy	Copy the selected template and save it under the name **'Template name'_#**.
Paste	Paste the selected e-mail template(s) after copying using the **Copy** menu item.
Delete	Deletes the selected template.
Send test E-mail	Sends test e-mail with the selected e-mail template.

6.3.3.3.2 Editing e-mail template

Dialog window: **Configuration ► Tools ► Templates ► E-mail templates... ► E-mail templates ► [New] / [Properties] ► Edit e-mail template**

E-mail template

Name of the e-mail template.

Entry	**16 characters**

Recipient

E-mail address(es)

E-mail address of the recipient. If there are several recipients, the addresses must be separated with a semicolon.

Entry	**1,024 characters**

Sender

E-mail address

E-mail address of the sender.

Entry	**200 characters**

SMTP server

Address of the SMTP mail server.

Entry	**200 characters**

Port

Port number of the SMTP mail server.

Input range	**1 to 65,536**
Default value	**25**

Authentication

on | off (Default value: **off**)

Check box for activating the authentication of the sender when sending the e-mail and selection of the authentication method.

Selection	**SMTP** | **SMTP after POP**
Default value	**SMTP**

POP server

Address of the POP mail server.

Entry	**3 - 200 characters**

Port

Port number of the POP mail server.

Input range	**1 to 65,536**
Default value	**110**

User

Name of the user for accessing the mail server. The name need not match the Windows user name.

Entry	**2 - 50 characters**

Password

Password for accessing the mail server. This password need not match the Windows password.

Entry	**50 characters**

6.3.4 Options

6.3.4.1 Options - Overview

Dialog window: **Configuration ► Tools ► Options... ► Options**

General program properties can be set on the following tabs under **Tools ► Options...**:

- *General*
  Selection of the dialog language and activating/deactivating the emergency stop button.
- *Save*
  Settings for saving on exiting the program.
- *PDF*
  Settings for PDF files.

6.3.4.2 Options - General

Tab: **Configuration ► Tools ► Options... ► Options ► General**

Dialog language

Dialog language

Selection of the dialog language.

Selection	**German** | **English** | **Additional languages (dependent on installed language patches)**
Default value	**English**

NOTICE

The program must be restarted for the modified setting to become effective.

Emergency stop button

Options for the display of the **Emergency stop viva** button.

Selection	**On** | **Off**
Default value	**Off**

On
The button is displayed in all program parts.

Off
The button is not displayed.

The button can be moved to any position with the left mouse button pressed down and is always shown at the very top of the screen both in the program window and outside it on the Windows desktop. A mouse click on this button immediately stops all running determinations on all active workplaces. When this happens, all devices are stopped (including pumps; any device commands that may have been started will be carried out to completion, e.g. **PREP** with Dosino) and the exit track will be started. The emergency stop is effective even if no user is logged in, e.g. when the user has been logged out automatically.

The emergency stop has no effect on actions that may still be ongoing in the manual control, each of which must therefore be stopped with **<Stop>**.

Reprocessing with history

Versioning behavior of reprocessed determinations.

Selection	**On** | **Off**
Default value	**Off**

On
A new version is created and saved each time a determination is reprocessed.

Off
The version number is increased with each reprocessing of a determination, but only two versions are stored in the database (the first, original version and the latest, reprocessed version). In the case of already reprocessed determinations, the version that was last saved is deleted and a new version is created.

6.3.4.3 Options - Save

Tab: **Configuration ▶ Tools ▶ Options... ▶ Options ▶ Save**

Save on closing

It can be defined here which settings are to be saved when the program is exited. If the option is **enabled**, the current view with its settings will be saved automatically when the program is exited. If the option is **disabled**, then any modifications that may have been made to the view will not be saved and the original, manually saved view will be loaded the next time that the program is started.

Configuration settings

on | off (Default value: **off**)

Activates/deactivates the saving of the configuration view when exiting.

Workplace settings

on | off (Default value: **off**)

Activates/deactivates the saving of the workplace view when exiting.

Database settings

on | off (Default value: **off**)

Activates/deactivates the saving of the database view when exiting.

6.3.4.4 Options - PDF

Tab: **Configuration ► Tools ► Options... ► Options ► PDF**

Security permissions for PDF files

Content copying or extraction allowed

on | off (Default value: **on**)

If this check box is **deactivated**, then content cannot be copied or taken from the PDF file.

Printing allowed

on | off (Default value: **on**)

If this check box is **deactivated**, then the PDF file cannot be printed.

Adding or changing comments allowed

on | off (Default value: **on**)

If this check box is **deactivated**, then comments and form fields can neither be added nor changed.

Modifying the document allowed

on | off (Default value: **on**)

If this check box is **deactivated**, then no changes can be made to the PDF file.

6.4 Devices subwindow

6.4.1 Configuration - Devices

Subwindow: **Configuration ▶ Devices**

Devices subwindow

The **Devices** subwindow contains the device table with all automatically recognized and manually added devices and is always shown in the **Configuration** program part, i.e., it cannot be removed from the configuration view. The subwindow can be enlarged and reduced as required; it can also be maximized.

USB devices

Devices connected to the PC via USB are automatically recognized when the program starts and are entered in the device table. If the connection between the PC and the device or the power supply is interrupted, then the device will remain in the device table with the status **not ok**. If it is reconnected, then it will be recognized automatically by its serial number and assigned to the existing device entry again. This causes the status to change to **ok**.

Peripheral devices of USB devices

Peripheral devices connected to USB devices (dosing device, Remote Box, etc.) are also recognized automatically, but they are not listed in the device table as separate devices. If they are connected or removed while a program is running, a corresponding message must be confirmed and then either the USB device must be reinitialized, the USB connection interrupted and then re-established, or the program must be restarted.

RS-232 devices

Devices that are connected to the PC via an RS-232 interface will not be recognized automatically. They must be added manually to the device table as new devices. If the connection between the PC and device is interrupted or the device is switched off, the device will nevertheless remain in the device table with **ok**. In order to update the status to **not ok**, the properties window of the device must be opened and closed again. The same applies when the device is connected again or switched on.

6.4.2 Device table

6.4.2.1 Device table - User interface

Subwindow: **Configuration ► Devices**

Contents

In the device table the following information about automatically recognized or manually added devices is shown by default:

Device name

Designation of the device.

Device type

Type of device.

Device serial number

Serial number of the device.

Status

Device status. A device that is ready has the status **ok** shown in green, a device that is not ready has the **not ok** status shown in red.

NOTICE

The device status is permanently monitored and updated for USB devices only. For Metrohm devices with RS-232 connection, the current status at the last access to the device is shown. For barcode readers and generic RS-232 devices, the status cannot be monitored. It will be set to **ok** after confirmation of the connection test.

Set to work

Date on which the device was added to the device table.

Next GLP test

Date on which the next GLP test is due. If GLP monitoring is enabled and the set date is before the current date (i.e., the GLP test has not yet been carried out), then the date will be shown in red.

Remarks

Remarks about the device.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

As soon as a determination is started, all the devices or device components used in the method (e.g. dosing device) will be occupied, i.e., they can neither be used at a different workplace nor used or configured in manual control until the determination has been finished. The line for an occupied device is shown in gray letters.

Table view

The device table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width.
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width.
- **Dragging the column title**:
  Moves the column to the required location.

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the device table contains the following menu items:

New...	Add manually a new device connected to the PC via an RS-232 interface *(see chapter 6.4.2.2, page 824)*.
Delete	Deletes the selected device. Only devices that are not connected can be deleted *(see chapter 6.4.2.3, page 824)*.
Properties...	Edit the selected device *(see chapter 6.4.3, page 826)*.
Column display...	Define columns for the device table *(see chapter 6.4.2.4, page 824)*.
Print (PDF)...	Outputs the device table as a PDF file *(see chapter 6.4.2.6, page 825)*.
Ignored devices...	Opens the list of ignored devices *(see chapter 6.4.2.5, page 825)*.
Initialize	Initializes the selected device (only possible for USB devices).

6.4.2.2 Adding a new device

Menu item: **Configuration ▶ Devices ▶ [Edit] ▶ New...**

Devices that are connected to the PC via an RS-232 interface must be added manually to the device table with **[Edit] ▶ New...**. This opens the **Device selection** dialog window.

The required new device must be selected from the tree-form list that is shown, which contains all the devices known to the program (arranged according to device type). When the dialog window has been closed with **[OK]** the properties window opens automatically for entering additional device data.

After the properties window has been closed, the new device with its set parameters is entered in the device table and the connection is tested. If the connection is **ok**, then the further available device information is read out of the device.

6.4.2.3 Deleting a device

Menu item: **Configuration ▶ Devices ▶ [Edit] ▶ Delete**

The device selected in the device table is deleted with **[Edit] ▶ Delete**.

NOTICE

Only devices that are not connected can be deleted.

6.4.2.4 Devices - Column display

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Column display... ▶ Column display**

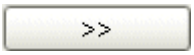
The **Column display** dialog window is opened with **[Edit] ▶ Column display...**. Here you can select the columns that are to be shown in the device table.

Columns available

Shows all the fields that can be shown as columns in the device table.

Columns displayed

Shows all the fields that will be shown as columns in the device table. The **Device name**, **Device type**, **Device serial number**, **Status**, **Set to work**, **Next GLP test** and **Remarks** columns are displayed by default. The **Device name** and **Device type** columns are always present and cannot be removed.



Adds the selected column to the table.

<<

Removes the selected column from the table.

Moves the selected column upwards (modifies sequence).

Moves the selected column downwards (modifies sequence).

6.4.2.5 Editing ignored devices

Dialog window: **Configuration ► Devices ► [Edit] ► Ignored devices... ► Ignored devices**

The **Ignored devices** dialog window is opened with **[Edit] ► Ignored devices...**. Here the list of ignored devices can be edited.

Ignored devices are devices which are recognized automatically upon connection but which the user wants to exclude permanently from being displayed in the device table. Ignored devices will no longer be recognized automatically at the time of the next program start.

Table contents

The following information concerning the ignored devices is shown in the table:

Device type

Type of device.

Device serial number

Serial number of the device.

[Delete]

The highlighted device is removed from the list. It will be recognized automatically again at the time of the next program start and can be included in the list of devices.

6.4.2.6 Printing the list of devices

Dialog window: **Configuration ► Devices ► [Edit] ► Print (PDF)... ► Print list of devices (PDF)**

The **Print list of devices (PDF)** dialog window is opened with **[Edit] ► Print (PDF)...**.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output of the device table in portrait format.

Landscape
Output of the device table in landscape format.

[OK]

The device table is output in the required format as a PDF file and opened directly in Acrobat Reader, where it can then be printed and/or saved.

6.4.3 Device properties

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The properties window for the device selected in the device table, in which the parameters of the device can be edited, is opened with the **[Edit] ► Properties.....** menu item in the **Devices** subwindow. It consists of several tabs. The **General** and **GLP** tabs are always present; the other tabs depend on the selected device. Properties can be set for the following devices:

- *919 IC Autosampler plus*
- *894 Professional CVS*
- *884 Professional VA*
- *858 Professional Sample Processor*
- *846 Dosing Interface*
- *814/815 USB Sample Processor*
- *Avantes spectrometer*
- *Barcode reader*
- *RS-232 device*

6.4.4 Device assignment

Dialog window: **Device assignment**

If devices of the type required by a command are present in the device table but not yet assigned, then a prompt will appear asking the user whether he or she wants to assign a device. If **[Yes]** is selected, the **Device assignment** dialog window appears, in which a device present in the configuration and with the required device type can be selected.

Command type

Shows the command type.

Command name

Shows the command name.

Device type

Shows the device type entered in the command.

Device name

Assignment of the required device to the command. The list of all devices of the required device type present in the configuration is available in the combo box.

6.5 Solutions subwindow

6.5.1 Solutions - General

Subwindow: **Configuration ► Solutions**

Solutions subwindow

The **Solutions** subwindow contains the solution table with all the auxiliary solutions and standard solutions that are to be used in a **ADD AUX** command or **ADD STD** command in a method. For automatic dosing, the definition of a solution in the configuration is mandatory *(see "Method with automatic addition of solution using a Dosino", page 827)*. For a method with manual addition, the solution names can also be defined directly in the method *(see "Method with manual addition of solution", page 828)*. The **Solutions** subwindow can be displayed in the **Configuration** program part as part of the configuration view or (if not present in the user interface) in a separate window with **View ► Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Standard solutions

Standard solutions are used as solutions for the dosing commands **ADD STD** or **ADD AUX**.

Auxiliary solutions

Auxiliary solutions are used as solutions for the **ADD AUX** dosing command.

Type of addition

Method with automatic addition of solution using a Dosino

1 Add the solution in the **Solutions** subwindow in the **Configuration** program part *(see chapter 6.5.2.2, page 830)*.

2 Choose the correct **Solution type**:

- Method with **ADD STD** dosing command: Solution type **Standard solution**
- Method with **ADD AUX** dosing command: Solution type **Standard solution** or **Auxiliary solution**

3 Assign the required dosing unit to the solution.

4 Select the corresponding solution from the selection list in the command **ADD STD** or **ADD AUX** in the method.

5 Select the **Add with dosing device** option.

Method with manual addition of solution

The solution does not have to be created in the Configuration.

1 Enter the solution name in the command **ADD STD** or **ADD AUX** in the method.

2 Select the **Add manually** option.

6.5.2 Solution table

6.5.2.1 Solution table

Subwindow: **Configuration ► Solutions**

Contents

The following information about the auxiliary and standard solutions is displayed in the solution table by default:

Solution name

Name of the solution.

Solution type

Type of the solution.

Manufacturer

Name of the manufacturer of the solution.

Production date

Production date of the solution.

Dosing unit

Shows the dosing unit to which the solution is assigned.

Expiry date

Expiry date of the solution. If solution monitoring is enabled and the set date is before the current date (i.e., the working life has expired), then the date will be shown in red.

GLP test date

Date of the last GLP test.

Next GLP test

Date on which the next GLP test is to be carried out.

Additional columns from the solution properties can be displayed with the **[Edit] ► Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The solution table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the solution table contains the following menu items:

New...	Add manually a new solution *(see chapter 6.5.2.2, page 830)*.
Delete	Deletes the selected solution *(see chapter 6.5.2.3, page 830)*.
Properties...	Edits the selected solution *(see chapter 6.5.3, page 831)*.
Column display...	Defines columns for the solution table *(see chapter 6.5.2.4, page 830)*.
Print (PDF)...	Outputs the solution table as PDF file *(see chapter 6.5.2.5, page 831)*.

6.5.2.2 Adding a new solution

Menu item: **Configuration ► Solutions ► [Edit] ► New...**

A new solution that is not supplied by dosing devices is manually added to the solution table with **[Edit] ► New...**. The properties window opens automatically for editing the solution. After the properties window has been closed, the solution will be entered into the solution table. The parameters can be modified at any time with **[Edit] ► Properties...**.

6.5.2.3 Deleting a solution

Menu item: **Configuration ► Solutions ► [Edit] ► Delete**

The solution selected in the solution table is deleted with **[Edit] ► Delete**.

6.5.2.4 Solutions - Column display

Dialog window: **Configuration ► Solutions ► [Edit] ► Column display... ► Column display**

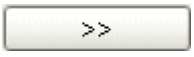
The **Column display** dialog window is opened with **[Edit] ► Column display...**. Here you can define the columns that are to be shown in the solution table.

Available columns

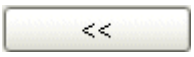
Shows all fields that can be displayed as columns in the solution table.

Displayed columns

Shows all fields that are displayed as columns in the solution table. The **Solution name**, **Solution type**, **Manufacturer**, **Production date**, **Dosing unit**, **Expiry date**, **GLP test date** and **Next GLP test** columns are displayed by default. The **Solution name** column is always present and cannot be removed.



Adds the selected column to the table.



Removes the selected column from the table.

Moves the selected column upwards (modifies sequence).

Moves the selected column downwards (modifies sequence).

6.5.2.5 Printing solution list

Dialog window: **Configuration ▶ Solutions ▶ [Edit] ▶ Print (PDF)... ▶ Print list of solutions (PDF)**

The **Print list of solutions (PDF)** dialog window is opened with **[Edit] ▶ Print (PDF)...**.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output of the solution table in portrait format.

Landscape
Output of the solution table in landscape format.

[OK]

The solution table is output in the required format as a PDF file and opened directly in Acrobat Reader; it can then be printed and/or saved.

6.5.3 Solution properties

6.5.3.1 Editing solution properties

Dialog window: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name'**

The parameters for the selected solution are defined on the following tabs:

- *Solution*
  Properties of the solution and solution monitoring.
- *GLP*
  Properties of GLP test and GLP monitoring.

6.5.3.2 Properties - Solution

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ Solution**

Solution name

Name of the solution. The name may not contain the following characters: **\ ' . { } [ ]**

Entry	**25 characters**

Solution type

Selection of the solution type.

Selection	**Auxiliary solution** | **Standard solution**
Default value	**Auxiliary solution**

Auxiliary solution
Solutions for the **ADD AUX** dosing command.

Standard solution
Solutions for the dosing commands **ADD STD** and **ADD AUX**.

Dosing unit

Selection of the dosing unit to which the solution is to be assigned. This assignment can be undone by selecting **'empty'**.

The dosing unit only has to be specified for the solution if the solution is to be dosed automatically with a dosing unit.

Selection	**'Name of dosing unit'** | **'empty'**
Default value	**'empty'**

Comment

Remarks about the solution (e.g. batch number, etc.).

Entry	**1000 characters**

Manufacturer

Name of the manufacturer of the solution.

Entry	**100 characters**

Production date

Date on which the solution was produced. This date can be edited only for manually added solutions by pressing ....

Selection	**Date selection**

Monitor solution

on | off (Default value: **off**)

If this check box is activated, then the working life of the solution is monitored.

Working life

Working life of the solution in days. If a value is entered here, then the **Expiry date** will be automatically adjusted.

Input range	**0 to 999 Days**
Default value	**999 Days**

Expiry date

Expiry date of the solution. This date can be selected by clicking on ... in the **Select date** dialog window. After a date has been entered, the value for the **Working life** will be automatically adjusted.

Default value	**Production date + 999 days**

Message

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

If during monitoring it is found that the working life has expired then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the working life has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, the message that the working life has expired is automatically saved with the determination.

Cancel determination
The ongoing determination will be canceled automatically. The following message must be confirmed with **[OK]**.

6.5.3.3 Properties - GLP

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ GLP**

Tab: **Configuration ▶ Dosing units ▶ [Edit] ▶ Properties... ▶ Dosing unit - 'Name' ▶ GLP**

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

6.6 Dosing units subwindow

6.6.1 Dosing units - General

Subwindow: **Configuration ► Dosing units**

Dosing units subwindow

The **Dosing units** subwindow contains the table with all automatically recognized dosing units. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present on the user interface) in a separate window with **View ► Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Intelligent dosing units (IDU)

Intelligent dosing units have a data chip with stored data. When mounted on intelligent devices, they are automatically recognized and stored in the table of dosing units.

6.6.2 Table of dosing units

6.6.2.1 Table of dosing units

Subwindow: **Configuration ► Dosing units**

Contents

The following information about the automatically recognized dosing units is shown by default in the table of dosing units:

Name

Name of the dosing unit.

Serial number

Serial number of the dosing unit.

Cylinder volume

Cylinder volume of the dosing unit in mL.

Device name / dosing device

Device name and number of the MSB connector to which the dosing device with the mounted dosing unit is connected.

GLP test date

Date of the last GLP test.

Next GLP test

Date on which the next GLP test is to be carried out.

Additional columns from the properties of the dosing units can be displayed with the **[Edit] ► Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The table of dosing units cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width

- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the list of dosing units contains the following menu items:

Delete	Deletes the selected dosing unit *(see chapter 6.6.2.2, page 837)*.
Properties...	Edit the selected dosing unit *(see chapter 6.6.3, page 838)*.
Column display...	Define columns for the table of dosing units *(see chapter 6.6.2.3, page 837)*.
Print (PDF)...	Outputs the table of dosing units as PDF file *(see chapter 6.6.2.4, page 838)*.

6.6.2.2 Deleting a dosing unit

Menu item: **Configuration ► Dosing units ► [Edit] ► Delete**

The dosing unit selected in the table of dosing units is deleted with **[Edit] ► Delete**.

6.6.2.3 Dosing units - Column display

Dialog window: **Configuration ► Dosing units ► [Edit] ► Column display... ► Column display**

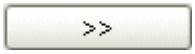
The **Column display** dialog window is opened with **[Edit] ► Column display...**. Here you can define the columns that are to be shown in the table of dosing units.

Available columns

Shows all fields that can be displayed as columns in the table of dosing units.

Displayed columns

Shows all fields that are displayed as columns in the table of dosing units. The **Name**, **Serial number**, **Cylinder volume**, **Device name / dosing device**, **GLP test date** and **Next GLP test** columns are displayed by default. The **Name** and **Serial number** columns are always present and cannot be removed.



Adds the selected column to the table.

<<

Removes the selected column from the table.

Moves the selected column upwards (modifies sequence).

Moves the selected column downwards (modifies sequence).

6.6.2.4 Printing the list of dosing units

Dialog window: **Configuration ► Dosing units ► [Edit] ► Print (PDF)... ► Print list of dosing units (PDF)**

The **Print list of dosing units (PDF)** dialog window is opened with **[Edit] ► Print (PDF)...**.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Outputs the table of dosing units in portrait format.

Landscape
Outputs the table of dosing units in landscape format.

[OK]

The table of dosing units is output in the required format as a PDF file and opened directly with Acrobat Reader; it can then be printed and/or saved.

6.6.3 Properties of dosing unit

6.6.3.1 Editing the properties of the dosing unit

Dialog window: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name'**

The parameters for the selected dosing unit are defined on the following tabs:

- *Dosing unit*
  Properties of the dosing unit.
- *GLP*
  Properties of GLP test and GLP monitoring.

6.6.3.2 Properties - Dosing unit

Subwindow: **Configuration ▶ Dosing units ▶ Properties... ▶ Dosing unit - 'Name'**

Hardware

Name

Freely definable designation for the dosing unit.

Entry	**24 characters**
Default value	**'empty'**

Comment

Remarks on the dosing unit.

Entry	**24 characters**

Device name / dosing device

Shows the device name and the number of the MSB connector to which the dosing device with the dosing unit is connected.

Order number

Shows the order number of the dosing unit.

Serial number

Shows the serial number of the dosing unit.

Cylinder volume

Shows the cylinder volume for the dosing unit.

Cylinder serial number

Shows the serial number of the cylinder, which is read out automatically. It is printed on new cylinders and can be modified at any time, e.g. if the cylinder has been replaced.

Entry	**8 characters**

Parameters for preparation

Configuration of the parameters which are to be used for the **PREP** and **EMPTY** commands.

Dosing port Prep/Empty

Dosing port through which the cylinder content is to be ejected during preparation and emptying.

Selection	**Dosing port 1** | **Dosing port 2** | **Fill port** | **Special port**
Default value	**Dosing port 1**

Dosing rate Dosing port 1

Rate at which dosing should take place via **Dosing port 1**. The maximum dosing rate depends on the cylinder volume of the dosing unit used (see below). When the function is carried out the rate will automatically be decreased to the highest possible value.

Input range	**0.01 to 166.00 mL/min**
Default value	**4 mL/min**
Selection	**maximum**

Dosing rate Dosing port 2

Rate at which dosing should take place via **Dosing port 2**. The maximum dosing rate depends on the cylinder volume of the dosing unit used (see below). When the function is carried out, the rate will automatically be decreased to the highest possible value.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

Dosing rate Fill port

Rate at which dosing or filling should take place via **Fill port**. The maximum dosing rate depends on the cylinder volume of the dosing unit used (see below). When the function is carried out, the rate will automatically be decreased to the highest possible value.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

Dosing rate Special port

Rate at which dosing should take place via the **Special port**. The maximum dosing rate depends on the cylinder volume of the dosing unit used (see below). When the function is carried out, the rate will automatically be decreased to the highest possible value.

Input range	**0.01 to 166.00 mL/min**
Selection	**maximum**
Default value	**maximum**

Maximum dosing rate for the dosing unit in relation to the cylinder volume:

Cylinder volume	Maximum rate
2 mL	6.0 mL/min
5 mL	16.0 mL/min

10 mL	33.0 mL/min
20 mL	66.0 mL/min
50 mL	166.0 mL/min

NOTICE

Enter lower rates if you are using capillaries or if the solution has a higher viscosity.

Tubing parameters

Definition of length and diameter of the tubing connected to the dosing unit. In addition, the port assignment can be modified.

NOTICE

The lengths and diameters must correspond to the actually used tubing, because this is a prerequisite to ensure a correct execution of the **PREP** and **EMPTY** commands. Please visit the Metrohm Web site (*Connectors made of plastic*) for information on the length and diameter of Metrohm tubing.

Dosing port 1

Port

Port to be used as dosing port 1.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 1**

Length

Length of the tubing on dosing port 1.

Input range	**0.0 to 999.9 cm**
Default value	**80.0 cm**

Diameter

Diameter of the tubing on dosing port 1.

Input range	**0.0 to 9.9 mm**
Default value	**0.3 mm**

Dosing port 2

Port

Port to be used as dosing port 2.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 3**

Length

Length of the tubing on dosing port 2.

Input range	**0.0 to 999.9 cm**
Default value	**0.0 cm**

Diameter

Diameter of the tubing on dosing port 2.

Input range	**0.0 to 9.9 mm**
Default value	**2.0 mm**

Fill port

Port

Port to be used as a fill port for aspirating solution.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 2**

Length

Length of the tubing on the fill port.

Input range	**0.0 to 999.9**
Default value	**25.0**

Diameter

Diameter of the tubing on the fill port.

Input range	**0.0 to 9.9 mm**
Default value	**2.0 mm**

Special port

Port

Port to be used as the special port.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 4**

Length

Length of the tubing on the special port.

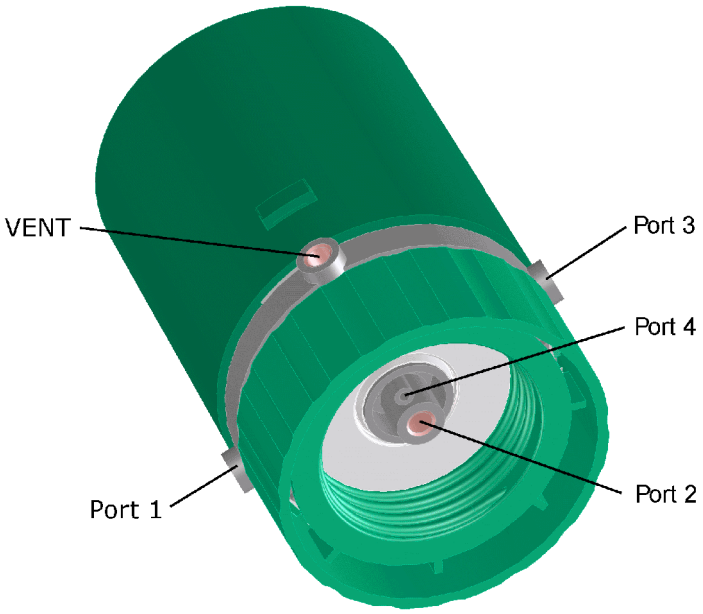
Input range	**0.0 to 999.9 cm**
Default value	**0.0 cm**

Diameter

Diameter of the tubing on the special port.

Input range	**0.0 to 9.9 mm**
Default value	**2.0 mm**

Port assignment of the dosing unit:



Valve disk

Rotating direction

Indicates the direction of rotation of the valve disk. **automatic** is the shift direction with the shortest path.

Selection	**ascending** | **descending** | **automatic** | **not over**
Default value	**automatic**

Not over

Selection of a protected port that is not crossed during rotation.

Selection	**Port 1** | **Port 2** | **Port 3** | **Port 4**
Default value	**Port 4**

6.6.3.3 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

6.6.4 Dosing unit assignment

Dialog window: **Dosing unit assignment**

The described behavior applies to the following dosing commands:

ADD SAMPLE | **ADD SAMPLE DT** | **LQH** | **PREP** | **EMPTY** | **RLS DOS**

If the option **not defined** is selected for the parameter **Dosing unit** in one of the mentioned dosing commands in the method, the user is asked at the start of the method if he wants to assign a dosing unit. If **[Yes]** is

selected, the **Dosing unit assignment** dialog window appears, in which one of the dosing units present in the configuration can be selected.

Command type

Shows the command type.

Command name

Shows the command name.

Dosing unit

Assignment of the required dosing unit to the command. The list of all dosing units present in the configuration is available in the combo box.

6.7 Sensors/electrodes subwindow

6.7.1 Sensors/electrodes - General

Subwindow: **Configuration ▶ Sensors/Electrodes**

Sensors/electrodes subwindow

The **Sensors/Electrodes** subwindow contains the sensor table with all manually added sensors and electrodes. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present on the user interface) in a separate window with **View ▶ Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Standard sensors

By default, the sensor table contains the following sensors and electrodes which cannot be deleted:

- **Auxiliary electrode** (auxiliary electrode)
- **MME** (Multi-Mode Electrode)
- **RDE** (rotating disk electrode)
- **Reference electrode** (reference electrode)
- **Temperature sensor** (temperature sensor)
- **scTRACE Gold**

6.7.2 Sensor table

6.7.2.1 Sensor table

Subwindow: **Configuration ▶ Sensors/Electrodes**

Contents

The following information about the configured sensors is displayed as the default settings in the sensor table:

Sensor name

Name of the sensor.

Sensor type

Type of the sensor.

Device name

Name of device to which the sensor is connected.

Set to work

Date on which the sensor was set to work for the first time.

Expiry date

Expiry date of the sensor. If sensor monitoring is enabled and if the set date is before the current date (i.e., the working life has expired) then the date will be shown in red.

Additional columns from the sensor properties can be displayed with the **[Edit] ► Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The sensor table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the sensor table contains the following menu items:

New ►	Manually add a new sensor *(see chapter 6.7.2.3, page 849)*.
MME...	Multi-Mode Electrode. Combines the operating modes **HMDE**, **DME** and **SMDE** for polarographic and voltammetric measurements.
Solid-state electrode ►	
RDE/SSE...	Sensor type.
scTRACE Gold...	Sensor type.
Reference electrode...	Sensor type.
Auxiliary electrode...	Sensor type.
Temperature sensor...	Sensor type.
Delete	Deletes the selected sensor *(see chapter 6.7.2.4, page 849)*.
Properties...	Edit the selected sensor *(see chapter 6.7.3.1, page 850)*.
Column display...	Define columns for the sensor table *(see chapter 6.7.2.2, page 848)*.
Print (PDF)...	Outputs the sensor table as a PDF file *(see chapter 6.7.2.5, page 849)*.

6.7.2.2 Sensors - Column display

Dialog window: **Configuration ► Sensors/Electrodes ► [Edit] ► Column display... ► Column display**

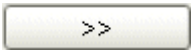
The columns that are to be displayed in the sensor table can be defined in the **Column display** dialog window.

Available columns

Shows all the fields that can be shown as columns in the sensor table.

Displayed columns

Shows all the fields that will be shown as columns in the sensor table. The **Sensor name, Sensor type, Device name, Set to work** and **Expiry date** columns are displayed by default. The three columns **Sensor name**, **Sensor type** and **Device** are always present and cannot be removed.



Adds the selected column to the table.

<<

Removes the selected column from the table.

Moves the selected column upward (modifies sequence).

Moves the selected column downward (modifies sequence).

6.7.2.3 Adding a new sensor

Menu item: **Configuration ► Sensors/Electrodes ► [Edit] ► New...**

In order to add a new sensor to the sensor table, the **[Edit] ► New...** menu item and the desired sensor type have to be selected. The properties window then opens automatically for the configuration of the sensor *(see chapter 6.7.3.1, page 850)*.

6.7.2.4 Deleting a sensor

Menu item: **Configuration ► Sensors/Electrodes ► [Edit] ► Delete**

The sensor selected in the sensor table is deleted with **[Edit] ► Delete**.

6.7.2.5 Printing the sensor list

Dialog window: **Configuration ► Sensors/Electrodes ► [Edit] ► Print (PDF)... ► Print list of sensors (PDF)**

The **Print list of sensors (PDF)** dialog window is opened with **[Edit] ► Print (PDF)...**.

Orientation

Selection of the printing orientation.

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output of the sensor table in portrait format.

Landscape
Output of the sensor table in landscape format.

[OK]

The sensor table is output in the required format as a PDF file and opened directly with Acrobat Reader, where it can then be printed out and/or saved.

6.7.3 Sensor properties

6.7.3.1 Editing the sensor properties

Dialog window: **Configuration ► Sensors/Electrodes ► [Edit] ► Properties... ► Sensor**

The properties window for the sensor selected in the sensor table, in which the parameters of the sensor can be edited, is opened with the **[Edit] ► Properties...** menu item in the **Sensors/Electrodes** subwindow . It consists of the following tab:

- *Sensor*
  General information about the sensor, such as sensor name, sensor type, set to work, etc.

6.7.3.2 Properties - Sensor

Tab: **Configuration ► Sensors/Electrodes ► [Edit] ► Properties... ► Sensor**

Sensor name

Name of the sensor.

Entry	**24 characters**

NOTICE

The name of the nondeletable standard sensors **Auxiliary electrode**, **MME**, **RDE**, **Reference electrode**, **scTRACE Gold** and **Temperature sensor** cannot be changed.

Sensor type

Shows the type of sensor.

Order number

Order number of the sensor.

Entry	**24 characters**
Default value	**'empty'**

Sensor serial number

Serial number of the sensor.

Entry	**15 characters**
Default value	**'empty'**

Device name

Selection of the device to which the sensor is connected. All devices in the device table to which sensors can be connected are shown in the selec-

tion list. The connection of a sensor to a particular device is not checked during the run.

MME

Selection	**884 Professional VA** | **'empty'**
Default value	**'empty'**

Other electrodes

Selection	**894 Professional CVS** | **884 Professional VA** | **'empty'**
Default value	**'empty'**

Comment

Possibility of entering remarks about the sensor.

Entry	**125 characters**
Default value	**'empty'**

Set to work

The current date is automatically entered here for a newly added sensor. When an existing sensor is edited, the date can be selected after clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Sensor monitoring

on | off (Default value: **off**)

The working life of the sensor is monitored when this check box is activated.

Working life

Working life of the sensor in days. If a value is entered here, then the **Expiry date** will be automatically adjusted.

Input range	**0 to 999 days**
Default value	**999 days**

Expiry date

Expiry date of the sensor. This date can be selected by clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After a date has been entered, the value for the **Working life** will be automatically adjusted.

Only editable if monitoring is switched on.

Default value	**Set to work+ 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

If this option is enabled, the message is sent to the address defined under **[E-mail...]**. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this option is enabled, an acoustic signal will be emitted in addition to the message defined above.

Action

The actions can only be edited if monitoring is switched on.

If during sensor monitoring it is found that the working life has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the working life of the sensor has expired is automatically saved in the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, then the message that the working life of the sensor has expired will be saved automatically with the determination.

Cancel determination
The ongoing determination will be canceled automatically. The following message must be confirmed with **[OK]**.

6.8 Colorimetric sensors subwindow

6.8.1 Colorimetric sensors - General

Subwindow: **Configuration ► Colorimetric sensors**

The **Colorimetric sensors** subwindow contains the data for colorimetric sensors in tabular form. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present in the user interface) in a separate window with **View ► Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

6.8.2 Table - Colorimetric sensors

6.8.2.1 Table - Colorimetric sensors

Subwindow: **Configuration ► Colorimetric sensors**

Contents

The following information about the colorimetric sensors is shown as the default setting in the table:

Name

Name of the colorimetric sensor.

Calibration date

Shows the date and time of the last calibration entered after each automatic calibration or manual entry.

Wavelength

Wavelength at which the calibration of the instrument has been carried out.

c0

Zero-order calibration coefficient.

c1

First-order calibration coefficient.

c2

Second-order calibration coefficient.

c3

Third-order calibration coefficient.

Confidence interval

Shows the confidence interval within which the measured values for the determination of the calibration curve must lie.

Outlier

Measured values that lie outside the confidence interval are called outliers.

Coefficient of determination

Shows the coefficient of determination R^2, which is calculated on the basis of the calibration function and the confidence interval and which is between 0 and 1. Five decimal places are displayed.

Additional columns from the properties of the colorimetric sensors can be displayed with the **Edit ► Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The table of the colorimetric sensors cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Display

- If the coefficient of determination lies outside the warning limits, then the measured value and the background of the line number are displayed in **orange**.
- If the coefficient of determination lies outside the intervention limits or the limit values defined on the **Limit values** tab, then the limit values and the background of the line number are displayed in **red**.

- If the Calibration data monitoring check box for monitoring of the date of the next calibration is activated, then the date and the background of the line number are displayed in **red** when the date has expired.
- If a colorimetric sensor is occupied during an ongoing determination or because of manual control, the entries in these lines will be displayed in **gray**.
- If a colorimetric sensor is occupied during an ongoing determination or because of manual control, the **Edit** display will be displayed with a gray background.

Functions

The **Edit** menu beneath the table of the colorimetric sensors contains the following menu items:

New...	Add a new colorimetric sensor to the table *(see chapter 6.8.2.3, page 856)*.
Delete	Deletes the selected colorimetric sensor *(see chapter 6.8.2.4, page 856)*.
Properties...	Edit the properties of the selected colorimetric sensor *(see chapter 6.8.3.1, page 857)*
Column display...	Define the columns for the table of the colorimetric sensors *(see chapter 6.8.2.2, page 855)*
Print (PDF)...	Output of the colorimetric sensor table as PDF file *(see chapter 6.8.2.5, page 856)*

6.8.2.2 Colorimetric sensors - Column display

Dialog window: **Configuration ► Colorimetric sensors ► Edit ► Column display... ► Column display**

The columns that are to be displayed in the table of the colorimetric sensors can be defined in the **Column display** dialog window.

Columns available

Shows all fields that are displayed as columns in the overview table for the colorimetric sensors. The columns **Comment**, **Upper limit calibration range**, **Lower limit calibration range**, **Calibration temperature**, **Calibration method**, **User**, **Calibration interval**, **Next calibration** and **Concentration unit** are displayed by default.

Columns displayed

Shows all fields that are displayed as columns in the overview table for the colorimetric sensors. The **Name**, **Calibration date**, **Wavelength**, **c0**, **c1**, **c2**, **c3**, **Confidence interval**, **Outlier** and **Coefficient of determination** columns are displayed by default. **Name** is fixed and cannot be removed.

>>

Adds the selected column to the table.

<<

Removes the selected column from the table.

Modifies the sequence of displayed columns by moving the selected column up and down.

6.8.2.3 Adding a new colorimetric sensor

Menu item: **Configuration ► Colorimetric sensors ► Edit ► New...**

New colorimetric sensors are entered in the table using the **Edit ► New...** menu item.

The properties window then opens automatically for the configuration of the colorimetric sensor *(see chapter 6.8.3.1, page 857)*.

6.8.2.4 Deleting a colorimetric sensor

Menu item: **Configuration ► Colorimetric sensors ► Edit ► Delete**

The colorimetric sensor selected in the sensor table is deleted with **Edit ► Delete**.

6.8.2.5 Printing the list of colorimetric sensors (PDF)

Dialog window: **Configuration ► Colorimetric sensors ► Edit ► Print (PDF)... ► Print list of colorimetric sensors (PDF)**

The **Print list of colorimetric sensors (PDF)** dialog window is opened with **Edit ► Print (PDF)...**.

Orientation

Selection of the printing orientation.

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output in portrait format.

Landscape
Output in landscape format.

[OK]

The sensor table is output in the required format as a PDF file and opened directly with Acrobat Reader, where it can then be printed out and/or saved.

6.8.3 Properties - Colorimetric sensors

6.8.3.1 Editing the sensor properties

Dialog window: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► Colorimetric sensor - 'Name'**

The properties window for the colorimetric sensor selected in the sensor table, in which the parameters of the colorimetric sensor can be edited, is opened with the **Edit ► Properties...** menu item in the **Colorimetric sensors** subwindow. It consists of the following tabs:

- *Colorimetric sensor*
  General information regarding the colorimetric sensor, e.g. name, device used and comment.
- *Calibration data*
  Information about the calibration of the colorimetric sensor.
- *Limit values*
  Definition of the limit value monitoring for outliers and the coefficient of determination.
- *History*
  Shows the last 10 calibration values.

6.8.3.2 Properties - Colorimetric sensors

Tab: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► Colorimetric sensor**

Name

Name of the sensor.

Entry	**24 characters**

Comment

Possibility of entering remarks about the sensor.

Entry	**24 characters**
Default value	**'empty'**

6.8.3.3 Properties - Calibration data

Tab: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► Calibration data**

Wavelength

Wavelength at which the calibration of the instrument has been carried out.

Input range	**100.0 to 2,000.0 nm**
Default value	**400.0 nm**

c0

Zero-order calibration coefficient.

Input range	**-1E+99 to 1E+99 (max. 10 significant places)**
Default value	**0**

c1

First-order calibration coefficient.

Input range	**-1E+99 to 1E+99 (max. 10 significant places)**
Default value	**0**

c2

Second-order calibration coefficient.

Input range	**-1E+99 to 1E+99 (max. 10 significant places)**
Default value	**0**

c3

Third-order calibration coefficient.

Input range	**-1E+99 to 1E+99 (max. 10 significant places)**
Default value	**0**

NOTICE

If the **Wavelength** and/or the coefficients **c0** to **c3** have been entered manually, then the following parameters will be reset to the default value or updated:

- Confidence interval = **off**
- Number of outliers = **0**
- Coefficient of determination = **invalid**
- Calibration method = **manual**
- Calibration range = **invalid**
- Calibration date is updated
- Determination ID is deleted
- User is updated

Confidence interval

Shows the confidence interval within which the measured values for the determination of the calibration curve must lie. Values outside this range are called outliers, they are not integrated in the calculation of the calibration coefficient. If the **Wavelength** and/or the coefficients **c0** to **c3** are entered manually, then **off** will be displayed.

Number of outliers

Number of outliers (values outside the confidence interval). If the wavelength and the coefficients c0 to c3 were entered manually, then **0** will be displayed.

Coefficient of determination

Shows the coefficient of determination (R^2), which is calculated on the basis of the calibration function and the confidence interval. If the **Wavelength** and/or the coefficients **c0** to **c3** have been entered manually, then **invalid** will be displayed here.

R^2 defines the extent of dispersion of y (absorbance) that can be explained by x (concentration). It lies between **0** and **1**. The closer R^2 is to 1, the more likely there is a linear dependency between x and y. If $R^2 = 0$, there is no correlation. Five decimal places are displayed.

Calibration range

Minimum and maximum concentration of the calibration solution. In this range, the calibration curve represents a monotonously ascending or descending function. The value cannot be modified. It is defined from the method and corresponds to the range between the first and last calibration points used.

Concentration unit

Concentration unit for the lower or upper limit value of the calibration range.

Selection	**mol/L** | **mmol/L** | **µmol/mL** | **g/L** | **mg/L** | **µmol/L** | **mg/mL** | **µg/mL** | **ppm** | **%** | **mEq/L**
Default value	**ppm**

Calibration temperature

Temperature at which the calibration is carried out. In addition, the display shows whether the temperature was measured with a Pt1000 or an NTC temperature sensor or entered manually.

Input range	**-20.0 to 150.0 °C**
Default value	**25.0 °C**

NOTICE

If the **Calibration temperature** has been entered manually, then the following parameters will be reset to the default value or updated:

- Calibration temperature = **manual**
- Calibration date is updated.
- Calibration method = **manual**
- Determination ID is deleted
- User is updated

Calibration date

Shows the date and time of the last calibration entered after each automatic calibration or manual entry.

Calibration method

Display of the method name with which the last calibration has been carried out. If the calibration data has been entered manually, then **manual** will appear.

Determination ID

Identification of the determination.

The determination ID can be copied and pasted into another field.

User

Shows the short name of the user who was logged in during the calibration or who entered the calibration data manually. If the login function is not used, then the user logged in under Windows will be entered automatically.

Calibration data monitoring

on | off (Default value: **off**)

If this check box is activated, then the validity of the calibration is monitored.

Calibration interval

Validity of the calibration in days. If a value is entered here, then the date for the next calibration will be adapted automatically. The days are monitored, i.e., the calibration becomes invalid when the date changes and not at the time when the calibration took place.

Only editable for **Calibration data monitoring** = **on**, otherwise inactive.

Input range	**0 to 999 days**
Default value	**999 days**

Next calibration

Date on which the next calibration is to be carried out. The date can be selected by clicking on in the **Select date** dialog window. After the date has been entered, the value for **Calibration interval** will be automatically adjusted.

Only editable for **Calibration data monitoring** = **on**, otherwise inactive.

Default value **Calibration date+ 999 days**

Message

Message by e-mail

on | off (Default value: **off**)

The message is additionally sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

Editable only if **Calibration data monitoring** = **on**, otherwise inactive.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5, page 83)*.

Active only if **Message by e-mail** = **on**.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Editable only if **Calibration data monitoring** = **on**, otherwise inactive.

Action

If during calibration data monitoring it is found that its validity has expired, then one of the following actions will be triggered automatically during the start test:

Editable only if **Calibration data monitoring** = **on**, otherwise inactive.

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity of the calibration has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether the run is to be continued or canceled. If the run is continued then the message that the validity of the calibration has expired will be saved automatically with the determination.

Cancel determination
The ongoing determination will be automatically canceled. The following message must be confirmed with **[OK]**.

6.8.3.4 Properties - Limit values

Tab: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► Limit values**

Monitoring number of outliers

on | off (Default value: **off**)

If this check box is activated, then the number of outliers during a new calibration is monitored. If this number exceeds the defined limit value, then a corresponding message will appear and you can decide whether the calibration should nevertheless be applied or if the previous calibration data should be retained.

Upper limit

Maximum number of permitted outliers.

Only editable for **Monitoring number of outliers** = **on**, otherwise inactive.

Input range	**0 to 9**
Default value	**1**

Monitoring coefficient of determination

on | off (Default value: **off**)

If this check box is activated, then the coefficient of determination (R^2) calculated from the calibration data will be monitored after a new calibration. If this number lies outside the defined range, then a corresponding message will appear and you can decide whether the calibration should nevertheless be applied or if the previous calibration data should be retained.

Lower limit

Lower limit value for the coefficient of determination.

Only editable for **Monitoring coefficient of determination** = **on**, otherwise inactive.

Input range	**0.00000 to 1.00000**
Default value	**0.95000**

6.8.3.5 Properties - History

Tab: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► History**

History table

The table contains the last 10 calibrations for the selected colorimetric sensor and can be neither edited nor sorted. The individual calibrations are sorted according to date in such a way that the most recent determination is listed last. The table contains the following columns:

Coefficient of determination

The values are shown in the following colors:

- **Blue**, if the values have been assigned automatically by a method.
- **Black**, if the values have been entered manually.
- **Orange**, if the values are outside the warning limits.
- **Red**, if the values are outside the intervention limits.

If the warning or intervention limits are breached, then the line number will also be shown with an orange and red background, respectively.

Confidence interval

Shows the confidence interval within which the measured values for the determination of the calibration curve must lie. Values outside this range are called outliers, they are not integrated in the calculation of the calibration coefficient.

Outlier

Total number of outliers (values outside the confidence interval).

Calibration date

Date and time of the calibration.

Calibration method

Name of the method with which the calibration was carried out. If the calibration data has been entered manually, then **manual** will be shown here.

User

Short name of the user who was logged in during calibration or who entered the calibration data manually. If the login function was not used, then the user logged in under Windows will be entered automatically.

History graph

The 10 last values for the selected colorimetric sensor are displayed on the **Coefficient of determination** tab. As in the history table, the values are shown in different colors:

- **blue**, if the value has been assigned automatically by a method.
- **black**, if the values have been entered manually.

If a limit value is defined, then the warning limits are shown in **orange** and intervention limits in **red**. The value **1** is always displayed as the upper warning and intervention limit.

[Limit values]

Opens the **Limit values for colorimetric sensor - 'Sensor name'** dialog window for the quantity selected in the graph, in which the warning and intervention limits for the coefficient of determination can be defined *(see chapter 6.8.3.6, page 864)*. These limits apply only for the graph. No monitoring takes place during the calibration. The limits set on the **Limit values** tab apply for the monitoring during the calibration *(see chapter 6.8.3.4, page 862)*.

[Delete history]

Deletes the history for the colorimetric sensors.

6.8.3.6 Colorimetric sensor history - Limit values

Dialog window: **Configuration ► Colorimetric sensors ► Edit ► Properties... ► History ► [Limit values] ► Limit values for colorimetric sensor - 'Sensor name'**

Warning and intervention limits for the coefficient of determination can be defined in the **Limit values for colorimetric sensor - 'Sensor name'** dialog window. If you have defined the limits, then these will be shown in the graph in **orange** for warning limits and **red** for intervention limits. However, whether these limits are observed is not monitored, i.e., a breach of these limits does not trigger any action. The limits set on the **Limit values** tab apply for the monitoring during the calibration.

Warning limits for coefficient of determination

on | off (Default value: **off**)

If this option is **enabled**, then the values for the coefficient of determination are displayed in **orange** if these limits are breached.

Lower limit

Lower warning limit for the coefficient of determination.

Input range	**0.00000 to 1.00000**
Default value	**0.98000**

Upper limit

Upper warning limit for the coefficient of determination.

Input range	**0.00000 to 1.00000**
Default value	**1.00000**

Intervention limits for coefficient of determination

on | off (Default value: **off**)

If this option is **enabled**, then the values for the coefficient of determination are displayed in **red** if these limits are breached.

Lower limit

Lower intervention limit for the coefficient of determination.

Input range	**0.00000 to 1.00000**
Default value	**0.96000**

Upper limit

Upper intervention limit for the coefficient of determination.

Input range	**0.00000 to 1.00000**
Default value	**1.00000**

6.9 Calibration data subwindow

6.9.1 Calibration data - General

Subwindow: **Configuration ► Calibration data**

Calibration data subwindow

The **Calibration data** subwindow contains the table with all data of the applied calibrations. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present on the user interface) in a separate window with **View ► Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

6.9.2 Calibration data table

6.9.2.1 Calibration data table

Subwindow: **Configuration ► Calibration data**

Contents

By default, the following information on the applied calibrations is shown in the calibration data table:

Calibration method

Method with which the calibration has been carried out.

Calibration date

Date of the last modification of the calibration.

Determination ID

Determination ID of calibration.

User

Short name of the user who modified the calibration.

Table view

The calibration data table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the calibration data table contains the following menu items:

Delete	Deletes the selected calibration data *(see chapter 6.9.2.2, page 866)*.
Print (PDF)...	Outputs the calibration data table as a PDF file *(see chapter 6.9.2.3, page 866)*.

6.9.2.2 Delete calibration data

Menu item: **Configuration ► Calibration data ► [Edit] ► Delete**

The calibration data selected in calibration data table is deleted with **[Edit] ► Delete**.

The calibration data set of an ongoing determination cannot be deleted.

6.9.2.3 Print calibration data list (PDF)

Dialog window: **Configuration ► Calibration data ► [Edit] ► Print (PDF)... ► Print calibration data list (PDF)**

Orientation

Selection of the printing orientation.

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output of the calibration data list in portrait format.

Landscape
Output of the calibration data list in landscape format.

[OK]

The calibration data list is output in the required format as a PDF file and opened directly with Acrobat reader; it can then be printed and/or saved.

6.10 Common variables subwindow

6.10.1 Configuration - Common variables

Subwindow: **Configuration ► Common Variables**

Common variables subwindow

The **Common Variables** subwindow contains the table with the configured common variables. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present in the user interface) in a separate window with **View ► Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Using common variables

Common variables are variables that apply to all methods and that are stored per client; they can be used in formulas under the designation **'CV.Name'**. They are either entered manually in the configuration or assigned in the method run under **Evaluation - Results - Common variables**.

6.10.2 Table of common variables

6.10.2.1 Table of common variables

Subwindow: **Configuration ► Common Variable - %1**

Contents

The table of common variables shows the following information about the global variables by default:

Name

Name of common variables.

Type

Type of common variables (**Number**, **Text** or **Date/Time**).

Value

Value of common variables.

Unit

Unit of common variables.

Assignment date

Date of the last value assignment for the common variable.

Assignment method

Name of the method used for value assignment.

User

Short name of the user who was logged in during value assignment.

Next assignment

Date on which the next value assignment is to be carried out. If monitoring of the common variable is enabled and the set date is before the current date (i.e., the value assignment has not yet been carried out), then the date will be shown in red.

Further columns from the properties of the common variables can be displayed with the **[Edit]** ▶ **Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The table of common variables cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the table of common variables contains the following menu items:

New...	Add manually a new common variable *(see chapter 6.10.2.2, page 869)*.
Delete	Deletes the selected common variable *(see chapter 6.10.2.3, page 869)*.
Properties...	Edit the selected common variable *(see chapter 6.10.3, page 870)*.
Column display...	Define the columns of the table of common variables *(see chapter 6.10.2.4, page 869)*.
Print (PDF)...	Output the table of common variables as PDF file *(see chapter 6.10.2.5, page 870)*.

6.10.2.2 Adding a new common variable

Menu item: **Configuration ► Common Variable - %1 ► [Edit] ► New...**

A new common variable is manually added to the table of common variables with **[Edit] ► New...**. The properties window for editing the common variables then opens automatically. After the properties window has been closed the common variable will be entered in the table of common variables. The parameters can be modified at any time with **[Edit] ► Properties...**.

6.10.2.3 Deleting a common variable

Menu item: **Configuration ► Common Variable - %1 ► [Edit] ► Delete**

The common variable selected in the table is deleted with **[Edit] ► Delete**.

6.10.2.4 Common variables - Column display

Dialog window: **Configuration ► Common Variable - %1 ► [Edit] ► Column display... ► Column display**

The **Column display** window is opened with **[Edit] ► Column display...**. Here you can define the columns that are to be shown in the table of common variables.

Available columns

Shows all fields that can be displayed as columns in the table of common variables.

Displayed columns

Shows all fields that are displayed as columns in the table of common variables. The **Name**, **Type**, **Value**, **Unit**, **Assignment date**, **Assignment method**, **User** and **Next assignment** columns are displayed by default. The three columns **Name**, **Type** and **Value** are always present and cannot be removed.

>>

Adds the selected column to the table.

<<

Removes the selected column from the table.

Changes the sequence of the displayed columns by moving the selected column upwards.

Changes the sequence of the displayed columns by moving the selected column downwards.

6.10.2.5 Printing the list of common variables

Dialog window: **Configuration ► Common Variable - %1 ► [Edit] ► Print (PDF)... ► Print list of common variables (PDF)**

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Outputs the table of common variables in portrait format.

Landscape
Outputs the table of common variables in landscape format.

[OK]

The table of common variables is output in the required format as a PDF file and opened directly with Acrobat Reader; it can then be printed out and/or saved.

6.10.3 Properties common variables

6.10.3.1 Editing properties of common variables

Dialog window: **Configuration ► Common Variables ► [Edit] ► Properties... ► Common variable 'Name'**

The properties window for the common variable selected in the table, in which the parameters of the common variables can be edited, is opened with the **[Edit] ► Properties...** menu item in the **Common Variables** subwindow. It consists of the following tabs:

- *Common variable*
  Information about common variables, such as name, type, value, etc.
- *History*
  Shows the last 10 values.

6.10.3.2 Properties - Common variable

Tab: **Configuration ► Common Variables ► [Edit] ► Properties... ► Common variable - 'Name' ► Common Variable**

Name

Name of common variables. The name may not contain the following characters: **\ ' . { } [ ]**

Entry	**50 characters**

Type

Selection of the type for a new common variable. For existing common variables, the type will only be shown; it cannot be edited.

Selection	**Number** | **Text** | **Date/Time**
Default value	**Number**

Value

Value of common variables. This value can be assigned in a method or entered manually. It is available for methods that use the common variable as variable **'CV.Name'** (short form) for calculations.

For type **Date/Time** variables, the date can be selected by clicking on in the **Select date** dialog window.

Type = Number

Input range	**-1E+99 to 1E+99 (max. 15 places)**

Type = Text

Entry	**256 characters**

Type = Date/Time

Selection	**Date selection**

Value (unit)

Designation of the unit. If a value is assigned automatically, then the unit will be automatically entered here. It is available for methods that use the common variable as variable **'CV.Name.UNI'** for calculations.

Entry	**20 characters**
Selection	**'empty'** | **mol/L** | **mmol/L** | **µmol/L** | **g/L** | **mg/L** | **µg/L** | **mg/mL** | **ppm** | **%** | **mEq/L** | **mL** | **µg**
Default value	**mg/L**

Comment

Possibility of entering remarks about the common variable.

Entry	**256 characters**

Assignment date

Date and time of last value assignment; this is entered automatically each time that a value is assigned automatically or entered manually.

NOTICE

In contrast to automatic value assignment, no new date is entered when the value is assigned manually if the value remains unchanged.

Assignment method

Name of the method with which the last value assignment was carried out. If the value has been entered manually, then **manual** will be shown here.

User

Short name of the user who was logged in during value assignment or who entered the value manually. If the login function is not used, then the user logged in under Windows will be entered automatically.

Common Variable monitoring

on | off (Default value: **off**)

If this check box is activated, then the validity of the common variables is monitored.

Validity

Validity period of the common variable in days. If a value is entered here, then the **Next assignment** field will be adjusted automatically.

Input range	**0 to 999 days**
Default value	**999 days**

Next assignment

Date on which the next value assignment must take place. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After a date has been entered, the value for the **Validity** will be automatically adjusted.

Selection	**Date selection**

Message

The message options can only be edited if monitoring of common variables is enabled.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring for common variables is enabled.

If during common variable monitoring it is found that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period of the common variable has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, then the message that the validity period of the common variable has expired will be automatically saved with the determination.

Cancel determination
The ongoing determination will be automatically canceled. The following message must be confirmed with **[OK]**.

6.10.3.3 Properties - History

Tab: **Configuration ► Common Variables ► [Edit] ► Properties... ► Common variable - 'Name' ► History**

History table

The table contains the last 10 values for the selected common variable and cannot be edited or sorted. The individual values are sorted according to date so that the most recent assignment is shown last.

Value

The values are shown in the following colors:

- **Blue**, if the value has been assigned automatically by a method.
- **Black**, if the values have been entered manually.
- **Orange**, if the values are outside the warning limits.
- **Red**, if the values are outside the intervention limits.

If the warning or intervention limits are breached, then the line number will also be shown with an orange and red background, respectively.

Assignment date

Date and time of value assignment.

Assignment method

Name of the method with which the value assignment was carried out. If the values have been entered manually, then **manual** will be shown here.

User

Short name of the user who was logged in during value assignment or who entered the values manually. If the login function was not used, then the user logged in under Windows will be entered automatically.

History graph

The graph shows the last 10 values for the selected common variable. As in the history table, the values are shown in different colors:

- **Blue**, if the value has been determined automatically by a method.
- **Black**, if the value has been entered manually.

If limits have been defined, then the warning limits will be shown in **orange** and the intervention limits in **red**.

NOTICE

The history graph can be copied in the clipboard with the context-sensitive **Copy** menu item.

[Limit values]

Opens the **Limits for common variable** dialog window, in which the warning and intervention limits can be defined for the common variables. These limits apply only to the graph; no monitoring takes place during value assignment.

[Delete history]

Deletes the history.

6.10.3.4 History - Limit values

Tab: **Configuration ► Common Variables ► [Edit] ► Properties... ► Common variable - 'Name' ► History ► [Limit values] ► Limit values common variable - 'Name'**

In the **Limits for common variable** dialog window both warning and intervention limits can be defined for the value of the common variables. If you have defined the limits, then these will be shown in the graph in **orange** for warning limits and **red** for intervention limits. However, whether these limits are observed is not monitored, i.e., a breach of these limits does not trigger any action.

Warning limits for Common Variable

on | off (Default value: **off**)

If this check box is activated, then the values of the common variables will be shown in **orange** if these limits are breached.

Lower limit

Lower warning limit for common variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Upper limit

Upper warning limit for common variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Intervention limits for Common Variable

on | off (Default value: **off**)

If this check box is activated, then the values of the common variables will be shown in **red** if these limits are breached.

Lower limit

Lower warning limit for common variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Upper limit

Upper warning limit for common variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

6.11 Global variables subwindow

6.11.1 Configuration - Global variables

Subwindow: **Configuration ► Global Variables**

Global variables subwindow

The **Global Variables** subwindow contains the table with the configured global variables. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present on the user interface) in a separate window with ► **Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Using global variables

Global variables are variables that apply to all methods and that are stored for all clients; they can be used in formulas under the designation **'GV.Name'**. They are either entered manually in the configuration or assigned in the method run under **Evaluation - Results - Global variables**.

6.11.2 Table of global variables

6.11.2.1 Table of global variables

Subwindow: **Configuration ► Global Variables**

Contents

The table of global variables shows the following information about the global variables by default:

Name

Name of global variable.

Type

Type of global variables (**Number**, **Text** or **Date/Time**).

Value

Value the global variables.

Unit

Unit of the global variables.

Assignment date

Date of the last value assignment for the global variable.

Assignment method

Name of the method used for value assignment.

User

Short name of the user who was logged in during value assignment.

Client ID

Identification of the client (client ID) on which the value was assigned.

Next assignment

Date on which the next value assignment is to be carried out. If monitoring of the global variable is enabled and the set date is before the current date (i.e., the value assignment has not yet been carried out) then the date will be shown in red.

Further columns from the properties of the global variables can be displayed with the **[Edit] ► Column display...** menu item.

NOTICE

Lines that contain red entries will also show the line number highlighted with a red background.

Table view

The table of global variables cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

Functions

The **[Edit]** menu beneath the table of global variables contains the following menu items:

New...	Add manually a new global variable *(see chapter 6.11.2.2, page 878)*.
Delete	Deletes the selected global variable *(see chapter 6.11.2.3, page 878)*.
Properties...	Edits the selected global variable *(see chapter 6.11.3, page 879)*.

Column display...	Defines the columns of the table of global variables *(see chapter 6.11.2.4, page 878)*.
Print (PDF)...	Outputs the table of global variables as a PDF file *(see chapter 6.11.2.5, page 879)*.

6.11.2.2 Adding a new global variable

Menu item: **Configuration ▶ Global Variables ▶ [Edit] ▶ New...**

A new global variable is manually added to the table of global variables with **[Edit] ▶ New...**. The properties window then opens automatically for editing the global variable. After the properties window has been closed the global variable will be entered in the table of global variables. The parameters can be modified at any time with **[Edit] ▶ Properties...**.

6.11.2.3 Deleting a global variable

Menu item: **Configuration ▶ Global Variables ▶ [Edit] ▶ Delete**

The global variable selected in the table is deleted with **[Edit] ▶ Delete**.

6.11.2.4 Global variables - Column display

Dialog window: **Configuration ▶ Global Variables ▶ [Edit] ▶ Column display... ▶ Column display**

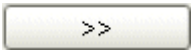
The **Column display** window is opened with **[Edit] ▶ Column display...**. Here you can define the columns that are to be shown in the table of global variables.

Available columns

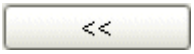
Display of all the fields that can be displayed as columns in the table of global variables.

Displayed columns

Displays all the fields that are displayed as columns in the table of global variables. The **Name**, **Type**, **Value**, **Unit**, **Assignment date**, **Assignment method**, **User** and **Next assignment** columns are displayed by default. The three columns Name, **Type** and **Value** are always present and cannot be removed.



Adds the selected column to the table.



Removes the selected column from the table.

Changes the sequence of the displayed columns by moving the selected column upwards.

Changes the sequence of the displayed columns by moving the selected column downwards.

6.11.2.5 Printing the list of global variables

Dialog window: **Configuration ► Global Variables ► [Edit] ► Print (PDF)... ► Print list of global variables (PDF)**

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Outputs the table of global variables in portrait format.

Landscape
Outputs the table of global variables in landscape format.

[OK]

The table of global variables is output in the required format as a PDF file and opened directly with Acrobat Reader; it can then be printed out and/or saved.

6.11.3 Properties global variables

6.11.3.1 Editing the properties of the global variable

Dialog window: **Configuration ► Global Variables ► [Edit] ► Properties... ► Global variable 'Name'**

The properties window for the global variable selected in the table, in which the parameters of the global variable can be edited, is opened with the **[Edit] ► Properties...** menu item in the **Global variables** sub-window. It consists of the following tabs:

- *Global variable*
  Information about the global variable, such as name, type, value, etc.
- *History*
  Shows the last 10 values.

6.11.3.2 Properties - Global variable

Tab: **Configuration ► Global Variables ► [Edit] ► Properties... ► Global variable - 'Name' ► Global Variable**

Name

Name of the global variable. The name may not contain the following characters: **\ ' . { } [ ]**

Entry	**50 characters**

Type

Selection of the type for a new global variable. For existing global variables the type will only be shown; it cannot be edited.

Selection	**Number** | **Text** | **Date/Time**
Default value	**Number**

Value

Value of the global variable. This value can be assigned in a method or entered manually. It is available for methods that use the global variable as variable **'GV.Name'** (short form) for calculations.

For type **Date/Time** variables, the date can be selected by clicking on in the **Select date** dialog window.

Type = Number

Input range	**-1E+99 to 1E+99 (max. 15 places)**

Type = Text

Entry	**256 characters**

Type = Date/Time

Selection	**Date selection**

Value (unit)

Designation of the unit. If a value is assigned automatically, then the unit will be automatically entered here. It is available for methods that use the global variable as variable **'GV.Name.UNI'** for calculations.

Entry	**20 characters**
Selection	**'empty'** | **mol/L** | **mmol/L** | **µmol/L** | **g/L** | **mg/L** | **µg/L** | **mg/mL** | **ppm** | **%** | **mEq/L** | **mL** | **µg**
Default value	**mg/L**

Comment

Possibility of entering remarks about the global variable.

Entry	**256 characters**

Assignment date

Date and time at of last value assignment; this is entered automatically each time that a value is assigned automatically or entered manually.

NOTICE

In contrast to automatic value assignment, no new date is entered when the value is assigned manually if the value remains unchanged.

Assignment method

Name of the method with which the last value assignment was carried out. If the value has been entered manually then **manual** will be shown here.

User

Short name of the user who was logged in during value assignment or who entered the value manually. If the login function is not used, then the user logged in under Windows will be entered automatically.

Client ID

Identification of the client (client ID) on which the value was assigned.

Global Variable monitoring

on | off (Default value: **off**)

If this check box is activated, then the validity of the global variable is monitored.

Validity

Validity period of the global variable in days. If a value is entered here, then the **Next assignment** field will be adjusted automatically.

Input range	**0 to 999 days**
Default value	**999 days**

Next assignment

Date on which the next value assignment must take place. The date can be selected by clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After a date has been entered, the value for the **Validity** will be automatically adjusted.

Selection	**Date selection**

Message

The message options can only be edited if monitoring of the global variable is activated.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring of the global variable is switched on.

If during global variable monitoring it is found that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period of the global variable has expired will be automatically saved in the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, then the message that the validity period of the global variable has expired will be automatically saved with the determination.

Cancel determination
The ongoing determination will be automatically canceled. The following message must be confirmed with **[OK]**.

6.11.3.3 Properties - History

Tab: **Configuration ► Global Variables ► [Edit] ► Properties... ► Global variable - 'Name' ► History**

History table

The table contains the last 10 values for the selected global variable and cannot be edited or sorted. The individual values are sorted according to date so that the most recent assignment is shown last.

Value

The values are shown in the following colors:

- **Blue**, if the value has been assigned automatically by a method.
- **Black**, if the values have been entered manually.
- **Orange**, if the values are outside the warning limits.
- **Red**, if the values are outside the intervention limits.

If the warning or intervention limits are breached, then the line number will also be shown with an orange and red background, respectively.

Assignment date

Date and time of value assignment.

Assignment method

Name of the method with which the value assignment was carried out. If the values have been entered manually, then **manual** will be shown here.

User

Short name of the user who was logged in during value assignment or who entered the values manually. If the login function was not used, then the user logged in under Windows will be entered automatically.

History graph

The graph shows the last 10 values for the selected global variable. As in the history table, the values are shown in different colors:

- **Blue**, if the value has been determined automatically by a method.
- **Black**, if the value has been entered manually.

If limits have been defined, then the warning limits will be shown in **orange** and the intervention limits in **red**.

NOTICE

The history graph can be copied to the clipboard with the context-sensitive **Copy** menu item.

[Limit values]

Opens the **Limit values for Global Variable** dialog window, in which the warning and intervention limits can be defined for the global variable. These limits apply only to the graph; no monitoring takes place during value assignment.

[Delete history]

Deletes the history.

6.11.3.4 History - Limit values

Dialog window: **Configuration ► Global Variables ► [Edit] ► Properties... ► Global variable - 'Name' ► History ► [Limit values] ► Limit values global variable - 'Name'**

In the **Limit values for Global Variable** dialog window both warning and intervention limits can be defined for the value of the global variable. If you have defined the limits, then these will be shown in the graph in **orange** for warning limits and **red** for intervention limits. However, whether these limits are observed is not monitored, i.e., a breach of these limits does not trigger any action.

Warning limits for Global Variable

on | off (Default value: **off**)

If this check box is activated, then the values of the global variable will be shown in **orange** if these limits are breached.

Lower limit

Lower warning limit for global variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Upper limit

Upper warning limit for global variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Intervention limits for Global Variable

on | off (Default value: **off**)

If this check box is activated, then the values of the global variable will be shown in **red** if these limits are breached.

Lower limit

Lower warning limit for global variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

Upper limit

Upper warning limit for global variable.

Input range	**-1.0E+99 to 1.0E+99 (max. 10 digits)**

6.12 Rack data subwindow

6.12.1 Configuration - Rack data

Subwindow: **Configuration ▶ Rack data**

Rack data subwindow

The **Rack data** subwindow contains the rack table with all sample racks for Metrohm sample changers defined for the client. It can be shown in the **Configuration** program part as a part of the configuration view or (if not present in the user interface) in a separate window with **View ▶ Quick access**. The subwindow can be enlarged and reduced as required; it can also be maximized.

Display of sample racks

The rack table is empty by default. Sample racks that are placed on sample processors are recognized automatically and included in the rack table. Additional racks can be imported manually from the program directory **...\Metrohm\viva\res\rackdata**.

6.12.2 Rack table

6.12.2.1 Rack table

Subwindow: **Configuration ▶ Rack data**

Contents

The rack data table shows the following information about the configured racks as the default setting:

Rack name

Name of the rack.

Rack code

Rack code of the rack.

Number of positions

Number of sample positions on the rack.

Beaker radius samples

Radius of the beakers on the rack.

Beaker sensor

Defines the beaker sensors for the rack.

Device

Shows the devices to which the rack is attached.

Table view

The rack table cannot be edited directly. Click on the column title to sort the table according to the selected column in either ascending or descending order. The table view can be adapted with the left mouse button as follows:

- **Dragging the margin between column titles**:
  Sets the column width
- **Double-clicking on the margin between column titles**:
  Sets the optimal column width
- **Dragging the column title**:
  Moves the column to the required location

If the content of a field is larger than the column width, then the entire content will be shown as a tooltip if the mouse cursor hovers over the field.

For sample racks that are placed on a Sample Processor and that are automatically recognized, the corresponding device name will be displayed in the **Device** column. In addition the line number will be shown with a green background.

If a rack is reserved for an ongoing determination or for manual control, then the line will be shown in gray and the rack cannot be edited until the determination has been finished.

Functions

The **[Edit]** menu beneath the rack table contains the following menu items:

New...	Add manually a new rack *(see chapter 6.12.2.2, page 887)*.
Delete	Deletes the selected rack *(see chapter 6.12.2.3, page 887)*.
Properties...	Edit the selected rack *(see chapter 6.12.3.1, page 888)*.
Print (PDF)...	Output of the rack table as a PDF file .*(see chapter 6.12.2.4, page 887)*

6.12.2.2 Adding a new rack

Dialog window: **Configuration ▶ Rack data ▶ [Edit] ▶ New... ▶ New rack**

A new rack can only be generated as a copy of an already existing rack under a new rack name and with a new rack code. The **New rack** dialog window opens with **[Edit] ▶ New...**.

Copy from

Selection of the rack to be used as a template for the new rack.

Selection	**All existing racks**

Rack name

Name for the new rack. The selected name must not already exist.

Entry	**25 characters**

Rack code

Code of the new rack. The selected rack code must not already exist.

Entry	**6-digit bit pattern consisting of 0 and 1**

6.12.2.3 Deleting a rack

Menu item: **Configuration ▶ Rack data ▶ [Edit] ▶ Delete**

The rack selected in the rack list is deleted with **[Edit] ▶ Delete**.

6.12.2.4 Printing the rack list

Dialog window: **Configuration ▶ Rack data ▶ [Edit] ▶ Print (PDF)... ▶ Print list of racks (PDF)**

The **Print list of racks (PDF)** dialog window is opened with **[Edit] ▶ Print (PDF)...**.

Orientation

Selection	**Portrait** | **Landscape**
Default value	**Portrait**

Portrait
Output of the rack table in portrait format.

Landscape
Output of the rack table in landscape format.

[OK]

The rack table is output in the required format as a PDF file and opened directly with Acrobat Reader; it can then be printed and/or saved.

6.12.3 Rack properties

6.12.3.1 Editing rack properties

Dialog window: **Configuration ► Rack data ► [Edit] ► Properties... ► Rack data**

Rack name

Shows the name of the rack attached. If no rack is attached, then "**-----**" will be shown.

Rack code

Shows the rack code of the rack attached. The rack code corresponds to the arrangement of magnets on the base of the rack and is read in by the Sample Processor in order to recognize the rack. If no rack is in position, then the display will be empty.

Number of positions

Shows the number of positions on the rack. If no rack is in position, then the display will be empty.

The parameters for the attached rack are defined on the following tabs:

- *Rack parameters*
  Defines the parameters that are valid for all rack positions.
- *Lift positions*
  Defines the work, rinse, shift and special positions for Tower 1 and Tower 2 (if present).
- *Special beakers*
  Settings for all special beakers on the attached rack.

6.12.3.2 Properties - Rack parameters

Dialog window: **Configuration ► Rack data ► [Edit] ► Properties... ► Rack data ► Rack parameters**

Beaker radius samples

Radius of the sample beakers on the rack. If the lift is moved to the work position, then this value will be compared with the **Min. beaker radius** parameter *(see chapter 7.1.3, page 894)*, which can be specifically defined for each tower. If **Beaker radius samples** < **Min. beaker radius**, then a corresponding error message will appear. With **off**, the beaker radius will not be checked.

Input range	**1.0 to 100.0 mm**
Selection	**off**

Beaker sensor

If a sample position is approached with the **MOVE** command, then the beaker sensor (**Tower**, **Robotic arm**) checks whether a sample beaker is

present or not. With **off**, no check takes place. For the **Robotic arm** option, a Swing Head with beaker sensor must be installed and a suitable work position with beaker contact must be defined for the lift, as this position is approached for beaker recognition.

With the **Beaker test** parameter in the **MOVE** command, you can determine whether the determination is to be canceled if a beaker is missing with or without the display of a corresponding message and whether the series is to be continued or canceled as well.

Selection	**Tower** | **Robotic arm** | **off**

Rack offset

The rack offset is a production-dependent tolerance value between the upper part of the rack and the lower part. The rack offset value is determined when the rack is adjusted and displayed here. If necessary, it can be edited.

Input range	**-5.00 to 5.00 °**

6.12.3.3 Properties - Lift positions

Dialog window: **Configuration ► Rack data ► [Edit] ► Properties... ► Rack data ► Lift positions**

Tower 1

Defines the lift positions for tower 1. These apply for all rack positions except those that are defined as **Special beakers**.

Work position

Work position for lift 1.

Input range	**0 to 235 mm**

Rinse position

Rinse position for lift 1.

Input range	**0 to 235 mm**

Shift position

Shift position for Lift 1. Each time that the rack shifts, the lift will move to this position if it is located at a lower lift position. If the lift is located at a higher lift position than that defined here, then it will shift at the current lift position. This means that the shift position must be selected so that a safe movement across the entire rack is possible at any time.

Input range	**0 to 235 mm**

Special position

Special position for lift 1.

Input range	**0 to 235 mm**

Tower 2

Defines the lift positions for tower 2. These apply for all rack positions except those that are defined as **Special beakers**.

Work position

Work position for lift 2.

Input range	**0 to 235 mm**

Rinse position

Rinse position for lift 2.

Input range	**0 to 235 mm**

Shift position

Shift position for Lift 2. Each time that the rack shifts, the lift will move to this position if it is located at a lower lift position. If the lift is located at a higher lift position than that defined here, then it will shift at the current lift position. This means that the shift position must be selected so that a safe movement across the entire rack is possible at any time.

Input range	**0 to 235 mm**

Special position

Special position for lift 2.

Input range	**0 to 235 mm**

6.12.3.4 Properties - Special beaker

Dialog window: **Configuration ► Rack data ► [Edit] ► Properties... ► Rack data ► Special beakers**

The table shows the data of all special beakers of the attached rack in tabular form. Any position on the rack can be assigned to each special beaker. The table cannot be edited directly.

NOTICE

Special beakers should preferably be set at high rack positions in order to be able to begin sample series at rack position 1. Rack positions defined as special beakers are no longer available as sample positions. A specific work position can be defined for each special beaker at tower 1 and tower 2 (if present). The shift, rinse and special positions of the corresponding tower are applied from the general rack positions.

The following columns are displayed in the table:

Special beaker

Number of the special beaker for the selected rack.

Rack position

Number of the rack position for the special beaker.

Work position Tower 1

Work position for the special beaker at tower 1.

Work position Tower 2

Work position for the special beaker at tower 2.

Beaker radius

Radius of the special beaker.

Beaker sensor

Defines whether a beaker sensor is to be used for the special beaker, and if so, which.

[Edit]

Opens the **Special beaker #** *(see chapter 6.12.3.5, page 891)* dialog window for editing the data of the selected special beaker.

6.12.3.5 Special beaker

Dialog window: **Configuration ▶ Rack data ▶ [Edit] ▶ Properties... ▶ Rack data ▶ Special beakers ▶ [Edit] ▶ Special beaker #**

The parameters for the special beaker selected in the table of special beakers can be defined in the **Special beaker #** dialog window.

Rack position

Number of the rack position for the selected special beaker.

Input range	**0 to n (n is rack-dependent)**

NOTICE

Special beakers should preferably be set at high rack positions in order to be able to begin sample series at rack position 1. Rack positions defined as special beakers are no longer available as sample positions. They will be skipped during an automatic movement to a sample position.

Work position Tower 1

Work position of the selected special beaker at tower 1.

Input range	**0 to 235 mm**

Work position Tower 2

Work position of the selected special beaker at tower 2.

Input range	**0 to 235 mm**

Beaker radius

Radius of the selected special beaker on the rack. If the lift is moved to the work position, then this value will be compared with the **Min. beaker radius** parameter *(see chapter 7.1.3, page 894)*, which can be specifically defined for each tower. If **Beaker radius samples** < **Min. beaker radius**, then a corresponding error message will appear. With **off**, the beaker radius will not be checked.

Input range	**1.0 to 100.0 mm**
Selection	**off**

Beaker sensor

If the **MOVE** command is used for moving to the selected special beaker, then the beaker sensor (**Tower**, **Robotic arm**) will check whether a sample beaker is present or not. With **off**, no check takes place. For the **Robotic arm** option, a Swing Head with beaker sensor must be installed and a suitable work position with beaker contact must be defined for the lift, as this position is approached for beaker recognition.

With the **Beaker test** parameter in the **MOVE** command, you can determine whether the determination is to be canceled if a beaker is missing with or without the display of a corresponding message and whether the series is to be continued or canceled as well.

Selection	**Tower** | **Robotic arm** | **off**

7 Devices

7.1 919 IC Autosampler plus

7.1.1 919 IC Autosampler plus - Overview

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name'**

Model versions

The **919 IC Autosampler plus** is available in one model version:

- **919.0020 919 IC Autosampler plus**
  Sample changer with integrated two-channel peristaltic pump.

Tabs

The parameters for the **919 IC Autosampler plus** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *Tower*
  Properties of the tower.
- *Rack*
  Information on the rack attached.
- *Starting position*
  Position which is automatically approached when the sample changer is initialized.
- *MSB #*
  Properties of the MSB connector and the peripheral devices connected to it.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.1.2 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.1.3 Properties - Tower

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Tower**

NOTICE

With the 858 Professional Sample Processor and the 919 IC Autosampler plus, the properties of the tower, including the Swing Head attached to it, are displayed on the **Tower** tab. In the case of the 814 USB Sample Processor and the 815 Robotic USB Sample Processor XL, the model versions with one tower have one tab, **Tower 1**; model versions with two towers have two tabs, **Tower 1** and **Tower 2**.

Tower parameters

Max. stroke path

Entry of the lowest permitted lift position. A lift height of **0 mm** corresponds to the "home position", i.e. the lift is moved all the way to the top.

Input range	**0 to 235 mm**
Default value	**127 mm**

Min. beaker radius

Definition of the minimum radius which the beakers used on the rack must have. If the lift is moved to the work position, the beaker radii defined in the rack table *(see chapter 6.12.2, page 885)* for general sample positions *(see chapter 6.12.3, page 888)* and special beakers *(see chapter 6.12.3.2, page 888)* are compared with the **Min. beaker radius**. If this minimum beaker radius is not achieved, the run is stopped and an error message is output. No check will be made if **off** is enabled.

Input range	**1.0 to 100.0 mm**

Selection	**off**
Default value	**off**

Lift rate

Lift rate for manual operation.

Input range	**3 to 25 mm/s**
Default value	**25 mm/s**

Axial distance

Distance between the axis of rotation of the sample rack and the swing axis of the robotic arm.

814 USB Sample Processor, 858 Professional Sample Processor

Input range	**100.0 to 300.0 mm**
Default value	**166.0 mm**

815 Robotic USB Sample Processor XL

Input range	**100.0 to 300.0 mm**
Default value	**196.0 mm**

919 IC Autosampler plus

Input range	**100.0 to 300.0 mm**
Default value	**189.0 mm**

Swing Head

This parameter is only shown only if a Swing Head is mounted on the tower.

Serial number

Shows the serial number of the Swing Head.

Swing position

Lift position that is valid for all four external positions and at which the robotic arm turns to the external positions.

Input range	**0 to 235 mm**
Default value	**0 mm**

Rinse position

Rinse position that is valid for all four external positions and which can be approached with the **LIFT** command.

Input range	**0 to 235 mm**
Default value	**0 mm**

[Configuration]

Opens the **Robotic arm configuration** dialog window *(see chapter 7.1.8, page 902)*, in which the properties of the robotic arm can be edited.

Table for external positions

The properties for the four possible external positions for the robotic arm mounted on the Swing Head are shown in the table. The table cannot be edited directly.

External position

Number of the external position.

Angle [°]

Swing angle for external position.

Work position [mm]

Work position for external position.

[Edit]

Opens the **External position #** dialog window *(see chapter 7.1.9, page 903)*, in which the parameters for the external position selected from the table can be edited.

7.1.4 Properties - Rack

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Rack**

The **Rack** tab shows the rack-specific data of the attached rack.

Rack name

Shows the name of the rack attached. If no rack is attached, then "**-----**" is shown.

Rack code

Shows the rack code of the rack attached. The rack code corresponds to the arrangement of magnets on the base of the rack and is read in by the Sample Processor in order to recognize the rack. If no rack is in position, then the display will be empty.

Number of positions

Shows the number of positions on the rack. If no rack is in position, then the display will be empty.

Shift rate

Sample rack shift rate for manual operation.

Input range	**3 to 20 °/s**
Default value	**20 °/s**

[Rack data]

Opens the **Rack data** dialog window *(see chapter 6.12.3, page 888)*, in which the data of the attached rack can be viewed and edited.

[Initialize rack]

Initializes the attached rack. This resets the rack, the lift and the robotic arm, reads out the rack code and transfers the corresponding rack data to the Sample Processor.

7.1.5 Properties - Starting position

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Starting position**

On the **Starting position** tab, a position can be defined which is automatically approached when the device is initialized.

Move to starting position

on | off (Default value: **off**)

If this check box is activated, the position defined here is approached when the device is initialized.

Tower

Selection of the tower on the sample changer for moving to the required position.

Only editable for **Move to starting position** = **on** and if the corresponding sample changer has two towers, otherwise inactive.

Selection	**1** | **2**
Default value	**1**

Move

Selection of the target position which is to be approached:

Only editable for **Move to starting position** = **on**, otherwise inactive.

Selection	**Rack position** | **Special beaker** | **External position**
Default value	**Rack position**

Rack position
Predefined position on the rack. The lift is lowered to the work position defined for that position.

Special beaker
Special position on the rack defined in the rack properties. The lift is lowered to the work position defined for that position.

External position
External position which is defined for the Swing Head mounted to the tower. The lift is lowered to the work position defined for that position.

Number

Specification of the number of the rack position, of the special beaker or of the external position.

Only editable for **Move to starting position** = **on**, otherwise inactive.

for Move = Rack position

Input range	**1 to 999**
Default value	**1**

for Move = Special beaker

Input range	**1 to 16**
Default value	**1**

for Move = External position

Input range	**1 to 4**
Default value	**1**

7.1.6 Properties - MSB

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.1.7 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.1.8 Robotic arm configuration

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Configuration] ► Robotic arm configuration**

The specific settings for the robotic arm mounted on a Swing Head can be made in the **Robotic arm configuration** dialog window.

Swing offset

Swing angle offset for specific robotic arm model. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Max. swing range

Maximum usable swing range for specific robotic arm model. Each robotic arm model displays a different value on the basis of its construction. This value must be set according to the leaflet supplied with the robotic arm and can also be reduced as required.

Input range	**0.0 to 330.0 °**
Default value	**60.0 °**

Swing radius

The swing radius depends on the length of the robotic arm and, together with the axial distance, is the most important parameter for exact movement to a rack position. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**30.0 to 300.0 mm**
Default value	**110.0 mm**

Rotation offset

Offset from the middle of the tower to the middle of the robotic arm; normally, this value does not have to be changed. If a robotic arm must be mounted on the tower so that it is offset to one side, then this value can be determined by the service technician during rack adjustment.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Swing direction

The swing direction of the robotic arm depends on the type of robotic arm.

For a two-tower model, the robotic arm on tower 1 must swing to the right, i.e., **–**, and that on tower 2 must swing to the left, **+**.

Selection	**+** | **–**
Default value	**+**

+
Clockwise rotation.

–
Counterclockwise rotation.

7.1.9 External position

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Edit] ► External position #**

An **Angle** and a specific **Work position** can be defined for each external position in the **External position #** dialog window.

Angle

Definition of the swing angle for the selected external position.

Input range	**-270.0 to 270.0 °**
Default value	**60.0 °**

Work position

Definition of the work position for the selected external position.

Input range	**0 to 235 mm**
Default value	**0 mm**

7.2 894 Professional CVS

7.2.1 894 Professional CVS - Overview

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The parameters for the **894 Professional CVS** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *(see chapter 7.1.6, page 899)*
  Properties of the MSB connector and the peripheral devices connected to it.

- *Calibrator*
  Properties of the calibrator.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.2.2 Properties - General

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.2.3 Properties - MSB

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.2.4 Properties - Calibrator

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Calibrator**

The general properties of the calibrator are displayed on the **Calibrator** tab.

Calibrator serial number

Shows the serial number of the calibrator.

Set to work

Shows the date on which the calibrator was activated.

Remarks

Remarks about the calibrator.

Entry	**max. 1,000 characters**
Default value	**'empty'**

Monitor calibrator

on | off (Default value: **on**)

If this check box is activated, then the **Replacement interval** for the calibrator is monitored. Editable only if **Monitor calibrator** has been enabled.

Replacement interval

Time interval to the next calibrator check.

Because the values of electronic components tend to deviate from the set-point value as a result of aging, the strict technical specifications of the components can only be guaranteed for two years. Afterwards, the calibrator should be replaced by MetroService, which allows the Potentiostat to offer the guaranteed measuring accuracy for another two years.

Editable only if **Monitor calibrator** has been enabled.

Input range	**1 to 730 days**
Default value	**700 days**

Next check

Date on which the calibrator is to be replaced the next time. Clicking on opens the **Select date** dialog window, in which you can select the date *(see chapter 2.4.1, page 81)*. After the date has been entered, the **Replacement interval** field will be adjusted automatically.

Message

The message options can only be edited if **Monitor calibrator** is enabled.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions are only editable if Monitor calibrator is enabled.

If it is found during calibrator monitoring that the replacement interval has expired, one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the replacement interval of the calibrator has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, the message that the replacement interval of the calibrator has expired will be automatically saved with the determination.

Cancel determination
The ongoing determination will be automatically canceled. The following message must be confirmed with **[OK]**.

7.2.5 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.2.6 Dialog window Load new program version

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► [General ► Update] ► Load new program version**

If it is discovered that the device to be connected has an old program version not supported by **viva**, then it must be updated. To do so, the device

must be selected in the device table and the properties window must be opened with **Edit ► Properties...**. Afterwards, the **Load new program version** dialog window is opened on the **General** tab with **[Update]**.

Old version

Shows the old device program version.

New version

Shows the new device program version.

[Load]

Loads the new program version. A progress bar is shown during loading.

NOTICE

Make sure that the device is not manipulated or switched off during the loading process, and follow the instructions shown.

7.3 884 Professional VA

7.3.1 884 Professional VA - Overview

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The parameters for the **884 Professional VA** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *(see chapter 7.1.6, page 899)*
  Properties of the MSB connector and the peripheral devices connected to it.
- *Calibrator*
  Properties of the calibrator.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.3.2 Properties - General

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.3.3 Properties - MSB

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.3.4 Properties - Calibrator

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Calibrator**

The general properties of the calibrator are displayed on the **Calibrator** tab.

Calibrator serial number

Shows the serial number of the calibrator.

Set to work

Shows the date on which the calibrator was activated.

Remarks

Remarks about the calibrator.

Entry	**max. 1,000 characters**
Default value	**'empty'**

Monitor calibrator

on | off (Default value: **on**)

If this check box is activated, then the **Replacement interval** for the calibrator is monitored. Editable only if **Monitor calibrator** has been enabled.

Replacement interval

Time interval to the next calibrator check.

Because the values of electronic components tend to deviate from the set-point value as a result of aging, the strict technical specifications of the components can only be guaranteed for two years. Afterwards, the calibrator should be replaced by MetroService, which allows the Potentiostat to offer the guaranteed measuring accuracy for another two years.

Editable only if **Monitor calibrator** has been enabled.

Input range	**1 to 730 days**
Default value	**700 days**

Next check

Date on which the calibrator is to be replaced the next time. Clicking on [...] opens the **Select date** dialog window, in which you can select the date *(see chapter 2.4.1, page 81)*. After the date has been entered, the **Replacement interval** field will be adjusted automatically.

Message

The message options can only be edited if **Monitor calibrator** is enabled.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions are only editable if Monitor calibrator is enabled.

If it is found during calibrator monitoring that the replacement interval has expired, one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the replacement interval of the calibrator has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued, the message that the replacement interval of the calibrator has expired will be automatically saved with the determination.

Cancel determination
The ongoing determination will be automatically canceled. The following message must be confirmed with **[OK]**.

7.3.5 Properties - GLP

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ GLP**

Tab: **Configuration ▶ Dosing units ▶ [Edit] ▶ Properties... ▶ Dosing unit - 'Name' ▶ GLP**

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.3.6 Dialog window Load new program version

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► [General ► Update] ► Load new program version**

If it is discovered that the device to be connected has an old program version not supported by **viva**, then it must be updated. To do so, the device must be selected in the device table and the properties window must be opened with **Edit ► Properties...**. Afterwards, the **Load new program version** dialog window is opened on the **General** tab with **[Update]**.

Old version

Shows the old device program version.

New version

Shows the new device program version.

[Load]

Loads the new program version. A progress bar is shown during loading.

NOTICE

Make sure that the device is not manipulated or switched off during the loading process, and follow the instructions shown.

7.4 858 Professional Sample Processor

7.4.1 858 Professional Sample Processor - Overview

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name'**

Model versions

NOTICE

The **858 Professional Sample Processor** is available in various versions that differ in the combination of integrated modules. The **858 Professional Sample Processor** is described in the online help with all possible modules.

Different versions are available for different fields of application:

- **858.0010 Professional Sample Processor**
  Sample changer without peristaltic pump.
- **858.0020 Professional Sample Processor**
  Sample changer with integrated two-channel peristaltic pump.
- **858.0030 Professional Sample Processor**
  Sample changer with integrated two-channel peristaltic pump and injection valve.

Tabs

The parameters for the **858 Professional Sample Processor** are set on the following tabs:

- *General*
  General device information, such as device name, device type, serial number, etc.
- *Tower*
  Properties of the tower.
- *Rack*
  Information on the rack attached.
- *Starting position*
  Position which is automatically approached when the sample changer is initialized.
- *MSB #*
  Properties of the MSB connector and the peripheral devices connected to it.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.4.2 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.4.3 Properties - Tower

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Tower**

NOTICE

With the 858 Professional Sample Processor and the 919 IC Autosampler plus, the properties of the tower, including the Swing Head attached to it, are displayed on the **Tower** tab. In the case of the 814 USB Sample Processor and the 815 Robotic USB Sample Processor XL, the model versions with one tower have one tab, **Tower 1**; model versions with two towers have two tabs, **Tower 1** and **Tower 2**.

Tower parameters

Max. stroke path

Entry of the lowest permitted lift position. A lift height of **0 mm** corresponds to the "home position", i.e. the lift is moved all the way to the top.

Input range	**0 to 235 mm**
Default value	**127 mm**

Min. beaker radius

Definition of the minimum radius which the beakers used on the rack must have. If the lift is moved to the work position, the beaker radii defined in the rack table *(see chapter 6.12.2, page 885)* for general sample positions *(see chapter 6.12.3, page 888)* and special beakers *(see chapter 6.12.3.2, page 888)* are compared with the **Min. beaker radius**. If this minimum beaker radius is not achieved, the run is stopped and an error message is output. No check will be made if **off** is enabled.

Input range	**1.0 to 100.0 mm**

Selection	**off**
Default value	**off**

Lift rate

Lift rate for manual operation.

Input range	**3 to 25 mm/s**
Default value	**25 mm/s**

Axial distance

Distance between the axis of rotation of the sample rack and the swing axis of the robotic arm.

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Input range	**100.0 to 300.0 mm**
Default value	**166.0 mm**

815 Robotic USB Sample Processor XL

Input range	**100.0 to 300.0 mm**
Default value	**196.0 mm**

919 IC Autosampler plus

Input range	**100.0 to 300.0 mm**
Default value	**189.0 mm**

Swing Head

This parameter is only shown only if a Swing Head is mounted on the tower.

Serial number

Shows the serial number of the Swing Head.

Swing position

Lift position that is valid for all four external positions and at which the robotic arm turns to the external positions.

Input range	**0 to 235 mm**
Default value	**0 mm**

Rinse position

Rinse position that is valid for all four external positions and which can be approached with the **LIFT** command.

Input range	**0 to 235 mm**
Default value	**0 mm**

[Configuration]

Opens the **Robotic arm configuration** dialog window *(see chapter 7.1.8, page 902)*, in which the properties of the robotic arm can be edited.

Table for external positions

The properties for the four possible external positions for the robotic arm mounted on the Swing Head are shown in the table. The table cannot be edited directly.

External position

Number of the external position.

Angle [°]

Swing angle for external position.

Work position [mm]

Work position for external position.

[Edit]

Opens the **External position #** dialog window *(see chapter 7.1.9, page 903)*, in which the parameters for the external position selected from the table can be edited.

7.4.4 Properties - Rack

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Rack**

The **Rack** tab shows the rack-specific data of the attached rack.

Rack name

Shows the name of the rack attached. If no rack is attached, then "**-----**" is shown.

Rack code

Shows the rack code of the rack attached. The rack code corresponds to the arrangement of magnets on the base of the rack and is read in by the Sample Processor in order to recognize the rack. If no rack is in position, then the display will be empty.

Number of positions

Shows the number of positions on the rack. If no rack is in position, then the display will be empty.

Shift rate

Sample rack shift rate for manual operation.

Input range	**3 to 20 °/s**
Default value	**20 °/s**

[Rack data]

Opens the **Rack data** dialog window *(see chapter 6.12.3, page 888)*, in which the data of the attached rack can be viewed and edited.

[Initialize rack]

Initializes the attached rack. This resets the rack, the lift and the robotic arm, reads out the rack code and transfers the corresponding rack data to the Sample Processor.

7.4.5 Properties - Starting position

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Starting position**

On the **Starting position** tab, a position can be defined which is automatically approached when the device is initialized.

Move to starting position

on | off (Default value: **off**)

If this check box is activated, the position defined here is approached when the device is initialized.

Tower

Selection of the tower on the sample changer for moving to the required position.

Only editable for **Move to starting position** = **on** and if the corresponding sample changer has two towers, otherwise inactive.

Selection	**1** | **2**
Default value	**1**

Move

Selection of the target position which is to be approached:

Only editable for **Move to starting position** = **on**, otherwise inactive.

Selection	**Rack position** | **Special beaker** | **External position**
Default value	**Rack position**

Rack position
Predefined position on the rack. The lift is lowered to the work position defined for that position.

Special beaker
Special position on the rack defined in the rack properties. The lift is lowered to the work position defined for that position.

External position
External position which is defined for the Swing Head mounted to the tower. The lift is lowered to the work position defined for that position.

Number

Specification of the number of the rack position, of the special beaker or of the external position.

Only editable for **Move to starting position** = **on**, otherwise inactive.

for Move = Rack position

Input range	**1 to 999**
Default value	**1**

for Move = Special beaker

Input range	**1 to 16**
Default value	**1**

for Move = External position

Input range	**1 to 4**
Default value	**1**

7.4.6 Properties - MSB

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.4.7 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.4.8 Robotic arm configuration

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Configuration] ► Robotic arm configuration**

The specific settings for the robotic arm mounted on a Swing Head can be made in the **Robotic arm configuration** dialog window.

Swing offset

Swing angle offset for specific robotic arm model. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Max. swing range

Maximum usable swing range for specific robotic arm model. Each robotic arm model displays a different value on the basis of its construction. This value must be set according to the leaflet supplied with the robotic arm and can also be reduced as required.

Input range	**0.0 to 330.0 °**
Default value	**60.0 °**

Swing radius

The swing radius depends on the length of the robotic arm and, together with the axial distance, is the most important parameter for exact movement to a rack position. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**30.0 to 300.0 mm**
Default value	**110.0 mm**

Rotation offset

Offset from the middle of the tower to the middle of the robotic arm; normally, this value does not have to be changed. If a robotic arm must be mounted on the tower so that it is offset to one side, then this value can be determined by the service technician during rack adjustment.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Swing direction

The swing direction of the robotic arm depends on the type of robotic arm.

For a two-tower model, the robotic arm on tower 1 must swing to the right, i.e., **–**, and that on tower 2 must swing to the left, **+**.

Selection	**+** | **–**
Default value	**+**

+
Clockwise rotation.

–
Counterclockwise rotation.

7.4.9 External position

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Edit] ► External position #**

An **Angle** and a specific **Work position** can be defined for each external position in the **External position #** dialog window.

Angle

Definition of the swing angle for the selected external position.

Input range	**-270.0 to 270.0 °**
Default value	**60.0 °**

Work position

Definition of the work position for the selected external position.

Input range	**0 to 235 mm**
Default value	**0 mm**

7.5 846 Dosing Interface

7.5.1 846 Dosing Interface - Overview

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The parameters for the **846 Dosing Interface** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *(see chapter 7.1.6, page 899)*
  Properties of the MSB connector and the peripheral devices connected to it.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.5.2 Properties - General

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.5.3 Properties - MSB

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.5.4 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.6 814/815 USB Sample Processor

7.6.1 814/815 USB Sample Processor - Overview

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The parameters for the **814 USB Sample Processor** and **815 Robotic USB Sample Processor XL** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *Tower*
  Properties of the tower.
- *Rack*
  Information on the rack attached.
- *Starting position*
  Position which is automatically approached when the sample changer is initialized.
- *MSB #*
  Properties of the MSB connector and the peripheral devices connected to it.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.6.2 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.6.3 Properties - Tower

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Tower**

NOTICE

With the 858 Professional Sample Processor and the 919 IC Autosampler plus, the properties of the tower, including the Swing Head attached to it, are displayed on the **Tower** tab. In the case of the 814 USB Sample Processor and the 815 Robotic USB Sample Processor XL, the model versions with one tower have one tab, **Tower 1**; model versions with two towers have two tabs, **Tower 1** and **Tower 2**.

Tower parameters

Max. stroke path

Entry of the lowest permitted lift position. A lift height of **0 mm** corresponds to the "home position", i.e. the lift is moved all the way to the top.

Input range	**0 to 235 mm**
Default value	**127 mm**

Min. beaker radius

Definition of the minimum radius which the beakers used on the rack must have. If the lift is moved to the work position, the beaker radii defined in the rack table *(see chapter 6.12.2, page 885)* for general sample positions *(see chapter 6.12.3, page 888)* and special beakers *(see chapter 6.12.3.2, page 888)* are compared with the **Min. beaker radius**. If this minimum beaker radius is not achieved, the run is stopped and an error message is output. No check will be made if **off** is enabled.

Input range	**1.0 to 100.0 mm**

Selection	**off**
Default value	**off**

Lift rate

Lift rate for manual operation.

Input range	**3 to 25 mm/s**
Default value	**25 mm/s**

Axial distance

Distance between the axis of rotation of the sample rack and the swing axis of the robotic arm.

814 USB Sample Processor, 858 Professional Sample Processor

Input range	**100.0 to 300.0 mm**
Default value	**166.0 mm**

815 Robotic USB Sample Processor XL

Input range	**100.0 to 300.0 mm**
Default value	**196.0 mm**

919 IC Autosampler plus

Input range	**100.0 to 300.0 mm**
Default value	**189.0 mm**

Swing Head

This parameter is only shown only if a Swing Head is mounted on the tower.

Serial number

Shows the serial number of the Swing Head.

Swing position

Lift position that is valid for all four external positions and at which the robotic arm turns to the external positions.

Input range	**0 to 235 mm**
Default value	**0 mm**

Rinse position

Rinse position that is valid for all four external positions and which can be approached with the **LIFT** command.

Input range	**0 to 235 mm**
Default value	**0 mm**

[Configuration]

Opens the **Robotic arm configuration** dialog window *(see chapter 7.1.8, page 902)*, in which the properties of the robotic arm can be edited.

Table for external positions

The properties for the four possible external positions for the robotic arm mounted on the Swing Head are shown in the table. The table cannot be edited directly.

External position

Number of the external position.

Angle [°]

Swing angle for external position.

Work position [mm]

Work position for external position.

[Edit]

Opens the **External position #** dialog window *(see chapter 7.1.9, page 903)*, in which the parameters for the external position selected from the table can be edited.

7.6.4 Properties - Rack

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Rack**

The **Rack** tab shows the rack-specific data of the attached rack.

Rack name

Shows the name of the rack attached. If no rack is attached, then "**-----**" is shown.

Rack code

Shows the rack code of the rack attached. The rack code corresponds to the arrangement of magnets on the base of the rack and is read in by the Sample Processor in order to recognize the rack. If no rack is in position, then the display will be empty.

Number of positions

Shows the number of positions on the rack. If no rack is in position, then the display will be empty.

Shift rate

Sample rack shift rate for manual operation.

Input range	**3 to 20 °/s**
Default value	**20 °/s**

[Rack data]

Opens the **Rack data** dialog window *(see chapter 6.12.3, page 888)*, in which the data of the attached rack can be viewed and edited.

[Initialize rack]

Initializes the attached rack. This resets the rack, the lift and the robotic arm, reads out the rack code and transfers the corresponding rack data to the Sample Processor.

7.6.5 Properties - Starting position

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Starting position**

On the **Starting position** tab, a position can be defined which is automatically approached when the device is initialized.

Move to starting position

on | off (Default value: **off**)

If this check box is activated, the position defined here is approached when the device is initialized.

Tower

Selection of the tower on the sample changer for moving to the required position.

Only editable for **Move to starting position** = **on** and if the corresponding sample changer has two towers, otherwise inactive.

Selection	**1** | **2**
Default value	**1**

Move

Selection of the target position which is to be approached:

Only editable for **Move to starting position** = **on**, otherwise inactive.

Selection	**Rack position** | **Special beaker** | **External position**
Default value	**Rack position**

Rack position
Predefined position on the rack. The lift is lowered to the work position defined for that position.

Special beaker
Special position on the rack defined in the rack properties. The lift is lowered to the work position defined for that position.

External position
External position which is defined for the Swing Head mounted to the tower. The lift is lowered to the work position defined for that position.

Number

Specification of the number of the rack position, of the special beaker or of the external position.

Only editable for **Move to starting position** = **on**, otherwise inactive.

for Move = Rack position

Input range	**1 to 999**
Default value	**1**

for Move = Special beaker

Input range	**1 to 16**
Default value	**1**

for Move = External position

Input range	**1 to 4**
Default value	**1**

7.6.6 Properties - MSB

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.6.7 Properties - GLP

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ GLP**

Tab: **Configuration ▶ Dosing units ▶ [Edit] ▶ Properties... ▶ Dosing unit - 'Name' ▶ GLP**

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.6.8 Robotic arm configuration

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Configuration] ► Robotic arm configuration**

The specific settings for the robotic arm mounted on a Swing Head can be made in the **Robotic arm configuration** dialog window.

Swing offset

Swing angle offset for specific robotic arm model. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Max. swing range

Maximum usable swing range for specific robotic arm model. Each robotic arm model displays a different value on the basis of its construction. This value must be set according to the leaflet supplied with the robotic arm and can also be reduced as required.

Input range	**0.0 to 330.0 °**
Default value	**60.0 °**

Swing radius

The swing radius depends on the length of the robotic arm and, together with the axial distance, is the most important parameter for exact movement to a rack position. This value must be set according to the leaflet supplied with the robotic arm.

Input range	**30.0 to 300.0 mm**
Default value	**110.0 mm**

Rotation offset

Offset from the middle of the tower to the middle of the robotic arm; normally, this value does not have to be changed. If a robotic arm must be mounted on the tower so that it is offset to one side, then this value can be determined by the service technician during rack adjustment.

Input range	**-270.0 to 270.0 °**
Default value	**0.0 °**

Swing direction

The swing direction of the robotic arm depends on the type of robotic arm.

For a two-tower model, the robotic arm on tower 1 must swing to the right, i.e., **–**, and that on tower 2 must swing to the left, **+**.

Selection	**+** | **–**
Default value	**+**

+
Clockwise rotation.

–
Counterclockwise rotation.

7.6.9 External position

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Tower ► [Edit] ► External position #**

An **Angle** and a specific **Work position** can be defined for each external position in the **External position #** dialog window.

Angle

Definition of the swing angle for the selected external position.

Input range	**-270.0 to 270.0 °**
Default value	**60.0 °**

Work position

Definition of the work position for the selected external position.

Input range	**0 to 235 mm**
Default value	**0 mm**

7.7 089 Photometer

7.7.1 089 Photometer - Overview

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name'**

The parameters for the **089 Photometer** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *Settings*
  Information on light source and heater.
- *Adjustment*
  Information on the determination of the transmission factor.
- *MSB #*
  Information on dosing device preparation and connected devices.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.7.2 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.7.3 Properties - Settings

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Settings**

Light source

Wavelength

Wavelength which has been set on the Photometer. If a value is defined here, a check is performed for each command containing a specified wavelength whether the wavelength specified in the command corresponds with the wavelength defined here for the device.

Input range	**100 to 2,000 nm**
Selection	**'empty'**
Default value	**'empty'**

Light source always active

on | off (Default value: **on**)

If this check box is activated, then the LED on the Photometer is always on. Otherwise, the firmware will switch it on before the measurement and switch it off after the measurement.

Heater

Initial temperature

Initial temperature of the device (temperature of the cuvette). Entering an initial temperature means that the heater will heat up to the set temperature when the device is switched on. **off** means that the heater will not be switched on.

Input range	**20 to 60 °C**
Default value	**30 °C**
Selection	**off**

7.7.4 Properties - Adjustment

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Adjustment**

Transmission factor

Transmission factor, either determined with **MEAS TMF** or manually entered here.

Input range	**0.0100 to 20.0000**
Default value	**1.0000**

Date

Shows the time and date when the transmission factor was determined.

User

Shows the user logged in during the determination of the transmission factor.

Method

Shows the method used to determine the transmission factor. If the transmission factor was entered manually, **manual** is displayed.

Determination ID

ID of the determination during which the transmission factor was determined.

7.7.5 Properties - MSB

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ MSB #**

The **MSB #** tabs show the properties of the MSB connector and the devices connected to it.

Request for dosing device preparation

Selects when to display the request to execute the **PREP** command *(see chapter 5.5.2.4.7.1, page 476)* (prepare) for the dosing device connected to the MSB.

At program start

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time the program is started.

When attaching a dosing unit

on | off (Default value: **on**)

If this check box is activated, then the request to prepare the dosing device is displayed every time a dosing unit is mounted.

Time interval

on | off (Default value: **off**)

If this check box is activated, then the request to prepare the dosing device is displayed after the time interval defined below.

all

Time interval after which the request to prepare the dosing device is displayed.

Input range	**0.1 to 999.9 h**
Default value	**12 h**

Connected devices

This is where information about the following peripheral devices connected to the MSB connector is displayed:

Dosing device 1

Dosing device type

Shows the dosing device type.

Dosing device serial number

Shows the serial number of the connected dosing device.

Stirrer 1

Stirrer type

Shows the stirrer type.

Stirrer serial number

Shows the serial number of the connected stirrer.

Remote Box 1

Shows the Remote Box connected.

7.7.6 Properties - GLP

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ GLP**

Tab: **Configuration ▶ Dosing units ▶ [Edit] ▶ Properties... ▶ Dosing unit - 'Name' ▶ GLP**

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.8 Avantes Spectrometer

7.8.1 Avantes Spectrometer - Overview

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name'**

The parameters for the **Avantes Spectrometer** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *Settings*
  Information on light source and output signal.
- *Detector*
  Information on the detector.
- *Calibration*
  Information on wavelength calibration.
- *Dark spectrum*
  Information on the dark spectrum.
- *Reference spectrum*
  Information on the reference spectrum.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.8.2 Properties - General

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.8.3 Properties - Settings

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Settings**

Light source

Type

Type of light source used.

Selection	**continuous** | **pulsed**
Default value	**continuous**

Pulses per integration time

Frequency at which the lamp flashes. This parameter can be edited only if **Type** = **pulsed**.

Input range	**0 to 1,000**
Default value	**10**

Analog output

Analog output

on | off (Default value: **on**)

If this check box is activated, then the measuring signal is output at the analog output of the spectrometer. If the connected spectrometer is not equipped with an analog output, then this setting will be ignored.

Sensitivity

Input range	**1 to 214,783,647 mAU/mV**
Default value	**100 mAU/mV**

7.8.4 Properties - Detector

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Detector**

The **Detector** tab shows information on the detector that is built into the spectrometer.

Detector type

Shows the detector type.

Minimum wavelength

Shows the minimum wavelength of the measurable range in nm.

Maximum wavelength

Shows the maximum wavelength of the measurable range in nm.

Number of pixels

Shows the resolution with which the spectrum is recorded.

7.8.5 Properties - Calibration

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ Calibration**

The **Calibration** tab shows the data of the wavelength calibration. A wavelength defined by four wavelength coefficients is allocated to each pixel on the detector. This wavelength calibration is carried out with the **CAL Spec** command. In this process, the calibration data is calculated automatically and displayed on this tab.

Date

Shows the time and date of the wavelength calibration.

User

Shows the user logged in at the time of the wavelength calibration.

Method

Shows the method with which the wavelength calibration has been carried out.

Selection	**Factory settings** | **"Method name"**
Default value	**Factory settings**

[Reset calibration]

Resets the device to the factory-set calibration. In this process, **Dark spectrum** and **Reference spectrum** are deleted.

Determination ID

ID of the determination with which the wavelength calibration has been carried out. With the **Factory settings** calibration method, **----** is displayed.

The determination ID can be copied and pasted into another field.

Calibration coefficients

Coefficients of the regression function with which the CCD pixels are allocated to a wavelength.

c#

Shows the wavelength coefficients **c1** - **c4**.

7.8.6 Properties - Dark spectrum

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Dark spectrum**

The **Dark spectrum** tab shows information on the dark spectrum stored in the device.

If no dark spectrum has been recorded yet or the calibration has been reset to factory settings, **--** is displayed in the fields.

Date

Shows the date and time when the dark spectrum was recorded.

User

Shows the user logged in during recording of the dark spectrum.

Method

Shows the method with which the dark spectrum has been recorded.

Determination ID

ID of the determination in which the dark spectrum has been recorded.

The determination ID can be copied and pasted into another field.

Integration time

Shows the integration time during recording of the dark spectrum.

Averaged spectra

Number of spectra recorded and averaged.

Smoothing

Shows the number of neighboring pixels with which the light intensity of each pixel was determined.

Spectrum

Shows the dark spectrum. The graph can be zoomed with the mouse. The whole spectrum is displayed again by double-clicking on the graph.

x axis

Shows the wavelength in nm.

y axis

Shows the intensity in Counts.

7.8.7 Properties - Reference spectrum

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Reference spectrum**

This tab shows information on the reference spectrum stored in the device.

If no reference spectrum has been recorded yet or the calibration has been reset to factory settings, **--** is displayed in the fields.

Date

Shows the date and time when the reference spectrum was recorded.

User

Shows the user logged in during recording of the reference spectrum.

Method

Shows the method with which the reference spectrum was recorded.

Determination ID

ID of the determination in which the reference spectrum was recorded.

The determination ID can be copied and pasted into another field.

Integration time

Shows the integration time during recording of the dark spectrum.

Averaged spectra

Number of spectra recorded and averaged.

Smoothing

Shows the number of neighboring pixels with which the light intensity of each pixel was determined.

Spectrum

Shows the reference spectrum. The graph can be zoomed with the mouse. The whole spectrum is displayed again by double-clicking on it.

x axis

Shows the wavelength in nm.

y axis

Shows the intensity in Counts.

7.8.8 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.9 Barcode reader

7.9.1 Barcode reader - General

A barcode reader is used to enter sample data and other data in **viva**.

NOTICE

A barcode reader only has to be configured as a **device** in **viva** when the functions for automatic data import into sample tables are to be used. If a USB barcode reader not configured as a device is connected to the PC, it will be recognized (in the same way as a keyboard) as being an **HID** (Human Interface Device) that can be used for data entries in all fields.

Barcode reader as a device

NOTICE

If the functions for automatic data import into sample tables are to be used, the barcode reader must be added as a device in **viva** and configured so that during each data transfer the following preamble and postamble control characters are also transmitted:

Preamble #1: **02hex** (^B, STX)

Preamble #2: **02hex - 09hex** (different identification code **02hex - 09hex** for each barcode reader connected)

Postamble #1: **04hex** (^D, EOT)

Finish: **<CR><LF>**

Refer to the barcode reader manual for instructions regarding its configuration.

Barcode reader as an HID

NOTICE

If a barcode reader is to be used as an HID it must be configured in such a way that it does not transmit any preamble control characters.

Refer to the barcode reader manual for instructions regarding its configuration.

7.9.2 Barcode reader - Overview

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name'**

The parameters for a **barcode reader** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *Settings*
  Settings for the barcode reader.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.9.3 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.9.4 Properties - Settings

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Settings**

Barcode reader ID

Shows the identification of the barcode reader.

Input target

Selection of the field into which the barcode reader input is to be entered.

Selection	**Active input field** | **Method** | **Sample type** | **Sample position** | **Sample amount** | **Sample amount unit** | **ID1...ID16** | **Analytical volume** | **Dilution volume**
Default value	**Active input field**

[Connect]

Establishes a connection with the barcode reader. The **Establish connection** dialog window appears *(see chapter 7.9.6, page 960)*.

[Disconnect]

Disconnects the connection with the barcode reader (only then can the device be deleted from the configuration).

7.9.5 Properties - GLP

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ GLP**

Tab: **Configuration ▶ Dosing units ▶ [Edit] ▶ Properties... ▶ Dosing unit - 'Name' ▶ GLP**

Tab: **Configuration ▶ Solutions ▶ [Edit] ▶ Properties... ▶ Solution - 'Name' ▶ GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on … in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.9.6 Establishing a connection with the barcode reader

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► Settings ► [Connect] ► Establish connection**

In order to test the connection with a barcode reader, click on the **[Connect]** button on the **Settings** tab.

If a barcode is then scanned with the barcode reader, the data received will be entered in the following fields:

Barcode reader ID

Identification of the barcode reader.

Data

Read-in data.

7.10 RS-232 device

7.10.1 RS-232 device - Overview

Dialog window: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name'**

The parameters for a generic **RS-232 device** are set on the following tabs:

- *General*
  General device information such as device name, device type, serial number, etc.
- *RS-232*
  Selects and configures the serial interface to which the device is connected.
- *GLP*
  Information on GLP tests and GLP monitoring.

7.10.2 Properties - General

Tab: **Configuration ▶ Devices ▶ [Edit] ▶ Properties... ▶ Properties - 'Device type' - 'Device name' ▶ General**

General properties of the device are displayed on the **General** tab.

Device name

Name of the device, can be freely defined by the user.

Entry	**50 characters**
Default value	**Device type number_#**

Device type

Shows the device type.

Program version

Shows the program version of the device.

[Update]

Opens the **Load new program version** dialog window *(see chapter 7.2.6, page 909)*.

This button is displayed only with devices that have their own firmware. It is only enabled if the device has an old program version that is not supported by **viva** and that can be updated by **viva** itself.

Device serial number

Shows the serial number of the device.

FPGA version

Shows the FPGA version of the device.

Set to work

Shows the date on which the device was automatically added to the device table.

Remarks

Remarks about the device.

Entry	**1,000 characters**
Default value	**'empty'**

7.10.3 Properties - RS-232

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► RS-232**

The properties of the RS-232 interface are defined on this tab.

COM Port

Selection of the serial interface on the PC to which the device is connected.

Selection	**COM1** | **COM2** | **...** | **COMn**
Default value	**COMn**

COMn
First free COM port.

Baud rate

Transfer rate. The baud rate selected here must also be set on the device itself.

Selection	**300** | **600** | **1,200** | **2,400** | **4,800** | **9,600** | **19,200** | **38,400** | **57,600** | **115,200**
Default value	**9,600**

Data bit

Number of data bits.

Selection	**7** | **8**
Default value	**8**

Parity

Type of parity testing.

Selection	**None** | **Odd** | **Even**
Default value	**None**

Stop bit

Number of stop bits.

Selection	**1** | **2**
Default value	**1**

Handshake

Type of the data transfer protocol.

Selection	**None** | **HW** | **SW**
Default value	**None**

Timeout

Maximum waiting time for receiving characters. If this time is exceeded, receiving will be canceled.

Input range	**1,000 to 9,999 ms**
Default value	**2,000 ms**

Terminator for send

Terminator for send in hexadecimal code.

Selection	**\0D** | **\0D\0A** | **\0D\0A\0A** | **\0D\0D\0A**
Default value	**\0D\0A** (**\0D** = CR, **\0A** = LF)

Terminator for receive

Terminator for receive in hexadecimal code.

Selection	**\0D** | **\0D\0A** | **\0D\0A\0A** | **\0D\0D\0A**
Default value	**\0D\0A** (**\0D** = CR, **\0A** = LF)

Code page

Code page used for the data transfer.

Selection	**Cp437** | **Cp850** | **Cp852** | **ASCII**
Default value	**Cp437**

Send characters one by one

on | off (Default value: **off**)

If this check box is activated, then each character is sent individually and the waiting time has to elapse before the next character is sent.

Delay time

Waiting time until the next character is sent.

Input range	**0 to 9,999 ms**
Default value	**0 ms**

[Connect]

Establishes the connection to the RS-232 device. The **Establish connection** dialog window appears *(see chapter 7.10.5, page 966)*.

[Disconnect]

Disconnects the connection to the RS-232 device (only then can the device be deleted from the configuration).

7.10.4 Properties - GLP

Tab: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► GLP**

Tab: **Configuration ► Dosing units ► [Edit] ► Properties... ► Dosing unit - 'Name' ► GLP**

Tab: **Configuration ► Solutions ► [Edit] ► Properties... ► Solution - 'Name' ► GLP**

GLP test date

Date of the last GLP test. This date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*.

Comment on GLP test

Comment regarding the GLP test.

Entry	**1,000 characters**

Monitoring of GLP validity

on | off (Default value: **off**)

If this check box is activated, then the time interval for the GLP test is monitored.

Monitoring cannot be switched on until after a date has been entered in the "GLP test date" field.

GLP test interval

Time interval to next GLP test. If a value is entered here, then the date in the **Next GLP test** field will be adjusted automatically.

Only editable if monitoring is switched on.

Input range	**1 to 999 days**
Default value	**999 days**

Next GLP test

Date on which the next GLP test is to be carried out. The date can be selected by clicking on ... in the **Select date** dialog window *(see chapter 2.4.1, page 81)*. After the date has been entered, the **GLP test interval** field will be adjusted automatically.

Only editable if monitoring is switched on.

Default value	**GLP test date + 999 days**

Message

The message options can only be edited if monitoring is switched on.

Message by e-mail

on | off (Default value: **off**)

The message is sent to the address defined under **[E-mail...]** if this check box is activated. The message is sent in text format.

[E-mail...]

[E-mail...] opens the **Send e-mail** window *(see chapter 2.5.1, page 83)*.

Acoustic signal

on | off (Default value: **off**)

If this check box is activated, an acoustic signal will be emitted in addition to the message.

Action

The actions can only be edited if monitoring is switched on.

If it is found during monitoring that the validity period has expired, then one of the following actions will be triggered automatically during the start test:

Selection	**Record message** | **Display message** | **Cancel determination**
Default value	**Display message**

Record message
The message that the validity period has expired will be automatically saved with the determination.

Display message
A message is displayed and you can select whether you want to continue the run or cancel it. If the run is continued then the message that the validity period has expired will be automatically saved with the determination.

Cancel determination
The determination is not started. The following message must be confirmed with **[OK]**.

7.10.5 Establishing a connection with the RS-232 device

Dialog window: **Configuration ► Devices ► [Edit] ► Properties... ► Properties - 'Device type' - 'Device name' ► RS-232 ► [Connect] ► Establish connection**

In order to establish a connection with an RS-232 device, click on the **[Connect]** button on the **RS-232** tab.

If a message is then entered into the field next to the **[Send]** button and sent, the message received by the device is displayed in the large text field.

Text field

The messages sent to the device and received by it are displayed in the large text field.

Input field

Input field for a message that is to be sent to the device.

[Send]

Sends the message entered into the input field to the device.

8 Manual control

8.1 Manual control - General

Program part: **Manual control**

Definition

The term **Manual control** is used in **viva** to refer to the program part in which the connected devices can be directly controlled, i.e. without a predefined run instruction. The precondition for this is that the devices are switched on and detected by **viva**. Manual control is also possible live during a method run.

Close

The **Manual control** dialog window can be closed with **[Close]** or the Close Window button.

NOTICE

The manual control can only be closed when no manually triggered actions are running any longer (exception: stirrer on).

8.2 Manual control - User interface

Program part: **Manual control**

Manual control - Symbol

Clicking on the **Manual** symbol in the vertical bar on the left opens the **Manual control** program part in a separate window; the **Manual** symbol is displayed in color at the same time.

Elements

The user interface of the **Manual control** program part comprises the following elements:

- *Instrument selection*
- *Functions/parameters*
- *Graphical display*

8.3 Manual control - Device selection

Program part: **Manual control**

In the subwindow for the device selection, you can select the devices or function units of devices for which you would like to trigger functions manually. For this purpose, they are displayed in tree-form. All devices configured in the device table with the status "**ok**" are displayed with the device name and (in brackets) the device type number. The currently selected device is shown with a blue background. Devices that are still performing manually triggered actions are shown in red letters.

8.4 Manual control - Functions

Program part: **Manual control**

In the subwindow for functions/parameters, the functions for the manual control of the selected device and the corresponding parameters can be selected. In addition, the measured values for ongoing actions and messages are displayed here.

Depending on the device different functions are possible.

8.4.1 Measuring

8.4.1.1 Measuring - Overview

Program part: **Manual control**

If a device of the type **894 Professional CVS** or **884 Professional VA** is selected in the voltammetry device section of the subwindow for device selection, then the functions and parameters that are possible for this device appear on the following tabs in the subwindow for functions/parameters:

- *Potentiostat*
- *Electrodes*
- *Temperature sensors*

8.4.1.2 Measuring - Potentiostat

Tab: **Manual control ► Potentiostat**

Stir

Stirring rate

Selection of stirring rate.

884 Professional VA

Input range	**0 to 3,000 min^{-1}** (Increment: **100**)
Default value	**2,000 min^{-1}**

894 Professional CVS

Input range	**0 to 3,000 min^{-1}** (Increment: **100**)
Default value	**2,500 min^{-1}**

[Start]

Starts the stirrer.

[Stop]

Stops the stirrer.

Measure potentiostatically

Potential

Potential that is applied to the electrodes.

Input range	**–5.000 to 5.000 V** (Increment: **0.001**)
Selection	**off**
Default value	**off**

Current measuring range

Selection of the current measuring range.

Selection	**224 mA** | **20 mA** | **2 mA** | **200 µA** | **20 µA** | **2 µA** | **200 nA** | **20 nA**
Default value	**224 mA**

[Start]

Starts the potentiostatic measurement. This button is disabled if an OCP (open-circuit potential) measurement has been started.

[Stop]

Stops the potentiostatic measurement.

Measure open-circuit potential

[Start]

Starts the open-circuit potential measurement.

[Stop]

Stops the open-circuit potential measurement.

Measured value window

Stirring rate

Shows the current number of revolutions per minute of the stirrer. The current stirring rate is also displayed if a stirrer is still switched on after a determination has ended.

Potential

Shows the potential currently applied to the electrode. The potential is also displayed if a standby potential is still activated after a determination has ended.

In the case of an OCP measurement, the open-circuit potential measured is displayed in this place.

Current

Shows the currently measured current. This value is displayed as soon as a potentiostatic measurement has been started.

Current measuring range

Shows the currently used measuring range for the current. This value is displayed as soon as a potentiostatic measurement has been started.

8.4.1.3 Measuring - Electrodes

Tab: **Manual control ▶ Electrodes**

Stir

Stirring rate

Selection of stirring rate.

884 Professional VA

Input range	**0 to 3,000 min^{-1}** (Increment: **100**)
Default value	**2,000 min^{-1}**

894 Professional CVS

Input range	**0 to 3,000 min^{-1}** (Increment: **100**)
Default value	**2,500 min^{-1}**

[Start]

Starts the stirrer.

[Stop]

Stops the stirrer.

Valves

The following parameters are displayed only for the 884 Professional VA:

Main valve

Valve for the inert gas supply.

[Open]

Opens the main valve.

[Close]

Closes the main valve.

Purge

Purges the measuring solution.

[Start]

Starts the purging of the measuring solution.

[Stop]

Stops the purging of the measuring solution.

Electrode

Sensor type

Select the type of working electrode connected.

884 Professional VA

Selection	**RDE/SSE** | **MME** | **scTRACE Gold**
Default value	**MME**

894 Professional CVS

Selection	**RDE/SSE** | **scTRACE Gold**
Default value	**RDE/SSE**

Operating mode

This parameter is displayed only for the sensor type **MME**.

Select the operating mode of the MME.

884 Professional VA

Selection	**HMDE** | **SMDE** | **DME**
Default value	**HMDE**

Drop size

This parameter is displayed only for the sensor type **MME** in the operating modes **HMDE** and **SMDE**.

Select the drop size for HMDE or SMDE.

884 Professional VA

Input range	**1 to 9** (Increment: **1**)
Default value	**4**

Drop formation

This parameter is displayed only for the sensor type **MME**.

Formation of mercury drops at the glass capillary of the MME.

[Start]

Starts the drop formation of the MME.

[Stop]

Stops the drop formation of the MME.

Electrode check

Performs the electrode test for the electrode selected under **Sensor type**.

[Start]

Starts the electrode test. No parallel runs are possible during the electrode test. Therefore, all other buttons are disabled until the end of the electrode test. Furthermore, the electrode test cannot be canceled.

Measured value window

Stirring rate

Shows the current number of revolutions per minute of the stirrer. The current stirring rate is also displayed if a stirrer is still switched on after a determination has ended.

Purging...

Shows that the measuring solution is being purged (is only displayed if the corresponding function has been started).

Drop formation

Shows the running countdown counter of the drop formation in seconds (is only displayed if the corresponding function has been started).

Electrode check

Shows the current status and result of the electrode test (is only displayed if the corresponding function has been started).

8.4.1.4 Measuring - Temperature sensors

Tab: **Manual control ► Temperature sensors**

Stir

Stirring rate

Selection of stirring rate.

884 Professional VA

Input range	**0 to 3,000 min^{-1}** (Increment: **100**)
Default value	**2,000 min^{-1}**

894 Professional CVS	
Input range	**0 to 3,000 min⁻¹** (Increment: **100**)
Default value	**2,500 min⁻¹**

[Start]

Starts the stirrer.

[Stop]

Stops the stirrer.

Measure temperature

Temperature sensor

Selection of the temperature sensor.

[Start]

Starts the temperature measurement.

[Stop]

Stops the temperature measurement.

Measured value window

Stirring rate

Shows the current number of revolutions per minute of the stirrer. The current stirring rate is also displayed if a stirrer is still switched on after a determination has ended.

Temperature

Shows the currently measured temperature. This value is displayed as soon as a temperature measurement has been started.

8.4.2 Dosing

8.4.2.1 Dosing - Overview

Program part: **Manual control**

If the **Dosing devices** group or a single **Dosing devices** is selected in the subwindow for device selection, then the functions and parameters that are possible with these dosing devices are displayed in the sub-window for functions and parameters.

Dosing functions

The dosing functions for dosing units are displayed on the following tabs:

- *General*
- *Preparing*
- *Filling*

- *Emptying*
- *Fixed volume*
- *Dosing*

Devices

The dosing functions can be carried out with dosing devices that are built in or connected to the following devices:

Voltammetry instruments: 884, 894

Dosing device: 800

Dosing Interface: 846

Sample changer: 814, 815, 858, 919

Photometer: 089

8.4.2.2 Dosing - General

Program part: **Manual control**

Information on the dosing device selected, the attached dosing unit and the solution contained therein is displayed here. This tab only appears if a single dosing device is selected.

Dosing unit

Name

Shows the designation for the dosing unit entered in the configuration.

Cylinder volume

Shows the cylinder volume of the dosing unit.

Solution

Solution

Shows the solution that is assigned to the dosing unit. If no solution is assigned, **-----** is displayed.

8.4.2.3 Dosing - Preparing

Program part: **Manual control**

Dosing unit preparation can be started and stopped here. This tab appears both when an individual or all dosing devices are selected.

[Start]

Starts preparation for the selected dosing device(s). In the process, the parameters defined for the dosing unit will be used.

[Stop]

Stops preparation for the selected dosing device(s).

8.4.2.4 Dosing - Filling

Program part: **Manual control**

The filling of dosing units can be started and stopped here. This tab appears both when a single dosing device or all dosing devices are selected.

[Start]

Starts filling for the selected dosing device(s).

[Stop]

Stops filling for the selected dosing device(s).

8.4.2.5 Dosing - Emptying

Program part: **Manual control**

Emptying of dosing units can be started and stopped here. This tab appears both when a single dosing device or all dosing devices with dosing units are selected.

[Start]

Starts emptying for the selected dosing device(s). In the process, the parameters defined for the dosing units will be used.

[Stop]

Stops emptying for the selected dosing device(s).

8.4.2.6 Dosing - Dosing a fixed volume

Program part: **Manual control**

The dosing of a preset volume can be started and stopped here. This tab only appears if a single dosing device is selected.

Volume

Fixed volume that is to be dosed.

Input range	**0.00 to 99,999.9 mL**
Default value	**1.000 mL**

Dosing rate

The volume is dosed at this rate. The maximum dosing rate depends on the cylinder volume of the dosing unit used. If the entered dosing rate is too high for the selected dosing device, it will automatically be reduced during dosing to the largest possible value.

NOTICE

The dosing rate should be reduced for viscous liquids.

Selection	**maximum**
Default value	**maximum**

Input range	**0.01 to 166.00 mL/min**
Default value	**4.00 mL/min**

Filling rate

The dosing cylinder will be filled at this rate after dosing. The maximum filling rate depends on the cylinder volume of the dosing unit used. If the entered filling rate is too high for the selected dosing device, it will automatically be reduced during filling to the largest possible value.

NOTICE

The filling rate should be reduced for viscous liquids.

Selection	**maximum**
Default value	**maximum**

Input range	**0.01 to 166.00 mL/min**
Default value	**4.00 mL/min**

Fill automatically

on | off (Default value: **on**)

If this option is activated, the dosing cylinder is filled automatically after dosing. The volume display shows the added volume until the filling procedure has ended. If this option is disabled, the added volume is displayed cumulatively.

[Start]

Starts fixed volume dosing for the selected dosing device. The dosed volume is displayed live.

NOTICE

Parameters that are modified after dosing has started are not valid until the next dosing procedure.

[Fill]

Starts filling of the dosing cylinder for the selected dosing device. This button is only present if **Fill automatically** is switched off. The volume display shows the added volume until the filling procedure has ended.

[Stop]

Stops fixed volume dosing for the selected dosing device. If dosing has been stopped, it cannot be resumed.

8.4.2.7 Dosing - Dosing

Program part: **Manual control**

Manual dosing can be started and stopped here. This tab is only displayed if a single dosing unit is selected.

Dosing rate

Rate at which dosing should take place. The maximum dosing rate depends on the cylinder volume of the dosing unit used. If the entered dosing rate is too high for the selected dosing device, it will automatically be reduced during dosing to the largest possible value.

NOTICE

The dosing rate should be reduced for viscous liquids.

Selection	**maximum**
Default value	**maximum**
Input range	**0.01 to 166.00 mL**
Default value	**4.00 mL**

Filling rate

The dosing cylinder will be filled at this rate after dosing. The maximum filling rate depends on the cylinder volume of the dosing unit used. If the entered filling rate is too high for the selected dosing device, it will automatically be reduced during filling to the largest possible value.

NOTICE

The filling rate should be reduced for viscous liquids.

Selection	**maximum**
Default value	**maximum**
Input range	**0.01 to 166.00 mL**
Default value	**4.00 mL**

[Dosing]

Starts manual dosing for the selected dosing device. Dosing continues as long as the button is pressed down. The dosed volume is displayed live.

NOTICE

Parameters that are modified after dosing has started are not valid until the next dosing procedure.

[Fill]

Starts filling of the dosing cylinder for the selected dosing device. The volume display shows the added volume until the filling procedure has ended.

8.4.3 Stirring

8.4.3.1 Stirring - Overview

Program part: **Manual control**

If a **Stirrer** connected via MSB or stirrer connector is selected in the subwindow for device selection *(see chapter 8.3, page 968)*, then the functions and parameters that are possible with the stirrers are displayed in the subwindow for functions/parameters.

Stirrer functions

The stirrer functions are displayed on the following tabs:

- *Switching on/off*
- *Operating time*

Devices

The stirrer functions can be carried out with stirrers that are connected to the following devices:

Voltammetry instruments: 884, 894

Dosing Interface: 846

Sample changer: 814, 815, 858, 919

8.4.3.2 Stirring - Switching on/off

Program part: **Manual control**

Here you can switch stirrers on and off. This tab appears both when a single stirrer or all stirrers are selected.

Stirring rate

Selection of stirring rate. This parameter can also be modified live.

all instruments except for Photometer	
Input range	**–15 to 15**
Default value	**8**

Photometer only	
Input range	**1 to 15**
Default value	**3**

[Start]

Starts stirring for the selected stirrer.

[Stop]

Stops stirring for the selected stirrer.

8.4.3.3 Stirring - Operating time

Program part: **Manual control**

You can switch on stirrers for a defined time. This tab only appears if a single stirrer is selected.

Stirring rate

Selection of the stirring rate. This parameter can also be modified live.

all instruments except for Photometer	
Input range	**–15 to 15**
Default value	**8**

Photometer only	
Input range	**1 to 15**
Default value	**3**

Stirring time

Entry of the time during which the stirrer has to remain switched on. If this parameter is modified after stirring has started, it is not valid until the next stirring procedure.

Input range	**1 to 999,999 s**
Default value	**60 s**

[Start]

Starts stirring for the selected stirrer. The remaining time is shown in the status display. The stirrer will be switched off automatically after the stirring time has elapsed.

[Stop]

Stops stirring for the selected stirrer.

8.4.4 Remote functions

Program part: **Manual control**

If a Remote Box or a remote interface is selected in the subwindow for the device selection, then the functions and parameters that are possible with the elements appear in the subwindow for functions/parameters.

Devices

The remote functions can be carried out with the following devices:

Voltammetry instruments: 884, 894

Sample changer: 814, 815, 858, 919

Spectrometer: Avantes

Dosing Interface: 846

Input signal

Is not shown for the Avantes spectrometer because it has no input lines.

Current status

Shows the current status of the eight input lines.

Templates/Entry

If the current status corresponds to one of the defined templates for the inputs, the corresponding name is shown here.

NOTICE

Only templates without asterisks ***** are recognized.

Output signal

Current status

Shows the current status of the 14 output lines.

Templates/Entry

Entry of the bit pattern for the output signal or selection of a predefined signal pattern.

It is possible to enter the following characters:

0 = line inactive

1 = line active

***** = any line status

p = set pulse (pulse duration = 1 s. If a pulse with a different length is to be output, then a corresponding template must be defined for this purpose.)

Sample changers

Selection	**Bit pattern with exactly 14 characters (0, 1, *, p) | ********** | signal pattern**
Default value	**********

884, 894

Selection	**Bit pattern with exactly 14 characters (0, 1, *, p) | ********** | signal pattern**
Default value	**********

Spectrometer

Selection	**Bit pattern with exactly 10 characters (0, 1, *, p) | ********** | signal pattern**
Default value	**********

The output lines and bits are numbered from right to left:

Output	13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit	13 12 11 10 9 8 7 6 5 4 3 2 1 0

Examples:

**********1*** sets the output line 1 to active (= set).

**********0*** sets the line to inactive.

NOTICE

We recommend masking the irrelevant output lines with an asterisk ***** so as not to modify these line statuses.

[Set]

Sets the bit pattern defined under **Output signal**.

8.4.5 Sampler changer functions

8.4.5.1 Sample changer - Overview

Program part: **Manual control**

If a tower of a sample changer is selected in the subwindow for the device selection, then the functions and parameters that are possible with this sample changer are displayed in the subwindow for functions/parameters.

Sample changer functions

The sample changer functions are displayed on the following tabs:

- *General*
- *Moving*
- *Assigning position*
- *Pump*

Devices

The changer functions can be carried out with the following devices:

- 814 USB Sample Processor
- 815 Robotic USB Sample Processor XL
- 858 Professional Sample Processor
- 919 IC Autosampler plus

8.4.5.2 Sample changer - General

Program part: **Manual control**

Information on the attached rack is displayed here.

Rack name

Shows the name of the attached rack. If no rack is attached, **--------** is displayed.

Rack code

Shows the rack code of the attached rack. If no rack is attached, **--------** is displayed.

Number of positions

Shows the number of positions on the attached rack. If no rack is attached, **--------** is displayed.

[Initialize rack]

The attached rack is initialized.

NOTICE

When the rack is initialized, the following actions are carried out:

- Rack rotates to the position for reading out the rack code.
- Rack data on the rack code is transferred to the sample changer.
- Lifts are moved upwards to 0 mm.
- The robotic arm is moved back.

8.4.5.3 Sample changer - Moving

Program part: **Manual control**

Moving to the desired rack position, lift position or robotic arm position can be triggered manually here. In addition, the shift rate and lift rate for the manual changer control can be set here.

Rack position

Set the rack position.

Current position

Shows the current rack position.

Target position

Selection or entry of the rack position to be approached.

Input range	**1 to n (depending on rack)**
Default value	**1**

Selection	**Special beaker 1 - 16**

Shift rate

Shift rate for manual control of the sample changer.

Input range	**5 to 20 °/s**
Default value	**20 °/s**

[Start]

Starts moving to the target position. After the start, the button changes to **[Stop]**, the two lower buttons are shown as inactive (gray) and **Move...** is shown as status message instead of **Ready**.

Moves to current rack position –1.

Moves to current rack position +1.

Lift position

Set the lift position for the selected tower.

Current position

Shows the current lift position in mm.

Target position

Selection or entry of the lift position that is to be approached for the current rack position (regular beaker, special beaker, external position).

Input range	**0 to max. stroke path defined (235 mm) mm**
Default value	**126 mm**

Selection	**Home position** | **Work position** | **Shift position** | **Rinse position** | **Special position**

Shift position
Only for normal beakers and external positions.

Rinse position
Only for normal beakers and external positions.

Special position
Only for normal beakers and external positions.

Lift rate

Lift rate for manual control on the selected tower.

Input range	**5 to 25 mm/s**
Default value	**25 mm/s**

[Start]

Starts moving to the target position. After the start, the button changes to **[Stop]**, the two lower buttons are shown as inactive (gray) and **Move...** is shown as status message instead of **Ready**.

Moves the lift upwards for as long as this button is pressed.

Moves the lift downwards for as long as this button is pressed.

Robotic arm position

Set the robotic arm position (angle) on the selected tower.

Current position

Shows the current position of the robotic arm in °.

Target position

Selection or entry of the robotic arm position to be approached.

Input range	**0.0 to 330.0 °**
Default value	**0.0 °**

Selection	**External 1 - 4**

Swing rate

Swing rate for manual control of the Swing Head on the sample changer.

Input range	**10 to 55 °/s**
Default value	**55 °/s**

[Start]

Starts moving to the target position. After the start, the button changes to **[Stop]**, the two lower buttons are shown as inactive (gray) and **Move...** is shown as status message instead of **Ready**.

Moves the robotic arm to the left (towards **0°**) at a swing rate of 55°/s as long as this button is pressed.

Moves the robotic arm to the right (towards **330°**) at a swing rate of 55°/s, as long as this button is pressed.

8.4.5.4 Sample changer - Assigning a position

Program part: **Manual control**

Here you can assign the current rack position, lift position or robotic arm position to a specific special position.

Rack position

Assign the current rack position to a specific special beaker.

Current position

Shows the current rack position.

Special beaker

Selection of the special beaker to which the current rack position is to be assigned.

Input range	**1 to 16**
Default value	**1**

[Assign]

Triggers assignment. During the assignment the cursor is displayed as hourglass.

Lift position

Assign the current lift position to a specific special position.

Current position

Shows the current lift position in mm.

Work position for

If this option is selected, the current lift position is assigned to the work position of the tower or a special beaker or to an external position of the robotic arm.

Selection	**Tower** | **Special beaker 1 - Special beaker 16** | **External 1 - External 4**
Default value	**Tower**

Rinse position for

If this option is selected, the current lift position is assigned to the rinse position of the tower.

Selection	**Tower** | **External positions**
Default value	**Tower**

Shift position for

If this option is selected, the current lift position is assigned to the shift position of the tower.

Selection	**Tower**
Default value	**Tower**

Special position for

If this option is selected, the current lift position is assigned to the special position of the tower.

Selection	**Tower**
Default value	**Tower**

Swing position

If this option is selected, the current lift position is assigned to the swing position of the robotic arm.

Selection	**External positions**
Default value	**External positions**

[Assign]

Triggers assignment. During the assignment the cursor is displayed as hourglass.

Robotic arm position

Assign the current rack position to a specific external robotic arm position.

Current position

Shows the current position of the robotic arm in °.

External position

Selection of the external position to which the current robotic arm position is to be assigned.

Input range	**1 to 4**
Default value	**1**

[Assign]

Triggers assignment. During the assignment the cursor is displayed as hourglass.

8.4.5.5 Sample changer - Pumping

Program part: **Manual control**

The pumps connected to the tower can be switched on and off here.

Pump 1

Manually control pump 1 or valve 1 on the selected tower.

Operation

Selection whether the pump or valve is to be switched on or off manually or whether it is to be switched on for a specified duration and then switched off again automatically.

Selection	**On/Off** | **Duration**
Default value	**On/Off**

Duration

Entry of the duration during which the pump/valve should remain switched on. This field is only displayed for **Operation** = **Duration**.

Input range	**1 to 999,999 s**
Default value	**8 s**

[Start]

Starts pump 1. The running time since start is shown in the status display.

[Stop]

Stops pump 1.

Pump 2

Manually control pump 2 or valve 2 on the selected tower.

Operation

Selection whether the pump or valve is to be switched on or off manually or whether it is to be switched on for a specified duration and then switched off again automatically.

Selection	**On/Off** | **Duration**
Default value	**On/Off**

Duration

Entry of the duration during which the pump/valve should remain switched on. This field is only displayed for **Operation** = **Duration**.

Input range	**1 to 999,999 s**
Default value	**8 s**

[Start]

Starts pump 2. The time elapsed since the start is shown in the status display.

[Stop]

Stops pump 2.

Peristaltic pump

Manually control peristaltic pump on the selected tower.

Rate

Speed of the peristaltic pump.

Input range	**-15 to 15**
Default value	**10**

Operation

Selection whether the peristaltic pump is to be switched on or off manually or whether it is to be switched on for a defined duration and then switched off again automatically.

Selection	**On/Off** | **Duration**
Default value	**On/Off**

Duration

Entry of the duration during which the peristaltic pump should remain switched on. This field is only displayed for **Operation** = **Duration**.

Input range	**0 to 9,999 s**
Default value	**300 s**

[Start]

Starts peristaltic pump. The time elapsed since the start is shown in the status display.

[Stop]

Stops peristaltic pump.

8.5 Manual control - Graphical display

Program part: **Manual control**

All ongoing, manually triggered device functions are displayed graphically in the subwindow for the graphical display.

9 Support

9.1 How to proceed?

9.1.1 Backup

9.1.1.1 Backing up a database

How to proceed?

General

The **determination databases** that, in contrast to the **configuration database**, can be generated by the user and contain the determination data, are referred to as databases in **viva**. Included among such determination data are the method data used for the determination, the measuring data generated during the determination and the results calculated from it.

In local server systems (**viva full**), the databases are stored on the drives managed by the computer and are only available to those users registered on that computer who have the appropriate access permission. In client/server systems (**viva multi**) the databases are stored on drives managed centrally by the server and are globally available throughout the entire client/server system, i.e., all users with the appropriate access rights can use these databases.

NOTICE

Each determination database has to be backed up separately. Afterwards, it is recommended that all backed-up files also be copied to an external directory or to a CD/DVD.

Backing up a database manually

1. Select the **Database** program part.
2. Click on the symbol or the **File ► Database manager...** menu item.

   The **Database manager** dialog window opens.
3. Select the database.

4 Click on **[Backup]** in the **Database manager** dialog window.

The **Backup database 'Database name'** dialog window opens.

5 Select the directory for the backup in the **Backup directory** field.

6 Select or enter the name for the backup file in the **Backup name** field. If an existing backup file is selected, it will be overwritten.

NOTICE

If the backup directory is on a network drive, the backup date should be added to the **Backup name** field, because the backup date information is not available when the data is restored.

7 Click on **[Start]**.

The manual backup of the database is started and the database is backed up to the selected directory.

Backing up a database automatically

1 Select the **Database** program part.

2 Click on the symbol or the **File ▶ Database manager...** menu item.

The **Database manager** dialog window opens.

3 Select the desired database and click on **[Properties]**.

The **Properties - Database - 'Database name'** dialog window opens for editing the database properties.

4 Enter a comment on the database in the **Comment** field on the **General** tab.

5 On the **Backup** tab, activate the **Backup monitoring** check box.

6 Enter an **Interval** for backup monitoring or a date for the next backup in the **Next backup** field.

7 Activate the **Start backup automatically** check box.

8 Select the directory for the backup in the **Backup directory** field.

9 Click on **[OK]**.

The **Properties - Database - 'Database name'** dialog window closes and the database is backed up automatically to the selected directory at the desired moment.

9.1.1.2 Restoring a database

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** window opens.

3 Click on **[Restore]** in the **Database manager** dialog window.

The **Restore databases** dialog window opens.

4 Select the directory in the **Backup directory** field in which the desired database was backed up.

5 Select the name for the desired backup file in the **Backup name** list box.

6 Under **Save as** enter the name under which the database is to be restored.

7 Click on **[Start]**.

The database restoring is started.

NOTICE

Existing databases cannot be overwritten, i.e., they must first be deleted so that the database can be restored under its old name.

9.1.1.3 Backing up configuration data

How to proceed?

General

The configuration data is saved in **viva** in the **Configuration database**. The configuration data includes all settings that apply to all methods, i.e. settings for devices, sensors/electrodes, solutions, dosing units, common variables, global variables, rack data and templates, **Security settings** *(see chapter 6.2.2, page 794)* and **User administration** *(see chapter 6.2.1, page 787)*.

In local server systems (**viva full**), the configuration database is located in the program directory of the computer on which the program has been installed. In client/server systems (**viva multi**), the configuration database is stored centrally on the server and contains all the configuration data of all computers (clients) that are connected to this server.

NOTICE

It is strongly recommended that the configuration database be backed up periodically.

Backing up configuration data manually

1. Select the **Configuration** program part.
2. Click on the **File ► Backup ► Manually** menu item.

   The **Backup configuration data manually** dialog window opens.
3. Select the directory for the backup in the **Backup directory** field.
4. Select or enter a new name for the backup file in the **Backup name** list box. If an existing backup file is selected, it will be overwritten.

   NOTICE

   If the backup directory is on a network drive, then the date of the backup should be added to the **Backup name**, because the backup date information is not available when the data is restored.
5. Click on **[Start]**.

The manual backup is started and the configuration database is backed up to the selected directory.

Backing up configuration data automatically

1. Select the **Configuration** program part.
2. Click on the **File ► Backup ► Automatically** menu item.

   The **Backup configuration data automatically** dialog window opens.
3. Activate the **Automatic backup** check box.
4. Enter an **Interval** for backup monitoring or a date for the next backup in the **Next backup** field.
5. Select the directory for the backup in the **Backup directory** field.
6. Click on **[OK]**.

   The **Backup configuration data automatically** dialog window closes and the configuration database will be backed up automatically to the selected directory at the desired moment.

9.1.1.4 Restoring configuration data

How to proceed?

viva full

1. Exit **viva**.
2. Start the **ConfigRestore.exe** file in the **…\viva\bin** program directory.

   The **Restore configuration data** dialog window opens.
3. Select the directory in the **Backup directory** field in which the configuration database was backed up.
4. Select or enter a name for the desired backup file in the **Backup name** list box.
5. Click on **[Start]**.

The restoring of the configuration database is started.

viva multi

1. Make sure that **viva** is closed on all clients connected to the server and on the server itself.
2. Start the **ConfigRestore.exe** file in the **…\viva\bin** program directory on the server.

   The **Restore configuration data** dialog window opens.
3. Select the directory in the **Backup directory** field in which the configuration database was backed up.
4. Select or enter a name for the desired backup file in the **Backup name** list box.
5. Click on **[Start]**.

   The restoring of the configuration database is started.

9.1.1.5 Backing up methods

How to proceed?

General

Methods are stored in the configuration database and are globally accessible for all clients. This means that in order to save methods the configuration data must be saved manually or automatically. Another possible way is to export the methods and then to save these files outside of **viva**.

Backing up configuration data manually

1. Select the **Configuration** program part.
2. Click on the **File ► Backup ► Manually** menu item.

   The **Backup configuration data manually** dialog window opens.
3. Select the directory for the backup in the **Backup directory** field.
4. Select or enter a new name for the backup file in the **Backup name** list box. If an existing backup file is selected, it will be overwritten.

NOTICE

If the backup directory is on a network drive, then the date of the backup should be added to the **Backup name**, because the backup date information is not available when the data is restored.

5 Click on **[Start]**.

The manual backup is started and the configuration database is backed up to the selected directory.

Backing up configuration data automatically

1 Select the **Configuration** program part.

2 Click on the **File ► Backup ► Automatically** menu item.

The **Backup configuration data automatically** dialog window opens.

3 Activate the **Automatic backup** check box.

4 Enter an **Interval** for backup monitoring or a date for the next backup in the **Next backup** field.

5 Select the directory for the backup in the **Backup directory** field.

6 Click on **[OK]**.

The **Backup configuration data automatically** dialog window closes and the configuration database will be backed up automatically to the selected directory at the desired moment.

Exporting methods

1 Select the **Method** program part.

2 Click on the symbol or the **File ► Method manager...** menu item.

The **Method manager** dialog window opens.

3 Select the desired **Method group**.

4 Select the desired methods.

5 Click on the **Edit ▶ Export...** menu item.

The **Select directory for export** dialog window opens.

6 Select the desired directory for the export files and click on **[OK]**.

The selected methods are each exported to a file named **'Method name'.vmet**.

NOTICE

The exported methods are stored uncoded but with a checksum. If a file stored in this manner is tampered with, then it cannot be imported again.

9.1.2 Determinations

9.1.2.1 Starting a single determination

How to proceed?

1 Select the **Workplace** program part.

2 Select the **Single determination** tab in the **Run** subwindow.

3 If desired, enter **Determination parameters**.

4 In the **Method** selection list, select the method to be used for carrying out the determination.

The **Method** subwindow shows the loaded method.

5 Enter **Sample data**.

6 Click on **[Start]**.

The single determination will be started. Active tracks and commands are displayed in the **Method** subwindow; live curves, measured values and messages in the **Live display** subwindow; and measurement and calibration curves in the **Curves** subwindow.

9.1.2.2 Starting a determination series

How to proceed?

1. Select the **Workplace** program part.
2. Select the **Determination series** tab in the **Run** subwindow.
3. If desired, enter **Determination parameters**.
4. Load existing sample table or enter sample data directly into the working sample table.

   The method loaded in the first line is displayed in the **Method** subwindow.
5. Click on **[Start]**.

   The first determination of the sample series will be started. Active tracks and commands are displayed in the **Method** subwindow; live curves, measured values and messages in the **Live display** subwindow; and measurement and calibration curves in the **Curves** subwindow.

9.1.2.3 Searching for determinations

How to proceed?

1. Select the **Database** program part.
2. Click on the icon or the **File ► Open...** menu item.

   The **Open database** dialog window opens.
3. Select the desired database or enter the name in the **Database name** field.
4. Click on **[Open]**.

   The data sets of the selected database are displayed in the **Determination overview**.
5. Click on the icon or the **Determinations ► Search...** menu item.

   The **Search - Database 'Database name'** dialog window opens.

6 Enter or select desired search terms and search options.

7 Click on **[Search next]**.

The next determination containing the search term is highlighted in the **Determination overview**.

9.1.2.4 Filtering determinations

How to proceed?

Opening a database

1 Select the **Database** program part.

2 Click on the icon or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**.

Filtering can now be done via quick filter or special filter in the **Determination overview** window.

Quick filter

1 Click on the icon or the **Filter ► Quick filter** menu item.

After this function has been selected, the field in which the cursor is located will have a yellow background when navigating in the determination table.

2 Double-click on the desired field with the left mouse button.

The contents of the field selected in the table will be set as a filter criterion and this filter will be applied directly to the table.

NOTICE

The quick filter can be applied again within the filtered table, so that the number of entries can be limited step by step.

Defining and using special filters

1 Click on the icon or the **Filter ► Special filter...** menu item.

The **Special filter - Database 'Name'** dialog window for the definition of user-specific filters opens.

2 Click on the **Edit ► Insert new line** menu item.

The **Edit filter criterion 'New filter'** dialog window opens.

3 Enter the filter criteria and confirm with **[OK]**.

4 Click on **[Apply filter]** in the **Special filter - Database 'Name'** dialog window.

The table is then filtered.

Defining and saving special filters

1 Click on the icon or the **Filter ► Special filter...** menu item.

The **Special filter - Database 'Name'** dialog window for the definition of user-specific filters opens.

2 Click on the **Edit ► Insert new line** menu item.

The **Edit filter criterion 'New filter'** dialog window opens.

3 Enter the filter criteria and confirm with **[OK]**.

4 Click on **[Save filter]** in the **Special filter - Database 'Name'** dialog window.

The **Save filter** dialog window opens.

5 Enter a name in the **Filter name** field.

6 Click on **[Save]**.

The special filter is saved under the desired name.

Using special filters

1 In the **Special filter - Database 'Name'** dialog window, select the required special filter in the **Filter** selection list.

The table is then filtered.

9.1.2.5 Exporting determinations

How to proceed?

Defining an export template

1 Select the **Database** program part.

2 Click on the **Tools ► Templates ► Export templates...** menu item.

The **Export templates** window opens.

3 Click on the **Edit ► New...** menu item.

The **Export templates – 'New file'** window opens.

4 Define the properties of the new export template.

5 Click on **[OK]**.

The dialog window closes.

6 Click on **[Close]**.

The **Export templates** dialog window closes.

Selecting determinations

1 Select the **Database** program part.

2 Click on the icon or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**.

5 Select the desired determinations.

Exporting determinations

1 Click on the **Determinations ► Export...** menu item.

The **Export determinations** window opens.

2 Select the desired option (**All filtered data records** or **All selected data records**) under **Selection**.

3 In the **Export template** selection list, select an export template.

4 Click on **[OK]**.

The selected determinations are exported into the directory defined in the export template.

9.1.2.6 Importing determinations

How to proceed?

1 Select the **Database** program part.

2 Click on the icon or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**.

5 Click on the **Determinations ► Import...** menu item.

The **Import determinations** window is displayed.

6 Select the desired determinations.

7 Click on **[Open]**.

The selected determinations are imported into the open database.

NOTICE

Exported determinations can be imported only in the ***.vdet** file format.

NOTICE

In the program directory under **...\viva\examples\determinations\...** you will find **example determinations** that can be imported into an opened database.

9.1.2.7 Deleting determinations

How to proceed?

1 Select the **Database** program part.

2 Click on the icon or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**.

5 Select the desired determinations.

6 Click on the icon or the **Determinations ► Delete** menu item.

7 Confirm deleting.

The selected determinations are deleted along with all determination versions.

9.1.2.8 Making a determination version current

How to proceed?

1. Select the **Database** program part.
2. Click on the icon or the **File ► Open...** menu item.

   The **Open database** dialog window opens.
3. Select the desired database or enter the name in the **Database name** field.
4. Click on **[Open]**.

   The data sets of the selected database are displayed in the **Determination overview**.
5. Select the desired determination.
6. Click on the icon or the **Determinations ► Show history** menu item.

   Only the currently selected determination as well as all saved determination versions will be shown in the determination table.
7. Select the desired determination that is once again to be made the current determination version.
8. Click on the icon or the **Determinations ► Make current** menu item.

   The determination version selected in the table will again be made the current determination version. This creates a new determination, the version number of which is increased by **+1** compared with the last version to have been saved.

9.1.2.9 Reprocessing determinations

How to proceed?

1. Select the **Database** program part.
2. Click on the icon or the **File ► Open...** menu item.

3 Select the desired database or enter the name in the **Database name** field.

The data sets of the selected database are displayed in the **Determination overview**.

4 Select the desired determinations.

5 Click on the icon or the **Determinations ► Reprocess...** menu item.

The **Reprocessing** dialog window opens. The first of the selected determinations is displayed.

Modifying variables

1 Select the **Variables** tab.

2 Select the desired variable in the table.

3 Click on **[Modify]**.

The **Modify variable** dialog window opens.

4 Enter the new value for the variable in the **Value** field.

5 Click on **[OK]**.

6 Click on **[Recalculate]**.

The selected determinations are recalculated. The results of this recalculation are automatically entered in the **Result view** subwindow.

NOTICE

If a variable is modified, then all selected determinations will be recalculated with the new value by clicking on **[Recalculate]**. If a variable is not modified, then the original variable values will be used when several determinations are recalculated (i.e., variables with the same name but different values will not be overwritten until they are deliberately modified).

7 Click on **[OK]** in the **Reprocessing** dialog window.

Each determination that has been modified by reprocessing will be saved as a new version with a version number increased by **+1** and the **Reprocessing** dialog window will be closed. This button is disabled for as long as recalculation has not yet been triggered and if not all the selected determinations were able to be recalculated.

Modifying a method

NOTICE

The method can only be modified if it is identical for all selected determinations.

1. Change to the **Method** tab.
2. Click on **[Modify method]**.

   The **Method editor** dialog window opens.
3. Modify the method as desired.

   Parameters of existing commands can be modified.
4. Click on **[OK]**.
5. Click on **[Recalculate]**.

   The selected determinations are recalculated. The results of this recalculation are automatically entered in the **Result view** subwindow.
6. If desired, save the modified method with **[Save as...]** under the same name or under a new name.

   If the modified method is saved under the name of an existing method, then all earlier method versions will be deleted and a new version with the number **1** will be generated.
7. Click on **[OK]** in the **Reprocessing** dialog window.

   Each determination that has been modified by reprocessing will be saved as a new version with a version number increased by **+1** and the **Reprocessing** dialog window will be closed. This button is disabled for as long as recalculation has not yet been triggered and if not all the selected determinations were able to be recalculated.

9.1.2.10 Printing a determination report

How to proceed?

1. Select the **Database** program part.

2. Click on the icon or the **File ► Open...** menu item.

   The **Open database** dialog window opens.

3. Select the desired database or enter the name in the **Database name** field.

4. Click on **[Open]**.

   The data sets of the selected database are displayed in the **Determination overview**. The database name is displayed in the title bar of the program; the number of currently opened databases is displayed in the left upper corner of the database icon.

   NOTICE

   A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

5. Select the desired determinations.

6. Click on the **File ► Print ► Report...** menu item.

   The **Report output** dialog window opens.

7. Under **Selection**, select the desired determinations for report output.

8. Select the **Original report(s)** or **Report template** option under **Report type**.

9. Under **Output target**, select the **Printer** and/or **PDF file** check box.

NOTICE

If several reports are output simultaneously as a PDF file, then an index will be automatically appended to the file name.

10 Click on **[OK]** in the **Report output** dialog window.

The reports of the selected determinations will be output.

9.1.2.11 Printing a determination overview

How to proceed?

1 Select the **Database** program part.

2 Click on the icon or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**. The database name is displayed in the title bar of the program; the number of currently opened databases is displayed in the left upper corner of the database icon.

NOTICE

A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

5 Click on the **File ► Print ► Determination overview...** menu item.

The **Print determination overview (PDF)** dialog window opens.

6 Under **Selection**, select the desired determinations for report output.

7 Select the **Portrait** or **Landscape** option under **Orientation**.

8 Click on **[OK]**.

The determination overview opens as a PDF file.

9.1.3 Databases

9.1.3.1 Opening a database

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter the name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**. The database name is displayed in the title bar of the program, the number of currently opened databases is displayed in the left upper corner of the database icon.

NOTICE

A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

9.1.3.2 Closing a database

How to proceed?

Closing a single database

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Close** menu item.

The selected database is closed.

Closing all databases

1 Select the **Database** program part.

2 Click on the **File ► Close all** menu item.

All opened databases will be closed.

9.1.3.3 Creating a database

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** dialog window opens.

3 Click on the **Edit ► New...** menu item.

The **New database** dialog window opens.

4 Enter a name for the new database.

5 Click on **[OK]**.

The **Properties - Database - 'Database name'** dialog window opens for editing the database properties.

NOTICE

The database name must be unique in the entire client/server system.

6 On the **General** tab, enter a comment on the database in the **Comment** field.

7 On the **Access rights** tab, define access permissions for reading and editing the newly created database for the different user groups.

8 On the **Backup** tab, define backup monitoring and automatic backup for the newly created database.

9 On the **Monitoring** tab, define the monitoring of the size and number of data sets.

9.1.3.4 Backing up a database

How to proceed?

Backing up a database manually

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** dialog window opens.

3 Click on **[Backup]**.

The **Backup database 'Name'** window opens.

4 Select the directory for the backup in the **Backup directory** field.

5 Select or enter the name for the backup file in the **Backup name** field. If an existing backup file is selected, it will be overwritten.

NOTICE

If the backup directory is on a network drive, the backup date should be added to the **Backup name** field, because the backup date information is not available when the data is restored.

6 Click on **[Start]**.

The manual backup is started and the database is backed up to the selected directory.

Backing up a database automatically

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** dialog window opens.

3 Select the desired database.

4 Click on **[Properties]**.

The **Properties - Database 'Name'** dialog window opens for editing the database properties.

5 On the **General** tab, enter a comment on the database in the **Comment** field.

6 On the **Backup** tab, activate the **Backup monitoring** check box.

7 Enter an **Interval** for backup monitoring or a date for the **Next backup**.

8 Activate the **Start backup automatically** check box.

9 Select the directory for the backup in the **Backup directory** field.

10 Click on **[OK]**.

11 The **Properties - Database 'Name'** dialog window closes.

The database is automatically saved in the selected directory at the desired moment.

9.1.3.5 Restoring a database

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** dialog window opens.

3 Click on **[Restore]**.

The **Restore databases** dialog window opens.

4 Select the directory in the **Backup directory** field in which the desired database was backed up.

5 Select or enter the name for the desired backup file in the **Backup name** field.

6 Under **Save as** enter the name under which the database is to be restored.

7 Click on **[Start]**.

The database restoring is started.

NOTICE

Existing databases cannot be overwritten, i.e., they must first be deleted so that the database can be restored under its old name.

9.1.3.6 Deleting a database

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Database manager...** menu item.

The **Database manager** dialog window opens.

3 Select the desired database.

4 Click on the **Edit ► Delete** menu item.

The selected database is deleted.

NOTICE

Databases that are open cannot be deleted.

9.1.4 Configuration data

9.1.4.1 Exporting configuration data

How to proceed?

1 Select the **Configuration** program part.

2 Click on the **File ► Export...** menu item.

The **Export configuration data** dialog window opens.

3 Select the desired configuration data.

4 Click on **[OK]**.

The **Export configuration data** dialog window closes and the **Save** dialog window opens.

5 Select or enter name and directory for the export file. If an existing export file is selected, it will be overwritten.

6 Click on **[Save]**.

The export of the configuration data is started.

The selected configuration data is then saved in a file with the extension **.mcfg**.

9.1.4.2 Importing configuration data

How to proceed?

1 Select the **Configuration** program part.

2 Click on the **File ► Import...** menu item.

The **Open** dialog window opens.

3 Select or enter a new name and directory for the ***.mcfg** import file.

4 Click on **[Open]**.

The **Import configuration data** dialog window opens.

5 Select the desired configuration data.

NOTICE

Data that is not present in the export file cannot be selected.

6 Click on **[OK]**.

The import is started and the selected configuration data is imported.

9.1.4.3 Backing up configuration data

How to proceed?

General

The configuration data is saved in **viva** in the **Configuration database**. The configuration data includes all settings that apply to all methods, i.e. settings for devices, sensors/electrodes, solutions, dosing units, common variables, global variables, rack data and templates, **Security settings** *(see chapter 6.2.2, page 794)* and **User administration** *(see chapter 6.2.1, page 787)*.

In local server systems (**viva full**), the configuration database is located in the program directory of the computer on which the program has been installed. In client/server systems (**viva multi**), the configuration database is stored centrally on the server and contains all the configuration data of all computers (clients) that are connected to this server.

NOTICE

It is strongly recommended that the configuration database be backed up periodically.

Backing up configuration data manually

1. Select the **Configuration** program part.
2. Click on the **File ► Backup ► Manually** menu item.

   The **Backup configuration data manually** dialog window opens.
3. Select the directory for the backup in the **Backup directory** field.
4. Select or enter a new name for the backup file in the **Backup name** list box. If an existing backup file is selected, it will be overwritten.

   NOTICE

   If the backup directory is on a network drive, then the date of the backup should be added to the **Backup name**, because the backup date information is not available when the data is restored.
5. Click on **[Start]**.

The manual backup is started and the configuration database is backed up to the selected directory.

Backing up configuration data automatically

1. Select the **Configuration** program part.
2. Click on the **File ► Backup ► Automatically** menu item.

   The **Backup configuration data automatically** dialog window opens.
3. Activate the **Automatic backup** check box.
4. Enter an **Interval** for backup monitoring or a date for the next backup in the **Next backup** field.
5. Select the directory for the backup in the **Backup directory** field.
6. Click on **[OK]**.

   The **Backup configuration data automatically** dialog window closes and the configuration database will be backed up automatically to the selected directory at the desired moment.

9.1.4.4 Restoring configuration data

How to proceed?

viva full

1. Exit **viva**.
2. Start the **ConfigRestore.exe** file in the **…\viva\bin** program directory.

   The **Restore configuration data** dialog window opens.
3. Select the directory in the **Backup directory** field in which the configuration database was backed up.
4. Select or enter a name for the desired backup file in the **Backup name** list box.
5. Click on **[Start]**.

The restoring of the configuration database is started.

viva multi

1. Make sure that **viva** is closed on all clients connected to the server and on the server itself.
2. Start the **ConfigRestore.exe** file in the **…\viva\bin** program directory on the server.

   The **Restore configuration data** dialog window opens.
3. Select the directory in the **Backup directory** field in which the configuration database was backed up.
4. Select or enter a name for the desired backup file in the **Backup name** list box.
5. Click on **[Start]**.

   The restoring of the configuration database is started.

9.1.5 Methods

9.1.5.1 Opening a method

How to proceed?

1. Select the **Method** program part.
2. Click on the icon or the **File ► Open…** menu item.

   The **Open method** dialog opens.
3. Select the desired method group in the **Method group** selection list.
4. Select the desired method in the table or enter a name in the **Method name** field.
5. Click on **[Open]**.

   The selected method is opened in the main window in the place of a method that is already opened. The method name is displayed in the title bar of the program; the number of currently opened methods is displayed in the left upper corner of the method icon.

NOTICE

A maximum of nine methods can be opened but only one can be displayed.

9.1.5.2 Closing a method

How to proceed?

Closing a single method

1 Select the **Method** program part.

2 Click on the icon or the **File ► Close** menu item.

The focused method will be closed. If the method has been modified, a prompt for confirmation to save the method as a new version will appear.

Closing all methods

1 Select the **Method** program part.

2 Click on the **File ► Close all** menu item.

All opened methods will be closed. A prompt for confirmation to save the method as a new version will appear for each method that has been modified.

9.1.5.3 Creating a method

How to proceed?

1 Select the **Method** program part.

2 Click on the icon or the **File ► New...** menu item.

The **New method** dialog opens.

3 Select the method template.

4 Click on **[OK]**.

The selected method template is opened for editing.

9.1.5.4 Saving a method

How to proceed?

Saving a method under the same name

1 Click on the icon or the **File ► Save** menu item.

The existing, focused method is newly saved under its name. A new method version with a new method identification is created.

Saving a method under a new name

1 Click on the **File ► Save as...** menu item.

The **Save method** dialog opens.

2 Select the desired method group in the **Method group** selection list.

3 Select the desired method in the table or enter a name in the **Method name** field.

4 Click on **[Save]**.

The focused method is saved under the desired method name in the selected method group as method version **1**.

9.1.5.5 Deleting a method

How to proceed?

1 Select the **Method** program part.

2 Click on the icon or the **File ► Method manager...** menu item.

The **Method manager** dialog opens.

3 Select the desired method group in the **Method group** selection list.

4 Select the desired method from the table.

5 Click on the **Edit ► Delete...** menu item.

The selected methods with all their method versions are deleted.

NOTICE

Locked methods cannot be deleted.

9.1.5.6 Exporting a method

How to proceed?

1. Select the **Method** program part.
2. Click on the icon or the **File ► Method manager...** menu item.

   The **Method manager** dialog opens.
3. Select the desired method group in the **Method group** selection list.
4. Select the desired method from the table.
5. Click on the **Edit ► Export...** menu item.

   The **Select directory for export** dialog opens.
6. Select the desired directory for the export files and click on **[OK]**.

   The selected methods are each exported to a file named **'Method name'.vmet**.

NOTICE

The exported methods are stored uncoded but with a checksum. If a file stored in this manner is tampered with, then it cannot be imported again.

9.1.5.7 Importing a method

How to proceed?

1. Select the **Method** program part.
2. Click on the icon or the **File ► Method manager...** menu item.

   The **Method manager** dialog opens.
3. Select the desired method group in the **Method group** selection list.

4 Click on the **Edit ► Import...** menu item.

The **Select files to import** dialog opens.

5 Select the files to be imported named **'Method name'.vmet** in the desired directory.

6 Click on **[OK]**.

The selected methods are imported into the currently opened method group.

NOTICE

In the program directory under **...\viva\examples\methods\...** you will find **sample methods** that can be imported into an opened method group.

9.1.5.8 Making a method version current

How to proceed?

1 Select the **Method** program part.

2 Click on the icon or the **File ► Method manager...** menu item.

The **Method manager** dialog opens.

3 Select the desired method group in the **Method group** selection list.

4 Select the desired method.

5 Click on **[History]**.

The **Method history** dialog window opens showing a table with all **versions** of the selected method.

6 Select the desired method that is to be made the current method version again.

7 Click on **[Make current]**.

The selected method version is set once again as the current method version. At the same time, the method is saved with a version num-

ber that is increased by **+1** compared with the last method version to have been saved.

9.1.5.9 Printing a method report

How to proceed?

1. Select the **Method** program part.
2. Click on the icon or the **File ► Open...** menu item.

   The **Open method** dialog opens.
3. Select the desired method group in the **Method group** selection list.
4. Select the desired method in the table or enter a name in the **Method name** field.
5. Click on **[Open]**.

   The selected method is opened in the main window in the place of a method that is already opened. The method name is displayed in the title bar of the program; the number of currently opened methods is displayed in the left upper corner of the method icon.
6. Click on the **File ► Print (PDF)...** menu item.

   The **Print method reports (PDF)** dialog opens.
7. Select the desired report and the orientation and click on **[OK]**.

   The desired report is opened as a PDF file.

9.1.5.10 Saving a method

How to proceed?

General

Methods are stored in the configuration database and are globally accessible for all clients. This means that in order to back up methods the configuration data must be backed up manually or automatically. Another possible way is to export the methods and then to store these files outside of **viva**.

Backing up configuration data manually

1. Select the **Configuration** program part.

2 Click on the **File ► Backup ► Manually** menu item.

The **Backup configuration data manually** dialog opens.

3 Select the directory for the backup in the **Backup directory** field.

4 Select or enter the name for the backup file in the **Backup name** field. If an existing backup file is selected, it will be overwritten.

NOTICE

If the backup directory is on a network drive, the backup date should be added to the backup name, because the backup date information is not available when the data is restored.

5 Click on **[Start]**.

The manual backup is started and the configuration database is backed up to the selected directory.

Backing up configuration data automatically

1 Select the **Configuration** program part.

2 Click on the **File ► Backup ► Automatically** menu item.

The **Backup configuration data automatically** dialog opens.

3 Activate the **Automatic backup** check box.

4 Enter an **Interval** for backup monitoring or a date for the **Next backup**.

5 Select a directory for the backup in the **Backup directory** field.

6 Click on **[OK]**.

The **Backup configuration data automatically** dialog window closes.

The configuration database is automatically saved in the selected directory at the desired moment.

Exporting methods

1 Select the **Method** program part.

2 Click on the icon or the **File ► Method manager...** menu item.

The **Method manager** dialog opens.

3 Select the desired method group in the **Method group** selection list.

4 Select the desired method.

5 Click on the **Edit ► Export...** menu item.

The **Select directory for export** dialog opens.

6 Select the desired directory for the export files and click on **[OK]**.

The selected methods are each exported to a file named **'Method name'.vmet**.

NOTICE

The exported methods are stored uncoded but with a checksum. If a file stored in this manner is tampered with, then it cannot be imported again.

9.1.5.11 Fixed point evaluation

How to proceed?

Fixed point evaluation is used to read out the corresponding y value (measured value = **Current**, **Potential** or **Time**) to a defined x value (measured value = **Potential** or **Time**) from a measurement curve.

Example:

Using fixed point evaluation to read out the current of the chloride potential from a CVS measurement. It is described how the mean value **MNV** of the current of several measurement curves (replications) of a variation can be read out.

Evaluating a fixed point

Proceed as follows to define a fixed point as user-defined result:

1 Determining the fixed point

- Select the **Method** program part and open the desired method.
- Select the **Curve evaluation** tab in the **Evaluation - General** subwindow.
- Select the desired measuring command for which fixed point evaluation should be performed in the **Measuring command** field.
- Activate the **Fixed point evaluation** check box.
- Click on the **Edit ► New...** menu item.
- Select the measured quantity **Potential** in the **Define fixed point** dialog window.
- Enter the value **1.475 V** for the chloride potential in the **Fixed value** field.
- Select the entry **anodic** in the **Sweep direction** field (only necessary for CVS measurements).
- Confirm the entries with **[OK]**.

The entered parameters are displayed in the table.

2 Creating user-defined result

- Select the **User-defined results** tab in the **Evaluation - Results** subwindow.
- Click on the **Edit ► New...** menu item.
- Enter the name **chloride potential** for the result in the **Result name** field in the **Define result** dialog window.
- Click on the icon.

The formula editor opens.

3 Selecting the corresponding result variable

- Select the result variable **MNV** with a double-click in the variable tree under **Result variables ► 'Command name' ► Var{x} ► FP{z} ► CUR**.
- In the formula, enter the number of the variations for **x** (e.g. **1** for the curves of the sample) and the line number of the fixed point for **z** in the table under **Curve evaluation**.
- Multiply the measured value variable by 1000000 to convert the current from A to µA.
- Confirm the entries with **[OK]**.

The formula is displayed under the title **Properties** in the **Formula** field.

4 **Completing user-defined result**

- Enter the unit **µA** in the **Define result** dialog window.
- If desired, define decimal places.
- If desired, define result assignment.

The value for the fixed point is displayed in the database in the **Results** window on the **User-defined results** tab after completion of the determination.

If the current of a single measurement curve should be read out, then a different result variable has to be selected in the variable tree under point **3**.

1 see above

2 see above

3 **Reading out the current of a single measurement curve**

- Select the result variable **CUR** with a double-click in the variable tree under **Result variables ► 'Command name' ► Var{x} ► Rep{y} ► FP{z}**.
- In the formula, enter the number of the variation for **x** (e.g. **1** for the curves of the sample) and the line number of the desired curve in the selected variation (e.g. **2** = second replication) for y and the line number of the fixed point for **z** in the table under **Curve evaluation**.
- Multiply the measured value variable by 1000000 to convert the current from A to µA.
- Confirm the entries with **[OK]**.

The formula is displayed under the title **Properties** in the **Formula** field.

4 see above

9.1.5.12 Measured value evaluation

How to proceed?

With a measured value evaluation, a determination can be evaluated regardless of whether a peak is present or not. Similarly to the fixed point evaluation, for a defined potential the corresponding value for the current is read out from the measurement curve. The fixed point evaluation is only used to read out single values from a curve. In contrast, during the measured value evaluation, the potential is assigned to a substance. With this,

the values for the current are automatically evaluated for each measurement curve. These can then be used for the calculation of the concentration, in the same way as the height or area, using a suitable calibration technique.

The measured value evaluation ist available for the voltammetry commands **CVS**, **LSV**, **DP**, **SQW** or **CV**.

A calibration can be calculated using the measured values.

Method for measured value evaluation

1 Determining the evaluation potential

- Select the **Method** program part and open the desired method.
- Select the **Recognition** tab in the **Evaluation - Substances** subwindow.
- Click on the **Edit ► New...** menu item.
  Alternatively, you can also edit an existing substance under **Edit ► Properties...**
- Define the substance name in the **Substance** field in the **Substances - Recognition** dialog window.
- Enter the potential at which the current is to be read out in the **Characteristic potential** field.
- Keep the default values in the fields **Tolerance**, **Min. width**, **Max. width** and **Min. measured quantity**. These values have no effect on the measured value evaluation. The fields must not be empty.
- If the measured value in a **CV** measuring command or **CVS** measuring command is to be evaluated, select the sweep direction in which the current is to be read out in the **Sweep direction** field.
- Confirm the entries with **[OK]**.

The entered parameters are displayed in the table.

2 Determining the baseline

- Select the **Baselines** tab in the **Evaluation - Substances** subwindow in the **Method** program part.
- Highlight the substance for which the settings are to be edited.
- Click on the **Edit ► Properties...** menu item.
- Select the baseline type **Measured value** in the **Substances - Baseline** dialog window.
- For the **Measured value** baseline type, the determination of the base point can only be carried out automatically. The option **Manual** cannot be selected.
- Confirm the entry with **[OK]**.

The entered parameters are displayed in the table.

3 **Determining the calibration method**

- Select the **General** tab in the **Evaluation - Calibration** sub-window in the **Method** program part.
- Select the required calibration method in the selection list.

If the baseline type **Measured value** is selected in the **Evaluation - Substances** area, then the evaluation quantity **Measured value** is automatically selected on the **Calibration curves** tab.

The evaluation quantity **Measured value** only works in combination with the baseline type **Measured value**.

4 **Saving a method**

- Save the method *(see chapter 5.2.6, page 399)*.

The method can now be used for a determination with measured value evaluation.

9.1.6 Method groups

9.1.6.1 Creating a method group

How to proceed?

1 Select the **Method** program part.

2 Click on the symbol or the **File ▶ Method groups...** menu item.

The **Method groups** dialog window opens.

3 Click on **[New]**.

The **Properties - Method group - New Group** dialog window opens.

4 On the **General** tab, enter a new name for the method group in the **Name** field and a comment in the **Comment** field.

5 On the **Access rights** tab, assign access permissions for method groups and their methods per user group.

NOTICE

The **Administrators** user group always has both access permissions, i.e., they cannot be disabled.

6 Click on **[OK]**.

The **Properties - Method group - New Group** dialog window is closed.

9.1.6.2 Deleting a method group

How to proceed?

1 Select the **Method** program part.

2 Click on the symbol or the **File ► Method groups...** menu item.

The **Method groups** dialog window opens.

3 Select the desired method group.

4 Click on **[Delete]**.

The selected method group is deleted.

5 Confirm deleting with **[OK]**.

9.1.7 Sample tables

9.1.7.1 Creating a sample table

How to proceed?

1 Select the **Workplace** program part.

2 Click on the symbol or the **Tools ► Sample table ► New...** menu item.

The **Sample table 'New sample table'** dialog window is opened with an empty sample table.

3 Click on the **[Sample table] ► Properties...** menu item.

The **Properties - Sample table 'New sample table'** dialog window opens.

4 Edit the properties of the new sample table.

5 Click on **[OK]**.

The **Properties - Sample table 'New sample table'** dialog window closes.

6 Click on the **[Edit] ► Edit line** menu item in the **Sample table 'New sample table'** dialog window.

The **Edit line - Sample table 'New sample table'** dialog window opens.

7 Select the desired method in the **Method** selection list and enter the sample data.

8 Click on **[Apply]**.

The sample data entered is applied to the respective line in the sample table.

9 Repeat step **6** for each required determination.

10 Click on **[Close]**.

The **Edit line - Sample table 'New sample table'** dialog window closes.

11 Click on the **[Sample table] ► Save as...** menu item in the **Sample table 'New sample table'** dialog window.

The **Save sample table** dialog window opens.

12 Enter the required name in the **Name** field.

13 Click on **[Save]**.

The sample table is saved under the name that has been entered.

9.1.7.2 Editing a sample table

How to proceed?

1 Select the **Workplace** program part.

2 Click on the symbol or the **Tools ► Sample table ► Open...** menu item.

The **Open sample table** dialog window opens.

3 Select the desired sample table.

4 Click on **[Open]**.

The dialog window with the selected sample table opens.

5 Click on the **[Sample table] ► Properties...** menu item.

The **Properties - Sample table 'Name'** dialog window opens.

6 Define the properties for the sample table.

7 Click on **[OK]**.

8 Select the line to be modified in the **Sample table 'Name'** dialog window.

9 Click on the **[Edit] ► Edit line** menu item in the **Sample table 'Name'** dialog window.

The **Edit line - Sample table 'New sample table'** dialog window opens.

10 Select the **Method** from the required method group, enter the sample data and click on **[Apply]**.

The sample data entered is applied to the respective line in the sample table.

11 Repeat step **8** for each required determination.

12 Close the **Edit line - Sample table 'New sample table'** dialog window with **[Close]**.

13 Click on the **[Sample table] ► Save as...** menu item in the **Sample table 'Name'** dialog window.

The **Save sample table** dialog window opens.

14 Enter a new name for the sample table or overwrite the existing name in the **Name** field.

15 Click on **[Save]**.

The edited sample table is saved.

9.1.7.3 Loading a working sample table

How to proceed?

1. Select the **Workplace** program part.
2. Click on the **Determination series** tab in the **Run** subwindow.
3. Click on the **[Sample table] ► Load...** menu item.

   The **Load sample table** dialog window opens.
4. Select the desired sample table.
5. Click on **[Load]**.

   The data of the selected sample table is loaded into the working sample table.

9.1.7.4 Editing a working sample table

How to proceed?

1. Select the **Workplace** program part.
2. Click on the **Determination series** tab in the **Run** subwindow.
3. If desired, load the existing sample table into the working sample table.
4. If desired, click on the **[Sample table] ► Properties...** menu item in the **Run** subwindow.

   The **Properties - Determination series** dialog window opens.
5. Define the properties for the determination series.
6. Click on **[OK]**.

   The **Properties - Determination series** dialog window closes.
7. Select the line to be modified in the **Run** subwindow.
8. Click on the **[Edit] ► Edit line** menu item.

   The **Edit line 'Name'** dialog window opens.

9 Select the desired method in the **Method** selection list and enter the sample data.

10 Click on **[Apply]**.

The sample data entered is applied to the respective line in the working sample table.

11 Repeat step **8** for each required determination.

12 Click on **[Close]**.

The **Edit line 'Name'** dialog window closes.

13 If desired, click on the **[Sample table] ► Save as...** menu item in the **Run** subwindow.

The **Save sample table** dialog window opens.

14 Enter a name in the **Name** field.

15 Click on **[Save]**.

The working sample table is saved as sample table under the name that has been entered.

9.1.8 Reports

9.1.8.1 Creating a report template

How to proceed?

1 Select the **Database** program part.

2

NOTICE

A database must be open in order to carry out the subsequent steps.

Click on the **Tools ► Report templates ► New ► Form report... / Tabular report...** menu item.

The **Report template - 'Name'** program window opens with an empty report template.

3 Click on the **File ► Page setup...** menu item in the **Report template - 'Name'** program window.

The **Page setup** dialog window opens.

4 Define the desired settings for the report format.

5 Click on **[OK]**.

The **Page setup** dialog window closes.

6 Click on the **Tools ► Options...** menu item in the **Report template - 'Name'** program window.

The **Options for report templates** dialog window opens.

7 Define the desired settings for the report template.

8 Close the dialog window with **[OK]**.

9 Select the desired module icon on the module bar and place it on the report template by creating a field with the left mouse button.

The properties window for the corresponding module opens automatically.

10 Enter the desired properties for the module.

11 Click on **[OK]**.

The properties window closes.

12 Repeat steps **7** and **8** for each desired module.

13 Click on the symbol or the **File ► Save as...** menu item.

The **Save report template** dialog window opens.

14 Enter a name in the **Name** field.

15 Click on **[Save]**.

The report template is saved under the name entered.

9.1.8.2 Editing a report template

How to proceed?

1. Select the **Database** program part.
2. Click on the symbol or the **Tools ► Report templates ► Open...** menu item.

   The **Open report template** program window opens.
3. Select the desired report template.
4. Click on **[Open]**.

   The program window with the selected report template opens.
5. Click on the **File ► Page setup...** menu item.

   The **Page setup** dialog window opens.
6. Define the desired settings for the report format.
7. Close the dialog window with **[OK]**.
8. Click on the **Tools ► Options...** menu item in the **Report template - 'Name'** program window.

   The **Options for report templates** dialog window opens.
9. Define the desired settings for the report template.
10. Close the window with **[OK]**.

Editing existing modules

1. Select the symbol on the module bar and double-click on the desired module in the report template.

   The properties window of the selected module opens automatically.
2. Enter the desired properties for the module.
3. Close the properties window with **[OK]**.

4 Repeat steps **1** and **2** for each desired module.

Creating new modules

1 Select the desired module icon on the module bar and place it on the report template by creating a field with the left mouse button.

The properties window for the corresponding module opens automatically.

2 Define the desired properties for the module.

3 Close the properties window with **[OK]**.

4 Repeat steps **1** and **2** for each desired new module.

5 Click on the symbol or the **File ► Save** menu item.

The report template is saved.

9.1.8.3 Printing a determination report

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**. The database name is displayed in the title bar of the program, the number of currently opened databases is displayed in the left upper corner of the database icon.

NOTICE

A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

5 Select the desired determinations.

6 Click on the **File ► Print ► Report...** menu item.

The **Report output** dialog window opens.

7 Under **Selection**, select the desired determinations for report output.

8 Select the **Original report(s)** or **Report template** option under **Report type**.

9 Under **Output target**, select the **Printer** and/or **PDF file** check box.

NOTICE

If several reports are output simultaneously as a PDF file, then an index will be automatically appended to the file name.

10 Click on **[OK]** in the **Report output** dialog window.

The reports of the selected determinations will be output.

9.1.8.4 Printing a determination overview

How to proceed?

1 Select the **Database** program part.

2 Click on the symbol or the **File ► Open...** menu item.

The **Open database** dialog window opens.

3 Select the desired database or enter name in the **Database name** field.

4 Click on **[Open]**.

The data sets of the selected database are displayed in the **Determination overview**. The database name is displayed in the title bar of the program, the number of currently opened databases is displayed in the left upper corner of the database icon.

NOTICE

A maximum of four databases can be opened, but only two can be displayed at the same time. Databases that are open at the time the program is exited will be opened automatically the next time the program is started.

5 Select the desired determinations.

6 Click on the **File ▶ Print ▶ Determination overview...** menu item.

The **Print determination overview (PDF)** dialog window opens.

7 Under **Selection**, select the desired determinations for report output.

8 Select the **Portrait** or **Landscape** option under **Orientation**.

9 Click on **[OK]**.

The determination overview opens as a PDF file.

9.1.9 Concentration calculation

9.1.9.1 Analysis of undiluted liquid samples

How to proceed?

1 Specify the sample amount as sample data variable

On the **Sample data variables** tab, a variable must be specified that is assigned to the **Sample amount** sample data variable. The name is freely selectable. For simplification, the name **Sample amount** was also chosen here.

Sample amount ⇨ SD.Sample amount

ADD SAMPLE
Sample

2 Sample addition with ADD SAMPLE

The sample volume (= **SD.Sample amount**) is added to the measuring vessel with the **ADD SAMPLE** command.

SD.Sample amount [**L**]

ADD AUX
Name #

3 Addition of auxiliary solutions with ADD AUX

Auxiliary solutions (e.g. water, buffer or electrolyte) are added to the measuring vessel with the **ADD AUX** command.

VTOT = **SD.Sample amount** + **Name 1.VOL** + **Name 2.VOL** + **...**

4 Result calculation

$$CONC = CONCM \cdot \frac{VTOT}{SAMPLEAMOUNT}$$

Variable	Description
CONC	= **RS.'Command name'.'Substance name'.CONC** Substance concentration in the sample. Unit **#g/L**, **#mol/L** or **#L/L**, depending on the unit of the standard solution used.

Variable	Description
CONCM	= **RS.'Command name'.'Substance name'.CONCM** Substance concentration in the measuring vessel. Unit **#g/L**, **#mol/L** or **#L/L**, depending on the unit of the standard solution used.
VTOT	= **RS.'Command name'.VAR{1}.VTOT** Total volume in the measuring vessel at the moment of sample measurement (variation 1). Unit **L**.
SAMPLEA-MOUNT	= **SD.Sample amount** Volume of the sample in the measuring vessel. Unit **L**.

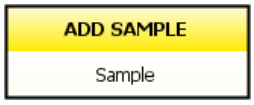
9.1.9.2 Analysis of undiluted solid samples

How to proceed?

1 Specify the sample amount as sample data variable

On the **Sample data variables** tab, a variable must be specified that is assigned to the **Sample amount** sample data variable. The name is freely selectable. For simplification, the name **Sample amount** was also chosen here.

Sample amount ⇨ SD.Sample amount



2 Sample addition with ADD SAMPLE

The sample amount (= **SD.Sample amount**) is added to the measuring vessel with the **ADD SAMPLE** command.

SD.Sample amount [**g**] or [**'Text'**], e.g. **Tablet**

3 Addition of auxiliary solutions with ADD AUX

Auxiliary solutions (e.g. water, buffer or electrolyte) are added to the measuring vessel with the **ADD AUX** command.

VTOT = **Name 1.VOL** + **Name 2.VOL** + **...**

4 Result calculation

$$CONC = CONCM \cdot \frac{VTOT}{SAMPLEAMOUNT}$$

Variable	Description
CONC	= **RS.'Command name'.'Substance name'.CONC** Substance concentration in the sample. Unit **#g/g**, **#mol/g**, **#L/g** or **#g/'Text'**, **#mol/'Text'**, **#L/'Text'**, depending on the unit of the standard solution used and the unit of the sample amount.
CONCM	= **RS.'Command name'.'Substance name'.CONCM** Substance concentration in the measuring vessel. Unit **#g/L**, **#mol/L** or **#L/L**, depending on the unit of the standard solution used.
VTOT	= **RS.'Command name'.VAR{1}.VTOT** Total volume in the measuring vessel at the moment of sample measurement (variation 1). Unit **L**.
SAMPLEA-MOUNT	= **SD.Sample amount** Amount of the sample in the measuring vessel. Unit **g** or **'Text'** such as **Tablet**.

9.1.9.3 Preparation and analysis of prediluted samples

How to proceed?

Diluting the liquid sample

1 **Measure the liquid sample**

2 **Place the sample in an external dilution vessel**

SD.Sample amount [**L**] = volume of the sample prior to dilution

3 **Fill sample to a specified volume**

SD.Dilution volume [**L**] = total volume after dilution

Dissolving and diluting the solid sample

1 **Measure the solid sample**

2 **Place the sample in an external dilution vessel**

SD.Sample amount [**g**] or [**'Text'**] (e.g. **Tablet**) = Sample amount prior to dissolving and dilution

3 **Dissolve the sample and fill it to a specified volume**

SD.Dilution volume [**L**] = total volume after dissolving and dilution

Analyzing the diluted sample

START
Main track

1 **Specify the sample amount as sample data variable**

On the **Sample data variables** tab, three variables must be specified that are each assigned to either the **Sample amount**, **Analysis volume** or **Dilution volume** sample data variable. The names are freely selectable. To make it easier, the following names are also used here:

Sample amount ⇨ SD.Sample amount

Analytical volume ⇨ SD.Analysis volume

Dilution volume ⇨ SD.Dilution volume

2 **Remove the analysis volume**

ADD SAMPLE
Sample

3 **Sample addition with ADD SAMPLE**

The aliquot of the diluted sample (= **SD.Analysis volume**) is added to the measuring vessel with the **ADD SAMPLE** command.

SD.Analysis volume [**L**]

ADD AUX
Name #

4 Addition of auxiliary solutions with ADD AUX

Auxiliary solutions (e.g. water, buffer or electrolyte) are added to the measuring vessel with the **ADD AUX** command.

VTOT = **SD.Analysis volume** + **Name 1.VOL** + **Name 2.VOL** + **...**

5 Result calculation

$$CONC = CONCM \cdot \frac{VTOT}{SAMPLEAMOUNT} \cdot \frac{VDILUTION}{VANALYSIS}$$

Variable	Description
CONC	= **RS.'Command name'.'Substance name'.CONC** Substance concentration in the sample. Unit depends on the standard solution used and the unit of the sample amount: for volume **#g/L**, **#mol/L** or **#L/L** (liquid samples) for mass **#g/g**, **#mol/g** or **#L/g** (solid samples) for 'Text' **#g/'Text'**, **#mol/'Text'** or **#L/'Text'**.
CONCM	= **RS.'Command name'.'Substance name'.CONCM** Substance concentration in the measuring vessel. Unit **#g/L**, **#mol/L** or **#L/L**, depending on the unit of the standard solution used.
VTOT	= **RS.'Command name'.VAR{1}.VTOT** Total volume in the measuring vessel at the moment of sample measurement (variation 1). Unit **L**.

Variable	Description
SAMPLEAMOUNT	= **SD.Sample amount** Amount of the sample (mass in **g**, volume in **L** or **'Text'** such as **Tablet**) that has been diluted.
VDILUTION	= **SD.Dilution volume** Total volume after dilution of the sample. Unit **L**.
VANALYSIS	= **SD.Analysis volume** Aliquot of the diluted sample that was used for the determination. Unit **L**.

9.1.10 No help available

NOTICE

There is unfortunately no help available for this topic.

9.2 Troubleshooting

9.2.1 884 Professional VA / 894 Professional CVS

Problem	Cause	Remedy
An electrode cable has broken.	*The cable has accidentally been jammed in the measuring head cover or a cable contact has been kinked.*	Replace the electrode cable set (see *Manual 894 Professional CVS / Manual 884 Professional VA*).
Conditioning takes a long time.	*The reference electrode is not yet equilibrated.*	After maintenance of the reference electrode, wait for at least 20 min before starting a measurement.
	The working electrode is contaminated.	Condition the working electrode in pure VMS.
	The electrode tip of the working electrode has been in use for a long period.	▪ Immerse the electrode tip in c(NaOH) = 0.5 mol/L for approx. 10 min and then thoroughly rinse with distilled water. ▪ Replace electrode tip if necessary.
	VMS is contaminated.	Check reagents for purity. (Only reagents of sufficient purity, i.e. > 99%, should be used.)

Problem	Cause	Remedy
	The water quality is poor.	Use distilled water, type-II grade (ASTM D1193-91) or higher.
	The measuring solution has been contaminated as a result of diffusion.	No infeed tubing other than the four-way micro dosing tip (6.1824.000) may be immersed in the measuring solution.
Solution is leaking between the measuring instrument and the measuring head.	*The measuring head is not correctly locked in place on the measuring head arm.*	Let the measuring head snap into place. The click must be audible.
	The sealing rings have aged or are defective.	Contact the Metrohm Service department.
The electrode test fails.	*One or several electrodes are not connected.*	Check the electrode cable connections.
	One or several electrodes are defective.	Perform maintenance in accordance with the electrode leaflet.
	The measuring vessel contains too little solution or is empty.	Check the fill level in the measuring vessel and add solution if necessary.
The electrode tip of the working electrode and/or the auxiliary electrode shows copper deposits.	*An incorrect potential has been applied because the reference electrode is defective.*	▪ Check the reference electrode; perform maintenance procedure in accordance with the electrode leaflet, if necessary. ▪ Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.
	An incorrect potential was applied because the reference electrode is not connected.	▪ Check the electrode connectors. ▪ Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.
	An incorrect potential was applied because the measuring vessel contains too little measuring solution.	▪ All three electrodes must be immersed in the measuring solution. ▪ Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.

Problem	Cause	Remedy
The measured values are widely scattered.	*The solutions are pipetted manually.*	Use an 800 Dosino with dosing unit.
	The solutions are not added via the pipetting opening.	Add solutions only via the pipetting opening (see *Manual 894 Professional CVS / Manual 884 Professional VA*).
The measurement curves are noisy.	*Contact problem at the driving axle (6.1204.510 or 6.1204.520).*	▪ Remove the abrasion residue from the driving axle. ▪ Replace the driving axle.
The measuring signal for Cu VMS fluctuates.	*The ambient and/or solution temperature is not constant.*	Keep the ambient and solution temperature stable during measurements (±4 °C).
	The reference potential drifts off.	Perform maintenance procedure for the reference electrode in accordance with the electrode leaflet. However, for CVS analyses, replace the reference electrolyte every other day and the bridge electrolyte every day.
	The measuring vessel and the electrodes have been contaminated with organic additives.	Thoroughly rinse the measuring vessel and the electrodes and use fresh VMS.
The measuring vessel overflows.	*Incorrect pump times have been defined in **viva**.*	Adjust the pump times.
	*The volumes defined in the dosing commands in **viva** are too large.*	Reduce the volumes.
The peak is no longer recognized.	*The reference potential has shifted.*	Perform maintenance procedure for the reference electrode in accordance with the electrode leaflet.
The signal does not decrease in spite of suppressor addition.	*No chloride is contained in the Cu VMS.*	Check the preparation of the Cu VMS and modify it if required.

9.2.2 Peripheral devices

Problem	Cause	Remedy
The 800 Dosino cannot be actuated by the viva 3.0.	*The connection between the 800 Dosino and the 884 Professional VA or 894 Professional CVS is either interrupted or an error has occurred on the 800 Dosino.*	▪ Check the cable connections. ▪ Disconnect the 884 Professional VA or 894 Professional CVS from the power supply and connect it again. ▪ Check the dosing and filling rate. ▪ Contact the Metrohm Service department if necessary.
The data of the dosing unit cannot be read.	*The data chip of the dosing unit is mechanically damaged or impaired by chemicals.*	▪ Remove the dosing drive and attach it again. ▪ Clean the data chip and the contact surfaces. ▪ Have the data chip replaced by Metrohm Service.
The dosing unit is blocked and/or leaking.	*Crystals have formed (in the dosing cylinder, on the valve disk or in the capillary).*	▪ Check the flow path. ▪ Rinse the dosing unit and the connected tubings and capillaries (**Prepare** function) when the measuring system is not in use. ▪ Clean the dosing unit at least every two weeks.
The dosing unit is recognized either not at all or incorrectly.	*The dosing drive was not attached correctly.*	▪ Remove the dosing drive and attach it again. ▪ Check whether the dosing drive is correctly seated. ▪ Disconnect the 894 Professional CVS or 884 Professional VA from the power supply and connect it again. ▪ Contact the Metrohm Service department if necessary.
The membrane pumps of the 843 Pump Station do not operate at full pump capacity.	*The cables are not or not correctly connected.*	Connect the cables in accordance with the instructions in the *Manual 894 Professional CVS / Manual 884 Professional VA*.
	The tubing connections are leaking.	Check the tubing connections and tighten, if necessary.
	The rinse and/or waste canister are sealed airtight.	Loosen the caps on the canisters a little or remove them.

Problem	Cause	Remedy
The pump time of the peristaltic pump increases.	*The pump tubing of the peristaltic pump has aged or is defective.*	Replace the pump tubing.
The sample is not completely transferred from the Sample Processor to the measuring vessel via the peristaltic pump.	*The PEEK needle on the Sample Processor is positioned more than 0.5 mm from the bottom of the sample vial.*	Position the PEEK needle in accordance with the instructions in the *Manual 894 Professional CVS / Manual 884 Professional VA*.
	The contact pressure set for the tubing cartridge is insufficient.	Set the contact pressure of the tubing cartridge in accordance with the *Sample Processor manual*.

9.3 Frequently asked questions

Question	Answer
How often should the dosing units be prepared?	The dosing units used must be prepared at least once a day before measurement begins. This ensures that fresh solution is used for the analysis.
What preparatory steps need to be taken before shutting down the measuring system?	All dosing units used should be rinsed with distilled water in order to prevent a possible crystallization of metal salts.
At what intervals should a dosing unit be cleaned?	The dosing units used for the voltammetry commands should be disassembled and thoroughly cleaned at 14-day intervals.
How often should maintenance procedures be performed on the reference electrode?	The reference electrolyte must be replaced daily. The bridge electrolyte should be replaced every other day. The multimedia guide "Electrodes in Voltammetry" contains a comprehensive video tutorial on this topic.

Question	Answer
How should the electrodes be stored?	Auxiliary, reference and working electrodes should be stored in distilled water. Storage in VMS is not recommended. If the measuring system is not used for an extended period (>24 h), then the reference electrode should be stored separately in c(KCL) 3 mol/L. The other electrodes can also be stored dry.
The auxiliary electrode or the working electrode show copper deposits. How can these copper deposits be removed?	Dip the auxiliary or working electrode into concentrated nitric acid for 1 to 2 seconds to redissolve the copper. Afterwards, clean the electrode thoroughly with distilled water.
How frequently do the electrodes need to be conditioned?	It is advisable to condition the electrodes at least once a day before you start work.
The measuring signal in Cu VMS is exceptionally small and conditioning in Cu VMS takes a long time. What is the reason for that?	Most likely, the VMS in the measuring vessel is contaminated. The contamination might have been caused by the chemicals used but also by organic additives.
The measurement curves are noisy. What is the reason for that?	The driving axle is defective and needs to be replaced.
Can measurements from another software be used in **viva**?	No, this is not possible.

Glossary

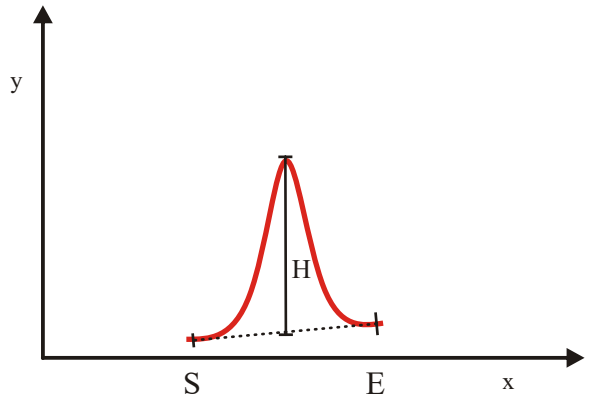
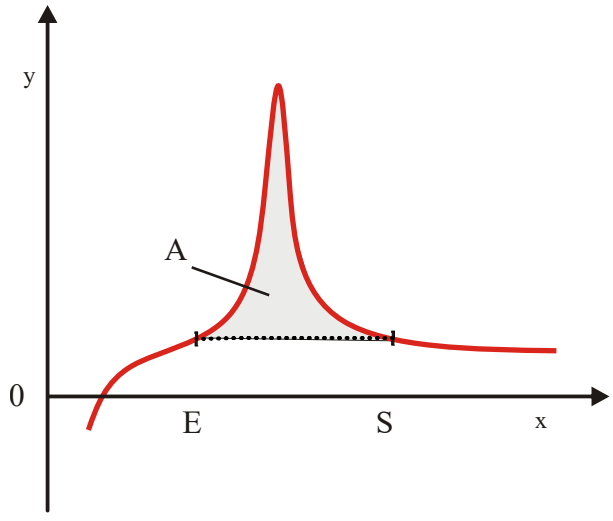
Analysis volume

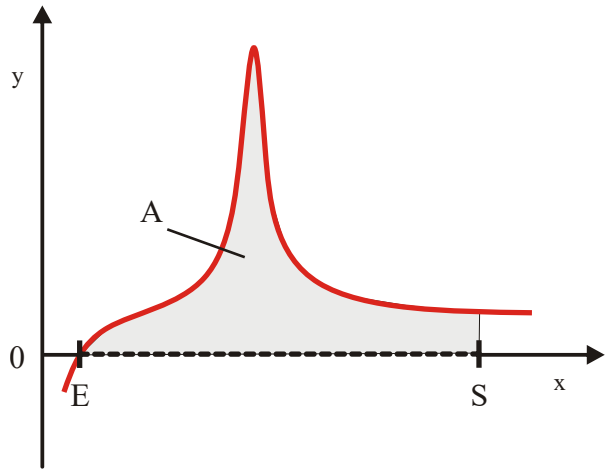
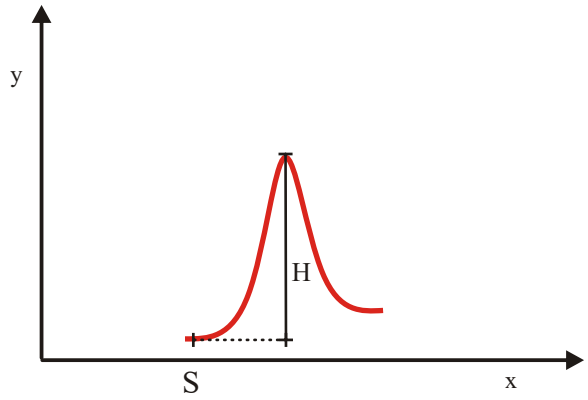
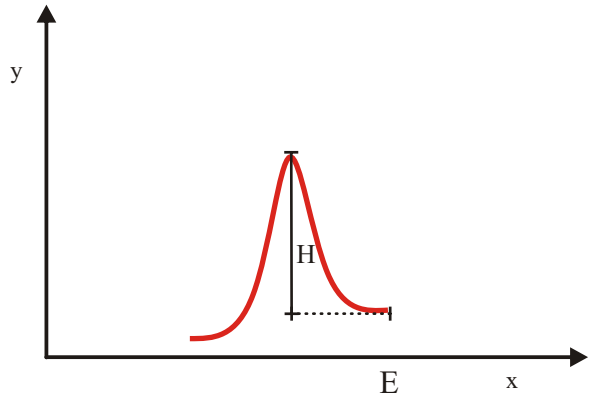
If a sample is diluted, then that part of the dilution volume *(see glossary, page 1059)* that is added to the measuring vessel is referred to as analysis volume *(see glossary, page 1072)*.

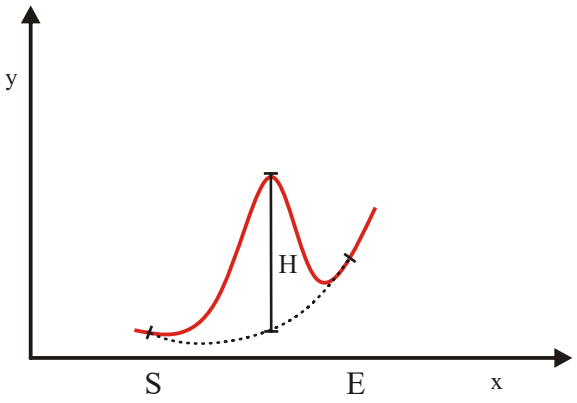
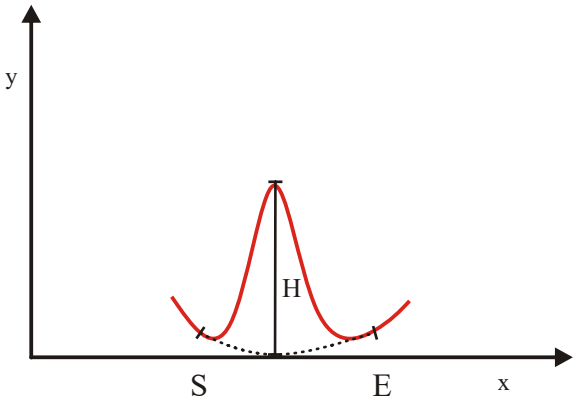
Baseline type

The evaluation of detected peaks is carried out using approximated baselines.

The following types of baselines are differentiated:

Baseline type	Description
	**Linear** Linear baseline between two automatically determined or manually specified base points.
	**Horizontal** Horizontal baseline starting from the automatically determined or manually specified start base point. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.

Baseline type	Description
	**Horizontal through 0** Horizontal baseline along the x axis (y = 0), starting from the automatically determined or manually specified start base point to the intersection point with the curve. Irrespective of the baseline settings in the evaluation, the start base point is always the base point with the more positive potential or the greater time.
	**Horizontal start** Horizontal baseline starting from the automatically determined or manually specified start base point. The evaluation of the first peak half is used for asymmetric peaks.
	**Horizontal end** Horizontal baseline starting from the automatically determined or manually specified end base point. The evaluation of the second peak half is used for asymmetric peaks.

Baseline type	Description
	**Exponential** Curved baseline for peaks that are located in the ascending or descending part of another peak or of the background current. The base points can be determined automatically or specified manually.
	**Polynomial** Curved baseline for peaks that are located in a valley between two ascending curve parts. The base points can be determined automatically or specified manually.
Legend: S = Start base point E = End base point A = Peak area H = Peak height	

Baseline

Auxiliary line for the calculation of the evaluation quantities (peak area, peak height) from the beginning of the steep increase of the peak to the end of the steep decrease of the peak. The peak area and the peak height are calculated between the baseline and the curve.

Brightener

see Brightener

Brightener

In electroplating bath analysis, "brightener" refers to an organic additive that increases the plating rate of metals. Because even small quantities of brightener can significantly increase metal plating, this characteristic effect

can be used to determine the brightener concentration in an electroplating bath.

CP (chronopotentiometry)

In the **CP** measuring mode with the option **Measure galvanostatically**, a constant current is applied to the working electrode and the diffusion-controlled change in the electrode potential over time is measured.

In the **CP** measuring mode with the option **Measure open-circuit potential** *(see glossary, page 1067)*, the circuit is opened and the potential between the working electrode and the reference electrode is measured during the indicated measurement duration.

The **CP** measuring mode is described in detail in the **CP** command *(see chapter 5.5.2.10.4.1, page 609)*.

CPVS (Cyclic Pulse Voltammetric Stripping)

In the **CPVS** measuring mode (Cyclic Pulse Voltammetric Stripping), the potential of an RDE/SSE (e.g. Pt) is changed between different potentials in pulsed discrete steps. The current *I* is measured as a function of the time *t*. The last recorded curves are saved and evaluated.

The **CPVS** measuring mode is described in detail in the **CPVS** command *(see chapter 5.5.2.10.3.1, page 595)*.

CPVS is used in the electroplating industry as a method for determining organic additives in electroplating baths. This method is an indispensable part of production control for many types of technical coatings and particularly in the manufacturing of printed circuit boards for electronic equipment. The main field of application is the determination of brightener in acidic copper baths. Quantitative determination of the additives takes place via their influence on the deposition of the main component of the electroplating bath. As the measurement utilizes a procedure that corresponds to the production process, the activity of the additives and thus their effectiveness in the electroplating process is measured directly.

CV (Cyclic Voltammetry)

In the measuring mode CV (Cyclic Voltammetry), the potential applied to the working electrode is changed once or more from the start potential to the 1st vertex potential, then to the 2nd vertex potential and back to the start potential again at a constant potential sweep rate. The current i is measured as a function of the potential U in this process. This measuring mode can only be used for electrodes with a static surface (RDE/SSE, scTRACE Gold or MME in HMDE operating mode). The curves recorded in the measuring cycles are saved and can be evaluated *(see chapter 5.5.2.10.8, page 665)*.

The **CV** measuring mode is described in detail in the **CV** command *(see chapter 5.5.2.10.8, page 665)*.

CV is used in electrochemical research and training to investigate the mechanism, the speed or the reversibility of electrode reactions. The technique can also be used to characterize electrode surfaces.

CVS (Cyclic Voltammetric Stripping)

In the **CVS** measuring mode (Cyclic Voltammetric Stripping), the potential applied to the working electrode of a rotating disk electrode (RDE/SSE, e.g. Pt) is changed once or more from the start potential to the 1st vertex potential, from there to the 2nd vertex potential and then back again to the start potential at a constant potential sweep rate. The current *i* is measured as a function of the potential *U* in this process. The curves recorded in the measuring cycles are saved and can be evaluated *(see chapter 5.5.2.10.2.1, page 583)*.

The **CVS** measuring mode is described in detail in the **CVS** command *(see chapter 5.5.2.10.2.1, page 583)*.

CVS is used in the electroplating industry as a method for determining organic additives in electroplating baths. This method is an indispensable part of production control for many types of technical coatings and particularly in the manufacturing of printed circuit boards for electronic equipment. The most important fields of application are acidic copper baths and tin-lead baths. Quantitative determination of the additives takes place via their influence on the deposition of the main component of the electroplating bath. As the measurement utilizes a procedure that corresponds to the production process, the activity of the additives and thus their effectiveness in the electroplating process is measured directly.

Calibration factor

The calibration factor is a quantity that is characteristic for the suppressor used under the given conditions (measuring parameters, metal concentration, temperature, etc.). It corresponds to the sensitivity of the method and indicates the suppressor concentration in the measuring cell necessary for achieving the evaluation ratio specified in the calibration method **DT**. The calibration factor is obtained from a measurement with a suppressor standard solution and is then used to calculate the suppressor concentration in an electroplating bath sample. *(see chapter 5.6.7.7.20, page 776)*.

Calibration

Way in which the content of the substances in the sample is determined from their evaluation quantities.

Calibrator

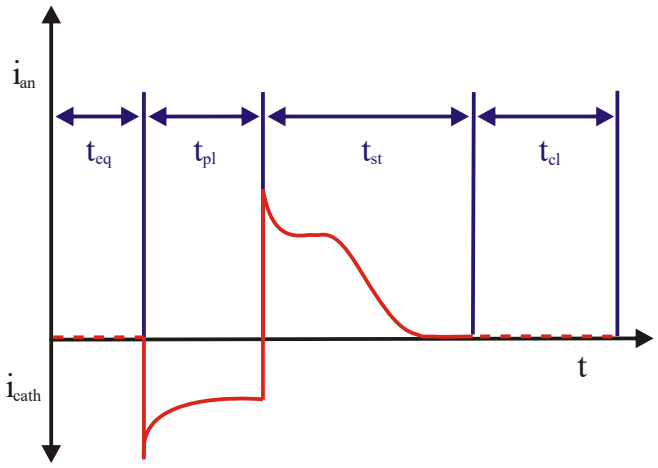
The voltammetry instrument is equipped with a built-in calibrator with precisely specified reference values that are defined in the corresponding calibration certificate. This innovative component permits the performance of voltammetric measurements with increased reliability and precision. The measuring input of the instrument is automatically adjusted to the reference values of the calibrator before each measurement. The measuring input thus yields stable, precise and reproducible measured values over a long period, even under suboptimal measuring conditions. In this way, the instrument automatically recalibrates itself before each measurement.

Chloride potential

Potential at which the value for the current in the bath is measured (usually 1.425 V in anodic direction). This value correlates with the chloride ion concentration in the electroplating bath.

Chronoamperogram

A chronoamperogram is the graphic representation of the current ***i*** as a function of the time ***t*** (current-time curve). Such curves are obtained, for example, for measurements in the **CPVS** measuring mode. The evaluation can be carried out via the *evaluation quantity* **Peak area** or **Peak height** or via *fixed point evaluation*.



i_{an} = Anodic current
i_{cath} = Cathodic current
t = Time
t_{eq} = **Equilibration time**
t_{pl} = **Plating time**
t_{st} = **Stripping time**
t_{cl} = **Cleaning time**

The red curve corresponds to the measured value display. In the curve window, the continuous part of the curve is only displayed.

Command variable

Variable generated by a command in the method run *(see chapter 2.3.3.4, page 23)*.

Command

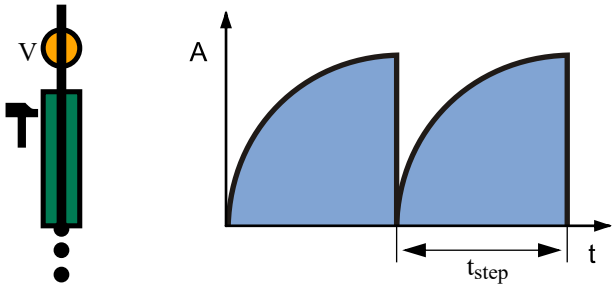
Smallest subset of a *track*; defines a single step in the *method* run.

Contamination potential

Potential at which the value for the current in the bath is measured (usually 1.125 V in anodic direction). This value correlates with the concentration of the organic degradation products in the electroplating bath.

DME

DME is an operating mode of the Multi-Mode Electrode and stands for **Dropping Mercury Electrode**. The **DME** is the classic mercury electrode, where the mercury flows freely through the glass capillary and forms drops at its end. After the **Potential step time**, which can be set in the measuring mode, has elapsed, the drops will be knocked off with the tapping mechanism.



V = Valve

A = Surface of the mercury drop

t_{step} = Potential step time

t = Time

NOTICE

An advantage of the **DME** over the **SMDE** is that there is less mechanical strain on the glass capillary of the Multi-Mode Electrode.

A disadvantage of the **DME** over the **SMDE** and **HMDE** is the higher use of mercury and the lower sensitivity, as the surface of the electrode (the mercury drop) constantly changes during the measuring phase.

See also

- *HMDE*
- *SMDE*
- *MME*
- *RDE*

DP

In the differential pulse measuring mode, a gradually increasing DC potential ramp is overlaid with rectangular pulses. If the pulse amplitude has a positive value, for each potential step a rectangular pulse is applied in sweep direction. If the pulse amplitude has a negative value, then the pulse is applied contrary to the sweep direction. The current *i* is measured immediately before the pulse and at the end of the pulse. The difference between the two measured currents is plotted as a function of the potential of the potential step $U + (U_{pulse} / 2)$. This results in a peak-shaped curve.

The **DP** measuring mode is described in detail in the **DP** command *(see chapter 5.5.2.10.6.1, page 634)*.

DP (differential pulse measuring mode) is the most frequently used voltammetric measuring mode. It is well-suited for both reversible and irreversible systems and offers high sensitivity.

DT (Dilution Titration)

Calibration method based on a dilution titration and mainly used for *suppressor* determination in electroplating baths. It consists of a two-stage process, in which a calibration is first carried out with a suppressor standard solution before the sample solution is measured.

Calibration with standard

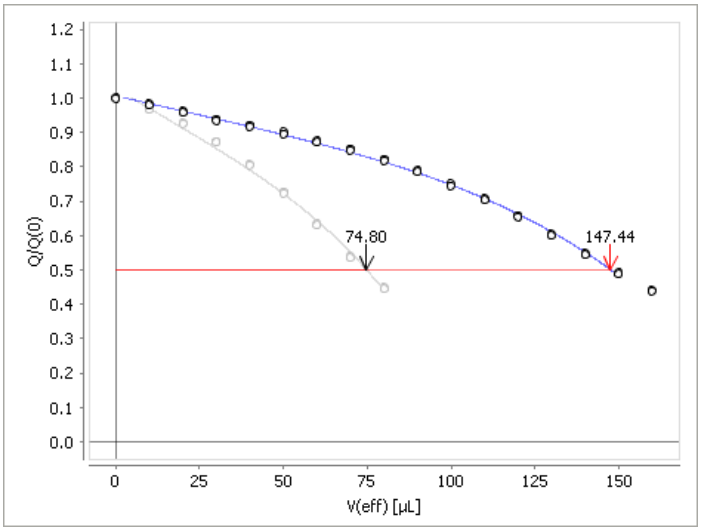
For the calibration, a basic solution with no added organic substances, called **VMS** (Virgin Make-up Solution), is measured first *(see glossary, page 1074)*. The area of the oxidation peak obtained with the anodic sweep is evaluated and the charge is calculated. This charge is used as start value **Q(0)** for the further calibration. Small amounts of a diluted suppressor standard solution are then dosed into the basic solution. The peak areas are standardized in order to improve the comparability of the measuring results obtained. This is achieved by setting up the quotient **Q/Q(0)** of the currently measured signal **Q** and the start value **Q(0)** and plotting it against the effective addition volume **VEFF** for each step *(see glossary, page 1059)*. The addition of standard solution is repeated until the **Evaluation ratio** defined in the method (usually **Q/Q(0) = 0.5**) has been achieved. The recorded calibration curve is then used to calculate the **Calibration factor**, which expresses the suppressor concentration in the measuring vessel for the **Evaluation ratio** *(see chapter 5.6.7.7.11, page 773)*.

Sample measurement

The suppressor concentration in the sample is determined under the same conditions used for the calibration, with the difference that sample solution and not the suppressor standard solution is added to the basic solution. Once the **Evaluation ratio** has been achieved, the suppressor con-

centration in the sample is calculated from the determined effective addition volume with the help of the previously determined **calibration factor** *(see chapter 5.6.7.7.20, page 776)*.

Example



The example shows the calibration curve for the standard (gray) and the measurement curve for the sample (blue) with the values determined for the effective addition volume **VEFF(STD) = 74.8 µL** and **VEFF(SMPL) = 147.44 µL** for the evaluation ratio **Q/Q(0) = 0.5**.

Dilution volume

If a sample is diluted, then the dilution volume refers to the entire volume of sample and dilution solution. Of this diluted sample, the analysis volume *(see glossary, page 1051)* is then added to the measuring vessel *(see glossary, page 1072)*.

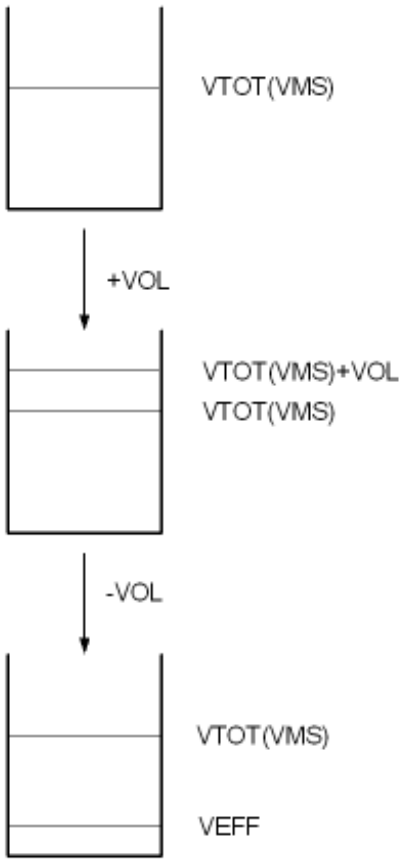
Effective addition volume

In order to avoid nonlinearities in the calculation of the regression data, a quantity must be found that exhibits a direct correlation between the measured quantity and the x axis of the calibration curve. Usually, this quantity is the concentration. In the calibration method **DT** *(see glossary, page 1058)*, however, the concentration of the sample is what is being investigated. The problem is that only the addition volume (i.e. the addition volume of the standard solution during calibration and the addition volume of the sample during sample determination) is known.

The measured quantity is, however, not dependent on the added volume but on the concentration of a substance. The quantity **VOL/VTOT**, which is proportional to the concentration of the substance in the measuring cell, is therefore selected on the x axis for generating the calibration curve. The **effective addition volume VEFF(X) = VOL*VTOT(VMS)/VTOT(X)**

is introduced in order for a familiar physical quantity to be able to be displayed on the x axis.

In the case of a very small addition volume as compared to the volume **VTOT(VMS)**, the **effective addition volume** approximately corresponds to the addition volume added.



Fill the measuring vessel with the electrolyte volume **VTOT(VMS)**.
Add the volume **VOL** of standard solution or sample solution.
Thoroughly mix the solution in the measuring vessel.
Remove the volume **VOL** from the mixed solution in order to obtain the original total volume **VTOT(VMS)** again.
The effective addition volume **VEFF** now corresponds to the volume of the standard solution or the sample solution that is still in the measuring cell.

Electrolyte solution

Basic solution consisting of *VMS*, *suppressor* and *brightener*. It is used in electroplating bath analysis in the **RC** calibration method *(see glossary, page 1069)* for the standardization of the curves for *leveler* determination.

In trace analysis, electrolyte solutions are liquids containing ions. The ohmic resistance of the measuring solution is reduced by adding an electrolyte solution to a voltammetric measuring cell. The potentiostat can thus correctly apply the desired nominal potential between the working electrode and the reference electrode.

Evaluation quantity

The software can automatically evaluate a peak in a measurement curve that was created with a voltammetry command. The quantity **Peak area** or **Peak height** that is to be evaluated, is referred to as evaluation quan-

tity. Using the evaluation quantity, the software can also perform an automatic calibration *(see chapter 5.6.5.2, page 700)*.

For the evaluation via the **Peak area**, the area between baseline and measurement curve is integrated. In the viva software, the area is always output as charge *Q* [C]. In the case of current-time curves *(chronoamperogram)*, the area corresponds directly to the charge *Q* (A · s = C). In the case of current-potential curves *(voltammogram)* the area under the curve corresponds to a performance (A · V = W), which divided by the sweep rate [V/s] results in the charge *Q* [A · V/(V/s) = A · s = C]. The evaluation quantity **Peak area** is calculated as power for all voltammetry commands in viva.

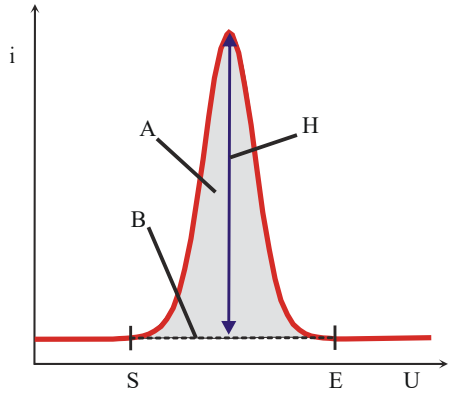
For the evaluation via the **Peak height**, a perpendicular is dropped from the peak maximum to the baseline and the height between peak maximum and baseline is determined. The peak height is output as current ***i*** [A].

If there is no peak-shaped signal in a voltammogram, then the evaluation can be carried out using the **Measured value** evaluation quantity *(see glossary, page 1067)*.

For the evaluation with the **Measured value**, for a defined characteristic potential the current ***i*** [A] is read out from the measurement curve.

The evaluation using the **Measured value** evaluation quantity can only be carried out for those measuring modes where the current is measured as function of the applied potential (**CVS**, **LSV**, **DP**, **SQW**, **CV**). For chrono measuring modes, (**CPVS**, **CP**), where the current or potential is measured as function of time, this evaluation option is not available.

An alternative option is the *fixed point evaluation*. For any measured quantity (potential or time), the corresponding evaluation quantity (time, current or potential) can be read out from a measurement curve with this evaluation. Unlike the measured value evaluation, the evaluation is limited to single curves here. The evaluation quantity obtained using fixed point evaluation cannot be used with the calibration techniques for the calculation of concentration available in the software either.



i = Current
U = Potential
S = Start base point
E = End base point
B = Baseline
A = Peak area
H = Peak height

Evaluation ratio

Preset ratio **Q/Q(0)** for the determination of the suppressor concentration using the calibration method **DT** *(see glossary, page 1058)*.

Q = currently measured charge

Q(0) = start value, charge **Q(0)**

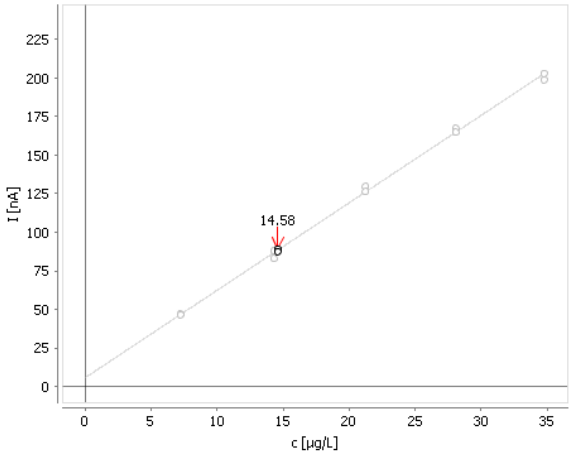
Evaluation

Process in which the evaluation quantities and concentrations of the individual *substances* are calculated from raw data.

External calibration

The external calibration is a calibration method that determines the substance content in a sample in two steps:

- First, the correlation between the substance concentration in the measuring vessel **CONCM** and the evaluation quantity is determined by measuring different standard solutions.
- Then the sample is measured and the substance concentration in the measuring cell **CONCM** as well as the substance concentration in the sample **CONC** are calculated on the basis of the recorded calibration curve while taking the dilution into account.



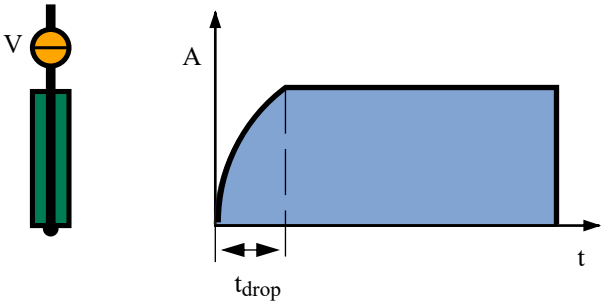
For details regarding the calculation of the substance concentration in the sample *see 5.6.5.13 722*.

Fixed point evaluation

Fixed point evaluation is used to read out the corresponding measured value (usually current or potential) to a defined x value (usually potential or time) from a single measurement curve. The exact combination of the quantities (current, potential, time etc.) for the x and y value depends on the selected voltammetry command. The fixed point evaluation is possible for all voltammetry commands for which a measurement curve is saved, irrespective of the shape of the curve *(see chapter 9.1.5.11, page 1024)*.

HMDE

HMDE is an operation mode of the Multi-Mode Electrode and stands for **Hanging Mercury Drop Electrode**. Four mercury drops of a defined size are formed one after the other at the glass capillary of the **MME**. The last drop remains suspended and thereby forms the **HMDE**, where a sweep is carried out - usually after deposition (stripping technique).



V = Valve

A = Surface of the mercury drop

t_{drop} = Drop formation time = Drop size × 40 ms

t = Time

NOTICE

The **HMDE** is predominantly used for the very sensitive stripping voltammetry. The species to be determined is first electrochemically deposited and then measured.

See also

- *DME*
- *SMDE*
- *MME*
- *RDE*

Intercept solution

Basic solution consisting of *VMS* and *suppressor*. It is used in electroplating bath analysis for determining the intercept value with the **LAT** *(see glossary, page 1064)* and **MLAT** *(see glossary, page 1066)* calibration methods.

Intercept value

The intercept value is the charge that is obtained from the measurement of the *intercept solution*. It is determined using the **LAT** *(see glossary, page 1064)* and **MLAT** *(see glossary, page 1066)* calibration methods in electroplating bath analysis.

LAT (Linear Approximation Technique)

Calibration method based on a standard addition and mainly used for the determination of *brightener* in electroplating baths. First, the basic solution spiked with suppressor, referred to as the *intercept solution*, is measured. Then, in a second step, the intercept solution is exchanged for a (bath) sample spiked with suppressor and the latter is measured. This is followed by a standard addition with brightener standard solution.

Determination of the intercept value

The intercept solution, which consists of *VMS (Virgin Makeup Solution)* and *suppressor* is measured first. The area of the oxidation peak obtained from the anodic sweep is evaluated, and the charge is calculated and saved as *intercept value*. This value is then subtracted as a background value from the subsequent measured values.

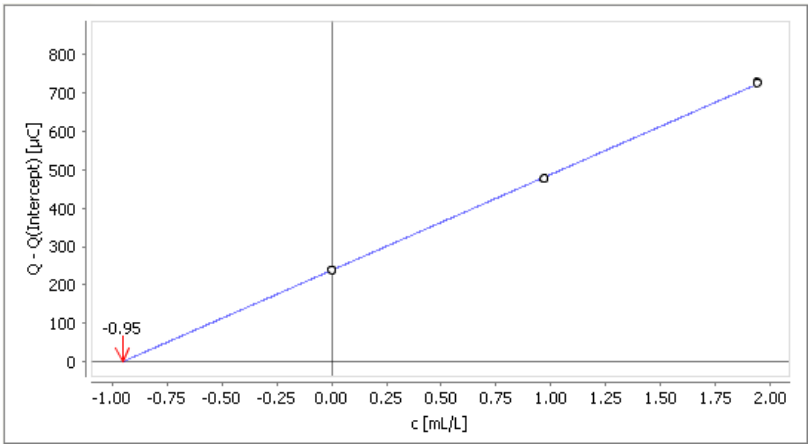
Sample measurement

The previously measured intercept solution is exchanged for a (bath) sample spiked with suppressor and the latter is measured.

Standard addition

Brightener standard solution is added once or several times to the measuring solution and a measured value is recorded each time. The concentration of brightener in the sample is then calculated by means of linear regression.

Example



LSV (Linear Sweep Voltammetry)

In the **LSV** measuring mode (Linear Sweep Voltammetry), the potential applied to the working electrode is changed from the start potential to the end potential at a constant potential sweep rate. The current i is measured as a function of the applied potential U in this process. This measuring mode can only be used for electrodes with a static surface (RDE/SSE, scTRACE Gold or MME in HMDE operating mode).

The measuring parameters of the **LSV** measuring mode are described in detail in the **LSV** command *(see chapter 5.5.2.10.5, page 620)*.

The **LSV** measuring mode is used in electroplating bath analysis as well as in trace analysis.

Leveler

A leveler is an electroplating bath additive that reduces metal plating and smoothens the metal layer surface. Levelers are only used in three-component galvanic baths (*suppressor*, *brightener* and leveler), which are predominantly applied in semiconductor production and only rarely in printed circuit board production.

MLAT (Modified Linear Approximation Technique)

Calibration method based on a standard addition and mainly used for the determination of *brightener* in electroplating baths. First, the basic solution spiked with suppressor, referred to as the *intercept solution*, is measured. After the addition of sample to the intercept solution, another measurement is made. This is followed by a standard addition with brightener standard solution.

Determination of the intercept value

The intercept solution, which consists of *VMS (Virgin Makeup Solution)* and *suppressor* is measured first. The area of the oxidation peak obtained from the anodic sweep is evaluated, and the charge is calculated and saved as *intercept value*. This value is then subtracted as a background value from the subsequent measured values.

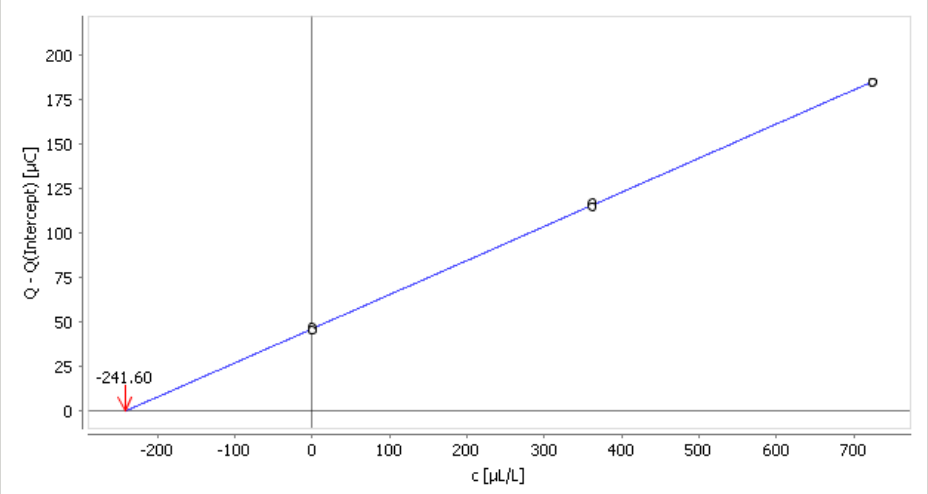
Sample measurement

The sample, which contains suppressor and brightener, is added to the intercept solution and measured.

Standard addition

Brightener standard solution is added once or several times to the measuring solution and a measured value is recorded each time. The concentration of brightener in the sample is then calculated by means of linear regression.

Example



MME

MME stands for **Multi-Mode Electrode**. It is a working electrode used in electrochemical measurements. It combines the three most important polarographic and voltammetric mercury electrodes in one single construction:

- *DME*
- *SMDE*
- *HMDE*

The electrode material used is mercury. The mercury flows through a glass capillary and forms mercury drops at its end, where the measurement is carried out.

Measured value evaluation

A voltammogram without peak can be evaluated with the measured value evaluation. In the measurement curves, for a defined characteristic potential the corresponding current is read out from the measurement curve.

The measured value evaluation ist available for the voltammetry commands **CVS**, **LSV**, **DP**, **SQW** or **CV**.

A calibration can be calculated using the measured values.

Method command

see Command

Method group

Collection of *methods* offering the possibility of defining access permissions.

Method track

see Track

Method

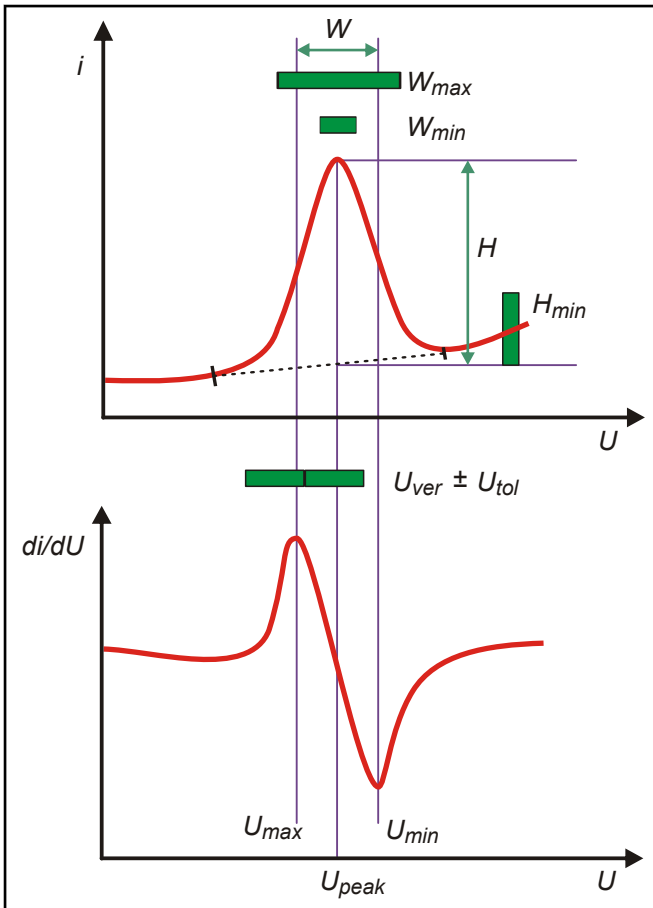
Run instruction for processing a sample and performing a VA measurement. A method consists of *tracks* that are themselves made up of *commands*.

OCP (open-circuit potential)

In the **OCP** measuring mode, the circuit is opened and the potential between the working electrode and the reference electrode is measured for the indicated measuring duration *(see glossary, page 1054)*.

Peak recognition

The derived curve is used to search for consecutive minima U_{min} and maxima U_{max}. A maximum followed by a minimum indicates a normal peak, a minimum followed by a maximum a "reversed peak". These values are used to determine the peak potential U_{peak} and the peak width *W* for each peak. After peak detection, a baseline *(see glossary, page 1053)* is constructed and the peak height *H* is determined from the value of the peak maximum minus the value of the baseline at the position of the peak potential.



i = Current
U = Potential
di/dU = 1st derivative of the current with respect to the potential
W = Peak width = □U_{min} - U_{max}□
W_{min} = Minimum peak width = **Min. width**
W_{max} = Maximum peak width = **Max. width**
H = Peak height
H_{min} = Minimum peak height = **Min. measured quantity**
U_{ver} = **Characteristic potential**
U_{tol} = **Tolerance** of the characteristic potential
U_{max} = Maximum potential of the derivative
U_{min} = Minimum potential of the derivative
U_{peak} = Peak potential = (U_{max} + U_{min}) / 2

The detected peaks are assigned to the defined substances based on these estimated values and the parameters defined on the **Recognition** tab in the **Substances** section. In the process, the following tests are carried out:

- **Peak potential**
  $U_{peak} = U_{ver} \pm U_{tol}$
- **Peak width**
  $W > W_{min}$
  $W < W_{max}$
- **Peak height**
  $H > H_{min}$

This peak is assigned to the corresponding substance and thus recognized as substance peak when all test conditions are fulfilled. The peak is labeled with the substance name in the curve display if the option **Peak label** is enabled in the curve window.

Polarography

Electrochemical analysis method that records **current/potential curves** on dropping mercury electrodes (*DME*, *SMDE*) *(see glossary, page 1074)*.

RC (Response Curve)

The response curve is a standardized calibration curve for electroplating bath additives with a suppressing effect. It involves a two-stage process, in which a calibration curve is first recorded with a standard solution before the sample solution is measured.

Calibration with standard

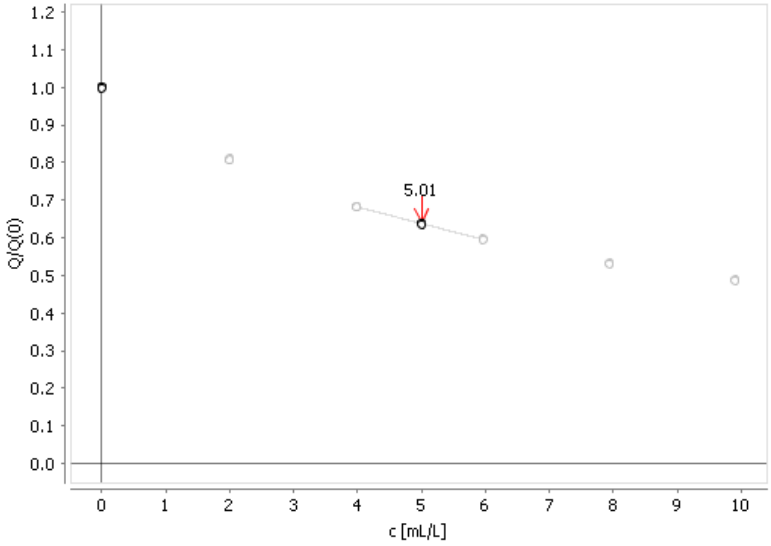
In order for a calibration curve to be produced, a basic solution spiked with additives, called the electrolyte solution, is measured first. The area of the oxidation peak obtained with the anodic sweep is evaluated and the charge is calculated. This charge is used as start value **Q(0)** for the further calibration. Then, standard solution is incrementally added to the electrolyte solution. The peak areas are standardized in order to improve the comparability of the measuring results obtained. This is achieved by setting up the quotient **Q/Q(0)** of the currently measured signal **Q** and the start value **Q(0)** and plotting it against the concentration of the standard in the measuring cell. Standard solution addition is repeated (at least three times). The calibration curve recorded in this way is then saved to the database.

Sample measurement

The additive concentration in the sample is determined with the same parameters as for the calibration. Two options are available for this:

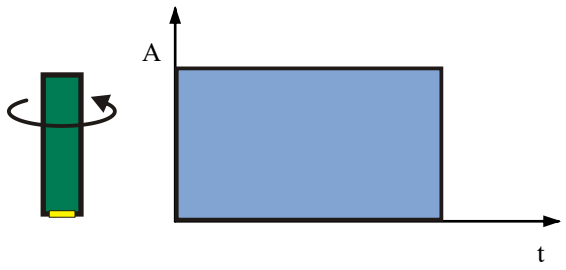
- **With solution exchange**
  First, the electrolyte solution is measured, the area of the oxidation peak obtained with the anodic sweep is evaluated and the charge is calculated. This charge is used as start value **Q(0)** for standardization in the further course of the determination. Then, the electrolyte solution is discarded and exchanged for sample. The area **Q** of the oxidation peak obtained with the anodic sweep is evaluated again and used together with the previously recorded calibration curve for determining the concentration (**Q/Q(0)**).
- **Without solution exchange**
  First, the electrolyte solution is measured, the area of the oxidation peak obtained with the anodic sweep is evaluated and the charge is calculated. This charge is used as start value **Q(0)** for standardization in the further course of the determination. Then, the sample is added to the electrolyte solution. The area **Q** of the oxidation peak obtained with the anodic sweep is evaluated again and used together with the previously recorded calibration curve for determining the concentration (**Q/Q(0)**).

Example:



RDE

RDE stands for **Rotating Disk Electrode**. It is a working electrode used in electrochemical measurements. The **RDE** consists of a conductive disk (usually metal, graphite, glass-like carbon etc.), built in the front side of a cylindrical shaft that is made of an insulating material such as polymer or glass. During the measurement the **RDE** can be set into rotation by a rotation drive mechanism, in order to keep the concentration of the analyte at the surface of the working electrode at a constant level. If the electrode rotates during the sweep as well, this is referred to as hydrodynamic measurement.



A = Surface of the electrode

t = Time

See also

- *DME*
- *HMDE*
- *SMDE*

Recognition

Criteria for the assignment of a peak or a potential to a *substance (see glossary, page 1067)*.

Replication

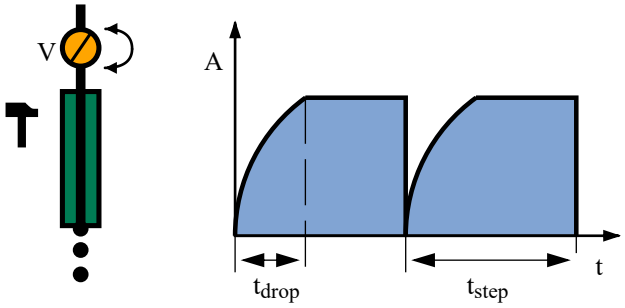
In voltammetric measurements, all data recorded is stored in a data set. The result variables belonging to a single voltammogram are unambiguously distinguished by an index **x** for the **variations** *(see glossary, page 1074)* and another index **y** for the **replications**. **Replication** refers to an identical repetition of a measurement.

Reversed peaks

Peaks that exhibit a positive signal during measurement in cathodic direction or a negative signal during measurement in anodic direction are referred to as reversed peaks.

SMDE

SMDE is an operating mode of the Multi-Mode Electrode and stands for **Static Mercury Drop Electrode**. The **SMDE** combines the characteristics of the **DME** and the **HMDE**. As with the **DME**, new drops are constantly formed. However, during the measurement the drop surface is constant, just as with the **HMDE**. Each mercury drop is knocked off with the tapping mechanism after the **Potential step time** t_{step}, set in the measuring mode, has elapsed.



V = Valve

A = Surface of the mercury drop

t_{drop} = Drop formation time = Drop size × 40 ms

t_{step} = Potential step time

t = Time

NOTICE

Compared to the **DME**, the **SMDE** has the advantage of a greater sensitivity, as the electrode surface (the mercury drop) stays constant during the measuring phase. Also, less mercury is being used. However, the glass capillary and the needle of the Multi-Mode Electrode are subject to a greater mechanical strain than those of the **DME**.

See also

- *DME*
- *HMDE*
- *MME*
- *RDE*

SQW (square-wave measuring mode)

In the square-wave measuring mode, a gradually increasing DC potential ramp is overlaid with rectangular AC potentials with a constant amplitude. For each potential step a rectangular pulse is applied in sweep direction and another one contrary to the sweep direction. The current *i* is measured at the end of each pulse during the measuring time. The difference between the two measured currents is plotted as a function of the potential *U* of the potential step. This results in a peak-shaped curve.

The **SQW** measuring mode is described in detail in the **SQW** command *(see chapter 5.5.2.10.7.1, page 649)*.

The SQW measuring mode (square-wave measuring mode) is well-suited for reversible electrode processes. It is used in particular for sensitive voltammetric determinations on static electrodes (RDE/SSE, scTRACE Gold or MME in HMDE operating mode).

SSE

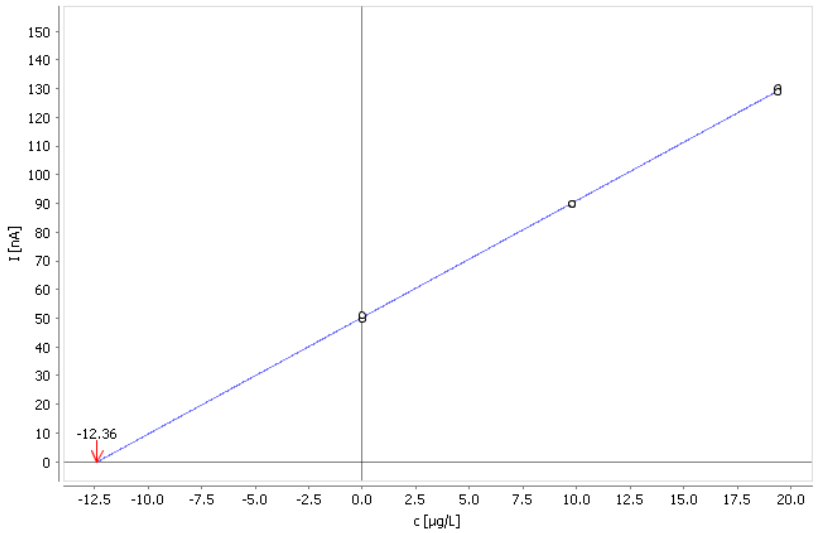
SSE stands for **Solid-State Electrode**. It is a working electrode used in electrochemical measurements. A solid-state electrode consists of a conductive component (usually metal, graphite, glass-like carbon etc.) that is at least partially surrounded by an insulating material (polymer or glass) or placed on such a material. During measurement with a solid-state electrode, the transport of the analyte to the surface of the working electrode can be maintained by stirring with a separate stirrer.

Sample amount

Amount of sample for which the default results are to be calculated. The sample amount can be entered as a volume or a weight or with any unit (e.g. **Number**).

Standard addition procedure

With the standard addition procedure (also known as spiking technique), a known amount of the substance to be determined is added to the sample once or more. The substance concentration is calculated from the thus increased peak height or peak area using linear regression. This addition can be carried out manually or automatically with a dosing device.



For details regarding the calculation of the substance concentration in the sample *see 5.6.5.11 718*.

Standard solution

The term standard solution is normally used for a solution with a known concentration of the substance to be determined.

In the **Solutions** subwindow of the **Configuration** program part, standard solution refers to a type of solution that must be used for all spiking solutions in different calibration methods.

Substance

Chemical substance (element or compound), the concentration of which is to be determined by means of a measurement procedure.

Suppressor

see Suppressor

Suppressor

In electroplating bath analysis, "suppressor" refers to an organic additive that reduces the plating rate of metals. Because even small quantities of suppressor can significantly reduce metal deposition, this characteristic effect can be used to determine the suppressor concentration in an electroplating bath.

Sweep

Sweep refers to a single electrochemical measurement that is carried out according to the parameters defined on the **Sweep** tab in the voltammetry command.

Track

Partial run of a *method* consisting of commands. The following types exist: main track, VA track, normal track and special tracks *(see chapter 5.5.1.2, page 410)*.

VMS (Virgin Makeup Solution)

Basic solution with a composition that should be as identical as possible to that of the electroplating bath solution to be analyzed, except that it contains no organic additives. It is used in electroplating bath analysis:

- In the calibration method **DT** *(see glossary, page 1058)* for the determination of the start value
- In the calibration methods **LAT** *(see glossary, page 1064)* and **MLAT** *(see glossary, page 1066)* as initial solution for preparing the intercept solution
- In the calibration method **RC** *(see glossary, page 1069)* for preparing the electrolyte solution

verwendet.

Variation

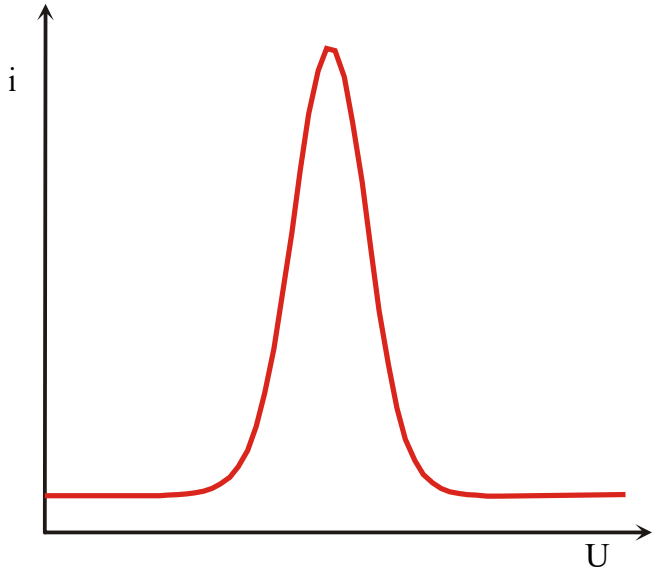
In voltammetric measurements, all data recorded is stored in a data set. The result variables belonging to a single voltammogram are unambiguously distinguished by an index **x** for the **variations** and another index **y** for the **replications** *(see glossary, page 1071)*. **Variation** refers to a measurement after modification of the measuring solution, e.g. after a standard solution has been added.

Voltammetry

Electrochemical analysis method that measures a current as function of an adjustable potential (i = f(U)). The classic form of voltammetry is polarography, where measurements are carried out on dropping electrodes (*DME*, *SMDE*). If, however, measurements are carried out on static electrodes (*HMDE*, *RDE*, *SSE*), this is referred to as (stripping) voltammetry.

Voltammogram

A voltammogram is the graphic representation of the current ***i*** as a function of the applied potential ***U*** (current-potential curve).



Such curves are obtained, for example, for measurements in the **DP** or **CVS** measuring mode. The evaluation can be carried out via the *Evaluation quantity* **Peak area**, **Peak height**, **Measured value** or via *Fixed point evaluation*.

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