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## ***Tutorial***

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Program version 1.0



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# 1 Introduction

This tutorial describes the first steps with *tiamo*. You will be introduced to the most important operating features by using a simple pH titration as an example.

Detailed information about *tiamo* can be found in the online help (). F1 opens the help for the particular dialog.

The tutorial is arranged in two parts:

## **Part 1: Titration without automation**

### *Configuration*

- Connecting a Titrande or a Titrino
- Adding a titrant
- Connecting a pH electrode

### *Method*

- Drawing up a method using a template
- Carrying out a titration

### *Database*

- Result view in the determination database
- Reprocessing the determination
- Printing a report

## **Part 2: Titration with automation**

You will learn how to insert a Sample Processor in an existing titration system and how to configure it. The titration method used in Part 1 is adapted accordingly in a few steps. For carrying out a determination series the creating of a sample table is explained.



## 2 Titration without automation

The following instruments are required for the titration described below:

- Titrando or Titrino
- Exchange unit or Dosino with dosing unit
- Stirrer

### 2.1 Configuration

#### 2.1.1 Connecting the titrator

##### Connecting a Titrando with stirrer:

- ☞ Connect a stirrer and – if available – an external dosing device to an MSB-connection of the Titrando.
- ☞ Use the 6.2151.000 Cable to connect the controller socket of the Titrando with a USB connection on the computer.
- ☞ Start *tiamo*. The Titrando is recognized automatically:



After confirming the message a dialog window containing the device properties opens automatically:

☞ Under **Device name** enter a name that describes the Titrand unambiguously; confirm it with **[OK]**.

### Connecting a Titrino:

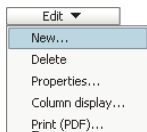


#### **Note!**

*Titrinos are not recognized automatically and must be entered manually in the device table.*

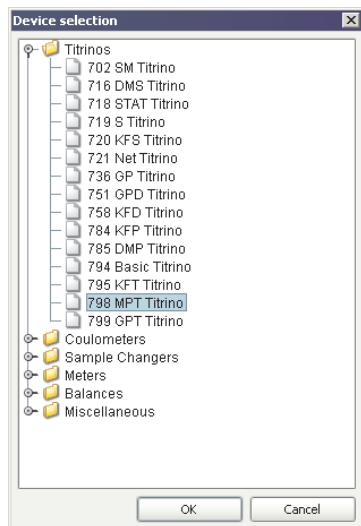
☞ Connect your Titrino to the PC via the RS232 interface COM1, COM2... (6.2125.110 Cable 9 p./f. – 25 p./f or 6.2134.040 9 p./f. – 9 p./f) and switch it on.

☞ Now start *tiamo*.

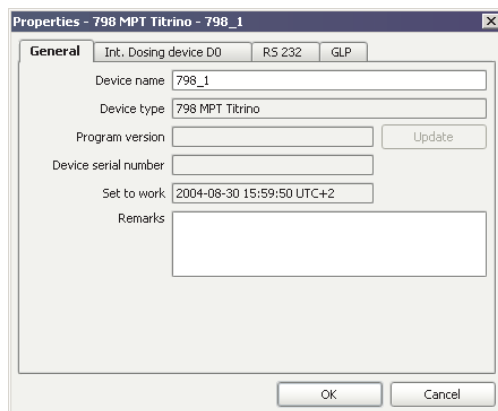


By clicking on the symbol **[Configuration]** you will access an overview showing all the connected devices, titrants and sensors.

☞ Select **Edit, New...** in the subwindow **"Devices"**. The dialog shows all the devices that can be connected via an RS232 interface opens:



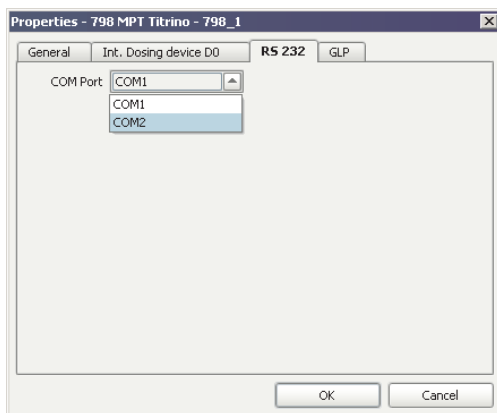
☞ Select your Titrimo from the list and press **[OK]**. The properties window of the selected device opens automatically:



☞ Under **Device name** enter a name that describes the Titrimo unambiguously.

☞ On the **RS 232** register card select the interface on the PC to

which you have connected the Titrino and confirm it with **[OK]**.



## 2.1.2 Configuring the titrant

### Configuring a titrant in an intelligent exchange or dosing unit with data chip

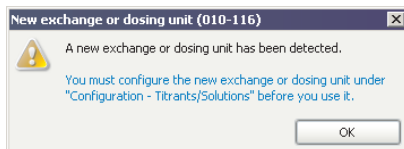


**Note!**

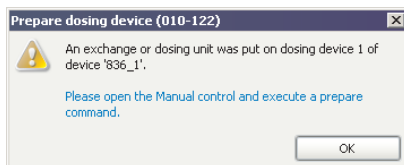
*The following description only applies if a Titrando is used.  
For Titrinos: please refer to next section.*

☞ Attach the exchange unit to the Titrando or the Dosino to the dosing unit.

As soon as the exchange or dosing unit has been recognized the following message appears:



After confirming this message you will be requested to carry out the **Prepare** function, with which all the tubing and the cylinder are rinsed:



Preparing the exchange or dosing unit is described in Section 2.1.4. However, the exchange or dosing unit must first be configured.



☞ If you are not yet in the configuration view click on the symbol **[Configuration]**. This accesses an overview showing all the connected devices, titrants and sensors.

The new titrant is entered in the **List of titrants**:

Titrants/Solutions						
	Solution name ▲	Concentration	Cylinder volume	Type	Dosing device	Titer
▶ 1		1.000 mol/L	50	IDU	836_1 / D1	1.000

The properties window is opened with a double-click on the new titrant:

**Titrant/Solution -**

**Solution** | Titer | Titer history | Dosing unit | GLP

Solution name: [dropdown]

Concentration: 1.000 mol/L [dropdown]

Comment: [text area]

Production date: [calendar icon]

☒ **Solution monitoring**

Working life: 999 days

Expiry date: [calendar icon]

**Action**

☐ Record message

☒ Display message

☐ Stop determination

OK Cancel

☞ Enter a **Solution name** or select one from the list.

☞ Now define the **Concentration** of your titrant.

☞ Switch on the option **Solution monitoring** and enter e. g. 60 days as the working life.

☞ Confirm the entry with **[OK]**.

### Configuring a titrant in an exchange or dosing unit without data chip:

A titrant in an exchange or dosing unit without data chip must be added manually to the solution table. The exchange or dosing unit does not need to be attached for this.

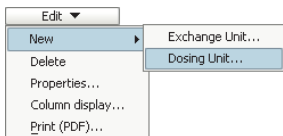


#### **Note!**

*If you use an exchange unit with data chip with a Titrino you will also have to enter the titrant in the solution table manually.*



☞ If you are not yet in the configuration view click on the symbol **[Configuration]**.



☞ Select **Edit, New, Exchange or Dosing unit...** in the subwindow **"Titrants/Solutions"**. The dialog window containing the properties of the titrant opens:

**Titrant/Solution -**

**Solution** | Titer | Titer history | Dosing unit | GLP

Solution name:

Concentration: 1.0000  mol/L

Comment:

Production date: 2004-08-30

☐ **Solution monitoring**

Working life: 999 days

Expiry date:

**Action**

☐ Record message

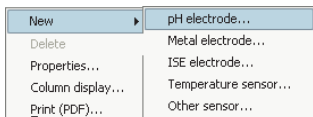
☒ Display message

☐ Stop determination

OK Cancel

- ☞ Enter a **Solution name** or select one from the list.
- ☞ Now define the **Concentration** of your titrant.
- ☞ Switch on the option **Solution monitoring** and enter e. g. 60 days as the working life.
- ☞ On the register card **Dosing unit** or **Exchange unit** select the **Cylinder volume** and enter the number printed on the cylinder under **Cylinder serial number**.
- ☞ Confirm the entries with **[OK]**.

## 2.1.3 Configuring a pH sensor



☞ In the subwindow **"Sensors"** select **Edit, New, pH electrode...**. The dialog window containing the properties of the sensor opens:


A screenshot of the 'Sensor - pH electrode' dialog window. The window has a title bar and a close button. It contains several tabs: 'Sensor', 'Calibration data', 'Limits', and 'History'. The 'Sensor' tab is active. Inside the tab, there are several input fields: 'Sensor name', 'Sensor type' (set to 'pH electrode'), 'Order number', 'Sensor serial number', and 'Device' (a dropdown menu). Below these is a 'Comment' text area and a 'Set to work' date field (set to '2004-08-30'). There is a checkbox for 'Sensor monitoring'. Below it, 'Working life' is set to '999' days and 'Expiry date' is set to '2007-05-26'. At the bottom, there is an 'Action' section with three radio buttons: 'Record message', 'Display message' (which is selected), and 'Stop determination'. At the very bottom are 'OK' and 'Cancel' buttons.

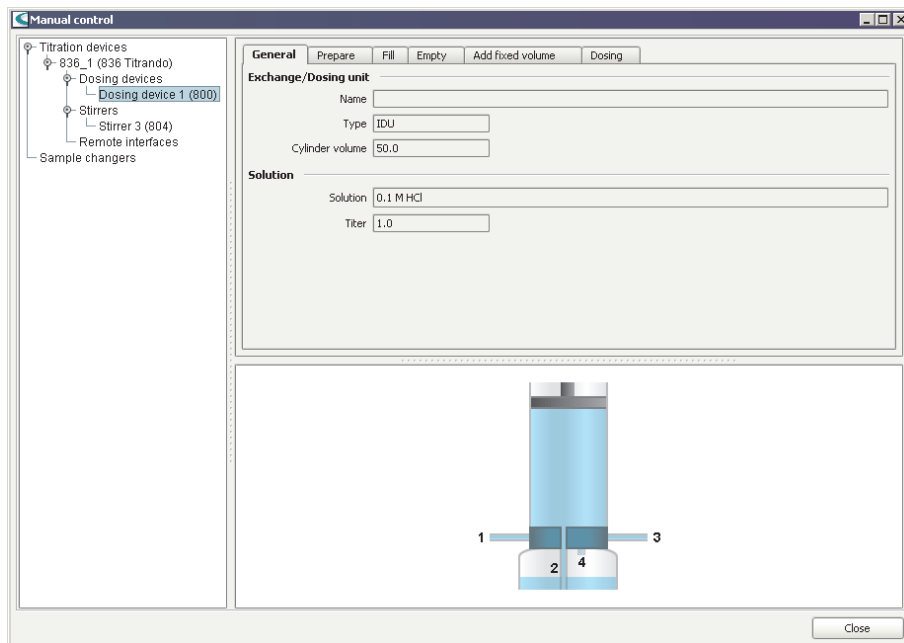
☞ Enter the **Sensor name** and the **Order number**.

☞ On the register card **Calibration data** switch on the option **Calibration data monitoring** and enter a calibration interval of e. g. 7 days.

☞ Confirm the entries with **[OK]**.

## 2.1.4 Preparing the exchange or dosing unit

☞ Open manual operation via the menu **Tools, Manual control** or directly via the symbol bar with :



☞ Mark the dosing device in the left-hand window and change to the register card **Prepare**.

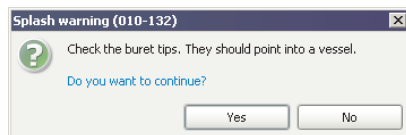


### **Note!**

*Make sure that the buret tip is directed into a container that can accommodate the volume of your exchange or dosing unit several times over.*

 **Start**

☞ Start rinsing the tubing with **[Start]**. The following message appears:



☞ Confirm the security query with **[Yes]**.

Preparation is carried out with standard parameters and is different for exchange units and dosing units.

☞ When preparation has been completed exit manual operation with **[Close]**.

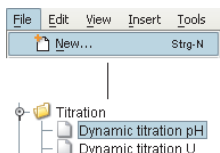
## 2.2 Methods

### 2.2.1 Creating a titration method

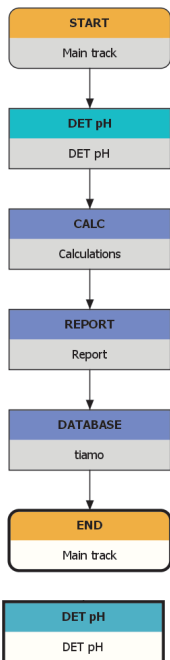
Below you will find a description of how to use a template to create your own method for DET pH titrations.



☞ Click on the symbol **[Method]**. The method editor is shown.



☞ Use **File, New...** to open the selection list of method templates and under the item **Titration** select **Dynamic titration pH**. After confirmation with **[OK]** the method is loaded.



The method template consists of the titration command **DET pH**, the calculation command **CALC**, the command **REPORT** for printing a determination report and the command **DATABASE** for saving the determination in the database.

The method is now already complete except for a few parameters which you are just going to set.

☞ Open the parameter window of the titration command **DET pH** with a double-click:

☞ Under **Device name** select the connected Titrand or Titrin.

☞ Under **Dosing device** select the MSB connection to which the dosing device has been connected. Select MSB 1 if you have attached an exchange unit to the Titrand / Titrin. Select your newly configured titrant under **Solution**.

☞ Select your previously configured pH electrode under **Sensor**.

☞ Under **Stirrer** select the MSB connection to which the stirrer has been connected.

Additional measured values

**Stop conditions**

Stop EP

Volume after EP  mL

☞ As stop criterion select **Stop EP = 1** and **Volume after EP = 1 mL** and confirm the alterations with **[OK]**.

**CALC**

Calculations

☞ Open the parameter window of the calculation command **CALC** with a double-click:

**CALC - Calculations**

Command name

Result name	Formula	Unit	Decimal places	Assignment	Statistics	Result monitoring

☞ Press **[New]**. The dialog window **"New result"** is shown:

**New result**

Templates	Description
Empty	Empty default template

In this window predefined result templates can be loaded and adapted for new calculations. As you have not yet defined a template

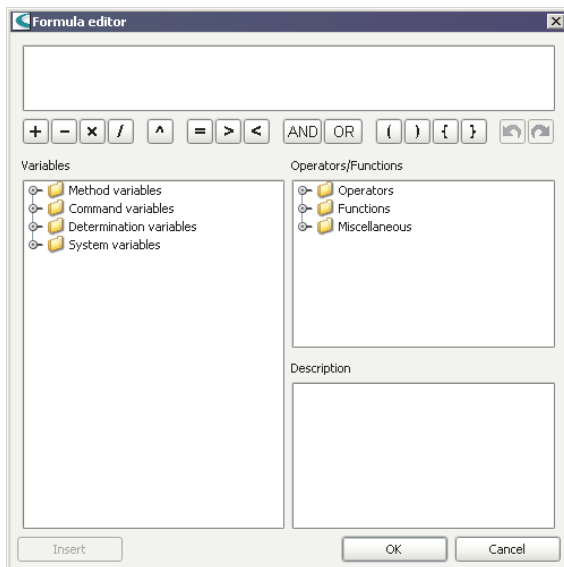
the selection is empty.

Next >>

☞ Press **[Next >>]**. The parameter window for the new result opens:

The screenshot shows a software window titled "Result New - RSXX". It has three tabs: "Definition", "Monitoring", and "Options". The "Definition" tab is selected. Inside this tab, there is a "Result name" dropdown menu showing "Res01". Below it is a large "Formula" text area, which is currently empty. To the right of the formula area is a small icon with a plus sign inside a square. Below the formula area are three more dropdown menus: "Unit" (empty), "Decimal places" (set to "2"), and "Assignment" (set to "RS01"). Below these is a checked checkbox labeled "Statistics". At the bottom of the tab is a "Description" text area containing the text "Result value.". At the very bottom of the window are three buttons: "Save as template", "OK", and "Cancel".

☞ Open the formula editor with .



The calculation formula is entered in the upper part of the window. Beneath it the most important mathematical functions are shown as symbols. In the subwindow **"Variables"** all the variables that are available for this method are listed in a tree structure. In the subwindow **"Operators/Functions"** further mathematical functions can be selected. A short description is shown for each variable and function.

The following steps describe how you can enter the simple formula shown below for determining the content of a sample:

'DET pH.EP{1}.VOL' x 'DET pH.CONC' x 'DET pH.TITER' x 40.00 x 0.1 /  
'MV.Sample size'

'DET pH.EP{1}.VOL': EP volume for 1st endpoint

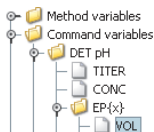
'DET pH.CONC': Titrant concentration

'DET pH.TITER': Titer of titrant

40.00: Equivalent mass of sample, NaOH as an example

0.1: Factor for conversion to %

'MV.Sample Size': Sample size



'DET pH.EP{x}.VOL'

☞ Select the variable **"VOL"** for the endpoint volume under the item **Command variables, DET pH, EP{x}**.

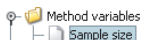
☞ Press **[Insert]** to accept the variable in the formula.

☞ Replace the **"x"** by **"1"**, i.e. this variable corresponds to the endpoint volume of the 1st endpoint.

☞ Insert the multiplication sign via the corresponding symbol or with the keyboard.

☞ In the same way insert the variables **"CONC"** and **"TITER"**.

☞ Enter the equivalent molar mass of the sample as well as the conversion factor.



☞ Select the variable **"Sample size"** under the item **Method variables** and insert it in the formula with **[Insert]**.

☞ Confirm the entries with **[OK]**. The formula editor is closed and you again find yourself in the parameter window for the new result.

Unit %

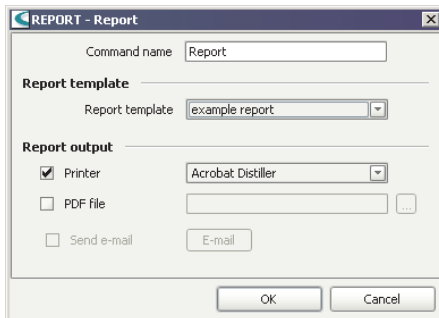
☞ As **Unit** select %.

☞ Confirm the entry with **[OK]**. The calculation is entered in the result table.

☞ Close this dialog with **[OK]**.



☞ Open the parameter window of the report command **REPORT** with a double-click:



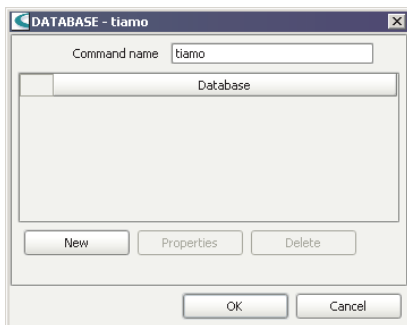
☞ Deactivate the option **Printer**.

☞ Activate the option **PDF-file** and after clicking on [...] enter the path and the file name under which the report is to be saved.

☞ Confirm the entry with **[OK]**.




☞ Open the parameter window of the database command **DATA-BASE** with a double-click:

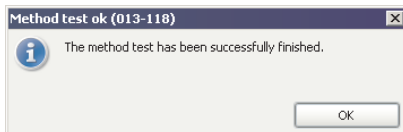


☞ Use **[New]** to select the standard database **tiamo** and confirm with **[OK]**.

☞ Close this dialog with **[OK]**.

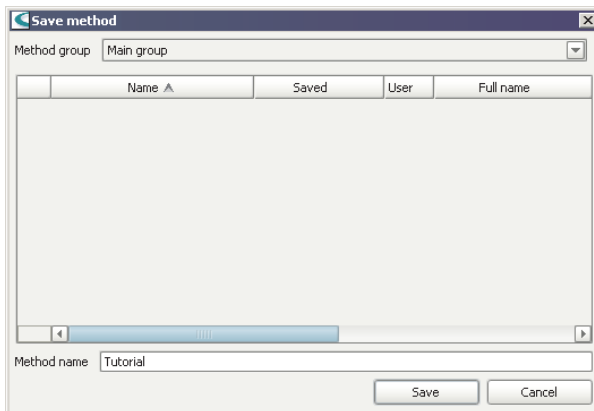
The method is now ready and can be checked with a method check and then saved:

- ☞ Start checking the method via the menu **File, Method check** or directly via the tool bar with . If the method test is successfully concluded the following message will appear:



- ☞ Confirm the message with **[OK]**.

- ☞ Save the new method with **File, Save as...**:

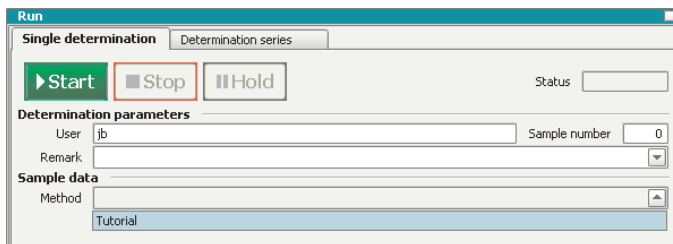


- ☞ Enter **"Tutorial"** as the **Method name** and press **[Save]**.

## 2.2.2 Carrying out a titration



- ☞ Change to the workplace view.
- ☞ In the subwindow **"Run"** under **Method** select the method you have just saved: **"Tutorial"**:



Sample size

- ☞ Enter the **Sample size**, e. g. "5.0" and select the **Unit** "g".

Sample size unit

- ☞ Place a sample on the stirrer and immerse the pH electrode and buret tip in it.

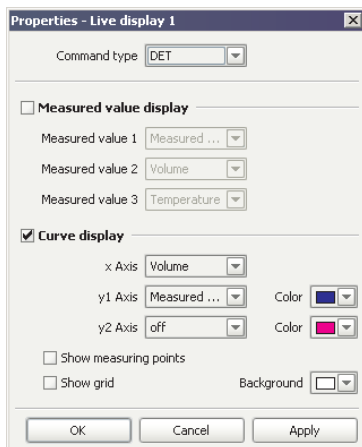


- ☞ Press **[Start]** to start the titration.

The currently active command is marked with a red border.

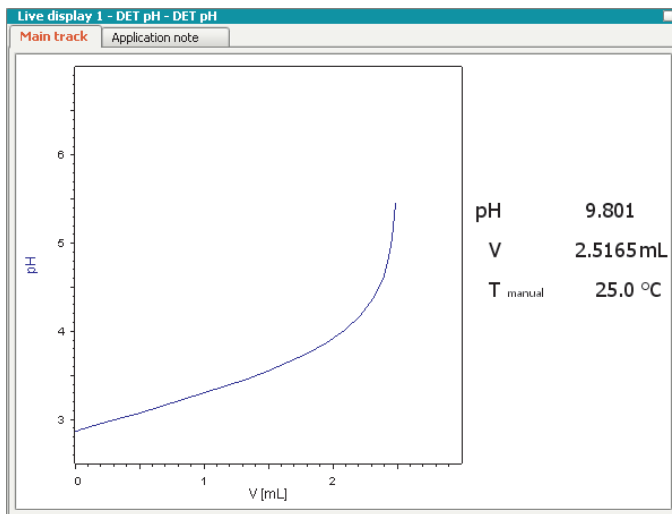
While the titration is being carried out you are going to configure the live display so that you can follow both the titration curve and the current measured value directly:

- ☞ With right-hand click in the subwindow **"Live display"** the properties window opens:



☞ Activate the parameter **Measured value display** and confirm the alteration with **[OK]**.

The live display now looks like this:



With the symbol  in the top right-hand corner of the live display

you can enlarge the window or diminish it again.

As soon as the determination has finished this will be shown in the live display by:

## Run: Regular with remarks

In the subwindow **"Report"** a preview of the report is shown. Printing out the report is described in the following section.

## 2.3 Database

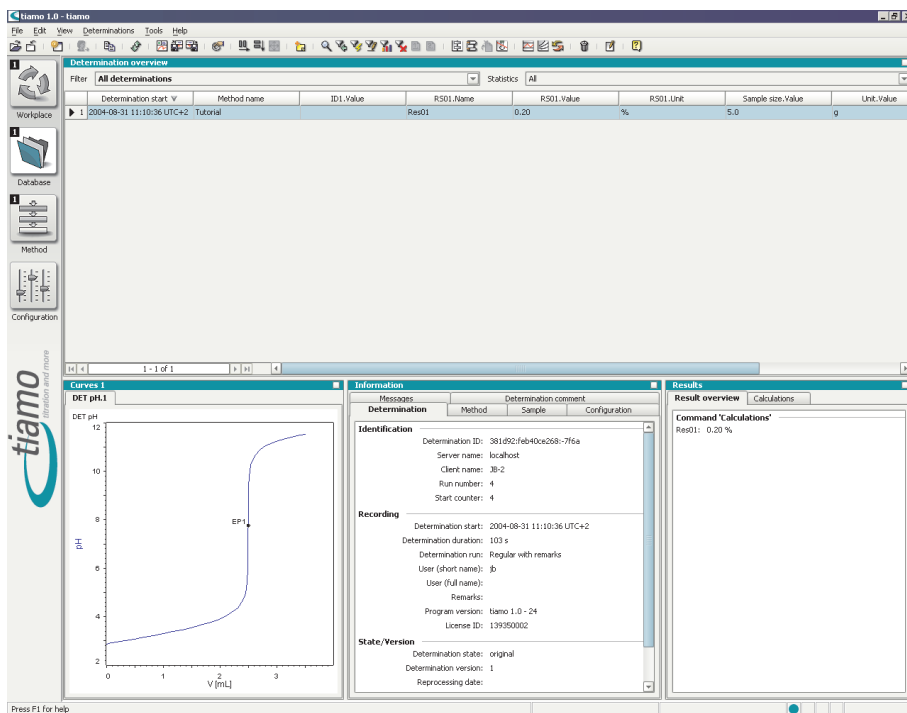
### 2.3.1 Overview



☞ Change to the database view.

☞ Open the standard database **tiamo** under **File, Open....**

The database is divided up into different windows. The standard setting looks like this:

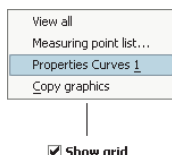


In the subwindow **"Determination overview"** the single determinations are listed in tabular form, sorted according to date and time. In the lower half of the screen the titration curve and the calculated result are shown in separate windows. In the subwindow **"Informa-**

**tion**" general information about the determination, such as determination start, method information, sample data, system configuration, etc. is shown.

### 2.3.2 Adapting the layout

A short description is given about how to adapt the database view to your own requirements. Reprocessing a determination is illustrated afterwards by a simple example.



☞ Use a right-hand click on the subwindow **"Curves"** to open the properties window for the curve view.

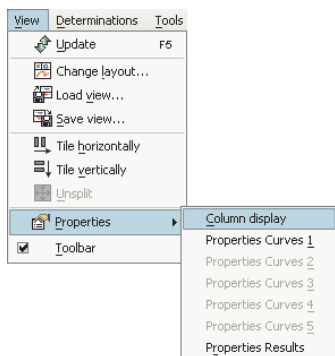
☞ On the register card **Options** activate the parameter **Show grid**.

☞ Confirm the alteration with **[OK]**.

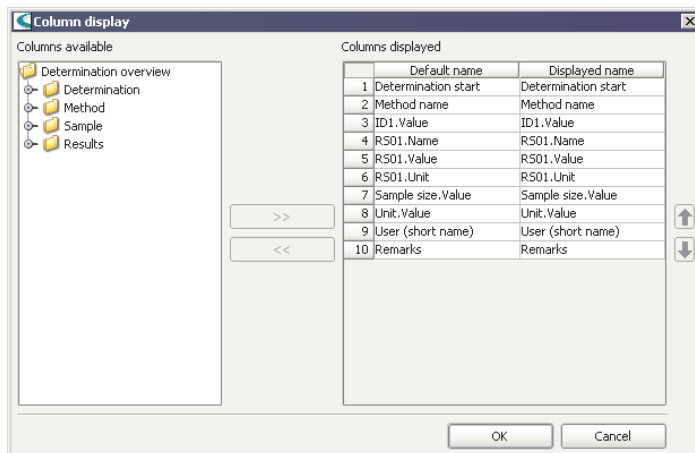
The titration curve is shown with a grid.

In the subwindow **"Determination overview"** you can define which columns are to be shown. You can also freely select the order in which the columns are to be shown:

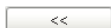
For example, the columns **User (Short name)** and **Note** are to be deleted and then the column **Method name** is to be moved:



☞ Via the menu **View, Properties, Column display** open the dialog window **Column display**:



☞ Select the column **User (Short name)**.




☞ Remove this column from the view by pressing [**<<**].

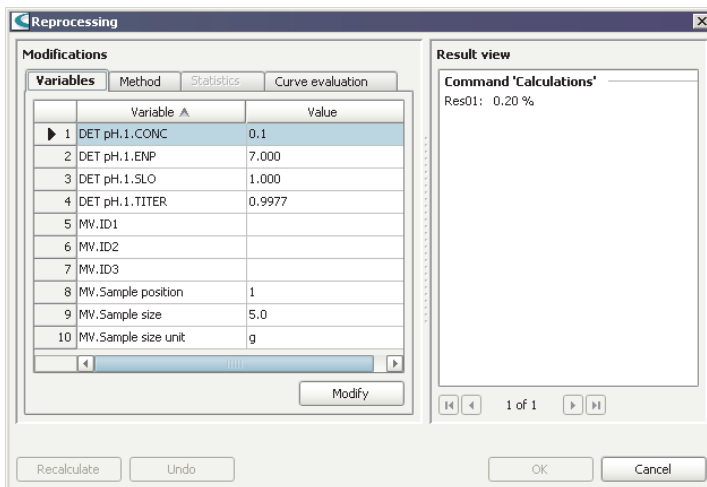
☞ Proceed in the same way for the column **Remarks**.

☞ Confirm the alteration with [**OK**]. The two columns are no longer shown.

☞ In the subwindow "**Determination overview**" click on the column title **Method name** and move this column to the right with the mouse key pressed down to insert it after the column **Result column RS01.Unit** (drag & drop).

### 2.3.3 Reprocessing a determination

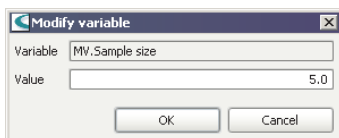
☞ Open the dialog window for reprocessing determinations under **Determinations, Reprocess...** or directly with the symbol :



For practice alter the sample size from 5.0 g to 10.0 g:



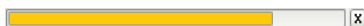
☞ Select line 9 and press **[Modify]**:



☞ Enter the new value 10.0 for the sample size and confirm it with **[OK]**.



☞ Trigger the recalculation with **[Recalculate]**. The progress is shown by a progress bar.



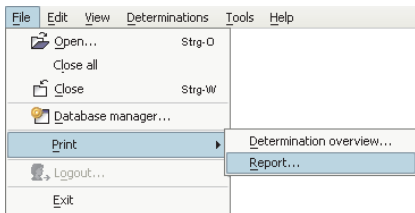
☞ The new result is shown in the right-hand part of the window.

☞ Close the dialog window with **[OK]**.

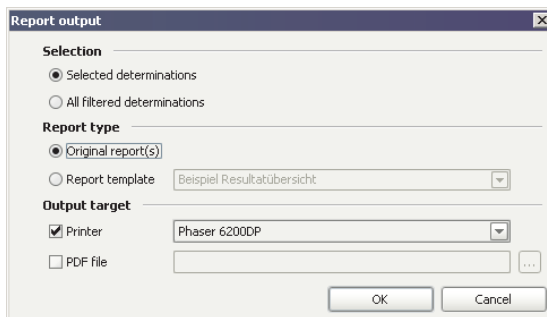
The recalculated determination is saved as a new version.

## 2.3.4 Report printout

The PDF report automatically generated by the determination can be printed out directly from the database view:



☞ Under **File, Print, Report...** select **Original report** and the required printer and confirm with **[OK]**:



The report is now printed out.



### **Note!**

*If the determination has been recalculated as in this example, the report of the recalculated determination is printed out.*



## 3 Titration with automation

For the second part of this tutorial you require a Sample Processor, a stirrer and a balance in addition to the titrator.

### 3.1 Configuration

#### 3.1.1 Connecting a Sample Processor

##### Connecting a Robotic USB Sample Processor

- ☞ Connect a stirrer to the stirrer connection of the tower.
- ☞ Use the Cable 6.2151.000 to connect the controller socket of the Robotic USB Sample Processor to a USB connection on the computer or Titrando.
- ☞ Start *tiamo*. The USB Sample Processor is recognized automatically:



After confirming the message the dialog window containing the device properties opens automatically:

The screenshot shows a software window titled "Properties - 815 Robotic USB Sample Processor XL - 815\_1". It has several tabs: "General", "Rack", "MSB 1", "MSB 2", "MSB 3", and "GLP". The "General" tab is selected. Inside, there are several input fields: "Device name" with the value "815\_1", "Device type" with "815 Robotic USB Sample Processor XL", "Program version" with "5.815.0021" and an "Update" button, "Device serial number" with "00002", "Set to work" with "2004-08-31 14:52:35 UTC+2", "Working hours" with "---- h", and a "Remarks" text area. At the bottom are "OK" and "Cancel" buttons.

☞ Under **Device name** enter a name that describes the Robotic USB Sample Processor unambiguously and confirm it with **[OK]**.

### Connecting a Sample Processor via an RS232 interface



#### **Note!**

*Sample Processors that are connected to the PC via the RS232 interface (e.g. 778 Sample Processor) are not recognized automatically and must be entered in the device table manually.*

The connection is identical to connecting a Titrino (see Section 2.1.1).

### 3.1.2 Connecting a balance



**Note!**

*Balances are not recognized automatically and must be entered in the device table manually.*

The connection is identical to connecting a Titrino (see Section 2.1.1).

☞ For unambiguous identification in addition to the **Device name** you must also enter the **Serial number** of the balance.

☞ Set the connection parameters on the register card **RS 232**. You can find the corresponding values in the Instructions for Use of your balance.

Check connection

☞ Press **[Check connection]**. The following dialog window is opened:


☞ Press the **[Print]** key on the balance in order to check the connection. If the correct connection parameters have been entered, the parameter fields **Device name**, **Sample size** and **Sample size unit** will be filled in with the corresponding data.

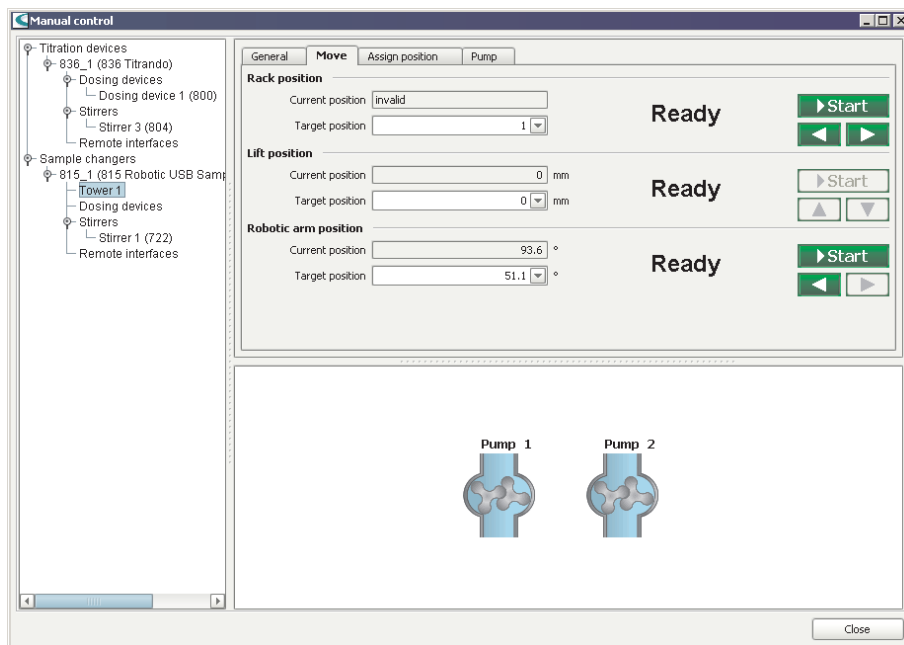
☞ Confirm with **[OK]**.

☞ Close the parameter window of the balance with **[OK]**.

### 3.1.3 Assigning lift positions

In this section you will learn how to define lift positions. This is necessary so that the subsequent titration can be carried out with the Sample Processor.

- ☞ Equip the titration head with all the necessary accessories such as electrode, dosing tip, etc., that you require for your daily work with the Sample Processor and place a sample vessel at Position 1.
- ☞ Open manual operation under **Extras, Manual operation** or directly via the symbol bar with :



The connected titrators and Sample Processors are shown on the left with their peripheral devices. On the right the functions of the marked

device are shown, in this example for the tower of an 815 Robotic USB Sample Processor XL.

☞ Mark the tower of the Sample Processor that you wish to use and click on the register card **Move**.



**Note!**

After initialization the Sample Processor is not at a valid rack position. This is indicated under **Current position** by **Invalid**.

▶ Start

☞ Under **Rack position** use **[Start]** or **[→]** to move to Position 1.



☞ You can move the lift by using the arrow keys **[↑]** and **[↓]** under the parameter **Lift position**. Set the lift height that you want to use as the work position, i.e. one at which the electrode is immersed.

☞ Change to the register card **Assign position**:

The current lift height is entered under **Lift position**. The option **Work position for Tower** is preselected.

Assign

☞ Now press **[Assign]**.

Now define a shift position:



☞ Change back to the register card **Move** and use the [↑] key to move the lift up so far that the rack can rotate freely without damaging the electrode or sample beaker.



☞ Change to the register card **Assign position** and select the option **Shift position for Tower** under **Lift position** and press [Assign].

☞ Define a rinse position in the same way.

Now check your settings:

☞ Change to the register card **Move**:

The screenshot shows the 'Move' register card with three sections: 'Rack position', 'Lift position', and 'Robotic arm position'. Each section has 'Current position' and 'Target position' fields, a 'Ready' status indicator, and a 'Start' button with directional controls. The 'Robotic arm position' section has a dropdown menu open showing options: 'Work position', 'Shift position', 'Rinse position', 'Special position', and 'Home position'.

Section	Field	Value	Status	Buttons
Rack position	Current position	1	Ready	▶ Start, ◀, ▶
	Target position	1		
Lift position	Current position	110 mm	Ready	▶ Start, ▲, ▼
	Target position	0 mm		
Robotic arm position	Current position	Work position	Ready	▶ Start, ◀, ▶
	Target position	Work position		



☞ Under **Lift position** select the target position **Work position** and press [Start]. The lift should now move to the height that has just been defined.

☞ Check the shift and rinse position in the same way.

### 3.1.4 Defining special beakers

Special beakers are particular rack positions which, e.g. can be used for rinsing or as conditioning beakers. Special beakers are preferably set at high rack positions so that sample series can start from rack position 1. Lift positions must be separately assigned for special beakers.

▶ Start

☞ Enter the required position on the register card **Move** under **Rack position** and press **[Start]**. The rack position is moved to.

☞ Change to the register card **Assign position**.

The current position is entered under **Rack position**.

Assign

☞ For **Special beaker** select "1" for the first special beaker and press **[Assign]**.

☞ Define a second special beaker position in the same way.

Now check the settings:

☞ Change again to the register card **Move**.

The screenshot shows the 'Move' register card in the tiamo software. It is divided into three main sections: 'Rack position', 'Lift position', and 'Robotic arm position'. Each section has 'Current position' and 'Target position' fields. In the 'Rack position' section, both are set to 1. In the 'Lift position' section, both are set to 'Special beaker 1' from a dropdown menu. In the 'Robotic arm position' section, both are set to 51.1. To the right of each section, the status is 'Ready' and there is a green '▶ Start' button. The 'Assign position' register card is also visible in the background.

▶ Start

☞ Under **Rack position** select the target position **Special beaker 1** from the selection list and press **[Start]**. The rack po-

sition that has just been defined will be moved to.

☞ Check the second special beaker position as well.

Now define a work position for each special beaker:

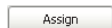
☞ Move to special beaker 1 as described above.



☞ Use the arrow keys **[↑]** and **[↓]** under the parameter **Lift position** to move the lift. Set the lift height that you want to use as the work position, i.e. so that the electrode is immersed.

☞ Change to the register card **Assign position**:

☞ Under **Lift position** select **Special beaker 1** for the work position.



☞ Now press **[Assign]**.

☞ In the same way define a work position for special beaker 2.

Now check the settings.



☞ Then close manual operation with **[Close]**.

## 3.2 Method

### 3.2.1 Creating an automation method

The method created in part 1 is to be extended to become an automation method so that a sample series can be processed automatically.



☞ Click on the symbol **[Method]**. The method editor is shown.

☞ Use **File, Open...** to open the saved method **"Tutorial"** if it is not already open.

#### Meaning of the individual commands

The following commands are required for a simple automation method:



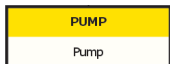
The command **MOVE** moves to a rack position or an external position (only with Swing Head).



The command **LIFT** moves the lift to the required height.

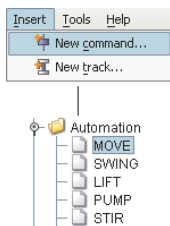


With the command **STIR** a stirrer connected to the Sample Processor is switched on and off.



The command **PUMP** switches an internal or external pump at the Sample Processor on and off.

## Extending the titration method



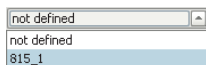
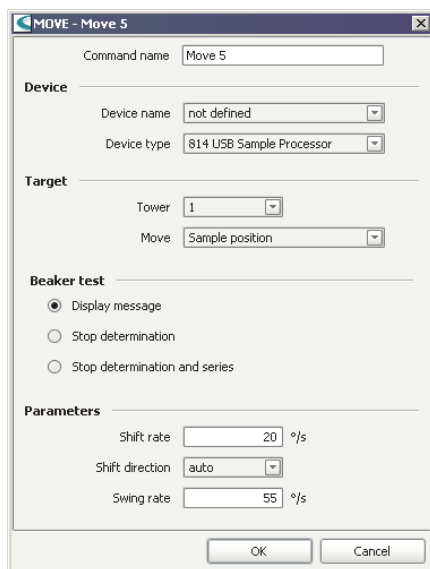
Insert a command before the titration command **DET pH** to move to the first sample:

☞ Mark the command **DET pH**. The command is shown with a black border.

☞ Under **Insert, New command...** select the command **MOVE** under the item **Automation** and confirm it with **[OK]**.

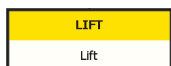
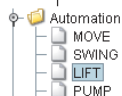
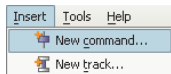
The command is inserted before the **DET pH** command.

☞ Open the parameter window of the command **MOVE** with a double-click:



☞ Under **Device name** select the connected Sample Processor. The other parameters are already set correctly and do not need to be altered.

☞ Confirm the alteration with **[OK]**.

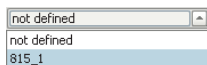
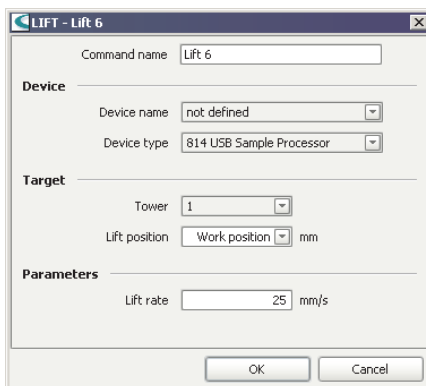


Now insert the command **LIFT** after the MOVE command in order to move the lift to the work position:

☞ Mark the command **DET pH** again. The command is shown with a black border.

☞ Under **Insert, New command...** select the command **LIFT** under the item **Automation** and confirm it with **[OK]**.

☞ Open the parameter window of the command **LIFT** with a double-click:



☞ Under **Device name** select the connected Sample Processor. The other parameters are already set correctly and do not need to be altered.

☞ Confirm the alteration with **[OK]**.



☞ Now insert the command **STIR** after the LIFT command in the same way to switch the stirrer on.

☞ Open the parameter window of the command **STIR** with a double-click:

☞ Under **Device name** select the connected Sample Processor. The other parameters are already set correctly and do not need to be altered.

☞ Confirm the alteration with **[OK]**.

As the stirrer is controlled by the STIR command, it must be switched off in the titration command **DET pH**:

☞ On the register card **General/Hardware** under **Stirrer** select the option **"off"** and accept the alteration with **[OK]**.

☞ Insert a **STIR** command before the **END** command to switch off the stirrer at the end of the titration and open its parameter window.

☞ Under **Device name** select the connected Sample Processor.

☞ Under **Action** select the option **"Switch off"**.

☞ Confirm the alteration with **[OK]**.

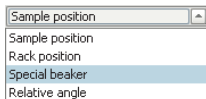
In the following steps you will insert the commands **MOVE**, **LIFT** and **PUMP** in order to rinse electrode, dosing tip and stirrer in

special beaker 1:



✎ Insert a **MOVE** command before the **END** command and open its parameter window.

✎ Under **Device name** assign it to the connected Sample Processor.



✎ Under **Target** and the parameter **Move** select the option **Special beaker**. Under **Number "1"** is already preselected for the first special beaker.

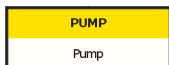
✎ Confirm the alteration with **[OK]**.



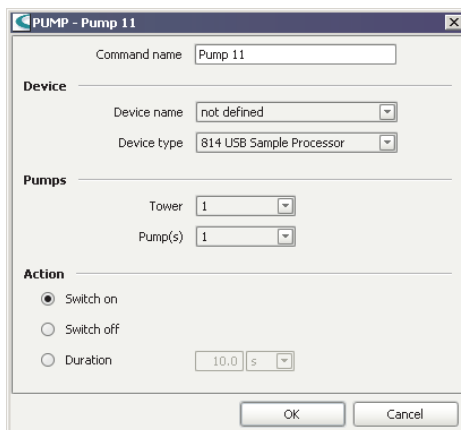
✎ Insert a **LIFT** command after the **MOVE** command and open its parameter window.

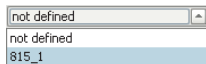
✎ Under **Device name** select the connected Sample Processor. The other parameters are already set correctly and do not need to be altered.

✎ Confirm the alteration with **[OK]**.



✎ Insert a **PUMP** command after the **LIFT** command and open its parameter window:





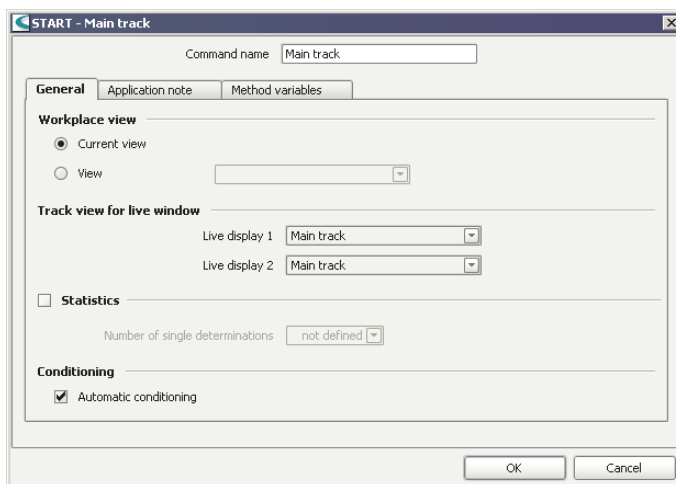
☞ Under **Device name** select the connected Sample Processor.

☞ Under **Pump(s)** select **"1+2"** in order to switch on both pumps. For built-in pumps pump 1 is used for rinsing the titration head and pump 2 is used for sucking off the solution in order that the special beaker is not overflowing.

☞ Under **Action** select the option **Duration** and enter the time **"3 s"**.

☞ Confirm the alteration with **[OK]**.

☞ Open the parameter window of the command **START** with a double-click:




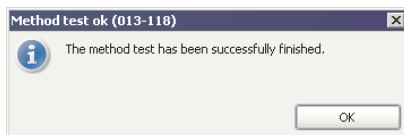
☞ Activate **Statistics** and enter the number **"3"**.

☞ Confirm the alteration with **[OK]**.

The method is now ready and can be checked with a method test and then saved:

☞ Start the method check via the menu **File, Method check** or

directly via the symbol bar with . If the method test has been completed successfully the following message will be shown:



☞ Confirm the message with **[OK]**.

☞ Save the method under **File, Save as...** and enter "**Tutorial Automation**" as the method name.

☞ Press **[Save]**.



### 3.2.2 Creating a sample table

You will now create a sample table in order to carry out a series of three determinations fully automatically. In a second step the sample size will be transferred directly from the balance to the sample table.



☞ Change to the workplace view.

☞ Click on the register card **Determination series** in the subwindow "Sequence":

**Run**

Single determination | **Determination series**

▶ Start | ■ Stop | || Hold | || Pause | Status:

**Determination parameters**

User:  | Sample number:

Remark:

Autostart:  of  |  | ☐ Statistics:  of

**Sample data**

	Method	Sample position	ID1	ID2	ID3	Sampl...	Sam...
▶ *							

Edit ▼ | Sample table ▼ | Loaded

☞ Under **Sample data** open the input window for the individual samples with a double-click on the marked line:

**Edit line - Working sample table - Workplace Workplace**

Method:

Sample position:

ID1:

ID2:

ID3:

Sample size:  | Sample size unit:


Line:  of 1 | Apply | Close

☞ Under **Method** select the previously created method **"Tutorial Automation"**.

☞ For **ID1** enter a sample identification for the first sample, e.g. "Sample 1".

☞ Confirm the entry with .

The data is entered in the first line of the sample table. A second line is automatically added to the table. The method and the sample identification are accepted. The sample position is increased automatically.

☞ Now alter the sample identification for the second sample, e.g. "Sample 2" and confirm the entry with .

☞ Also alter the sample identification for the third sample, e.g. "Sample 3".

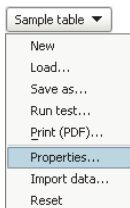
Apply

☞ Confirm this last entry with **[Apply]**.

Close

☞ Exit the input window with **[Close]**.

In the next step you will configure the sample table so that the sample weight is automatically transferred to the sample table.



☞ In the subwindow **"Run"** under **Sample table, Properties...** open the dialog window with the properties for determination series:

Properties - Determination series

Display Edit Process Data import Comment

Default method group: Main group

Accept data with: ☒   
 Lock editing in working sample table: ☐

Copy automatically into next line:

<input checked="" type="checkbox"/> Method	<input checked="" type="checkbox"/> ID1	<input checked="" type="checkbox"/> ID2	<input checked="" type="checkbox"/> ID3	<input type="checkbox"/> ID4
<input type="checkbox"/> Sample size	<input type="checkbox"/> ID5	<input type="checkbox"/> ID6	<input type="checkbox"/> ID7	<input type="checkbox"/> ID8
<input checked="" type="checkbox"/> Sample size unit	<input checked="" type="checkbox"/> Sample position + 1			

OK Cancel

☞ Change to the register card **Edit**.

☞ Activate the parameter **Accept data with**. The option **sample size** is preselected.



**Note!**

*If this parameter is activated then a switch will be made to the next line as soon as the sample size has been transferred from the balance to the selected sample line.*

☞ Change to the register card **Data import**:

Properties - Determination series

Display Edit Process Data import Comment

☒ Import from balance

Balance:   
 ☒ Always accept data   
 ☐ Accept data only for active window

☐ Import from barcode reader

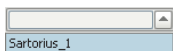
Barcode reader:   
 ☒ Always accept data   
 ☐ Accept data only for active window

☐ Import from file

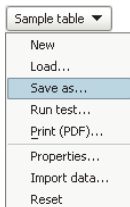
Import file:   
 Import format:

OK Cancel

☞ Activate the parameter **Import from balance**.



☞ Select the connected balance and confirm the alteration with **[OK]**.



☞ Now save the sample table under **Sample table, Save as...**

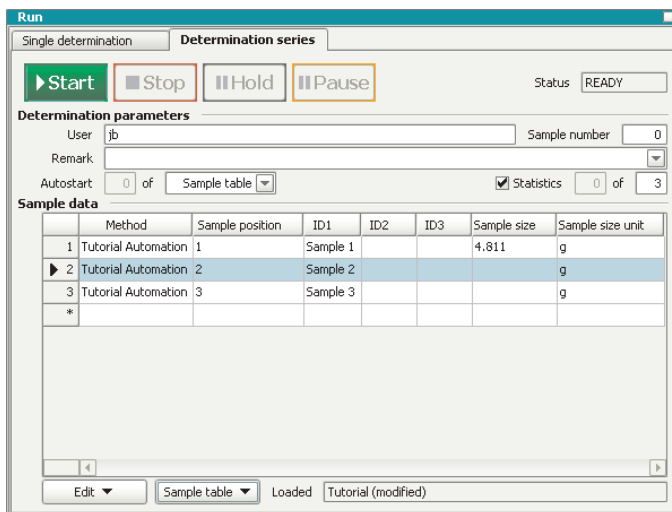
☞ Enter **"Tutorial"** as the name and press **[Save]**.

### 3.2.3 Processing a sample series

☞ Select the first line in the sample table.

☞ Weight out the first sample.

☞ Press the **[Print]** key on the balance. The sample weight is inserted in the first line. The line for Sample 2 is marked:



☞ Prepare the second and third sample.

☞ Place the samples at rack positions 1 to 3.



**Note!**

Under **Determination parameters** for the Autostart the option **Sample table** is selected by default. This means that the whole sample table will be processed. If you only wish to process part of the sample table then simply enter the corresponding number of samples here.



☞ Press **[Start]** to start the titration.

In the sample table the current sample is marked in orange, samples that have already been processed have a gray background.

**Run**

Single determination | **Determination series**

▶Start ■Stop ■■Hold ■■Pause Status: BUSY

Determination parameters

User: jib Sample number: 2

Remark: [dropdown]

Autostart: 2 of [dropdown] ☒ Statistics 2 of 3

**Sample data**

	Method	Sample position	ID1	ID2	ID3	Sample size	Sample size unit
1	Tutorial Automation	1	Sample 1			4.811	g
2	Tutorial Automation	2	Sample 2			5.494	g
3	Tutorial Automation	3	Sample 3			5.535	g
▶ *							

◀ ▶

Edit ▼ Sample table ▼ Loaded: Tutorial (modified)



With **[Stop]** the whole determination series is canceled, with **[Hold]** you can stop the running determination as well as the whole series. However, if you want to complete the running determination and then interrupt the series you should press **[Pause]**.

### 3.2.4 Extending the automation method

A samples series is processed in the following three phases:

- Start sequence: Commands that are carried out once at the start of a sample series.
- Sample sequence: Commands that are carried out for each sample.
- End sequence: Commands that are carried out once at the end of a sample series.

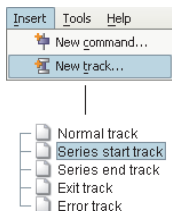
These single sequences can be subdivided in *tiamo* into **Part sequences**, the so-called **Tracks**. Each track contains a START and an END command which cannot be deleted. Any number of commands can be inserted between them.

In the following steps the automation method that has just been created will be altered accordingly:



☞ Click on the **[Method]** button. The method editor is shown.

☞ Use **File, Open...** to open the saved method "**Tutorial Automation**" if it is not already open.



Insert a new track for the start sequence:

☞ Under **Insert, New track...** select the template **Series start track** and confirm it with **[OK]**.

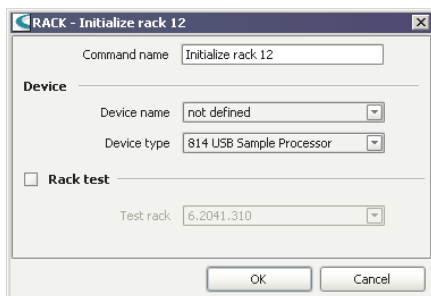
A new empty track will be inserted beside the previous track.

Now insert a command in the series start track which resets the Sample Processor to the normal operating condition at the start of the sample series:

☞ Under **Insert, New command...** select the command **RACK** under the item **Automation** and confirm it with **[OK]**.

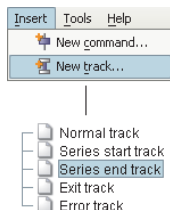


☞ Open the parameter window of the command **RACK** with a double-click:



☞ Under **Device name** select the connected Sample Processor.

☞ Confirm the alteration with **[OK]**.



Insert a new track for the end sequence:

☞ Under **Insert, New track...** select the template **Series end track** and confirm it with **[OK]**.

A new empty track will be inserted beside the previous track.

In the following steps you will insert the commands **MOVE** and **LIFT** in order to store the electrode in special beaker 2 (filled with conditioning solution).



☞ Insert a **MOVE** command and open its parameter window.

☞ Under **Device name** assign it to the connected Sample Processor.

☞ Under **Target** and the parameter **Move** select the option **Special beaker**.

☞ Under **Number** enter **"2"** for the second special beaker.

☞ Confirm the alteration with **[OK]**.



☞ Insert a **LIFT** command after the **MOVE** command and open its parameter window.

☞ Under **Device name** select the connected Sample Processor. The other parameters are already set correctly and do not need to be altered.

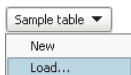
☞ Confirm the alteration with **[OK]**.

☞ Check the altered method with a method test.

☞ Save the method under the name **"Tutorial Automation extended"**.

### Adapting the sample table

Finally you should assign this new method to the individual samples of the sample table created in *Section 3.2.2*:



☞ Change to the workplace view.

☞ Use **Sample table, Load...** to load the **"Tutorial"** sample table created in *Section 3.2.2*.

☞ Open the input window with a double click on the first sample line:

☞ Now select under **Method** the method "**Tutorial Automation extended**" that you have just created.

☞ Confirm the entry with .

☞ Repeat this step for the remaining samples.

☞ Confirm the entry for the last sample with **[Apply]**.

☞ Exit the input window with **[Close]**.

☞ Save the new sample table under the name "**Tutorial extended**".

A sample series can now be processed with the extended automation method and the appropriately adapted sample table as described in *Section 3.2.3*.

Apply

Close