Metrohm IC Driver 2.1 for Empower®

Instructions for Use

8.0102.8002EN / 2018-04-09

Metrohm

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2.1

Instructions for Use

8.0102.8002EN / 2018-04-09 zst/ksah

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This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

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1 Preconditions

The following preconditions must be met to ensure proper mode of operation:

- Empower® is installed according to the Waters instructions. Refer to the Waters instructions for information concerning the minimum system requirements.
- The Metrohm driver is installed according to the instructions (8.0102.8001EN Metrohm IC Driver 2.1 for Empower® Installation).

2 Starting Empower®

Starting Empower®

1 Connect the Metrohm instruments via USB to the PC. Connect the Metrohm instruments to the power supply unit.

2 Switch the PC on.

3 Switch the Metrohm instruments on.

4 Start Empower® by clicking on the corresponding icon on the desktop.

NOTE

Ensure that all Metrohm instruments are switched on before starting Empower®. In case of issues while starting Empower®, *see Chapter 16, page 113*.

5 

Enter your Empower® user name and password. Click on **[OK]**.

NOTE

If you have a client server installation, choose your database.

2.1 Configuring the system

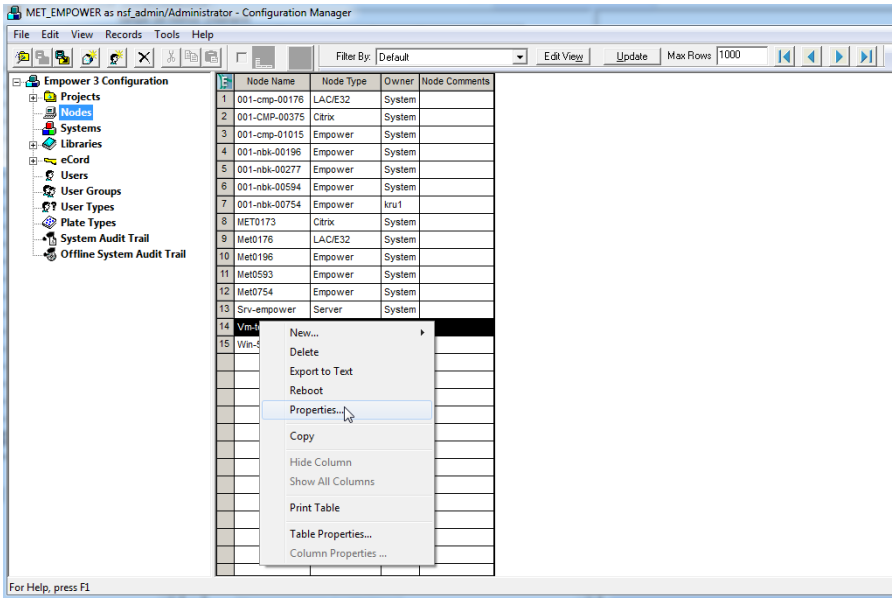
1

Click on **[Configure the System]**.

The configuration manager opens. Its icon appears and blinks in the lower task bar of your screen. 

2 Go to **Nodes**.

3

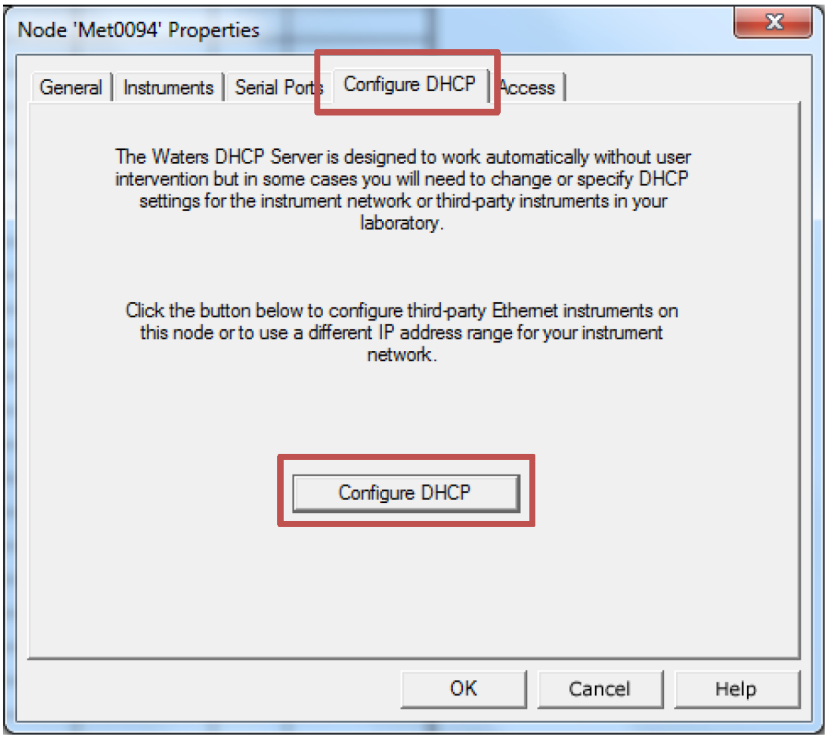


Select a node. Right-click on the respective node. Open the **Properties** menu item of the connected instrument. The connection to the node will be established.

NOTE

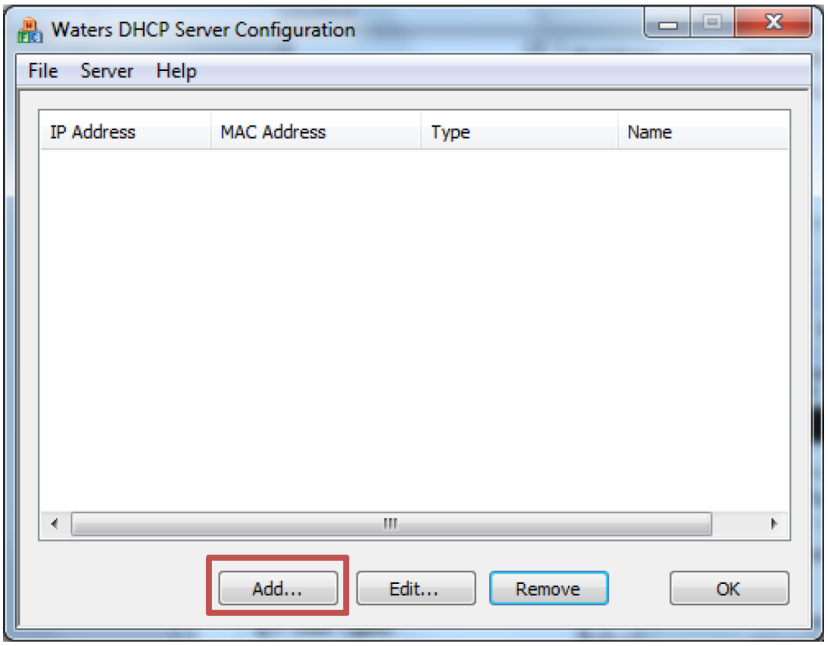
If the node does not exist yet, create a new node *(see "Creating a node ", page 9)*.

4



Click on **[Configure DHCP]** on the **Configure DHCP** tab.

5



Click on **[Add...]**.

6 Enter the following parameters:

NOTE

If several systems are added, the **IP address** and the **MAC address**, have to differ.

NOTE

You must power on all systems that are configured on the DHCP Server.

Parameter	Value
IP Address	000.000.000.xxx, (where xxx = 001-255) e.g. start with 000.000.000.001
MAC Address	00-00-00-00-00-xx, (where xx = 00-99) e.g. start with 00-00-00-00-00-01
Instrument Type	Select **Metrohm IC**. This includes all implemented Metrohm instruments, also sample processors and dosinos.
Serial Number / Unique Name	These are the actual settings used to detect the instrument on the USB bus. They must meet the requirements described in the next section.

Requirements for the **Serial Number / Unique Name**:

The serial number must be the last six characters (including leading 0s) printed on the serial number sticker found on the back of the instrument.

NOTE

You cannot find the serial number of the IC Sample Center on the instrument. Please contact a Metrohm service engineer, if you need to know the number of your sample center.

Prefix the serial numbers with the following abbreviations:

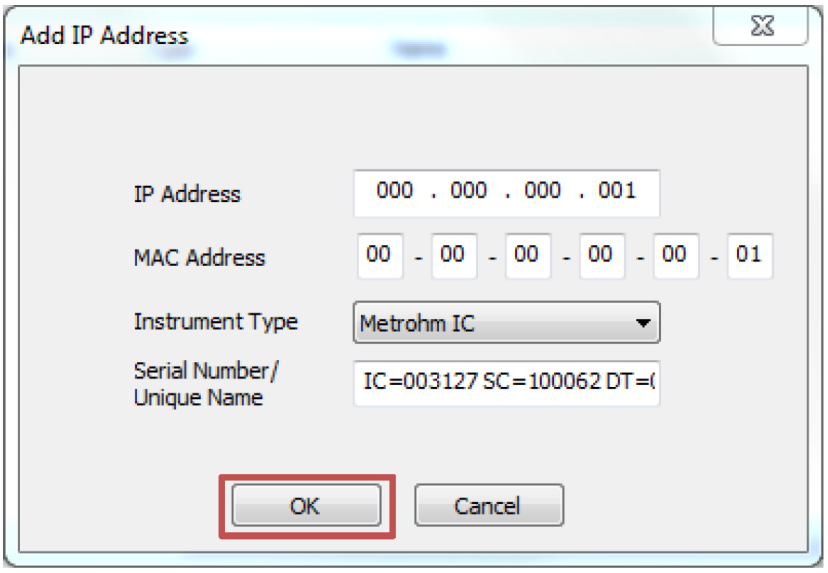
Instrument	Prefix
IC-instrument (e.g. 940)	IC=
Professional Sample Processor (e.g. 858)	SP=
IC Sample Center (e.g. 889)	SC=
Professional Detector Vario (Stand Alone) (e.g. 945)	DT=
Professional UV/VIS Detector (e.g. 944)	UV=
Eluent Production Module (e.g. 941)	EL=

If you are using multiple instruments, you can combine them. *See Chapter 17, page 114* for possible combinations. In this case, separate the serial numbers by a space. The order of the different modules is freely selectable.

Table 1 Examples

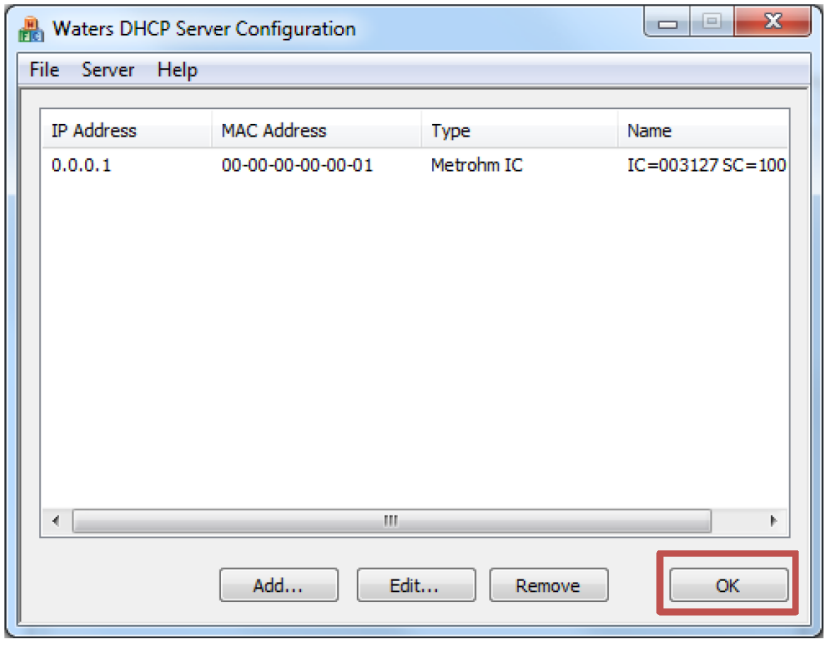
Instrument	Prefix
IC only	IC=003127
SP only	SP=003534
SC only	SC=100062
DT only	DT=004101
Combination	IC=003127 SC=100062 DT=004101 UV=001536 EL=100897

7 Example:



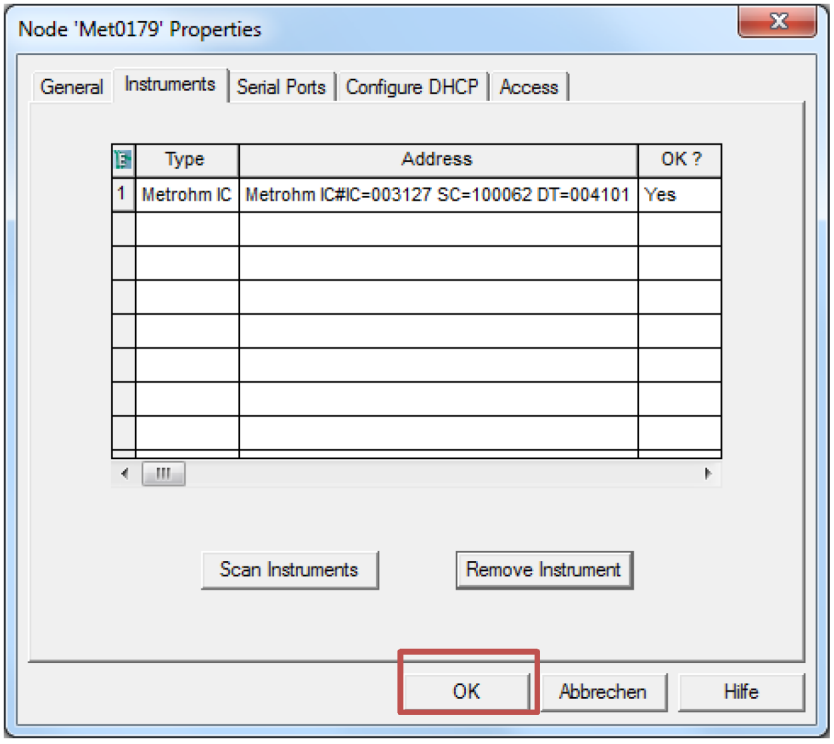
When entered the values, click on **[OK]**.

8



Click on **[OK]**.

9



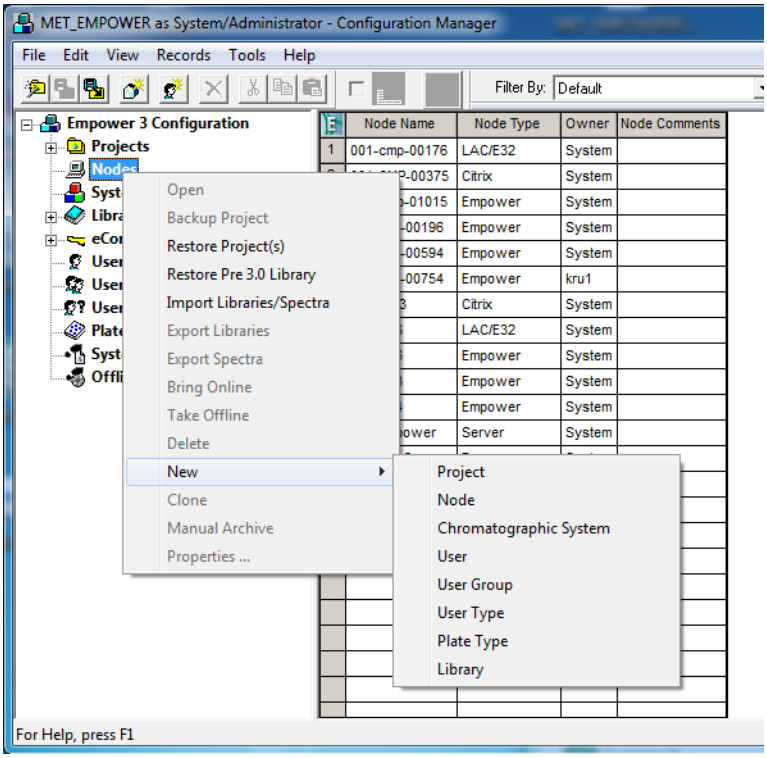
Click on **[OK]**.

Creating a node

Usually the required node already exists. If this is not the case, it is necessary to create a new node.

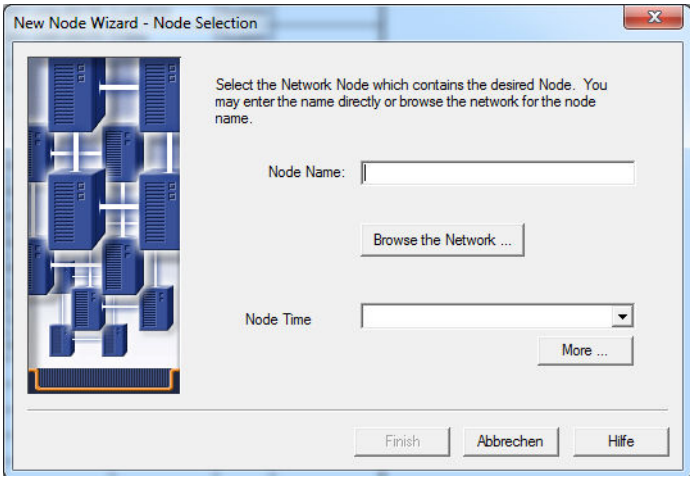
1 Go to **Nodes** in the configuration manager.

2



Create a new node (i.e. where your instruments are connected to the PC). For this purpose, right-click on the table and click on **New ▸ Node**.

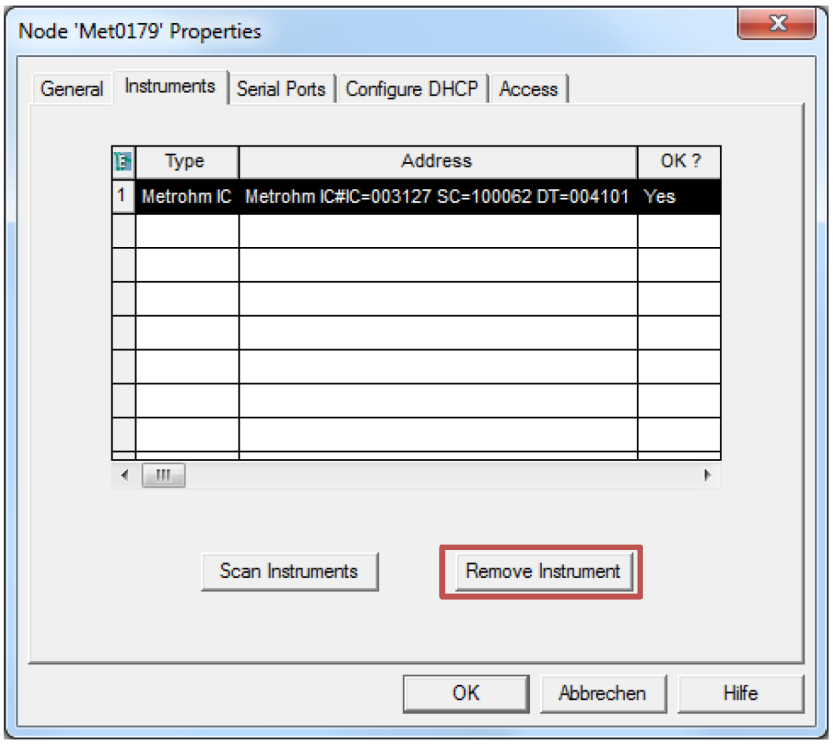
3



Enter the name of the node. Choose your timezone. Click on **[Finish]**.

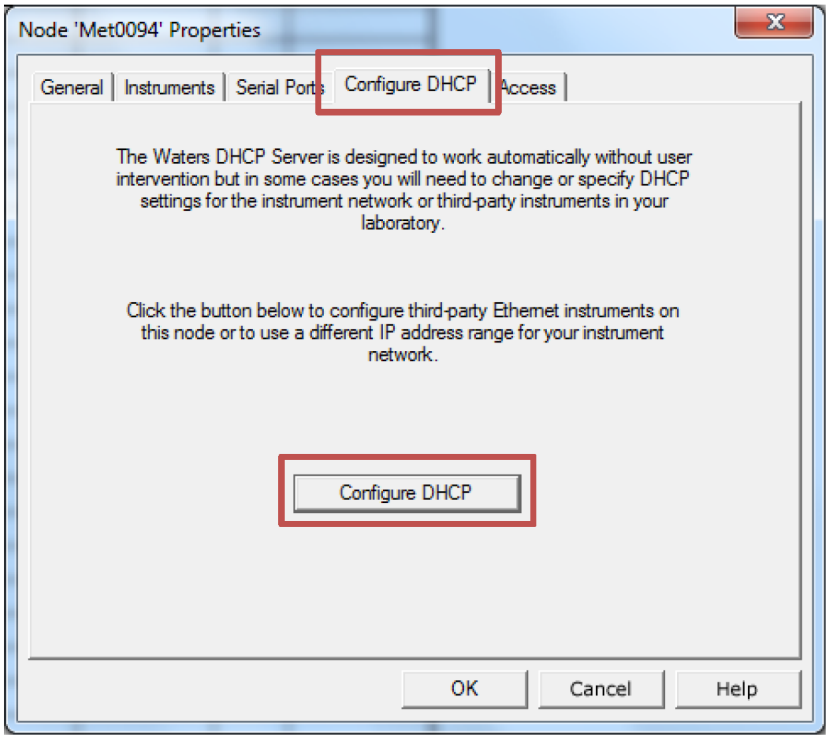
2.2 Removing an instrument

1



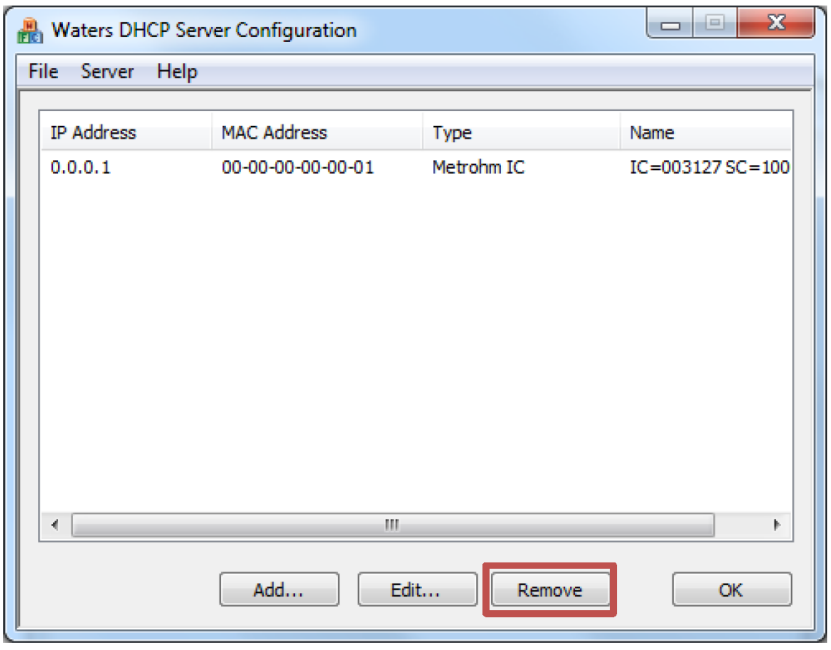
To remove an unused instrument, select the instrument by clicking on the number of the corresponding row and click on **[Remove Instrument]**.

2



Click on **[Configure DHCP]** on the **Configure DHCP** tab.

3

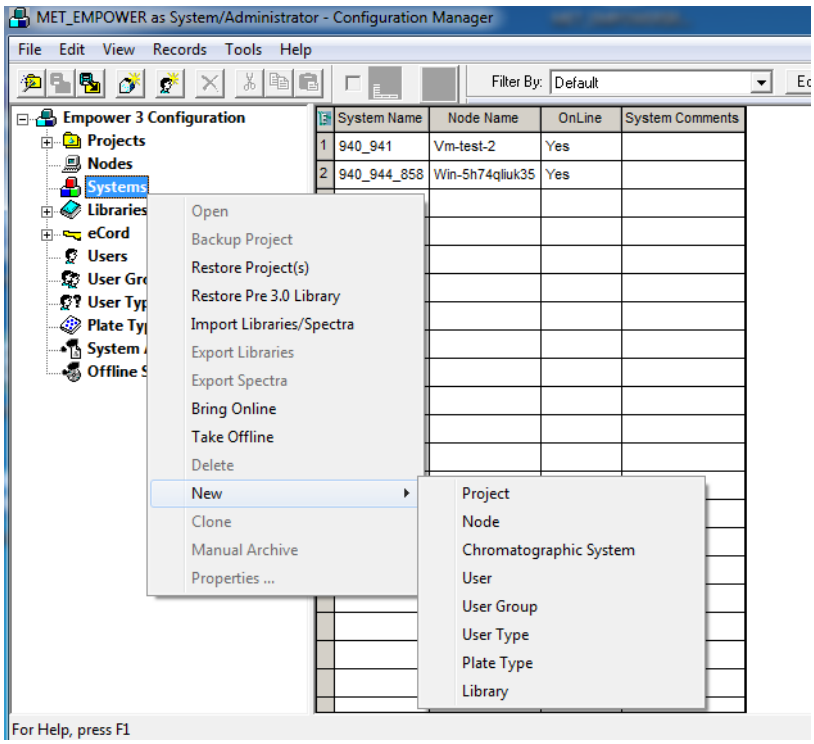


Select the instrument you want to remove. Click **[Remove]**.

4 Reboot the computer.

3 Setting up a chromatographic system

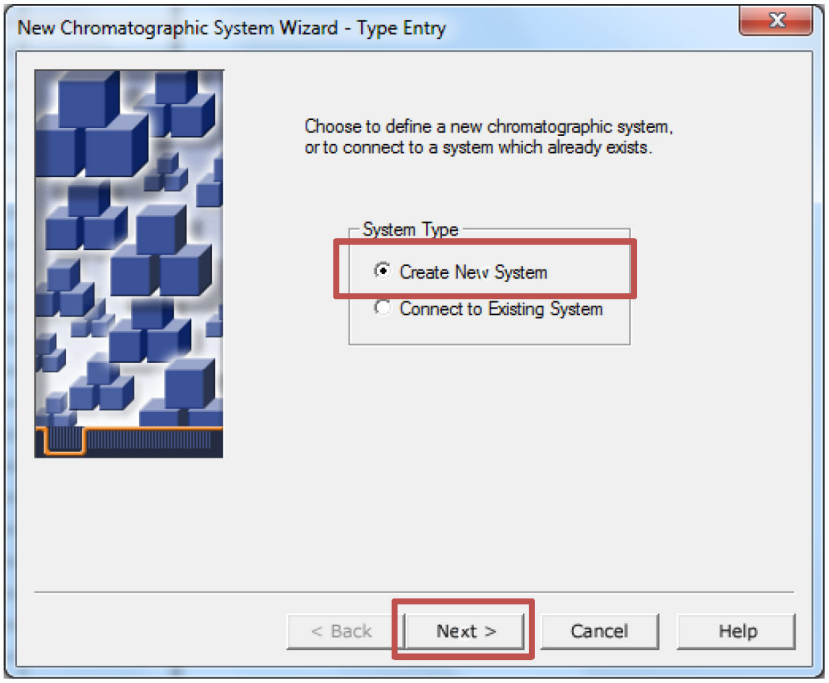
1



Go to **Systems**.

Create a new system by selecting the menu item **New ▸ Chromatographic System**.

2



Select **Create New System**. Click on **[Next]**.

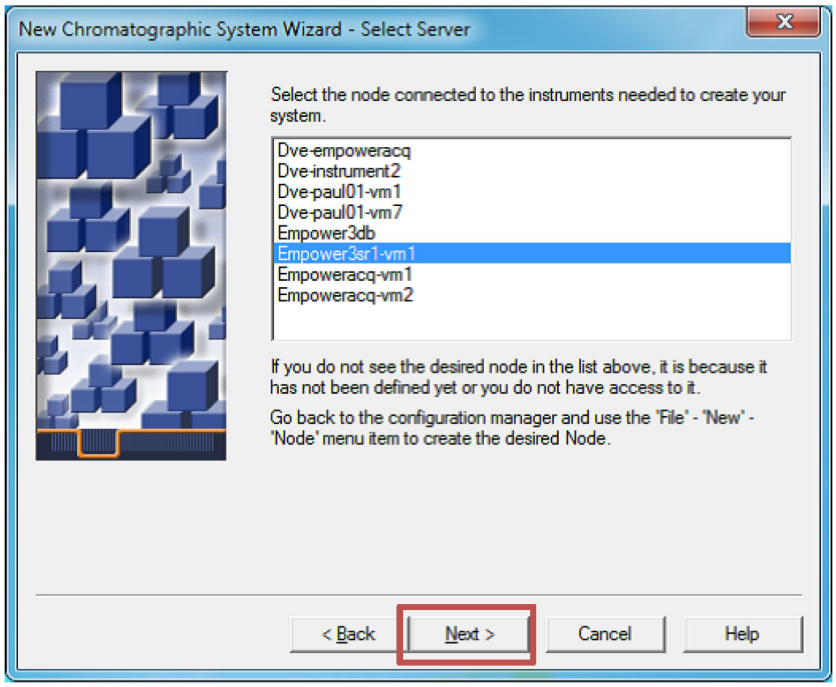
Table 2 Detailed explanations

Field	Explanation
Create New System	Specifies that you create a new chromatographic system using available instruments connected to an acquisition server. It is not necessary that the system is directly connected to your Empower® workstation.
Connect to Existing System	Specifies that the current user can access the selected chromatographic system. If the system is password-protected, you need the password to access the system. Then you can use the chromatographic system to acquire and process data and to generate reports.

3 Click on **[Next]**.

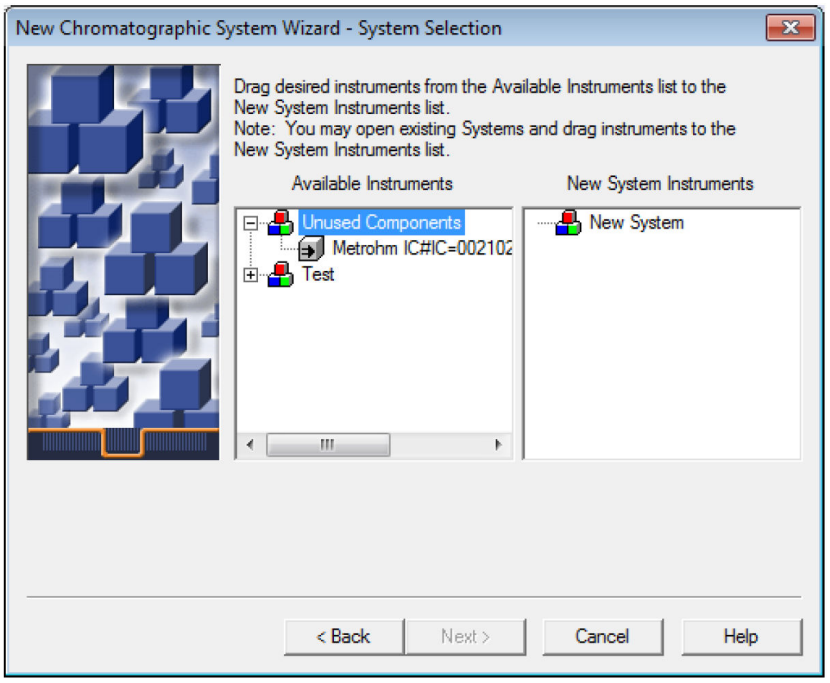
4 Choose (client/server) acquisition server.

In case of a client/server installation, select the **node** on which the **Metrohm IC Driver for Empower®** was installed.



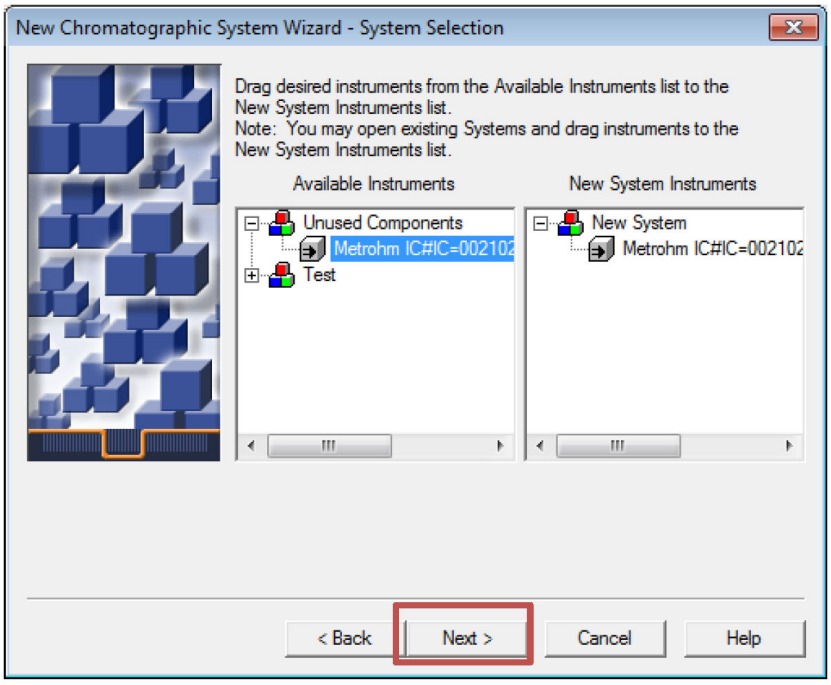
Click on **[Next]**.

5



Select an instrument from the **Available Instruments** list. Drag the instrument to the list beneath **New System Instruments**. You can use instruments from the **Unused Components** and an existing sys-

tem. If the instrument is not in the **Available Instruments** list, click on **[Cancel]** and check the properties of the **acquisition server**.

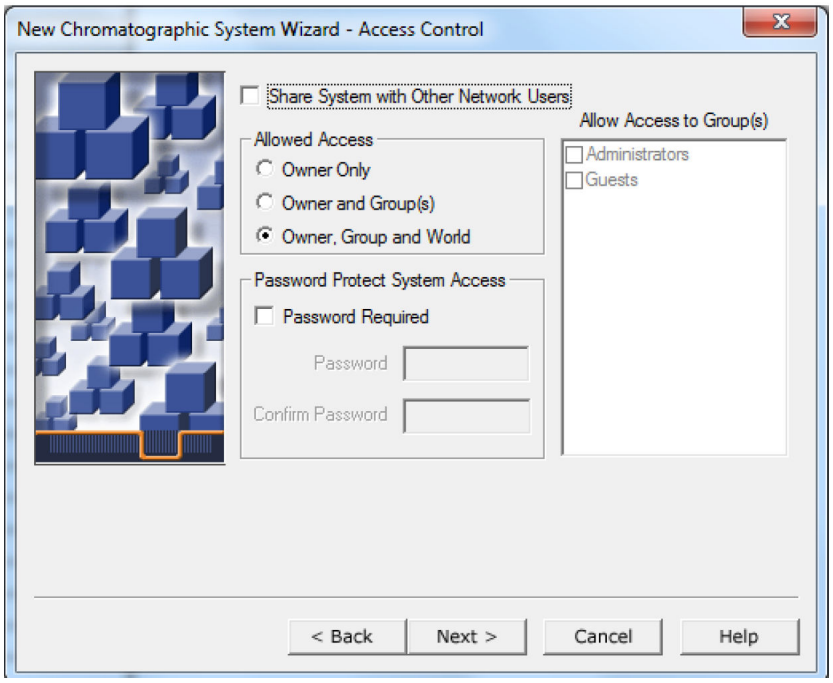


Click on **[Next]**.

NOTE

You cannot drag the last instrument from an existing system. To free up the last instrument, delete the system.

6



If you have access to a chromatographic system, you do not need to enter the password unless you are crossing databases.

If required, enable the fields under **Allow Access to Group(s)**.

Detailed explanations

Table 3 Share System with Other Network Users

Field	Explanation
Share System with Other Network Users	Specifies that other network users (determined by the access option you select *(see Table 4, page 18)*) can use the system. If you select this option, consider password-protecting the system to limit its use to authorized users.

Table 4 Allowed Access

Field	Explanation
Owner Only	Specifies that the owner of the chromatographic system and users with administrator rights can access the selected chromatographic system.
Owner and Group(s)	Specifies that the owner of the chromatographic system, group members as specified in the **Allow Access to Group(s)** list and administrators can access the selected system. Group access only allows a user to operate a chromatographic system. **Note:** To modify a chromatographic system, you need access to the chromatographic system and its **acquisition server**.
Owner, Group and World	Specifies that all users in the database can operate the selected chromatographic system.

Table 5 Password Protect System Access

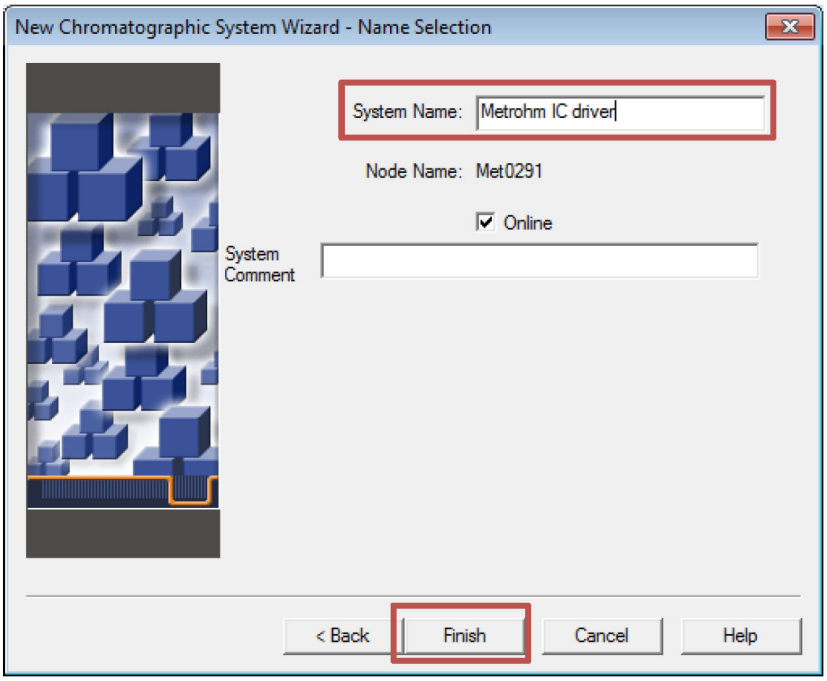
Field	Explanation
Password Required	Specifies that users enter a password before they can access the selected chromatographic system across databases.
Password	Specifies that you need a password (up to 30 alphanumeric characters) to access the selected chromatographic system across databases.
Confirm Password	Requires reentry of the password to confirm that you spelled it correctly.

Table 6 Allow Access to Group(s)

Field	Explanation
Allow Access to Group(s)	Select the user group(s) that you want to give access to the selected chromatographic system. Access rights of these user groups override access rights of the selected world user type. If you select **Owner, Group and World**, groups that you did not select in the **Allow Access to Group(s)** list are assigned the world user type access.

Click on **[Next]**.

7

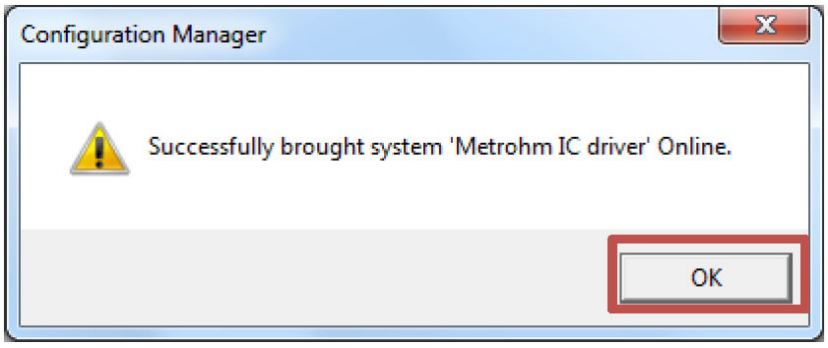


Enter a system name and click on **[Finish]** to complete the setup of the new chromatographic system and to close the wizard.

Table 7 Detailed explanations

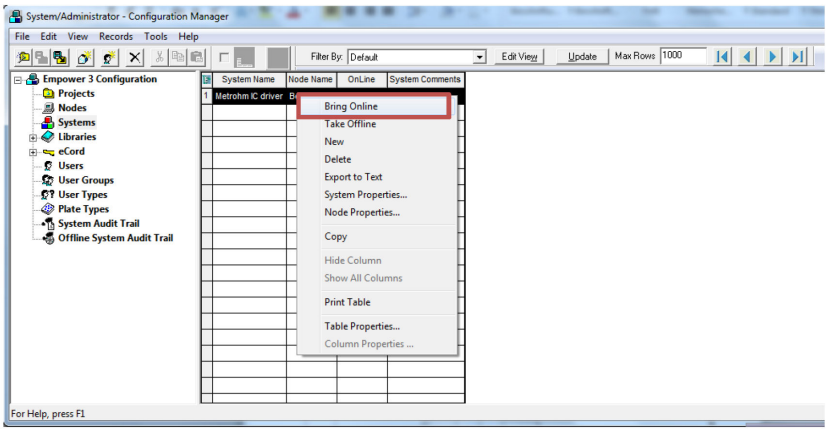
Field	Explanation
System Name	Identifies the chromatographic system in the Empower® database and in the **Configuration Manager**. Up to 30 alphanumeric characters are allowed for the system name. Use a meaningful system name in case other users have access to the system.
Node Name	Name of the acquisition server to which the selected system is connected. This field is not editable.
Online	If all configured system instruments are available (not configured in another online system), this brings the new system online. Default value: selected.
System Comment	Displays optional comment (up to 250 characters). Comments that describe the chromatographic system, its components and its intended use can help others if they have access to the system.

8 The following message appears.



Click on **[OK]**.

9



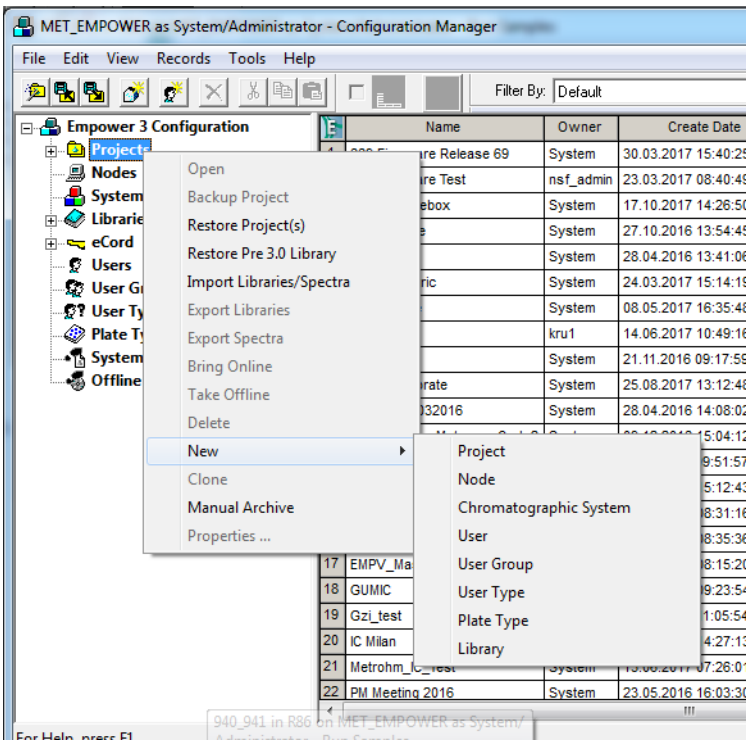
Check if the system is online. If not, bring it online by right-clicking on the system and clicking on **Bring Online**.

NOTE

The number of instruments, which can be online at the same time, depends on the Empower license.

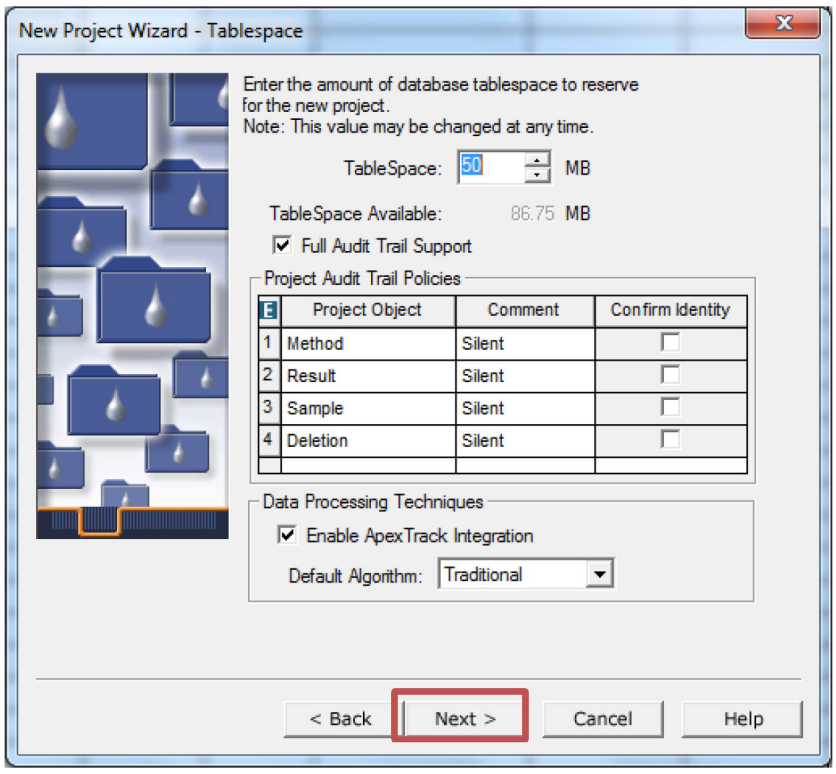
4 Creating a project

1



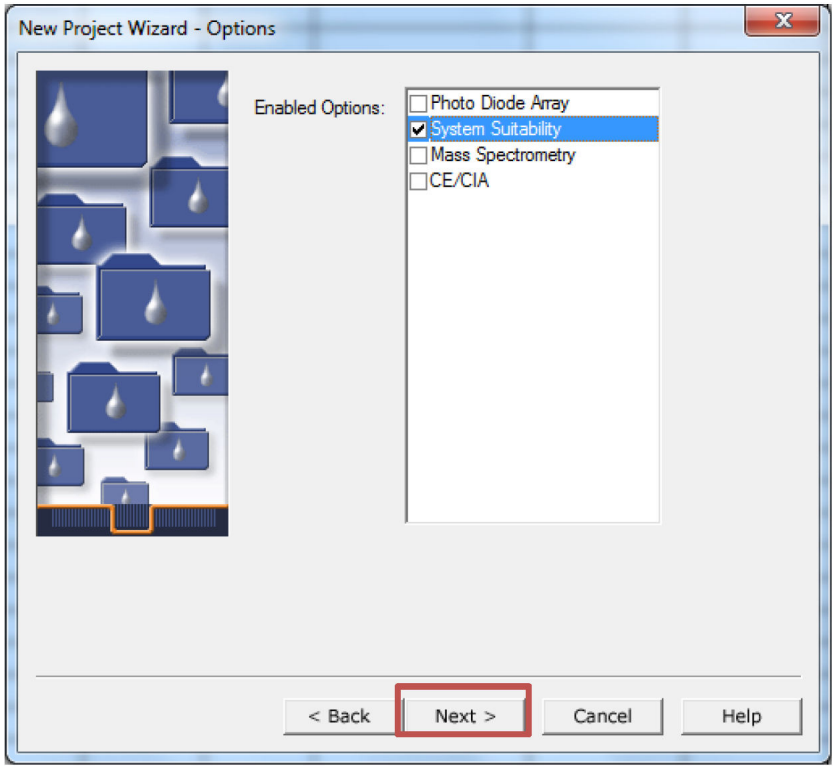
Create a new project by selecting the menu item **New** ▸ **Project**.

2 The **Tablespace** form appears.



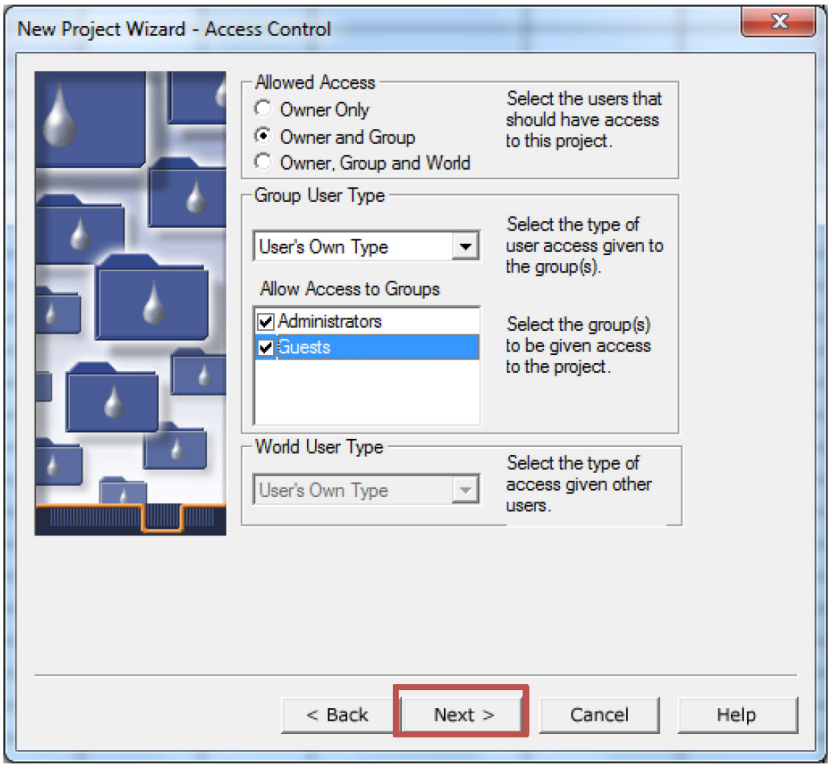
Click on **[Next]**.

3



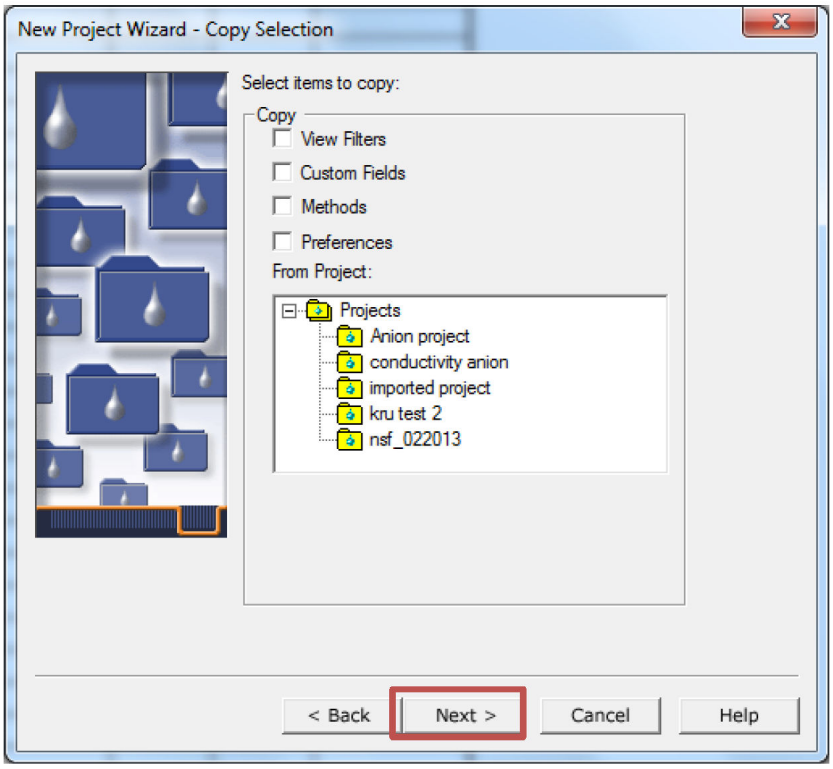
Click on **[Next]**.

4



Click on **[Next]**.

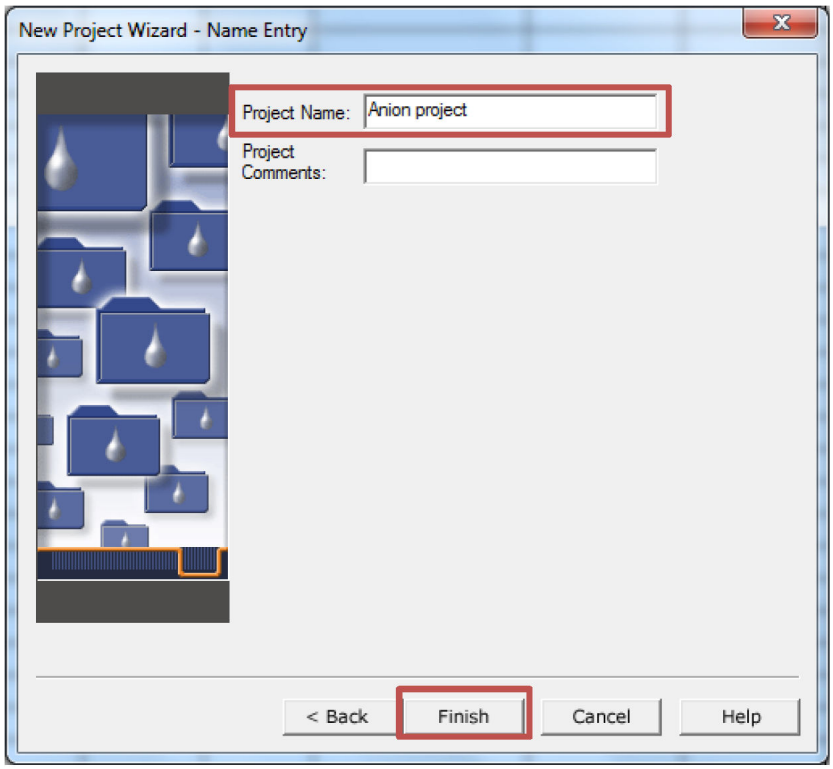
5



In the Projects tree view, select an appropriate project for already existing settings.

Click on **[Next]**.

6



Enter a **Project Name**.

Click on **[Finish]**.

5 Creating an instrument method

NOTE

You can only use an already existing instrument method with the same system configuration the instrument method has been created with.

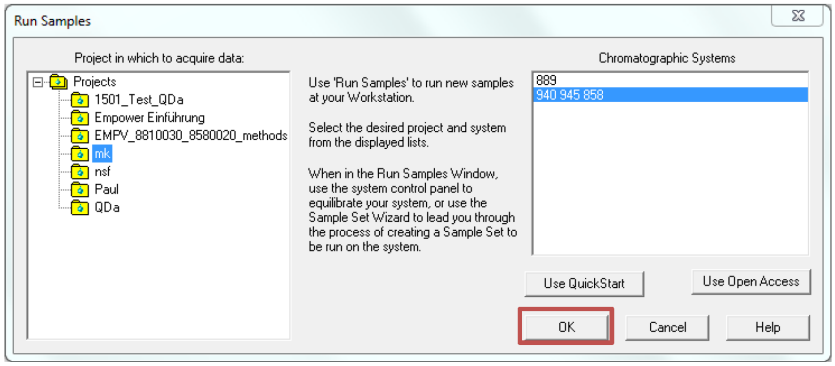
NOTE

This manual shows you how to create an instrument method by using the pro interface. For a quick set up of an instrument method, click on **[Use QuickStart]**. The basic principle for the quickstart is the same as described in the following procedure.

1

In the Empower® start window, go to **[Run Samples]**.

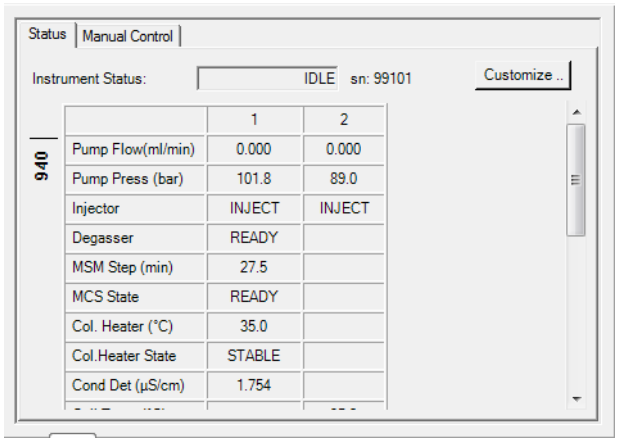
2



Choose your chromatographic system and the desired project. Click on **[OK]**.

A **Run Samples** session is initiated. The corresponding icon in the task bar appears. 

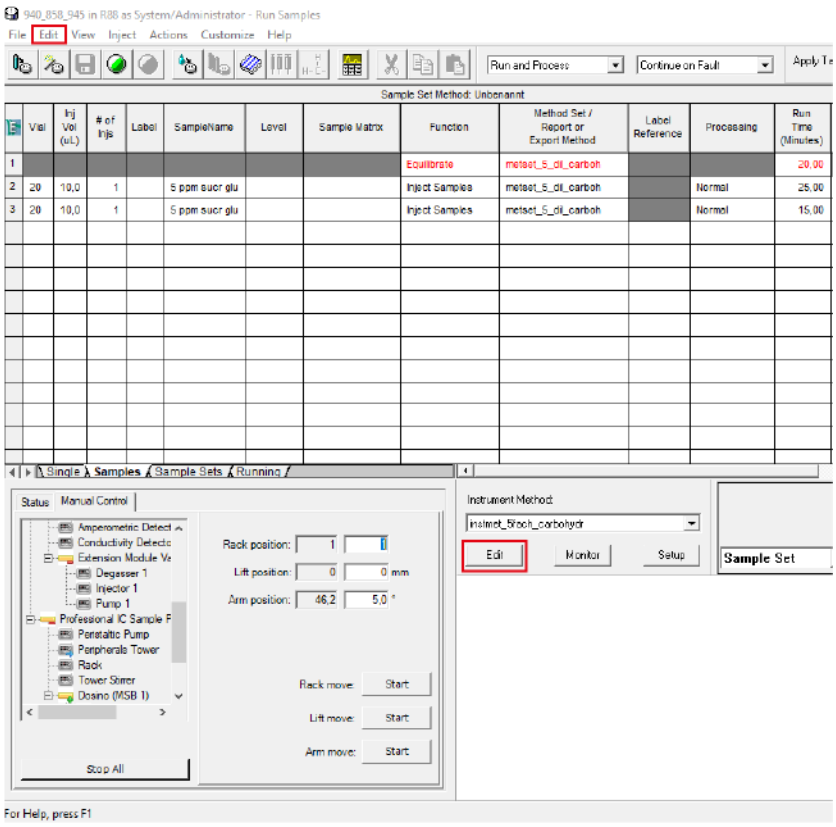
3



Wait until the instrument status changes from **INITIALIZING** to **IDLE**. This may take several minutes.

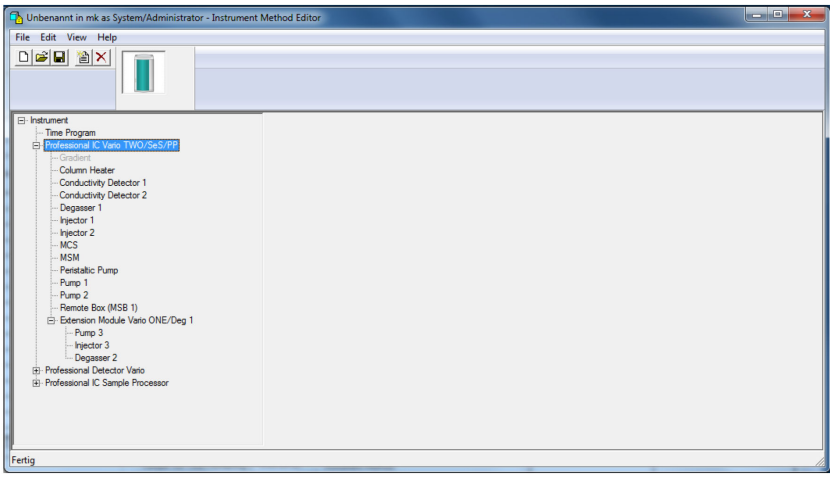
If the instrument does not become **IDLE**, refer to *chapter 16, page 113*.

4



As soon as the instrument status has changed to **IDLE**, select **Edit ▸ Instrument Method**.

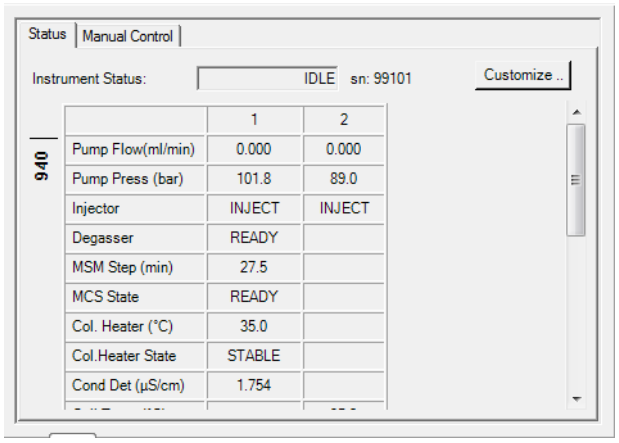
5



The instrument method shows all modules of your setup in a tree structure. Select a module and enter the desired instrument parameters *(see Chapter 6.1.2, page 30)*.

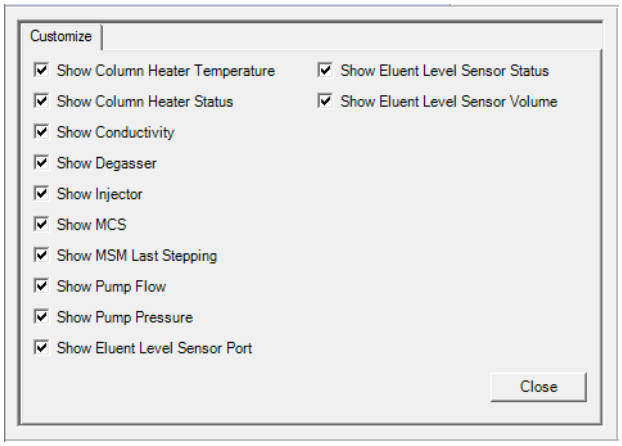
Customize the status panel

1



Click on **[Customize]** in the status panel.

2



In the **Customize** tab, you can select the information, which the status panel shows.

6 Adjusting the instruments

6.1 General

6.1.1 Status panel and manual control

Status panel

The **Status** panel displays the current state of the instrument and its modules. For further information concerning the numbering of the modules *refer to Chapter 14, page 108*.

Manual control

Under **Manual Control**, you can operate all hardware components individually (only when no measurement is running). The manual control is located next to the status panel.

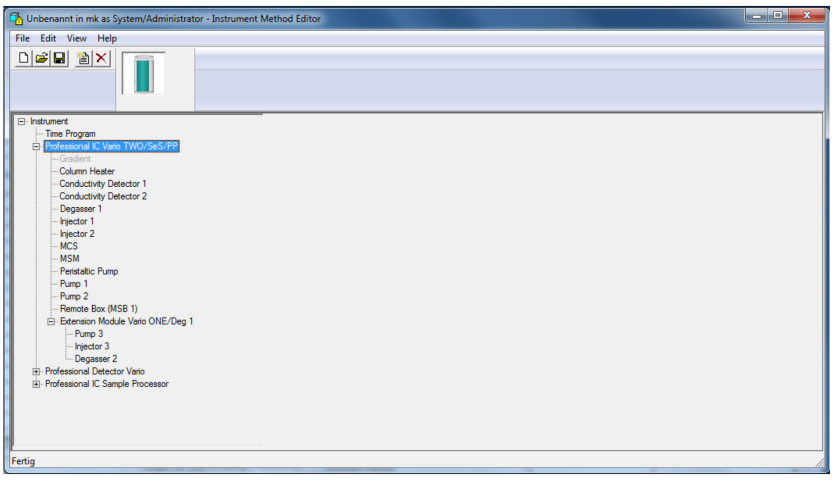
6.1.2 Instrument parameters

Setting the instrument parameters

NOTE

Instrument parameters are sent to the instruments when you start the method.

1

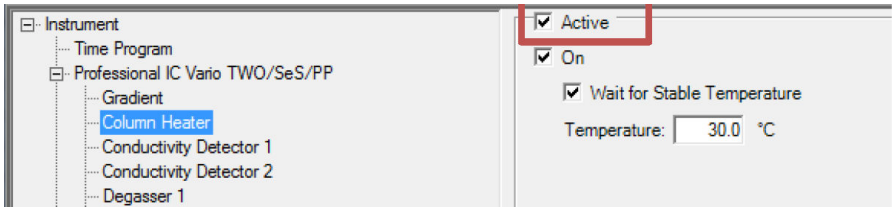


Select a module of the created instrument method. Enter the desired instrument parameters.

NOTE

The selection option with the tabs depends on the instrument types.

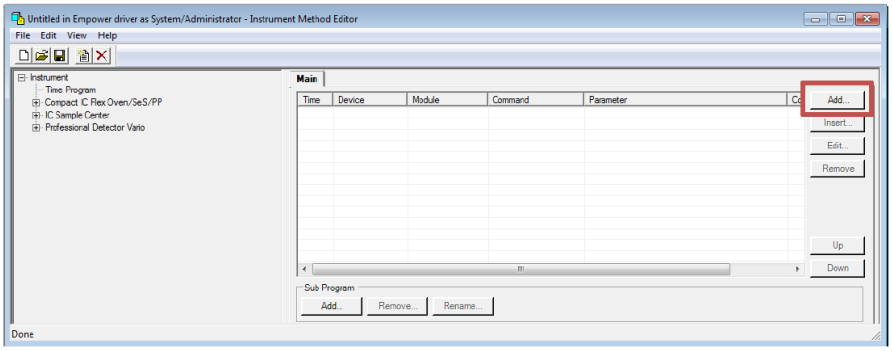
2



To set the parameters for an instrument, you first have to activate the instrument by checking the checkbox **Active**.

6.1.3 Time program

Write a time program to set the chronological order of the action of your measurement.

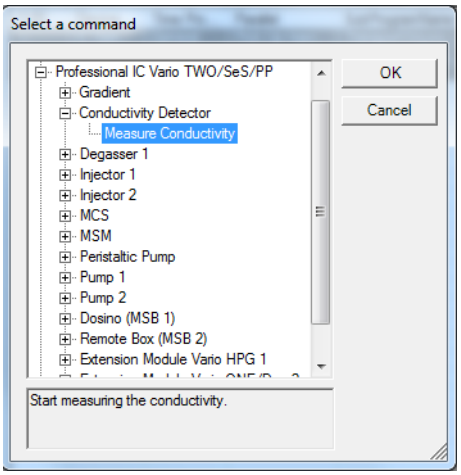


Select commands with **[Add...]**.

Time program – Example

To start a simple time program, you can proceed as follows:

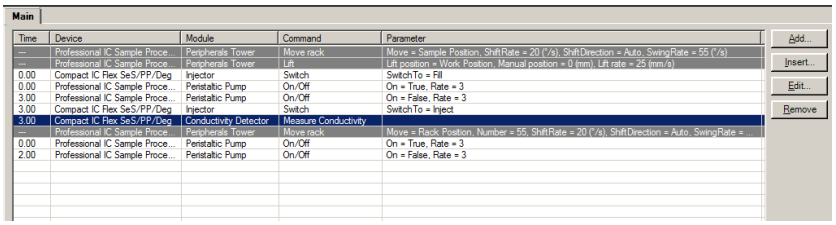
1



Select an instrument and a command.

2 Enter the required parameters. Which parameters you need to enter depends on the command that you selected.

3

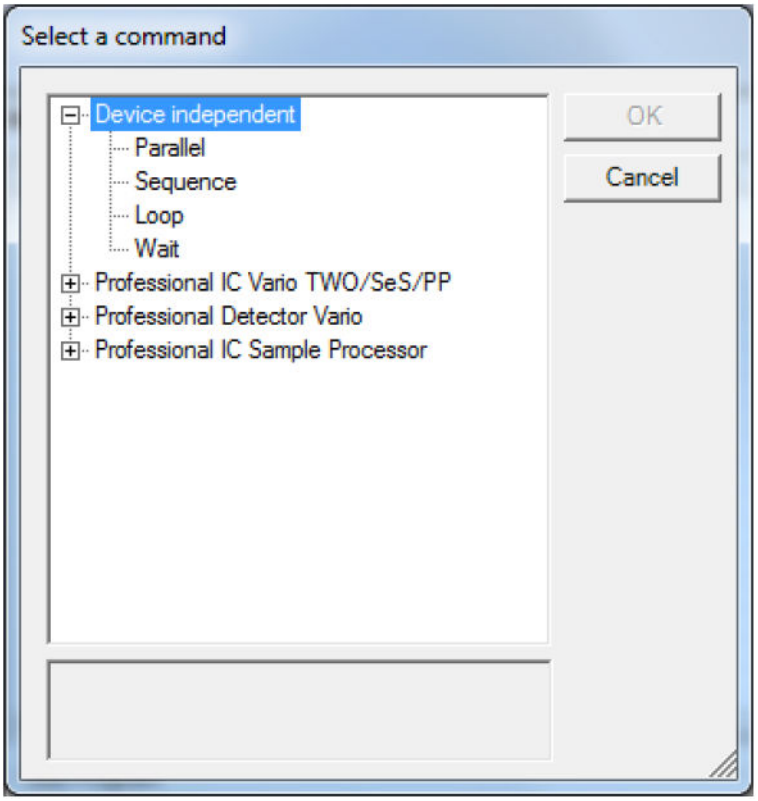


The picture shows what the time program looks like.

Actions of indefinite time are highlighted in **gray** in the time program. The time counter restarts at 0 after such a command.

Add more lines with **[Add…]**.

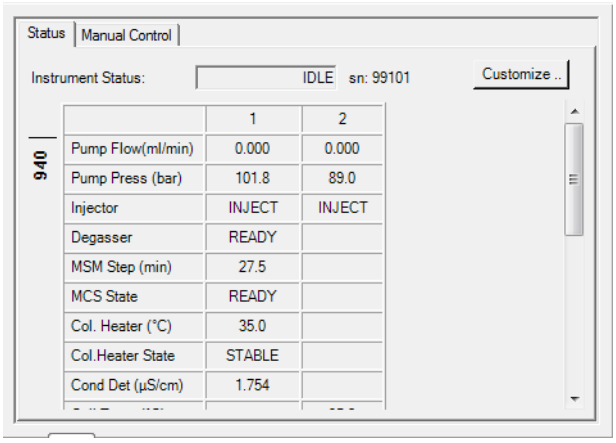
4 Save your instrument method.



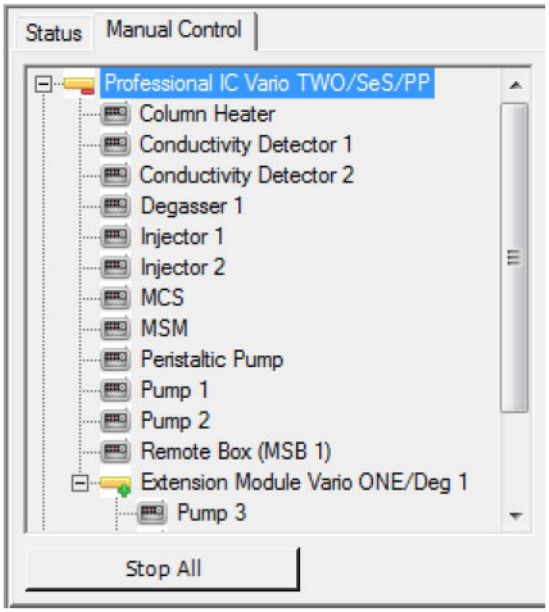
Device-independent commands are commonly used for the execution of subprograms. Use subprograms to create more complex time programs.

6.2 IC instrument

6.2.1 Status panel and manual control



The status panel displays the current state of the IC instrument.



Operate all hardware components individually in the manual control of the IC instrument.

6.2.2 Instrument parameters

The following screenshots show instrument parameters for a typical anion setup.

IC instrument – Gradient

The following explanations apply only to 940 instruments.

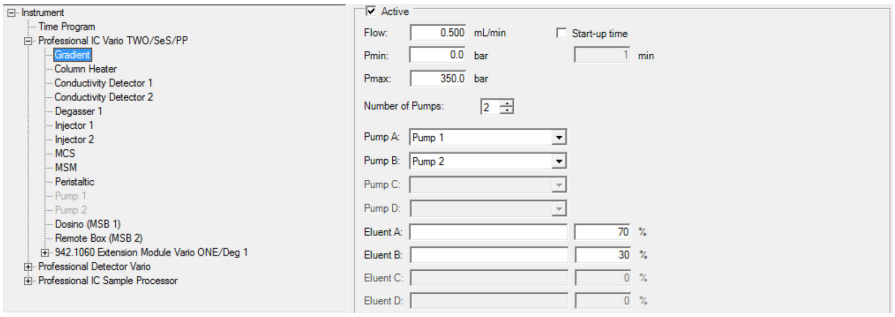


Table 8 Detailed explanations

Parameter	Explanation
Flow	Flow of the high-pressure pump when starting the method.
Pmin	Minimum pressure when starting the method. If the pressure is below the entered minimum pressure, the system switches off automatically.

Parameter	Explanation
Pmax	Maximum pressure when starting the method. If the pressure is above the entered maximum pressure, the system switches off automatically.
Start-up time	When activated, a start-up time for reaching the defined flowrate can be defined.
Number of pumps	Determines the amount of connected high-pressure pumps.
Pump A-D	To assign the pumps to pumps A-D.
Eluent A-D	Determines the mixing ratio of the eluents when starting the method. The total in percent has always to be 100.

A pump can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

NOTE

The total of the gradient ratios must equal 100%.

Set the instrument parameters of the eluents in such a way that they result in a total of 100%.

NOTE

Always use pump 1 in a high-pressure gradient.

If pump 1 is active but off, the run does not start.

IC instrument – Column heater

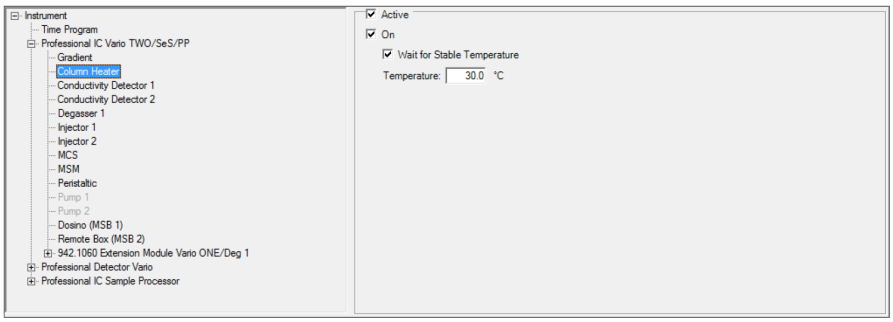


Table 9 Detailed explanations

Parameter	Explanation
Wait for Stable Temperature	If you switch on this option, a determination will not start until the set temperature has been reached and is stable.
Temperature	Temperature that is set for the column oven when you start the hardware.

IC instrument – Degasser

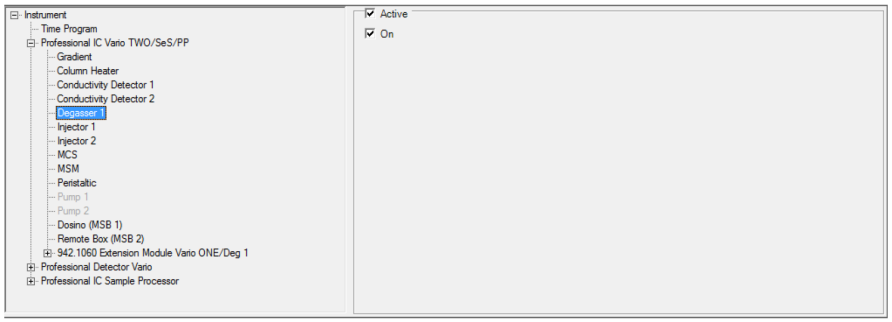


Table 10 Detailed explanations

Parameter	Explanation
On	Determines whether the degasser is switched on or off when you start the hardware.

A degasser can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

IC instrument – Injector

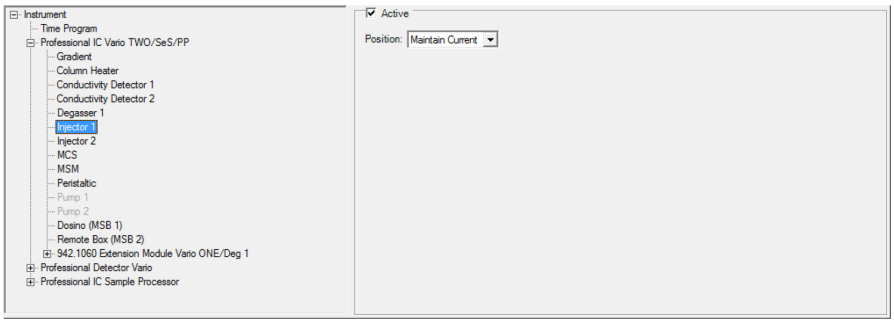


Table 11 Detailed explanations

Parameter	Explanation
Position	Position of the injection valve when you start the hardware.

An injector can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

IC instrument – MCS

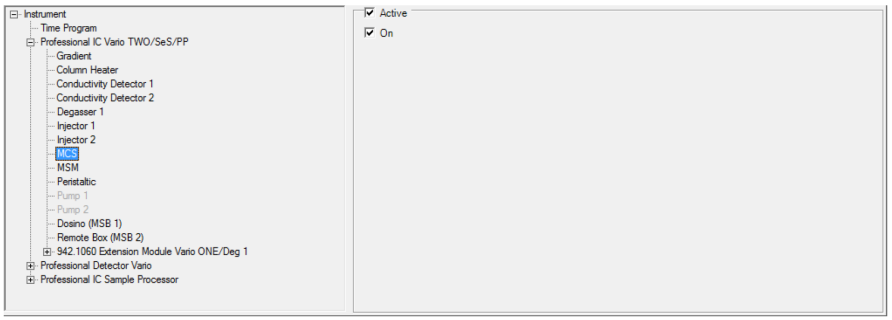


Table 12 Detailed explanations

Parameter	Explanation
On	Determines whether the MCS is switched on or off when you start the hardware.

An MCS can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

IC instrument – MSM

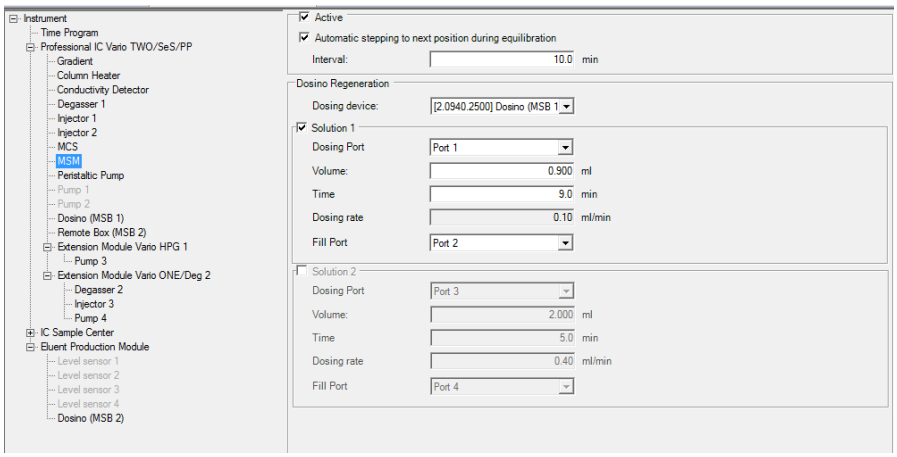


Table 13 Detailed explanations

Parameter	Explanation
Automatic stepping to next position during equilibration	If you enable this option, then – after the method is loaded – automatic stepping of the rotor to the next position is initiated within the equilibrate mode. The time interval defined in the parameter interval is used.
Interval	Time interval between 2 sequential automatic rotor stepping operations.

Dosino regeneration

Table 14 Detailed explanations

Parameter	Explanation
Dosing device	Selection of the dosino that regenerates the suppressor.
Dosing Port	Port for regeneration solution.
Volume	Volume of solution 1 or solution 2 for the regeneration of the suppressor in milliliter.
Time	The parameter defines for how many minutes the suppressor chamber is used.

Parameter	Explanation
Dosing rate	Dosing rate, at which the suppressor is regenerated or rinsed in milliliter per minute. It is automatically calculated from the values of volume and time.
Fill Port	Port for filling regeneration solution.

NOTE

It is possible to use a dosino as a suppressor dosino for MSM regeneration. Therefore, use a dosino that is connected to the IC instrument. Dosino regeneration with a dosino connected to a sample changer or eluent production module is not possible.

An MSM can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

IC instrument – Peristaltic

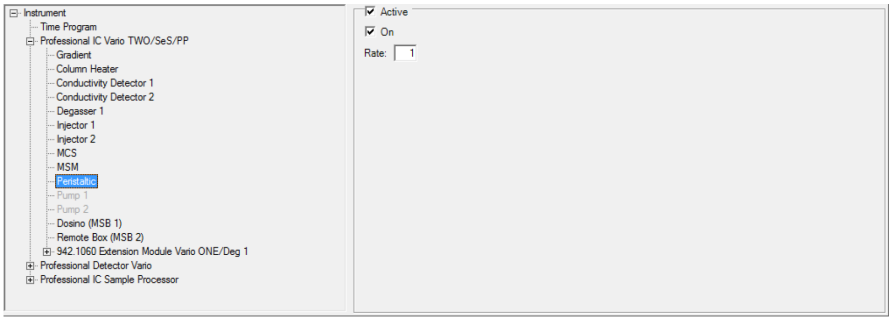


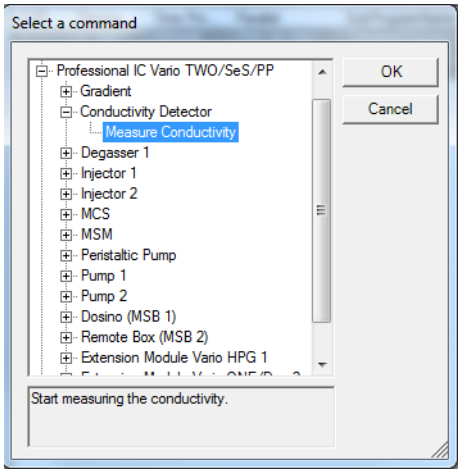
Table 15 Detailed explanations

Parameter	Explanation
Rate	Rate of the peristaltic pump when you start the hardware.
On	Determines whether the peristaltic is switched on or off when you start the hardware.

A peristaltic pump can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.

6.2.3 Time program

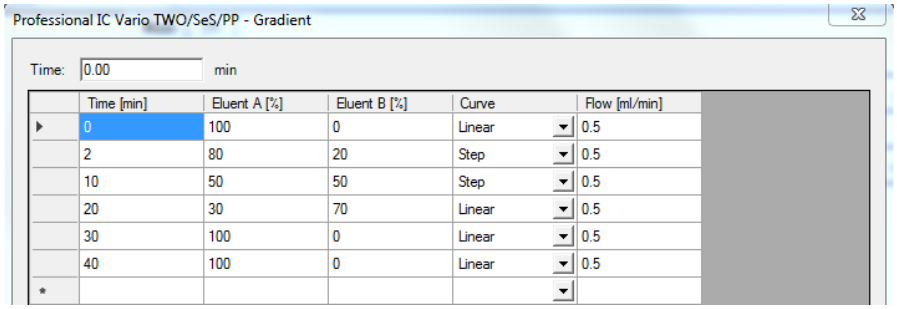
The actions, which an IC instrument can perform, depend on the instrument type.



This window shows the commands of the **IC instrument** (depending on the instrument type).

Start the data acquisition with **Measure Conductivity**.

Time program for the gradient



	Time [min]	Eluent A [%]	Eluent B [%]	Curve	Flow [ml/min]
▶	0	100	0	Linear	0.5
	2	80	20	Step	0.5
	10	50	50	Step	0.5
	20	30	70	Linear	0.5
	30	100	0	Linear	0.5
	40	100	0	Linear	0.5
*					

Enter the steps of the gradient profile in chronological order. They are not sorted automatically.

6.3 Eluent production module

6.3.1 Manual control

NOTE

It is not possible to produce several eluents at the same time in the manual control.

When you start producing the second eluent, the production of the first eluent is stopped immediately.

6.3.2 Instrument parameters

With up to 3 connected dosinos and up to 4 level sensors, eluents can be produced in an automated fashion on the one hand, and the fill levels in storage and waste vessels can be monitored on the other hand.

The eluent production module has 2 functions.

- Eluent production
- Monitoring of the level sensor

Eluent production

NOTE

Choosing a dosing device is a precondition for eluent production.

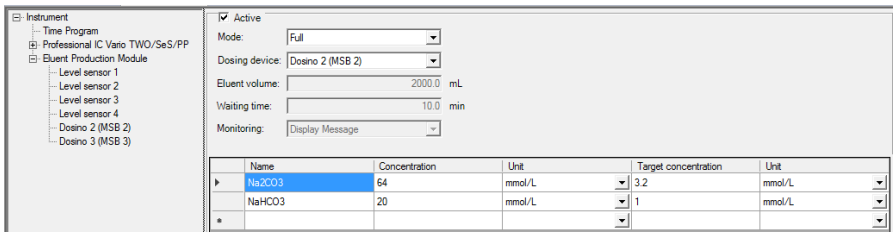


Table 16 Detailed explanations for the parameter "Mode"

Parameter	Explanation
Mode: Full	Sensor (with short rods) indicates when the monitored vessel is filled. When the vessel is not full, the eluent production module produces as much eluent as necessary to fill the vessel. In the **Full** mode, small portions of eluent are produced at short intervals.
Mode: Empty	Sensor (with long rods) indicates when the monitored vessel is nearly empty. The eluent production module produces as much eluent as defined to fill the vessel. In the **Empty** mode, a bigger portion of eluent is produced at longer intervals than in the **Full** mode.

Table 17 Detailed explanations for the "Empty" mode

Parameter	Explanation
Dosing Device	Choose a dosino that is used for eluent production. Assign it to the respective level sensor. In this list, you can select only dosinos that are connected to an MSB connector of the eluent production module.
Eluent volume	Indication how many milliliter of eluent are to be produced.
Waiting time	Time in minutes that must elapse before data for a determination is recorded again with the newly produced eluent.

Table 18 Detailed explanations for the "Full" mode

Parameter	Explanation
Dosing Device	Choose a dosino, which is used for eluent production. Assign it to the respective level sensor. In this list, you can select only dosinos that are connected to an MSB connector of the eluent production module.

NOTE

A dosino, which is used as eluent production dosino, must be connected to the eluent production module.

A dosino connected to an eluent production module can only be used as eluent production dosino.

The following table lists the parameters for eluent production. They are relevant for **Full** and **Empty** mode. The parameters can be defined after defining a dosing device.

Table 19 Detailed explanations for the component concentrations

Parameter	Explanation
Concentration	Concentration of the respective component in the concentrate or in the eluent. You can select in which unit the concentration will be displayed in the report.
Target Concentration	Target concentration of the respective component in the finished eluent. The input range applies to the first component in the table. The target concentrations of the additional components are calculated by applying the dilution factor required for the first component. You can select in which unit the target concentration will be displayed in the report.

Procedure of the eluent production

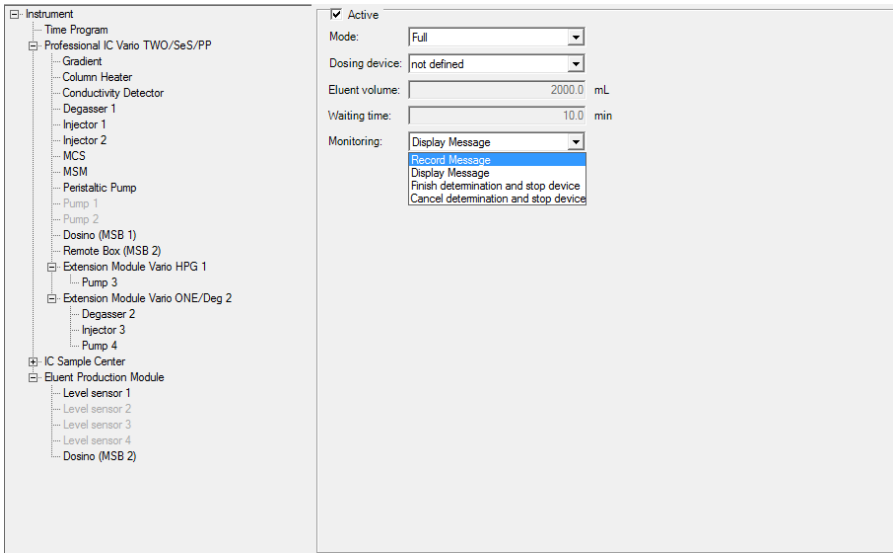
The port assignment is fixed.

Port 1	Concentrate
Port 2	H_2O / UPW
Port 3	Eluent
Port 4	Waste

Step	Port	Action	Description
1	4	ejecting	Remaining eluent in the cylinder is discarded
2	3	aspirating 0.2 mL of eluent	For compensating a change of direction
3		waiting 2 s	
4	2	aspirating 5 mL H_2O	Adding H_2O in order to improve the subsequent mixing of concentrate and H_2O
5		waiting 5 s	
6	1	aspirating concentrate	The volume of the concentrate is calculated on the basis of the data in the component table and aspirated
7		waiting 5 s	Mixing concentrate and H_2O
8	2	aspirating H_2O	The volume is calculated on the basis of the data in the component table; the eluent has a defined target concentration
9		waiting 5 s	Mixing the eluent
10	3	ejecting	The eluent is transferred to the eluent bottle

Step	Port	Action	Description	
11		Repeating steps 1 to 10 or interrupting	**Empty Mode** Repeating in the workplace if eluent volume not achieved Interrupting in the workplace if eluent volume achieved. The waiting time until the next determination is observed	**Full Mode** Repeating in the workplace if sensor = 0 Interrupting in the workplace if sensor = 1

Monitoring of the level sensor



Level sensor monitoring is only possible if the dosing device is **not defined**.

The level sensor that is connected to the eluent production module monitors the fill level.

Table 20 Detailed explanations for the parameter "Mode"

Parameter	Explanation
Mode: Full	Sensor (with short rods) indicates when the monitored vessel is filled. The **Full** mode is activated for level sensors that are installed on a waste canister, for example.
Mode: Empty	Sensor (with long rods) indicates when the monitored vessel is nearly empty. The **Empty** mode is activated for level sensors that are installed on a storage vessel (e.g. with water for dilution).

Table 21 Detailed explanation for "Monitoring"

Parameter	Explanation
Display Message	A message is displayed in the message center if the level sensor responds.
Record Message	A message is recorded in the post-run report if the level sensor responds.
Finish determination and stop device	The ongoing determination is finished and then the instruments are stopped if the level sensor responds.
Cancel determination and stop device	The ongoing determination is canceled automatically and all devices are immediately stopped if the level sensor responds.

NOTE

Refer to the following manual for more information regarding the eluent production module:

MagIC Net 3.2 (8.102.8077EN)

6.4 Dosino

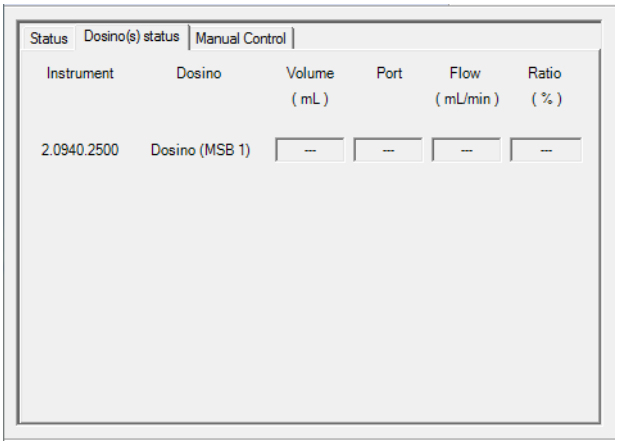
6.4.1 Status panel

NOTE

The **Dosino(s) Status** panel appears in only 2 cases.

- A dosino is used for a dose-in gradient.
- A dosino is used as a suppressor dosino for MSM regeneration.

All other dosino activities are described in the manual control under the respective instrument.



In the **Dosino(s) Status** panel, you can see the status of the dosino.

6.4.2 Instrument parameters

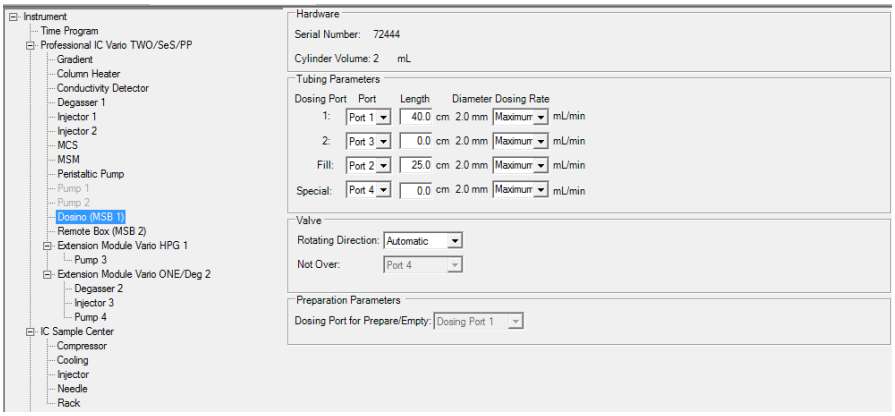


Table 22 Detailed explanations "Hardware"

Parameter	Explanation
Serial Number	Shows the serial number of the dosing unit.
Cylinder Volume	Shows the cylinder volume for the dosing unit in milliliter.

Table 23 Detailed explanations "Tubing Parameters"

Parameter	Explanation
Dosing Port	Port to be used as dosing port.
Length	Length of the tubing on the dosing port in centimeter.
Diameter Dosing Rate	Diameter of the dosing rate in milliliter per minute.

Table 24 Detailed explanations "Valve"

Parameter	Explanation
Rotating Direction	Rotating direction of the valve disk. Automatic is the rotating direction with the shortest path.
Not Over	Selection of a protected port that is not crossed during rotation.

NOTE

The dosing devices (dosinos) have to be connected to the instrument before you set up the system, because they are not plug-and-play instruments.

You can connect the dosinos to the following instruments:

- IC instrument
- Stand-alone detectors
- Sample processors

Connecting dosinos to the sample center is not possible.

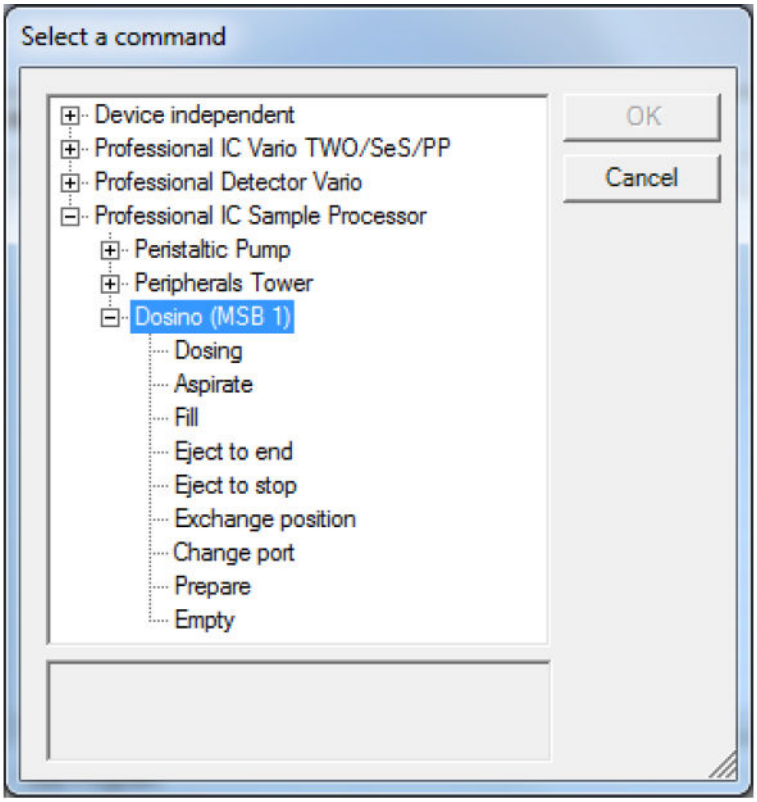
NOTE

Dosino default settings normally do not require any modification.

NOTE

If you perform a prep or empty command with the dosino, then the **Dosing Port 1** will always be used as the port for ejecting the solution (port for prep/empty).

6.4.3 Time program



This window shows the commands of the **Dosino**.

6.5 Remote box

NOTE

Connect the remote box only to the IC instrument or to the Professional Detector Vario.

Do **not** connect the remote box to a sample changer.

6.5.1 Instrument Parameters

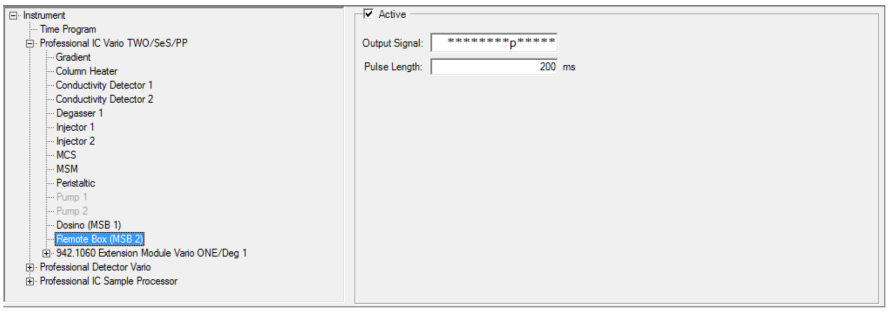


Table 25 Detailed explanations

Parameter	Explanation
Output signal	Input of the binary pattern for the output signal of exactly 14 bits. 0 = Output line deactivated 1 = Output line activated * = Retain the status of the output line p = set pulse (pulse length = 200 ms). If an impulse with a different length is to be emitted, you can enter the desired value in the field **Pulse Length**. The output lines are numbered from right to left: 13-12-11-10-9-8-7-6-5-4-3-2-1-0 **Examples:** ********1***** : Sets the status of output line 9 on active. ****0********* : Sets the status of output line 5 on inactive.

6.6 Conductivity detector

6.6.1 Instrument parameters

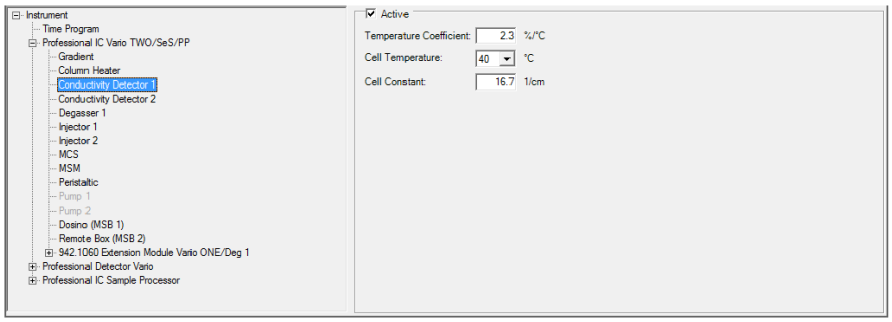


Table 26 Detailed explanations

Parameter	Explanation
Temperature Coefficient	Temperature coefficient that is set when you start the hardware. The temperature coefficient corrects the measured conductivity of the detector at the operating temperature to the conductivity at the reference temperature 20 °C.
Cell Temperature	Selecting thermostat temperature of the detector block.
Cell Constant	Cell constant of the measuring cell. The cell constant is read from a chip in the detector. You can change the value if necessary.

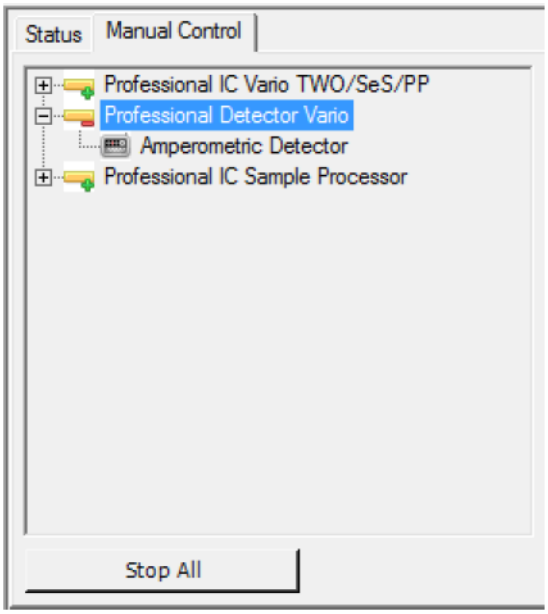
NOTE

When changing the cell constant, the value does not update automatically. Close and restart **Run Samples** to display the new cell constant value.

For internal conductivity detectors, the parameters are exactly the same as described in this section.

6.7 Amperometric detector

6.7.1 Manual control



Operate the amperometric detector individually in the manual control.

6.7.2 Instrument parameters

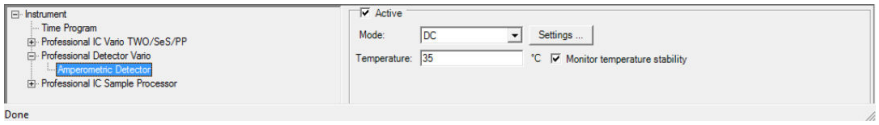
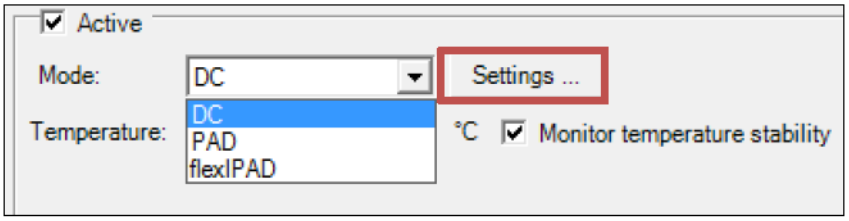


Table 27 Detailed explanations

Parameter	Explanation
Mode	Selection of the measuring mode of the amperometric detector. Following measuring modes are available: ▪ DC: Measurement with constant potential. ▪ PAD: Measurement with several potential steps. ▪ flexIPAD: Measurement with flexible potential steps (levels, ramps) and integration.

Parameter	Explanation
Temperature	Temperature that is set in the detector when you start the hardware.
Monitor Temperature Stability	If this option is switched on, then a determination will not start until the set temperature has been reached and is stable. If this option is switched off, then the sequence of a determination will not be influenced by the temperature. An attempt will indeed be made to achieve the temperature and to maintain it, but the determination will begin in any case.
Settings	Opens the dialog for setting the parameters of the selected measuring mode of the amperometric detector. For further information concerning the settings for the different modes, see next section.

Settings for the different measuring modes



Several measuring modes are available. Select the desired mode. Click on **[Settings]** to change the parameters.

DC

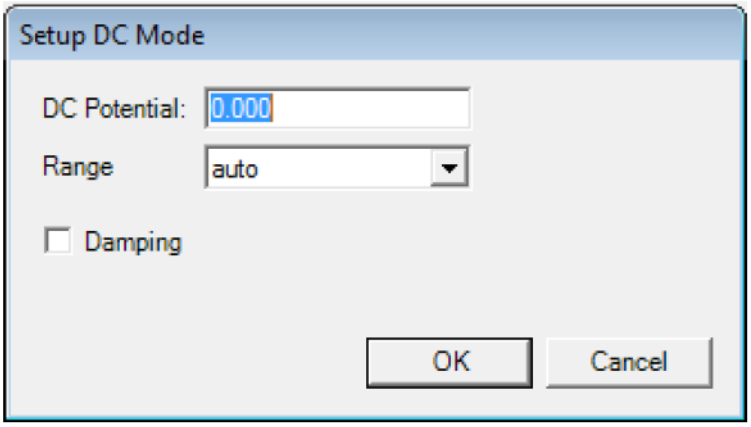


Table 28 Detailed explanations

Parameter	Explanation
DC Potential	Potential of the working electrode in comparison to the reference electrode.
Range	Selection of the measuring range. **auto:** Automatic setting of the measuring range. This selection is not allowed with damping activated.
Damping	Switching the auxiliary damping on or off.

PAD

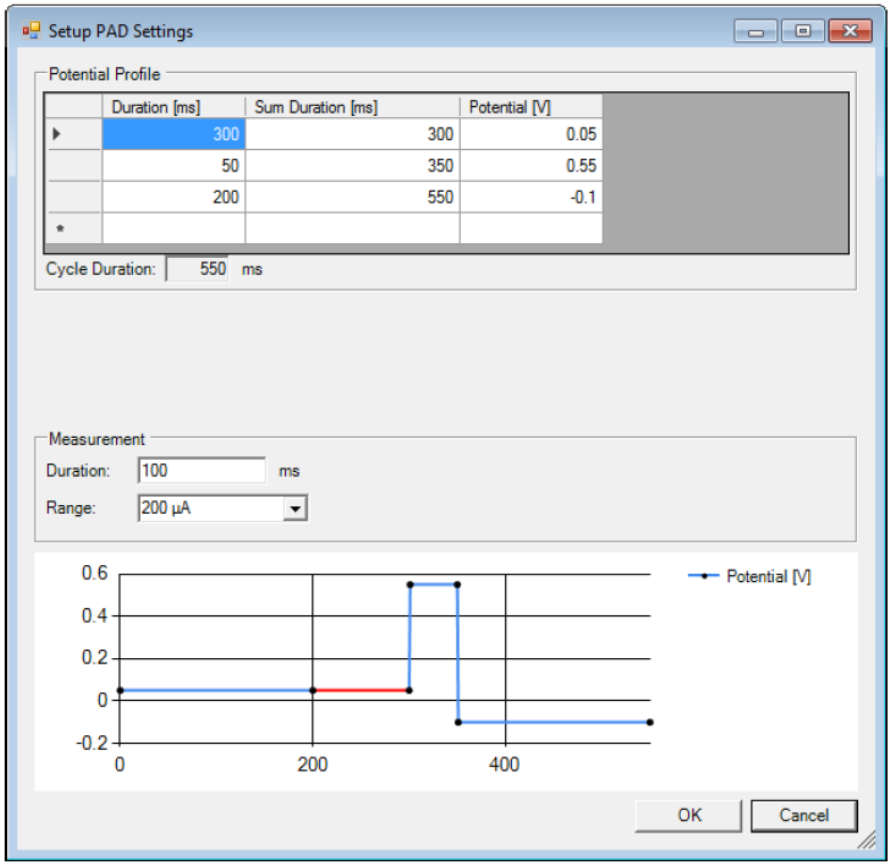


Table 29 Detailed explanations

Parameter	Explanation
Duration	Duration of the potential step in milliseconds.

Parameter	Explanation
Sum Duration	Cumulative duration of potential steps 1 - n in milliseconds (n = number of the observed potential step).
Potential	Potential of the step in volts.
Cycle Duration	Display of the total duration of the potential profile in milliseconds (sum of the durations of the individual steps).
Duration	Duration of the measurement.
Range	Selection of the measuring range.

FlexIPAD

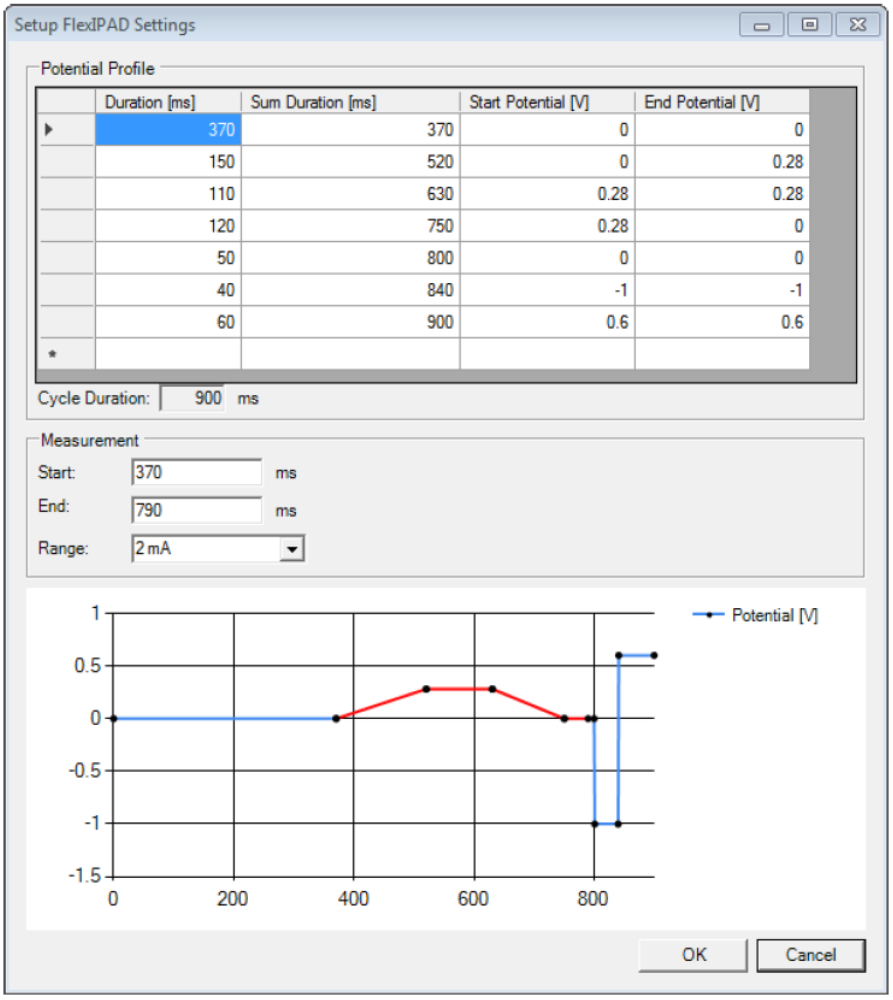
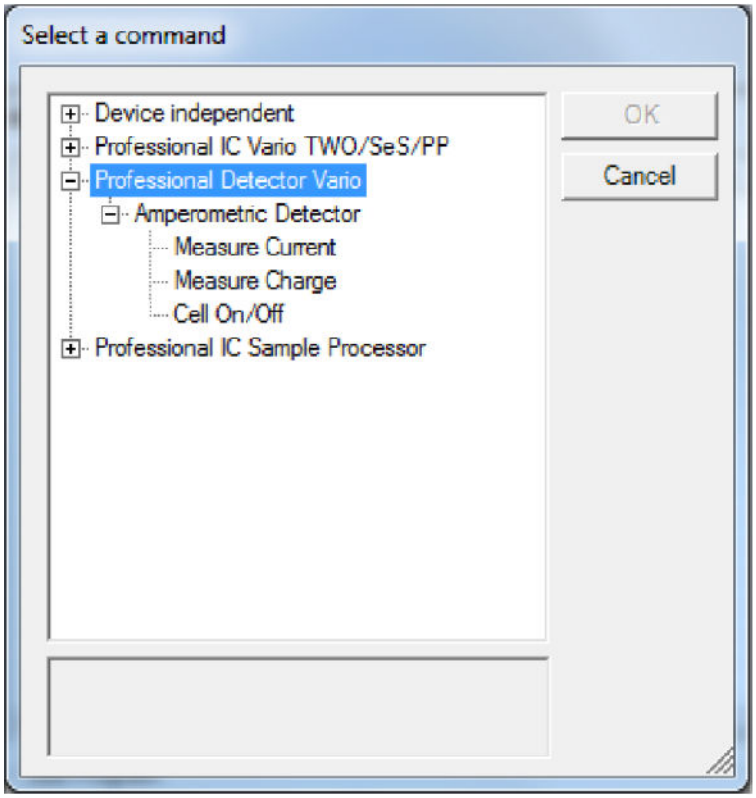


Table 30 Detailed explanations

Parameter	Explanation
Duration	Duration of the potential step in milliseconds.
Sum Duration	Cumulative duration of potential steps 1 - n in milliseconds (n = number of the observed potential step).
Start Potential	Start potential of the step in volts.
End Potential	Terminal potential of the step in volts.
Cycle Duration	Display of the total duration of the potential profile in milliseconds (sum of the durations of the individual steps).
Start	Start time of the measurement.
End	Ending time point of the measurement.
Range	Selection of the measuring range.

For internal amperometric detectors, the parameters are exactly the same as described in this section.

6.7.3 Time program



This window shows the commands of the **Amperometric Detector**.

6.8 UV/VIS Detector

6.8.1 Manual control

Define spectra

Set parameters

1 Enter parameters for the UV/VIS detector.

These parameters are used for every method. You only need to set them once.

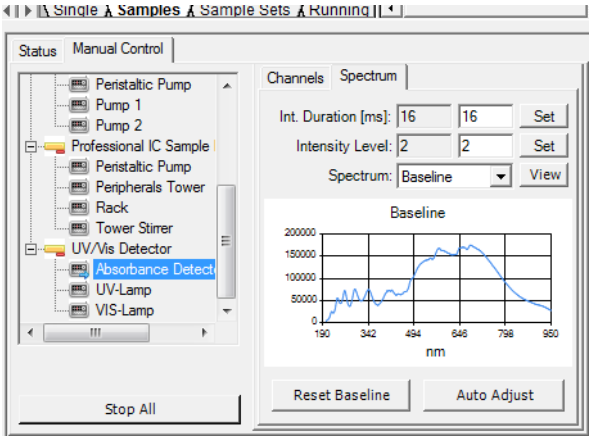


Table 31 Detailed explanations

Parameter	Explanation
Integration Duration (Int. Duration)	Time until the next reading of each diode in milliseconds.
Intensity level	Intensity level of the VIS lamp. Range from 1 to 8.
Spectrum	Baseline spectrum: The last baseline spectrum that has been recorded. Intensity spectrum: Current intensity spectrum. Absorbance spectrum: Current absorbance spectrum.

NOTE

Refer to the following manual for more information.

MagIC Net 3.2 (8.102.8077EN)

2 Click **[Set]**.

3 A dialog window opens. Enter the password **MIC9100** to confirm the change of the intensity level of the VIS lamp and the change of the integration duration. Click on **[OK]**.

Auto adjust

NOTE

Only use **Auto Adjust**, if **all** of the following preconditions are met.

- The UV lamp has been burning for at least 30 minutes.
- The flow-through cell is clean.
- The flow-through cell is rinsed with ultrapure water.
- The flow-through cell is free of air bubbles.
- The intensity spectrum has been checked and shows a cut-off.

As an alternative to the manual adjustment, the settings can also be adjusted automatically.

Click on **Auto Adjust** to adjust the settings automatically.

A built-in algorithm of the instrument carries out the adjustment. This calculates and sets optimized values for the **Integration Duration** and **Intensity Level**.

A new intensity spectrum is displayed after the adjustment.

NOTE

Refer to the following manual for more information.

944 Professional UV/VIS Detector Vario (8.944.8001EN)

6.8.2 Instrument parameters

Absorbance detector

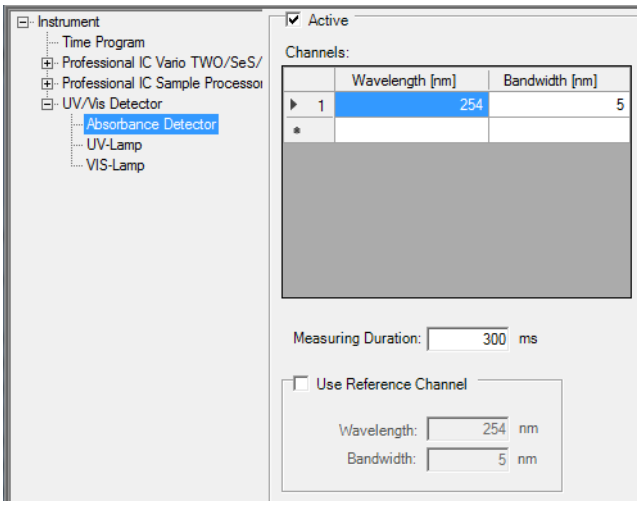


Table 32 Detailed explanations

Parameter	Explanation
Channel 1-8	Indicates the number of a channel. When writing a time program, you have to choose a channel by its number. You can measure up to 8 channels in parallel.
Wavelength	Entry of the wavelength of the channel in nanometer.
Bandwidth ±	Subtracting and adding the bandwidth to the wavelength gives the actually measured wavelengths. Example: If the wavelength of the channel is **390 nm** and for bandwidth ± the value **5 nm** has been entered, then the channel comprises the interval 385 - 395 nm.
Measuring Duration	Entry of the measurement duration per data point in milliseconds.
Use Reference Channel	Determines whether a reference channel is used in the determination. If you do not use a reference channel, the properties previously defined for a reference channel will be retained. If you use a reference channel, the absorbance of the reference channel is subtracted from the signal of each channel.

UV lamp

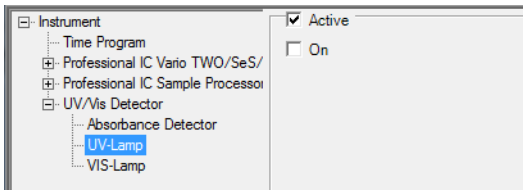


Table 33 Detailed explanations

Parameter	Explanation
On	Determines whether the lamp is switched on or off when you start the hardware.

VIS lamp

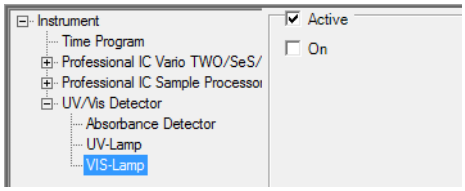
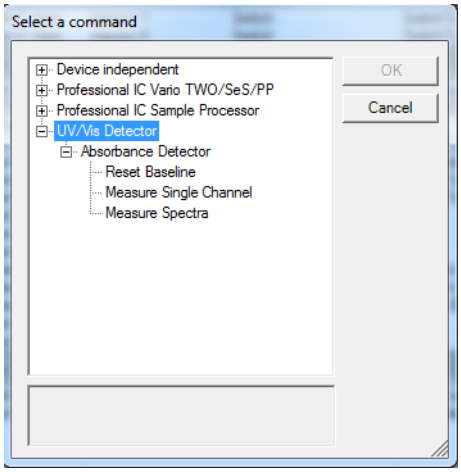


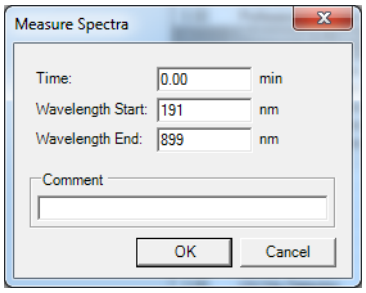
Table 34 Detailed explanations

Parameter	Explanation
On	Determines whether the lamp is switched on or off when you start the hardware.

6.8.3 Time program



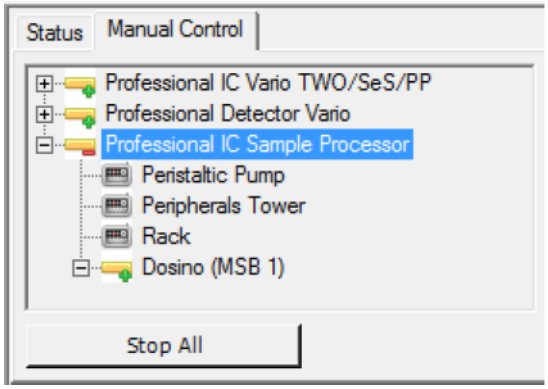
This window shows the commands of the **UV/VIS Detector**.



Define the wavelength under **Measure Spectra**.

6.9 Sample processor

6.9.1 Manual control



Peripherals tower

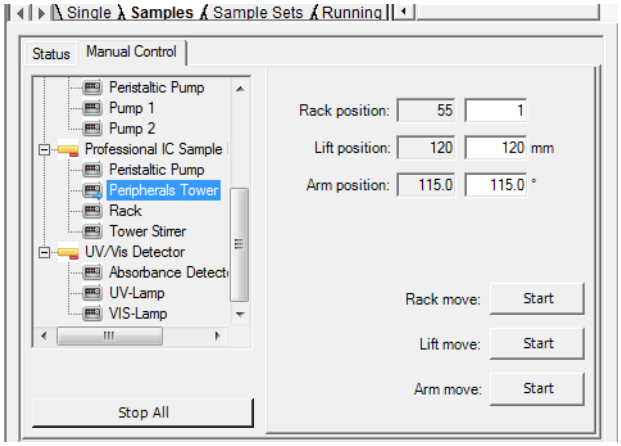


Table 35 Detailed explanations

Parameter	Explanation
Rack position	Defines the position on the rack. Click on the **[Start]** button behind **Rack move** to move the rack.
Lift position	Defines the lift position in mm. Click on the **[Start]** button behind **Lift move** to move the lift.

Parameter	Explanation
Arm position	The needle of the sample processor can move to external positions such as the rinsing station. Adjust external positions in the manual control. Use the adjusted external positions in the instrument method. **Arm position** defines the position of the robotic arm in °. Click on the **[Start]** button behind **Arm move** to move the arm.

6.9.2 Instrument parameters

Sample processor – Peripherals tower

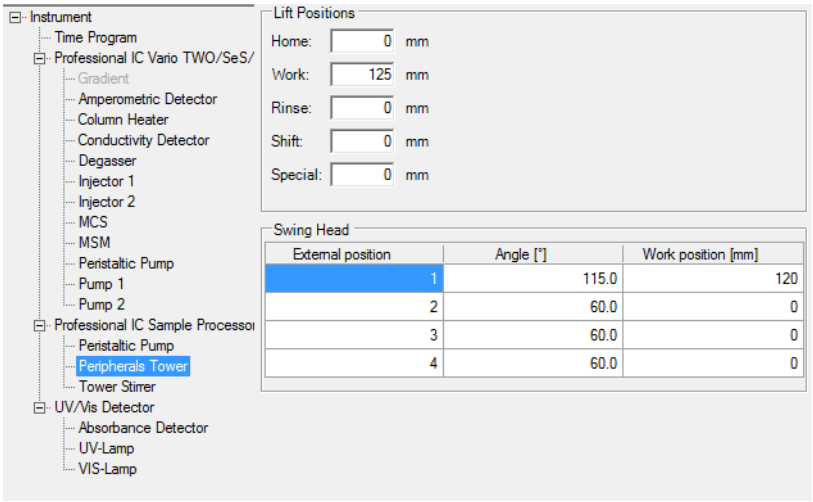


Table 36 Detailed explanations for Lift Positions

Parameter	Explanation
Home	The home position is usually the uppermost stop of the lift.
Work	Usually at this lift position the sample is taken.
Rinse	This lift position is used for rinsing.

Parameter	Explanation
Shift	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 the shifting will take place 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.
Special	This additional definable position can be used e.g. during pipetting so that the tip is just immersed in the sample solution.

NOTE

The lift positions are dependent on the racks and sample vessels used.

Detailed explanations for "Swing Head"

The **Swing Head** section shows the external positions that you use to access the positions of the liquid handling station.

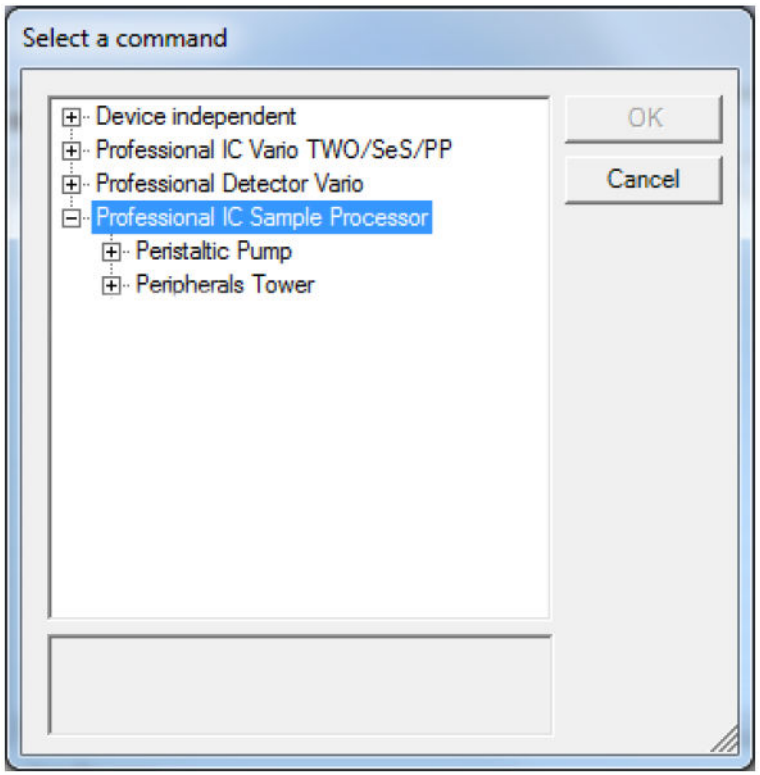
You can adjust external positions in the manual control *(see Chapter 6.9.1, page 63)* and use adjusted external positions in the instrument method.

Sample processor – peristaltic pump

Table 37 Detailed explanations

Parameter	Explanation
On	Determines whether the peristaltic pump is switched on or off when you start the hardware.
Rate	Rate of the peristaltic pump when you start the hardware.

6.9.3 Time program



This window shows the commands of the **Sample Processor**.

In the time program of the peristaltic pump and the peripherals tower, you can set the same parameters as in the manual control.

6.10 Sample center

6.10.1 Manual control

Set parameters in the configuration

Set the parameters for injector, needle and syringe in the **Configuration** part of the **Manual Control** window.

You can set all parameters for the sample center in the same manner.

1. Enter parameters for the sample center.
2. Click **[Set]**.
3. A dialog window opens. Enter the password **MIC9100** to confirm that you want to change parameters. Click on **[OK]**.

These parameters are used for every method. You only need to set them once.

Injector

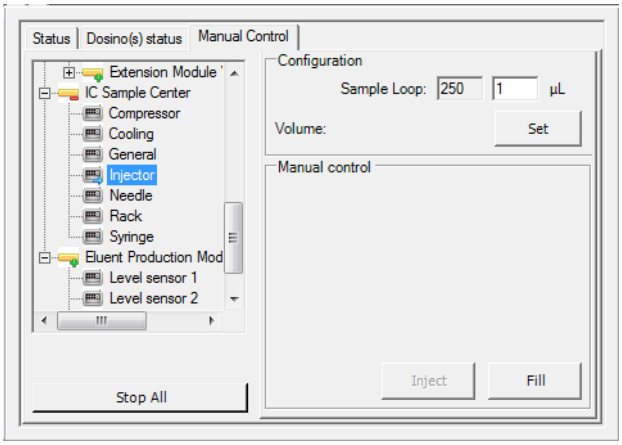


Table 38 Detailed explanations for "Configuration"

Parameter	Explanation
Sample Loop Volume	Volume of the sample loop of the injection valve, in microliter. **Note:** If you operate the instrument in the full loop mode, the injection volume in the sample table has to fit to the entered value in the field **Sample Loop Volume** For further information refer to the 889 Sample Center user manual.

Table 39 Detailed explanations for "Manual control"

Parameter	Explanation
Inject / Fill	Position of the injection valve. Click on **[Inject]** or **[Fill]** to switch between the positions.

NOTE

The range of the injection volume is depending on the injection mode. If the volume is outside the respective range, the instrument switches to failure. The maximum injection volume is calculated in accordance with the following formulas:

- Full loop: injection volume = sample loop volume
- Partial loopfill: max. injection volume = 0.5 × sample loop volume
- Pickup: max. injection volume = (sample loop volume – 3 × needle volume) / 2

Needle

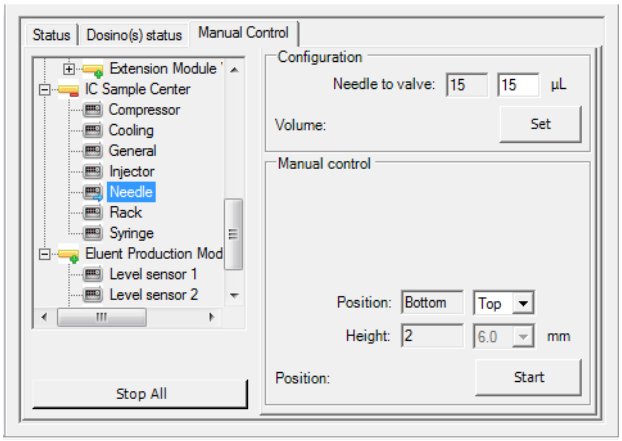


Table 40 Detailed explanations for "Configuration"

Parameter	Explanation
Volume Needle to Valve	Whole volume, from the needle tip to the injection valve, in micro-liter.

Table 41 Detailed explanations for "Manual control"

Parameter	Explanation
Position	Display of the current needle position and selection of a (different) needle position. ▪ Top: Vertical movement of the needle to the top. ▪ Bottom: Vertical movement of the needle to the bottom. If the needle is located above a rack position, it will be moved to the bottom so far that the distance between the needle tip and the bottom of the vial specified in the parameter **Needle height** is reached. ▪ Wash position: Horizontal movement of the needle to the wash position. ▪ Waste position: Horizontal movement of the needle to the waste position. ▪ Exchange position: Movement of the needle to the exchange position.
Height	Display of the current value of the needle height and input of a (different) needle height.

Syringe

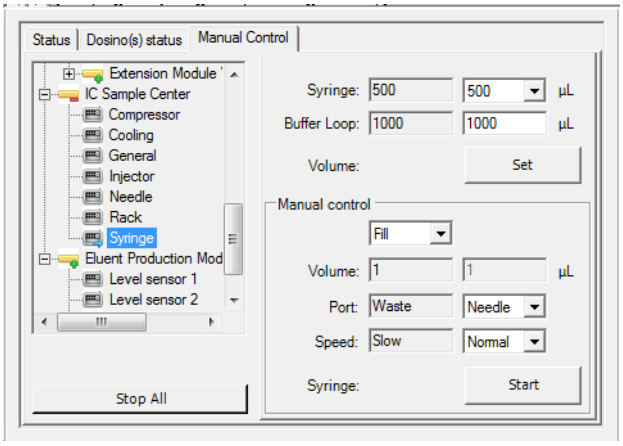


Table 42 Detailed explanations for "Configuration"

Parameter	Explanation
Syringe Volume	Display of the volume of the syringe in microliter.
Buffer Loop Volume	Volume of the buffer loop in microliter. The Buffer Loop Volume is between 1 µL and 9999 µL.

NOTE

The buffer loop volume and the syringe volume have to match. Check that the volumes correspond to one of the combinations in the following table.

Table 43 Detailed explanations for "Manual control"

Parameter	Explanation
Command	Selection of the required action of the syringe. ▪ Fill ▪ Eject ▪ Aspirate ▪ Dispense
Volume	If the command **Aspirate** or **Dispense** has been selected, the volume in µL has to be entered here.
Port	Display of the current position of the syringe valve and selection of a (different) position of the syringe valve. ▪ Needle: Port to the needle. ▪ Wash: Port to the wash container. ▪ Waste: Port to the waste container.
Speed	Selection of the syringe speed when carrying out the selected command.

Table 44

Syringe volume	Buffer Loop volume
250 µL	500 µL
500 µL	1'000 µL
1'000 µL	2'000 µL

NOTE

Refer to the following manual for further information about the sample center.

889 IC Sample Center (8.889.8001EN)

6.10.2 Instrument parameters

NOTE

Needle or rack commands can only be processed if the door of the sample center is closed. If the door is open, the state of the module changes to **Error**. The red LED on the sample center and a corresponding message in the message center indicate the error. In this case, go to **Manual Control** and select the command **Reset Device** in the folder **General**. If the command **Reset Device** does not work, reset the system *(see Chapter 16, page 113)*.

NOTE

Set further parameters for the sample center in the **Manual Control** *(see Chapter 6.10.1, page 66)*.

Compressor

Table 45 Detailed explanations

Parameter	Explanation
On	Determines whether the compressor is switched on or off when you start the hardware.

Cooling

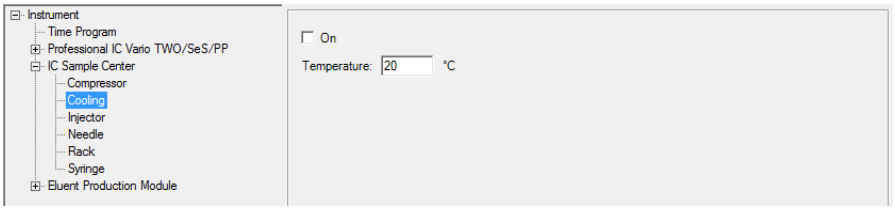


Table 46 Detailed explanations

Parameter	Explanation
On	Determines whether the cooling is switched on or off when you start the hardware.
Temperature	Temperature that is set for the cooling when you start the hardware.

Injector

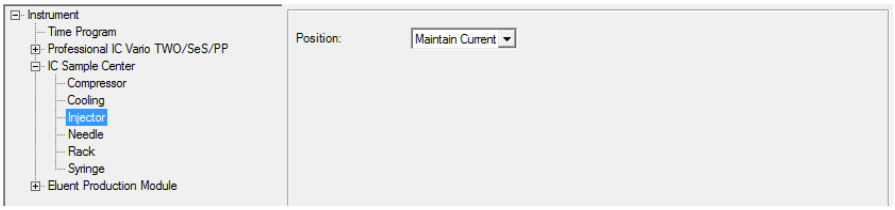


Table 47 Detailed explanations

Parameter	Explanation
Position	Position of the injection valve when you start the hardware.

Needle

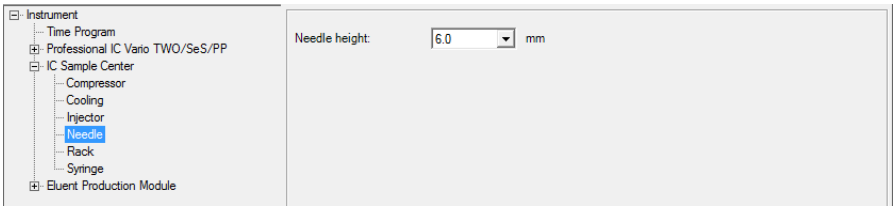


Table 48 Detailed explanations

Parameter	Explanation
Needle Height	Vertical distance of the needle tip from the bottom of the vial or the cavity of the micro titer plate.

NOTE

Refer to the following manual for further information about exchanging the needle.

889 IC Sample Center (8.889.8001EN)

Rack

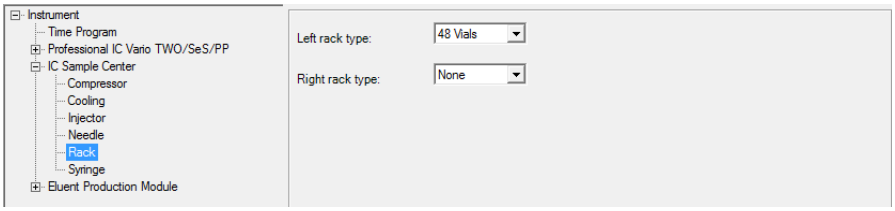


Table 49 Detailed explanations

Parameter	Explanation
Type	Selection of the rack type.

NOTE

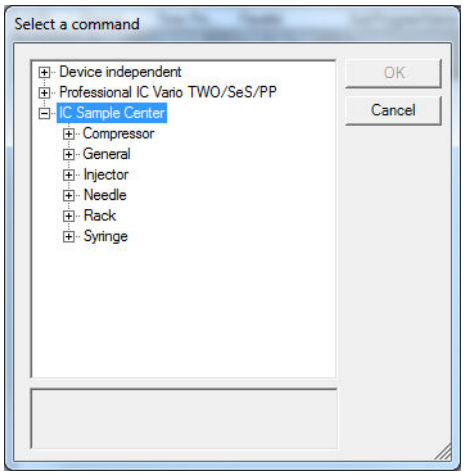
It is necessary to define the rack in the **Instrument Method Editor** and in the tab **Define Plates for Sample Method**. Make sure that you choose the same number of vials in the **Instrument Method Editor** and in the tab **Define Plates for Sample Method**.

You find the tab **Define Plates for Sample Method** in the **Run Samples** section.

Syringe

All parameters for the syringe have to be defined in the configuration part of the manual control.

6.10.3 Time program

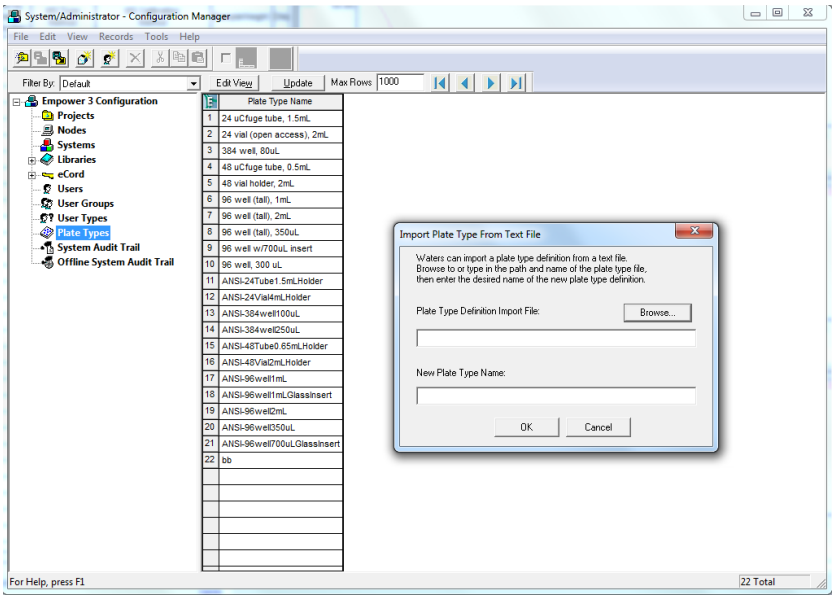


This window shows the commands of the **IC Sample Center**.

6.10.4 Import predefined plates

1 Go to the **Configure the System** section.

2



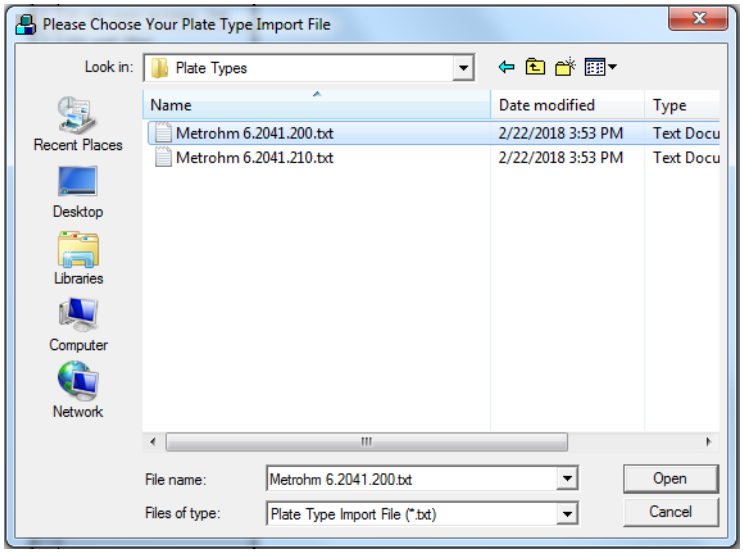
Go to **Plate Types**.

Right-click in table. Select **Import Plate Type From Text File**.

Enter a name for the new plate type.

Click on **[Browse]**.

3



Navigate to the installation medium. Open the folder **Plate Types**.

Select a file.

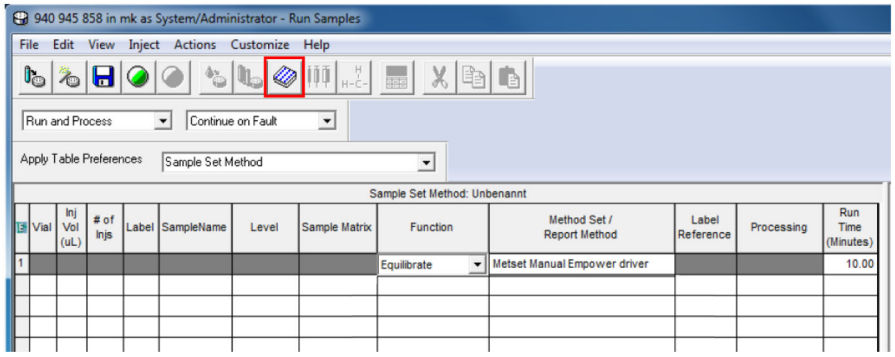
NOTE

Metrohm 6.2041.200 contains a predefined plate with 48 vials.

Metrohm 6.2041.210 contains a predefined plate with 12 vials.

Click on **[Open]**.

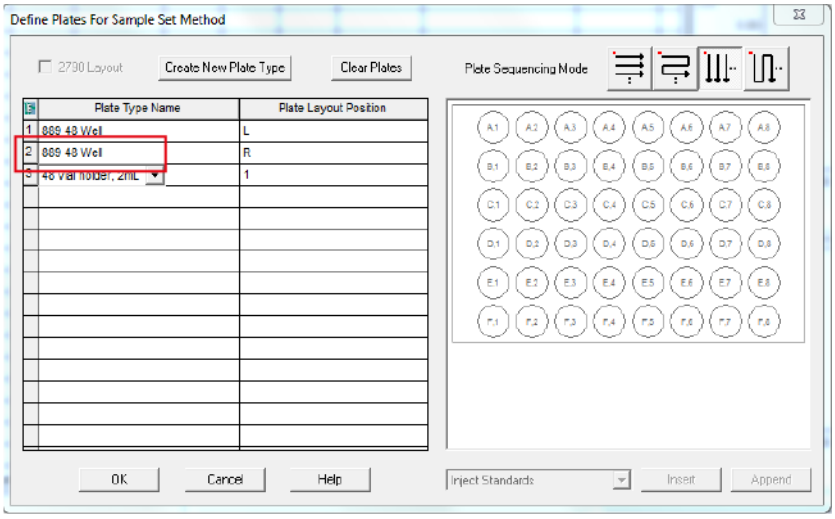
4



Go to the **Run Samples** section.

Click on the plates symbol.

5



Select the newly imported plate in the drop-down list.

6.10.5 Define plates for sample set method

It is possible to define plates if the required plates are not predefined.

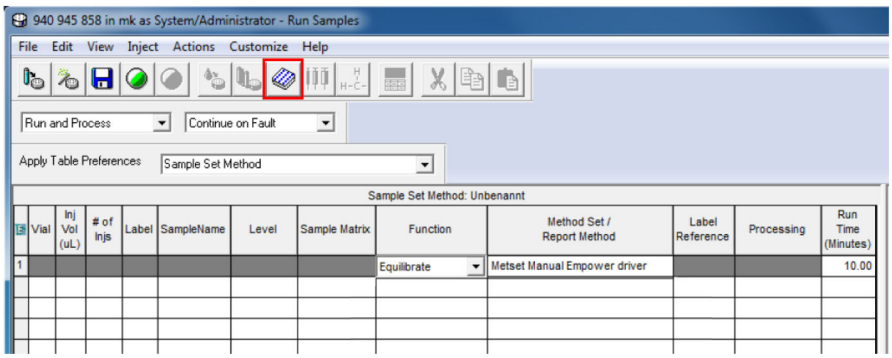
The following screenshots show the definition of the 48 vial rack for the sample center.

Configure the sample center in the **Run Samples** section.

NOTE

Pay attention to select the correct **Plate Sequencing Mode**.

1



To enter the configuration, click on the Plates symbol in the **Run Samples** section and click on **Create New Plate Type**.

2

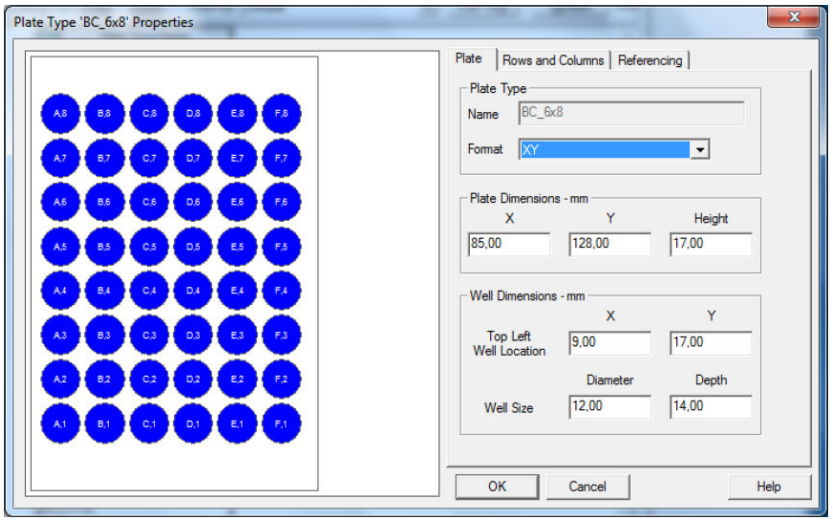


Plate Type 'BC_6x8' Properties
Plate
Rows and Columns
Referencing
Plate Type
Name
BC_6x8
Format
XY
Plate Dimensions - mm
X
Y
Height
85,00
128,00
17,00
Well Dimensions - mm
X
Y
Top Left Well Location
9,00
17,00
Diameter
Depth
Well Size
12,00
14,00
OK
Cancel
Help

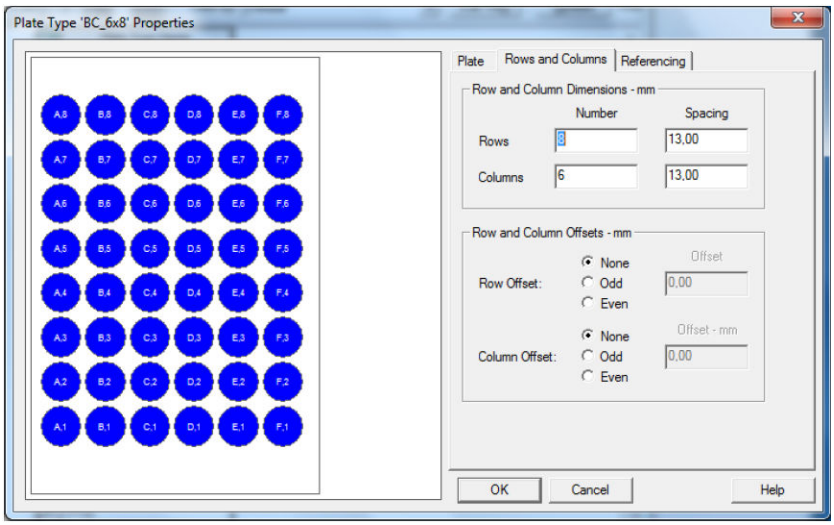


Plate Type 'BC_6x8' Properties
Plate
Rows and Columns
Referencing
Row and Column Dimensions - mm
Number
Spacing
Rows
8
13,00
Columns
6
13,00
Row and Column Offsets - mm
Row Offset:
None
Odd
Even
Offset
0,00
Column Offset:
None
Odd
Even
Offset - mm
0,00
OK
Cancel
Help

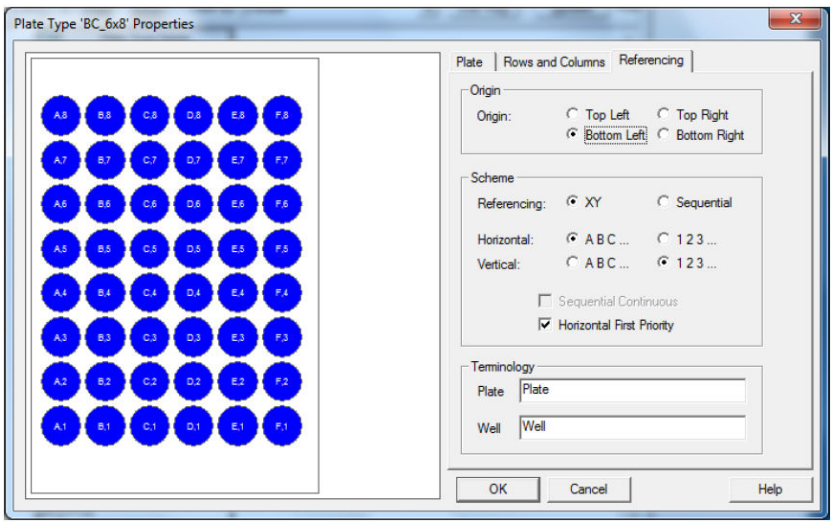
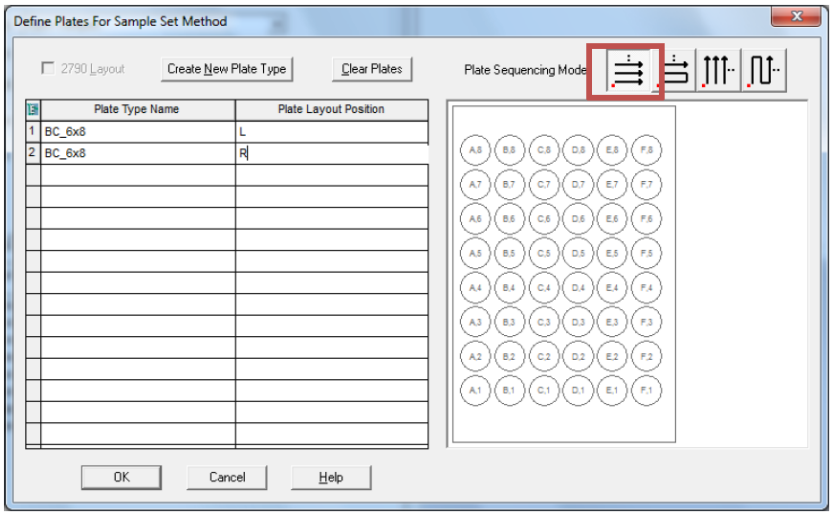


Plate Type 'BC_6x8' Properties
Plate
Rows and Columns
Referencing
Origin
Origin:
Top Left
Top Right
Bottom Left
Bottom Right
Scheme
Referencing:
XY
Sequential
Horizontal:
A B C ...
1 2 3 ...
Vertical:
A B C ...
1 2 3 ...
Sequential Continuous
Horizontal First Priority
Terminology
Plate
Plate
Well
Well
OK
Cancel
Help

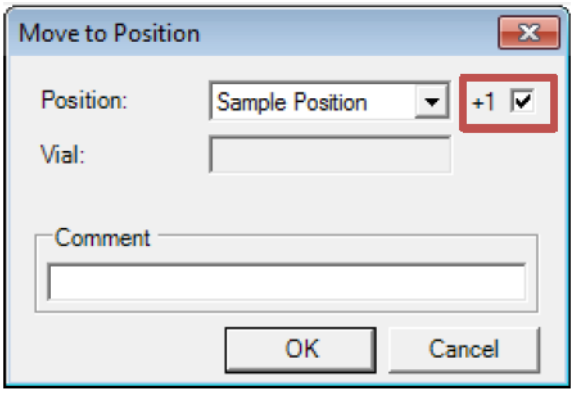


6.10.6 Define the sample positions when measuring 2 channels

When measuring 2 channels (with 2 different solutions, e.g. anions/cations) with 1 time program, you have to define the sample positions for standards in the time program.

NOTE

If you are using the **+1** command as described in the following section, you cannot use a predefined injection mode (e.g. Full Loop Injection). In this case you have to write the sequence for the injection manually.



When adding a **Move to Position** command, check the checkbox **+1**.

Checking the checkbox **+1** has the following meanings:

- LA1+1=LB1
- LF1+1=LA2
- LF8+1=RA1
- RF8+1=RA9 (is invalid)

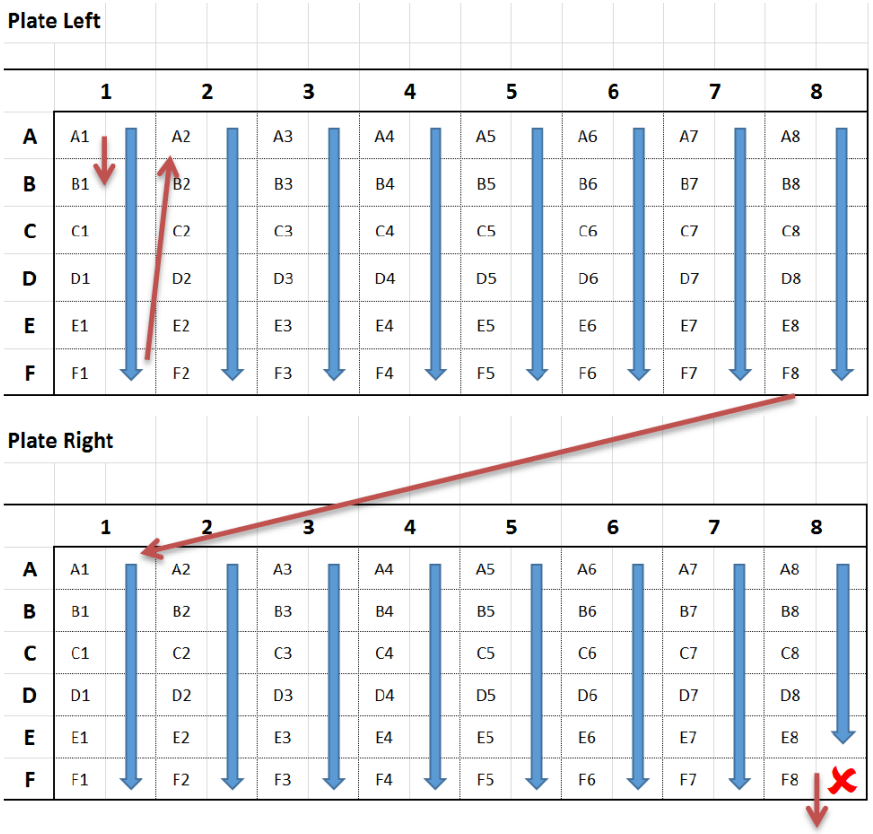


Plate Left
1 2 3 4 5 6 7 8
A A1 A2 A3 A4 A5 A6 A7 A8
B B1 B2 B3 B4 B5 B6 B7 B8
C C1 C2 C3 C4 C5 C6 C7 C8
D D1 D2 D3 D4 D5 D6 D7 D8
E E1 E2 E3 E4 E5 E6 E7 E8
F F1 F2 F3 F4 F5 F6 F7 F8
Plate Right
1 2 3 4 5 6 7 8
A A1 A2 A3 A4 A5 A6 A7 A8
B B1 B2 B3 B4 B5 B6 B7 B8
C C1 C2 C3 C4 C5 C6 C7 C8
D D1 D2 D3 D4 D5 D6 D7 D8
E E1 E2 E3 E4 E5 E6 E7 E8
F F1 F2 F3 F4 F5 F6 F7 F8

7 Creating an offline method

NOTE

It is not recommended to create an offline method. Use an online method whenever possible.

The offline method allows you to create a method without any instruments connected to your PC. The following prerequisites have to be fulfilled that you can create an offline method and afterwards use it for your analysis:

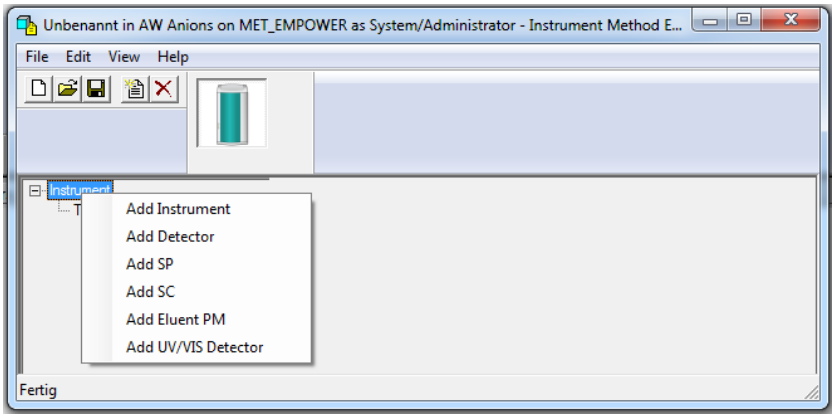
- When creating an offline method, no instrument has to be connected to the PC. If an instrument is connected to the PC, setting up an offline method is not possible.
- Ensure that the configuration of the node and the system correspond with the real system you want to connect to the PC afterwards. Otherwise there will be an error message when you try to use the method for your analysis.

To create an offline method proceed as follows:

1. If not yet done, disconnect all Metrohm instruments connected to the PC.

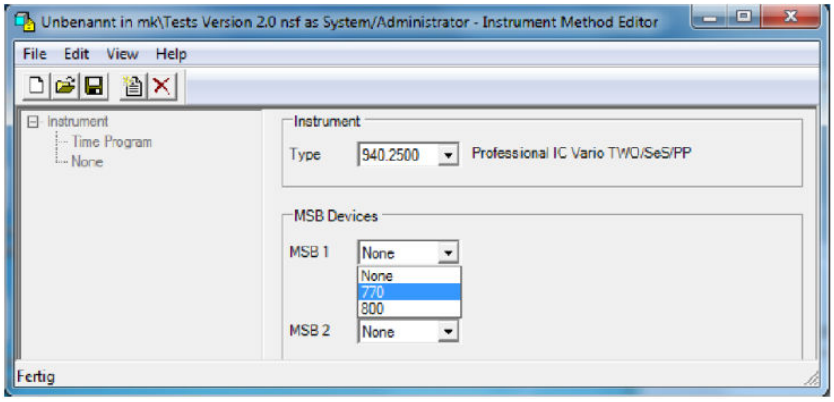
2. Create a new node *(see "Creating a node ", page 9)*.

3. Insert the parameters for the DHCP. In case, you want to use the method for your analysis afterwards, ensure that the values correspond with the real system values.

4. 

Right-click on **Instrument**. Click on **Add Instrument**.

5



Select the desired instrument in the drop-down list **Type**. If you want to connect any MSB instruments, select them in the drop-down lists. The numbers belong to the following instruments: **770** Remote Box, **800** Dosino.

6 Click on **Apply** in the lower right corner. If the button is not visible, maximize the window.

7 If desired, add more instruments by right-clicking on **Instrument** *(see Chapter 2.1, page 3)*.

NOTE

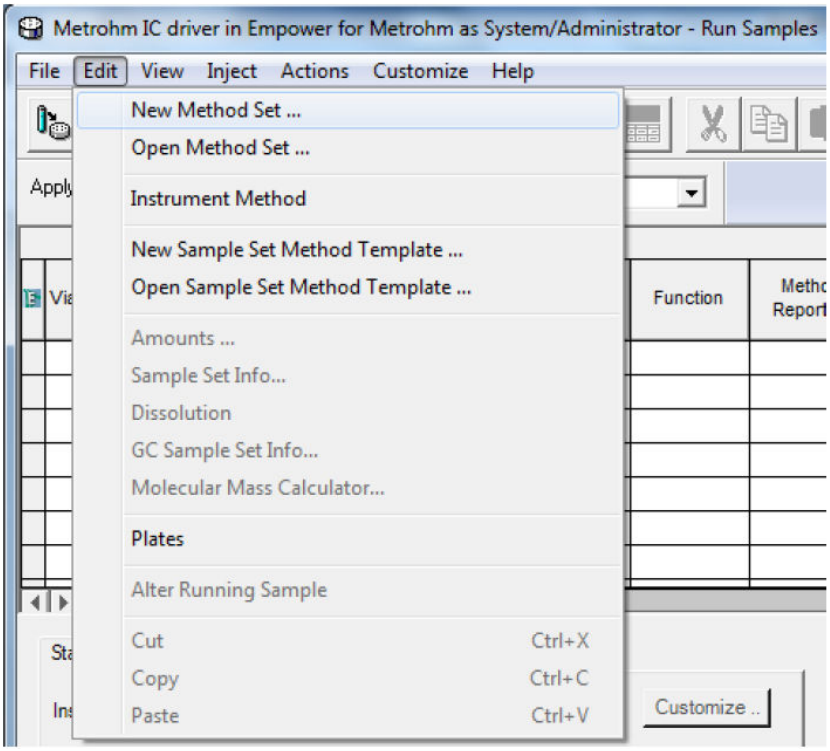
It is not possible to select the amount of detectors.

A single channel IC instrument contains always 1 amperometric detector and 1 conductivity detector.

A dual channel IC instrument contains always 2 amperometric detectors and 2 conductivity detectors.

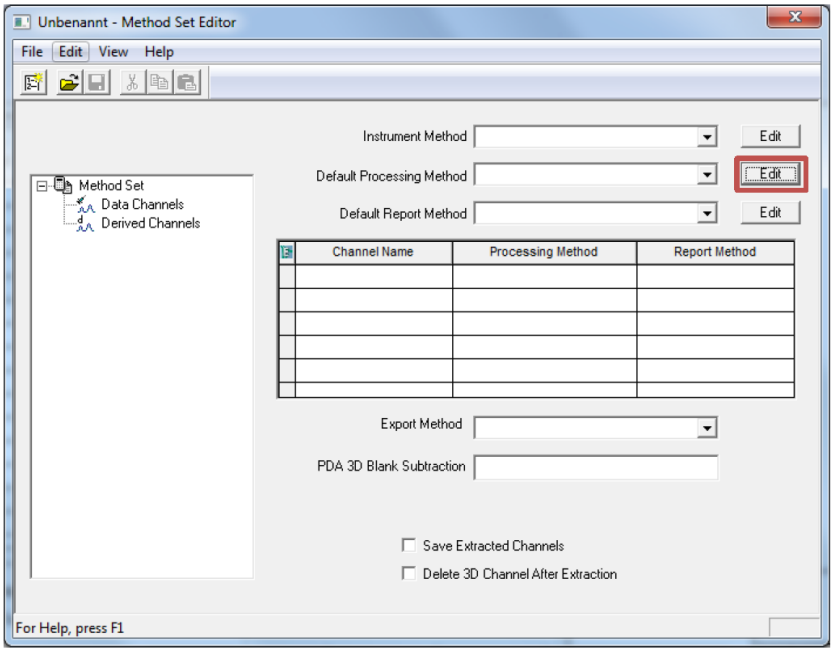
8 Creating a processing method

1



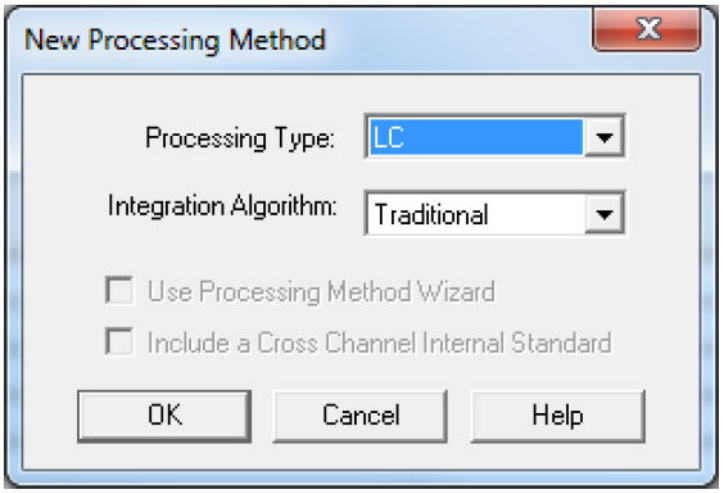
Click on **Edit** ▸ **New Method Set**.

2



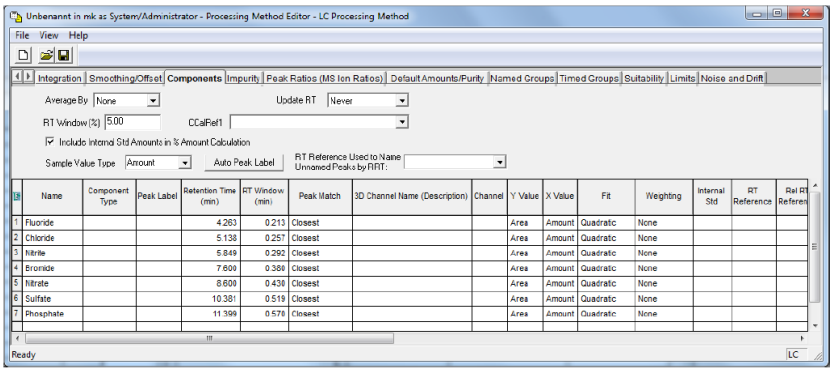
Click on **[Edit]** in the line **Default Processing Method**.

The following window appears.



3 Select the processing type and the integration algorithm. Click on **[OK]**.

4

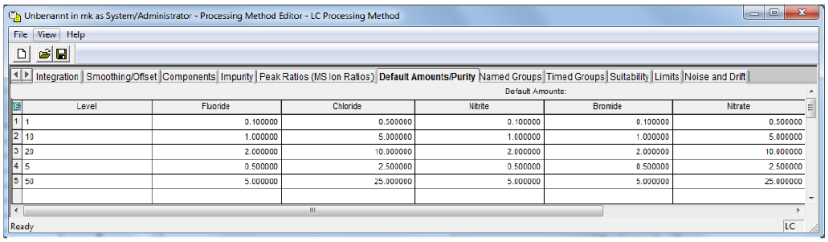


Open the tab **Components** to perform the following actions.

- Make a list of the analytes and their retention time.
- Define the retention times of the analytes.
- Define the desired calibration parameters.

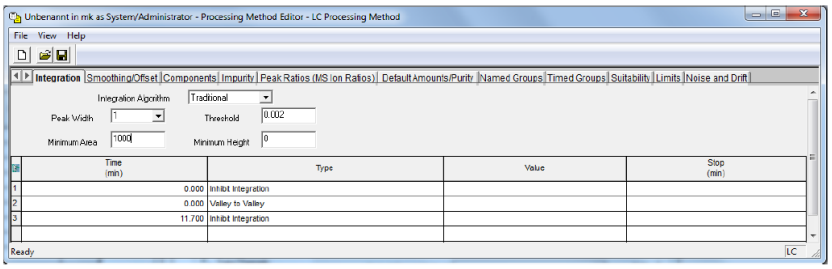
Adjust the processing method later. It is not necessary to fill in all parameters. It is possible to start with the default settings.

5



Enter the levels of your standard solutions on the tab **Default Amounts**.

6

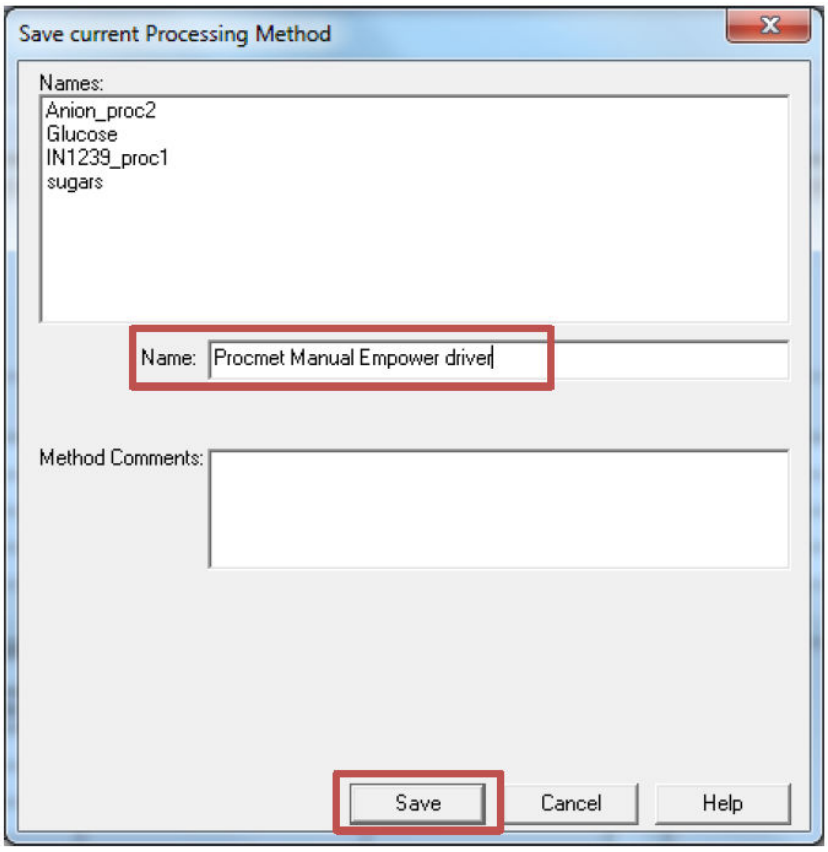


Set the integration parameters on the tab **Integration**.

7

Save the processing method by clicking on **[Save]**. 

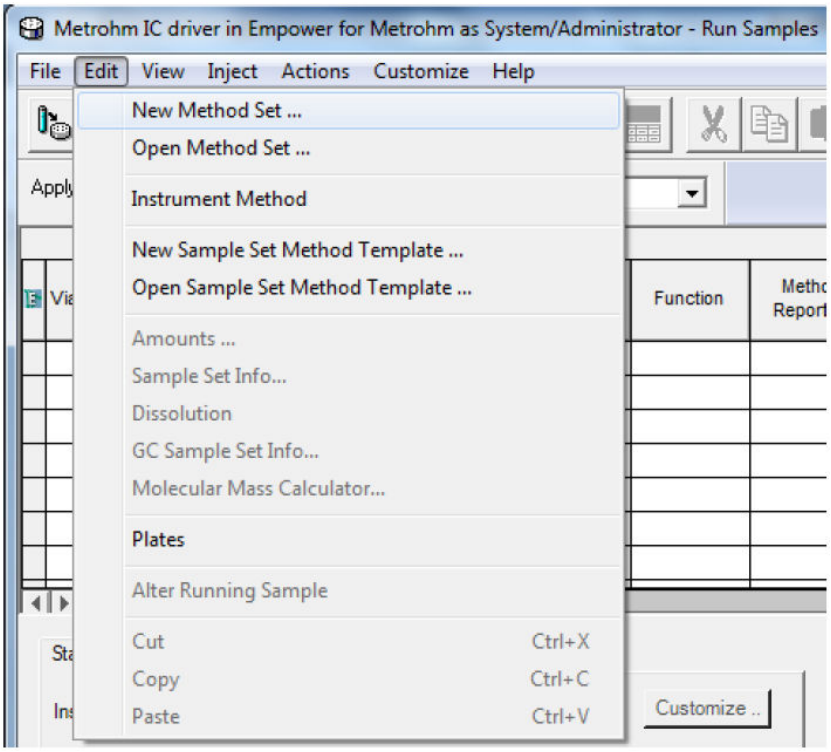
8



Enter a name for the processing method. Click on **[Save]**.

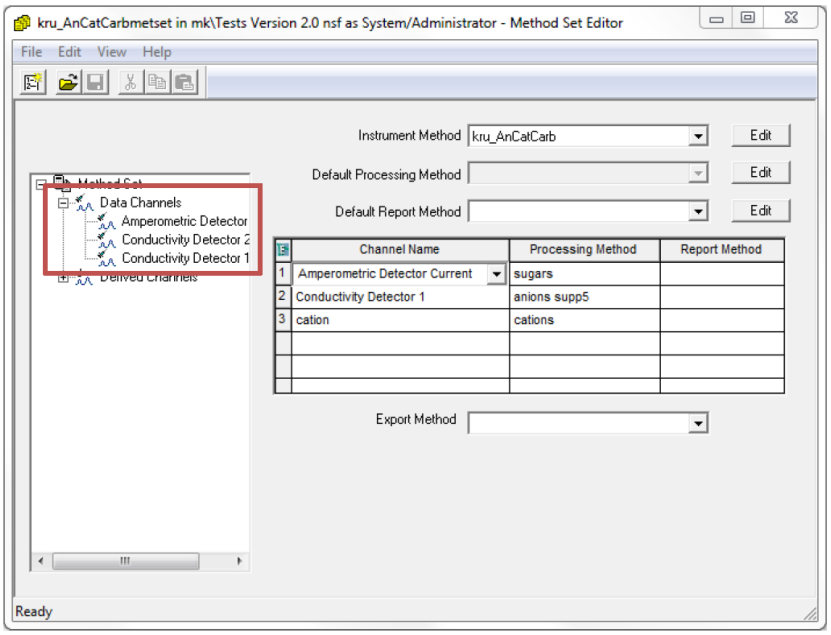
9 Forming a method set

1



Click on **Edit ▸ New Method Set...**.

2



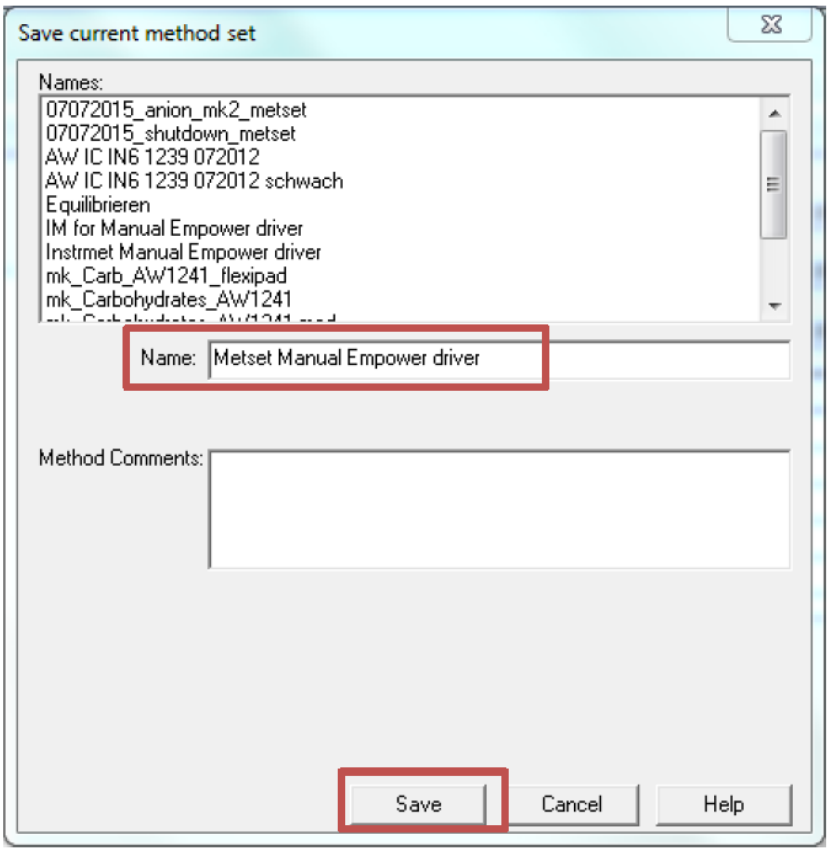
Select your **Instrument Method** for the **Method Set**.
Default Processing Method, **Default Report Method** and **Export Method** are optional.

NOTE

If you measure 2 different channels simultaneously, select them in the tree view **Data Channels** and drag them to the table beneath. You can assign to each channel a processing method.

3 Save your method set by clicking on the **[Save]** button.

4



Enter a name for the method set. Click on **[Save]**.

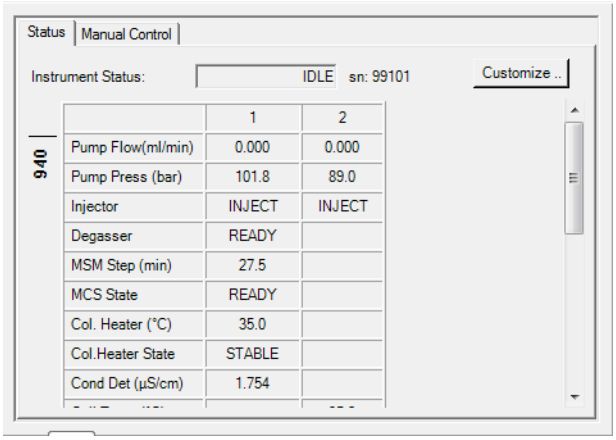
10 Running samples

10.1 Creating a sample table and starting the analysis

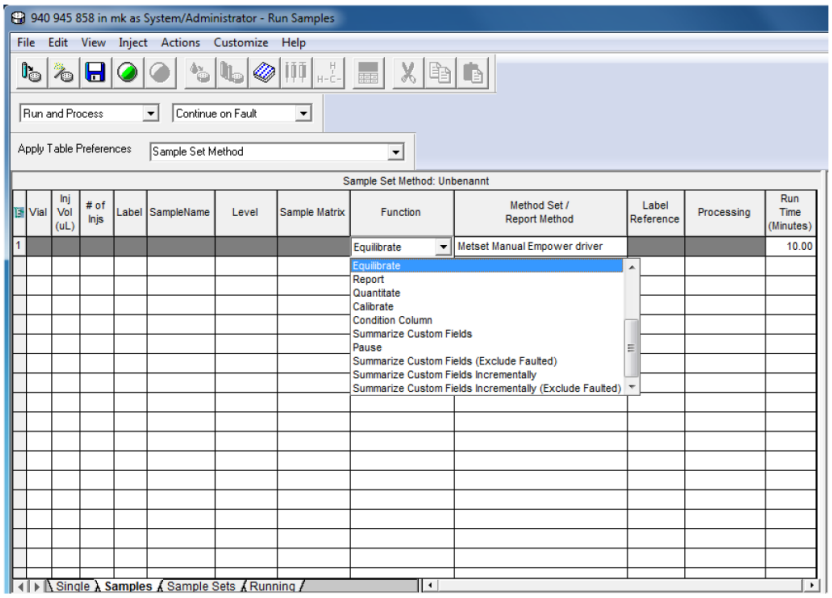
NOTE

The **Instrument Status** must be **IDLE** before starting a measuring series.

If the instrument is not **IDLE**, refer to *chapter 16, page 113*.



1



Start filling in the sample table.

- Start with a line for equilibration of the system. Use the **Equilibrate** function for this.

Enter a long run time (e.g. 30 min). This makes sure that the system has a stable baseline before moving on to the next line.

2

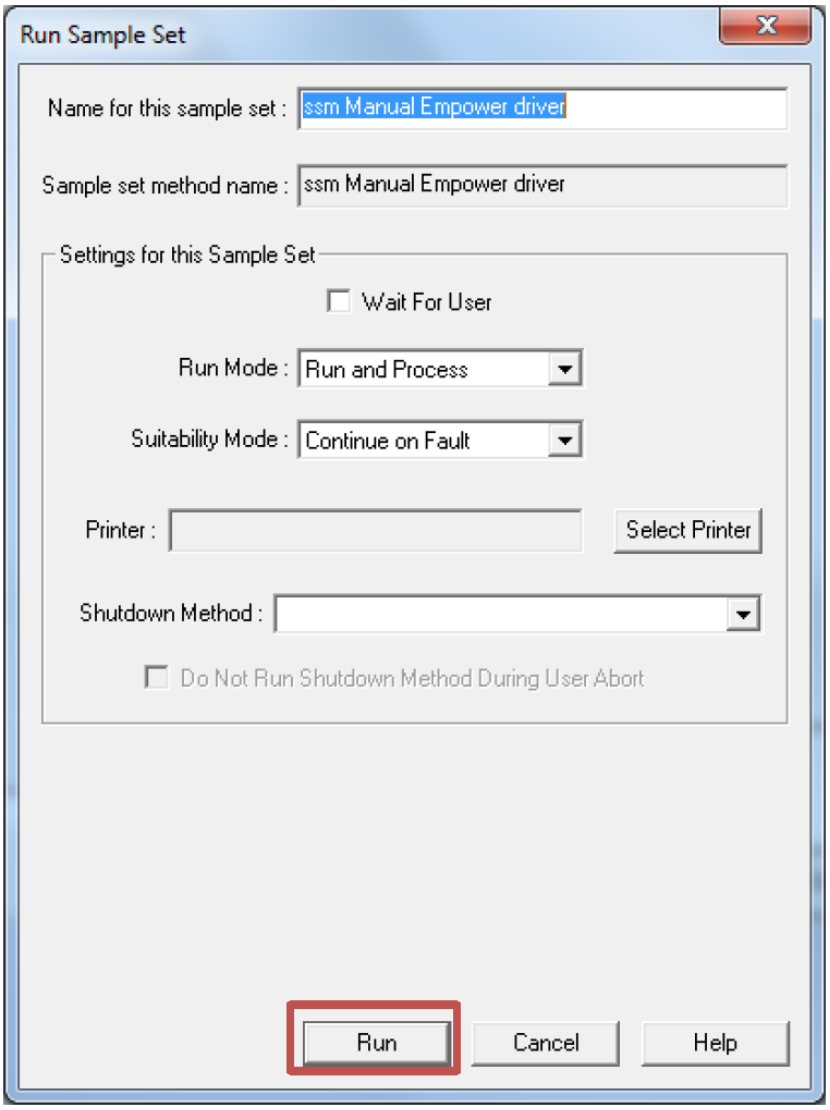
Sample Set Method: Unbenannt

	Vial	Inj Vol (uL)	# of Injs	Label	SampleName	Level	Sample Matrix	Function	Method Set / Report Method	Label Reference	Processing	Run Time (Minutes)
1								Equilibrate	Metset Manual Empower driver			10.00
2	1	20.0	1		Standard 1	Level 1		Inject Standards	Metset Manual Empower driver		Normal	10.00
3	2	20.0	1		Standard 2	Level 2		Inject Standards	Metset Manual Empower driver		Normal	10.00
4	3	20.0	1		Standard 3	Level 3		Inject Standards	Metset Manual Empower driver		Normal	10.00
5	4	20.0	1		tab			Inject Samples	Metset Manual Empower driver		Normal	10.00

Create a sample table according to your needs.

3 To start the series, click on the **[Run]** button (only if the instrument status is **IDLE**). 

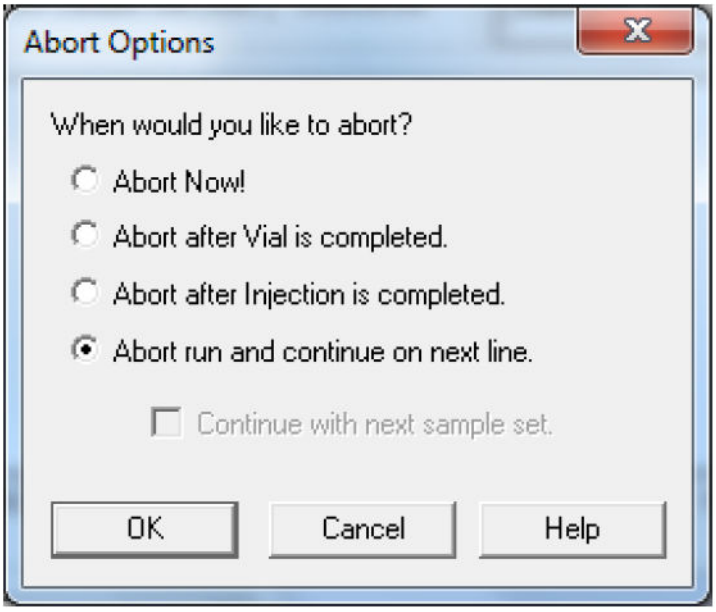
4



Enter a name for the sample set and click on **[Run]**.

NOTE

For information regarding the shutdown method, *refer to Chapter 10.2, page 92*.



When your baseline is stable, you can click on **Abort** and select the **Abort run and continue on next line** option. This results in a short stop of all modules.

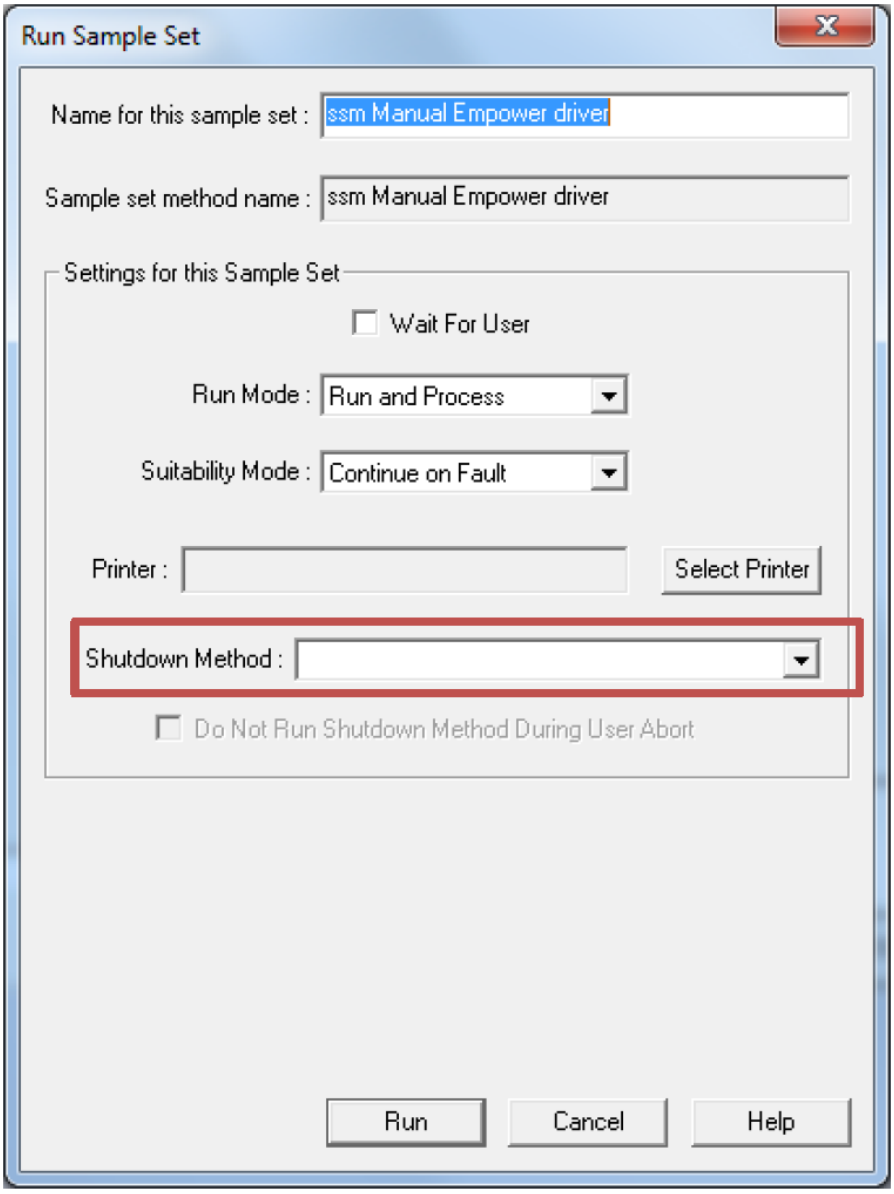
The different abort options have the following results:

- **Abort Now**: The current run including all modules stops immediately. Some values in the status window are frozen.
- **Abort after Vial is completed**: The run stops after completing all injections from the current vial, on the current row in the samples table. The modules do not stop.
- **Abort after Injection is completed**: The run stops after completing the current injection. The modules do not stop.
- **Abort current run and continue on next line**: The run including all modules stops on the current row. Then, the run continues acquisition with the next row in the sample set method.

NOTE

If you select a shutdown method *(see Chapter 10.2, page 92)* and do not activate the option **Do not Run Shutdown Method During User Abort**, the shutdown method is executed subsequently.

10.2 Using a shutdown method



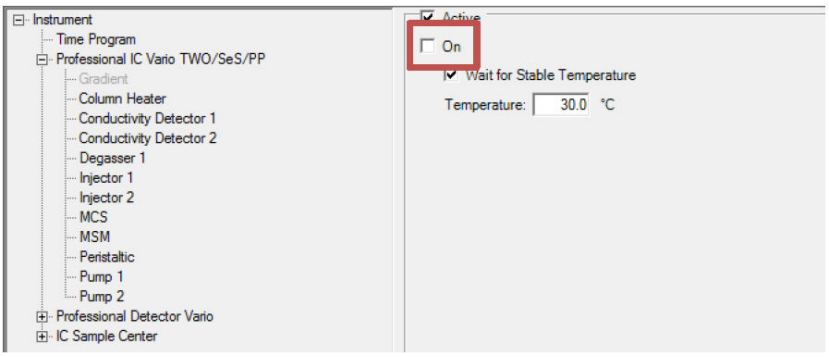
A shutdown method is downloaded to the instrument at the end of the sample set. This allows the user to deactivate not used instruments.

Creating a shutdown method

To create a shutdown method, proceed as follows (example):

1 Create a new instrument method *(see Chapter 6, page 30)*.

2



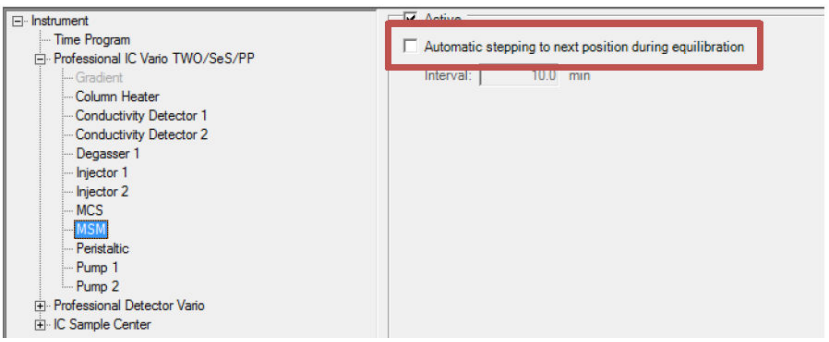
Switch off the following instruments by unchecking the checkbox **On**:

- Column Heater
- Degasser
- MCS
- Peristaltic
- Pumps

NOTE

Do not uncheck the checkbox **Active**.

3

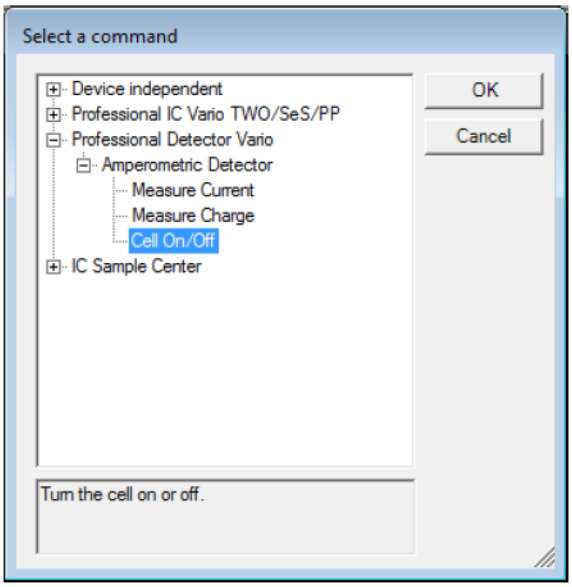


Open **MSM** and uncheck
Automatic stepping to next position during equilibration.

4 If you are using the amperometric detector: Open the **Time Program**.

5 Click **[Add]**.

6

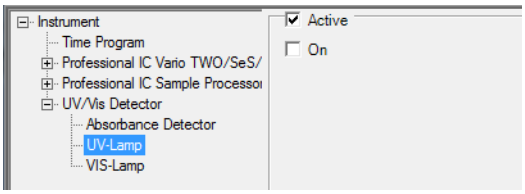


Go to **Professional Detector Vario ▸ Amperometric Detector ▸ Cell On/Off**.

7 Uncheck **Cell On** and click **[OK]**.

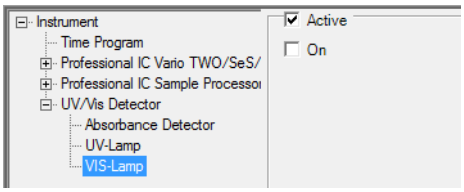
8 If you are using the UV/VIS detector: Open the UV/VIS detector.

9



Open **UV-Lamp** and uncheck the checkbox **On**.

10



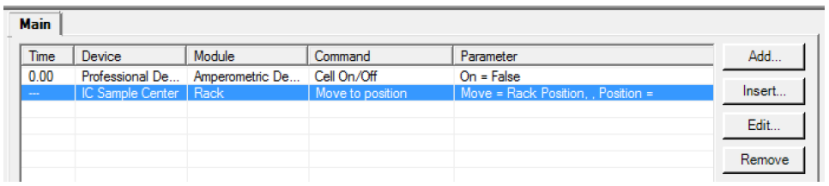
Open **VIS-Lamp** and uncheck the checkbox **On**.

11 Save the instrument method.

Restrictions

When using a shutdown method, take into consideration the following restrictions:

- Empower® shows status IDLE and accepts user input while the time program might still be running. Before starting a new sample set, ensure that the shutdown method is finished.



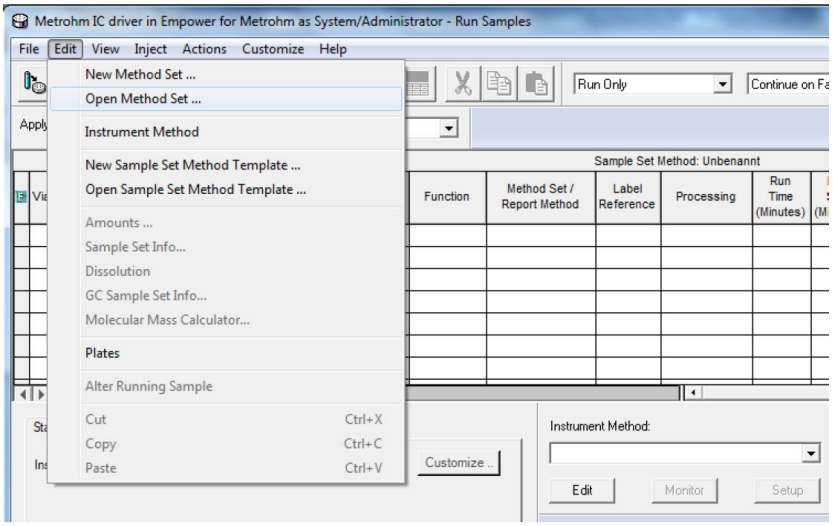
- In case of a shutdown method, Empower® does not pass sample location information. So any time program entry that tries to use this information will fail. Example: The command **Move to position** in the time program in the picture will not be executed and the time program fails.
- When you use a shutdown method at the end of a sequence in a dual system, an instrument failure occurs. Use a normal instrument method instead of a shutdown method. Set the instrument parameters for the last sample line in the same way as you would set them in the shutdown method.

11 Measuring cations

For non-suppressed cation determination, the peaks in the live display are negative. In the analysis results, the chromatograms are displayed correctly (with positive peaks), if you use a derived channel. For anion determination, the peaks are always positive.

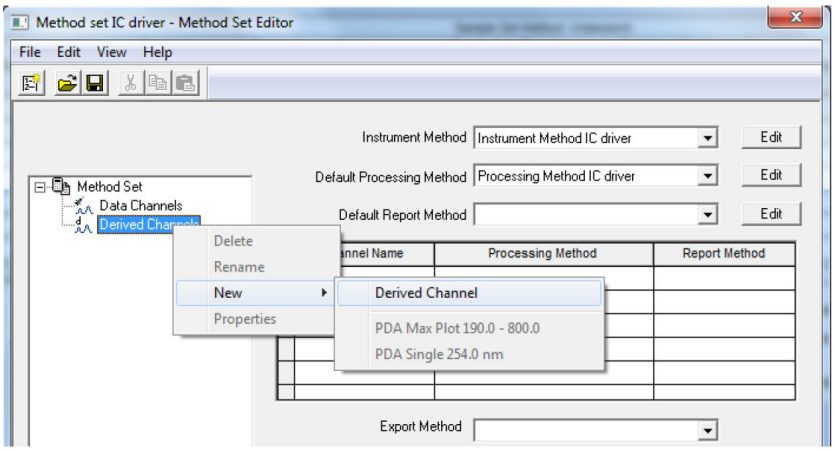
If you measure the analytes as negative peaks, the chromatogram has to be inverted by means of a **derived channel**. This means that the conductance measured is multiplied by **-1**. In order to swap the chromatogram, modify the method set as follows.

1

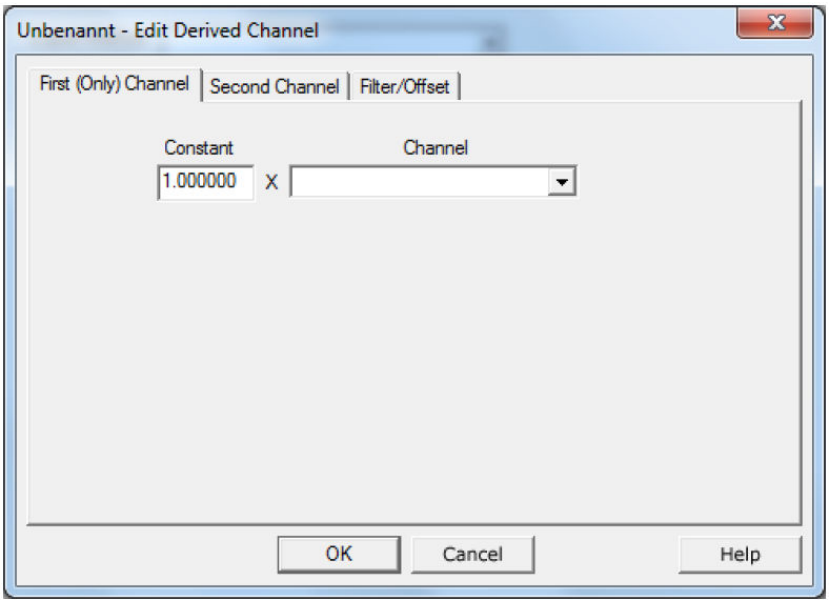


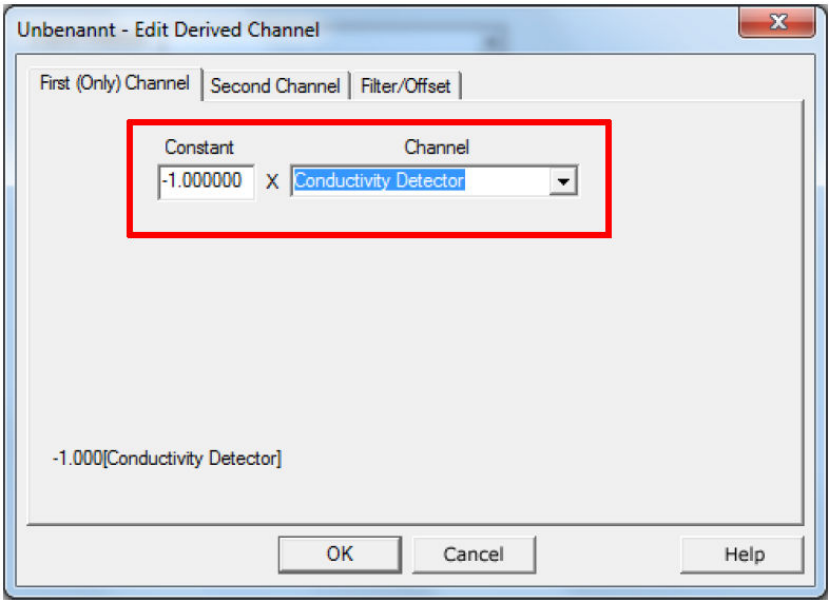
Open the desired method set by clicking on **Edit ▸ Open Method Set...**.

2 Create a derived channel by right-clicking on **Derived Channels ▸ New ▸ Derived Channel**.



3



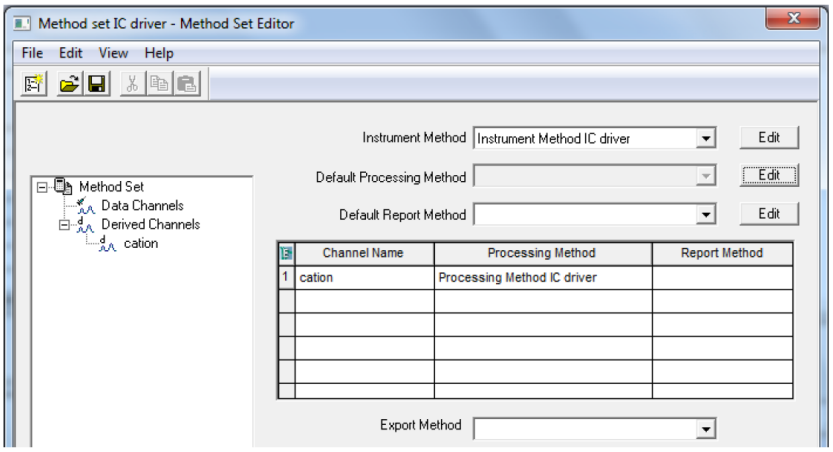


For the derived channel, the conductivity needs to be multiplied by **-1** to obtain the inverse:

4

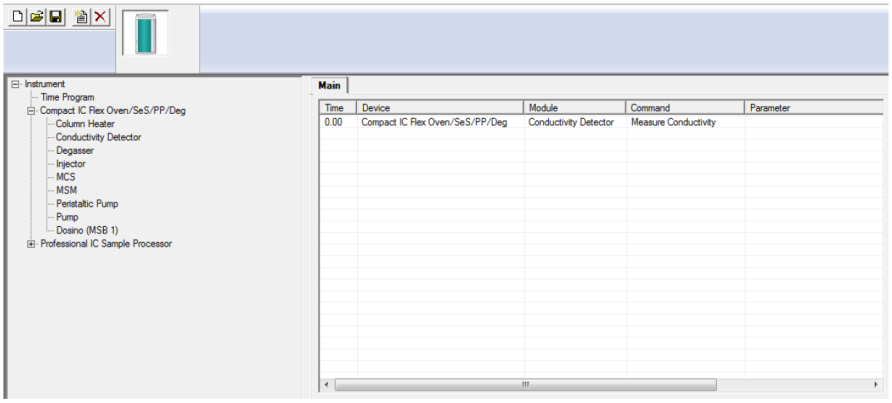
Give the derived channel a name.

5



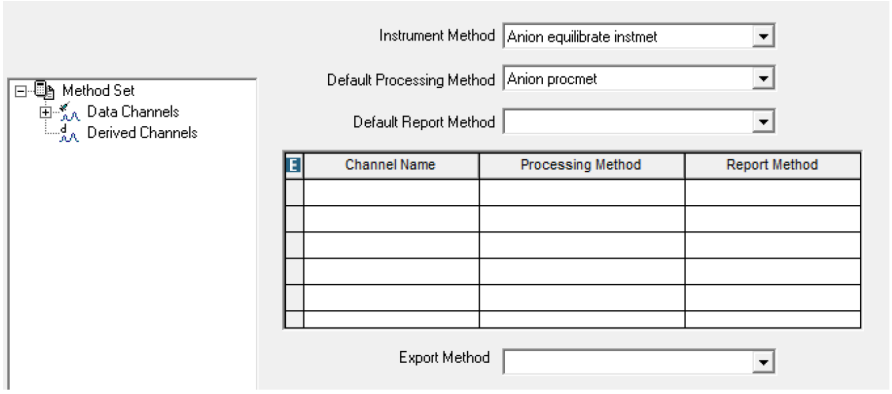
Choose a processing method for the cation channel.

12 Equilibrating the system



You can use the method, which you use afterwards, for the analysis to equilibrate the system. For this purpose add the function **Equilibrate** to the sample table. In this case, only the commands to start data acquisition (e.g. **Measure Conductivity**, **Measure Current**, **Measure Charge**) of the time program will be executed. The other commands of the time program will not be executed.

Additionally it might be useful to create an **Equilibration** method. For this purpose create an instrument method named **Equilibration** (all parameters as desired, e.g. pump flow 0.7 milliliter per minute, MSM autostep all 10 minutes etc.). In the time program enter just 1 line to start data acquisition to be able to monitor the baseline during equilibration.



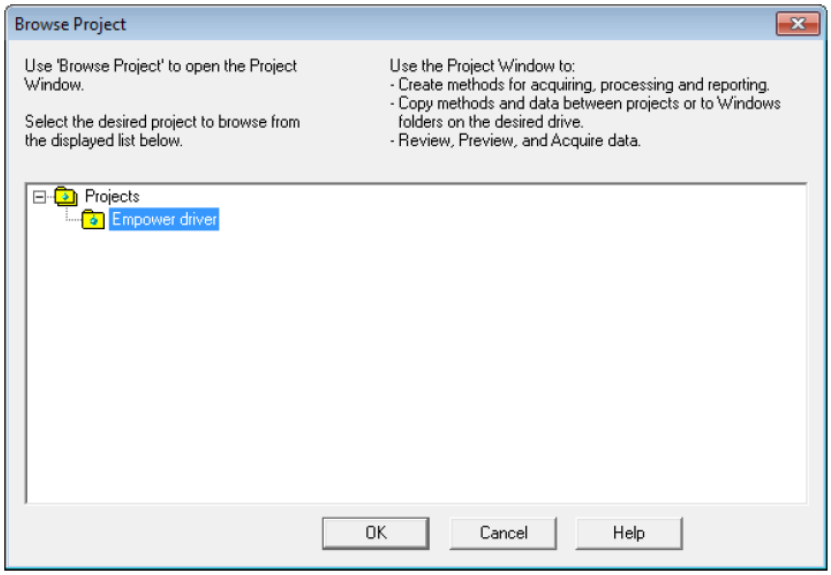
Create also a **method set Equilibration**. You can run this method set in the 1st line of each sample table.

13 Evaluating recorded data

1

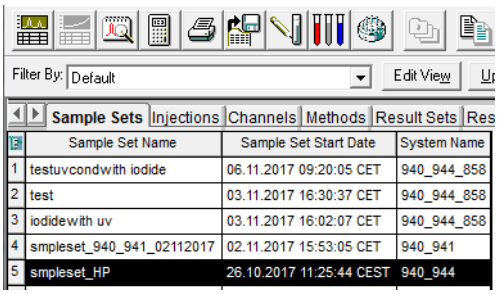
To review recorded data, go to **[Browse Project]** in the Empower® start window.

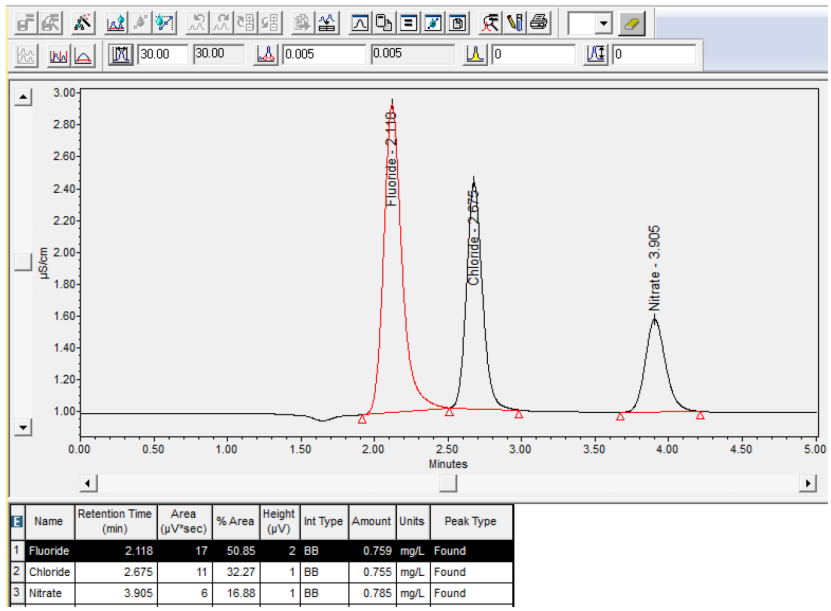
2



Select the desired project in the project tree and click on **[OK]**.

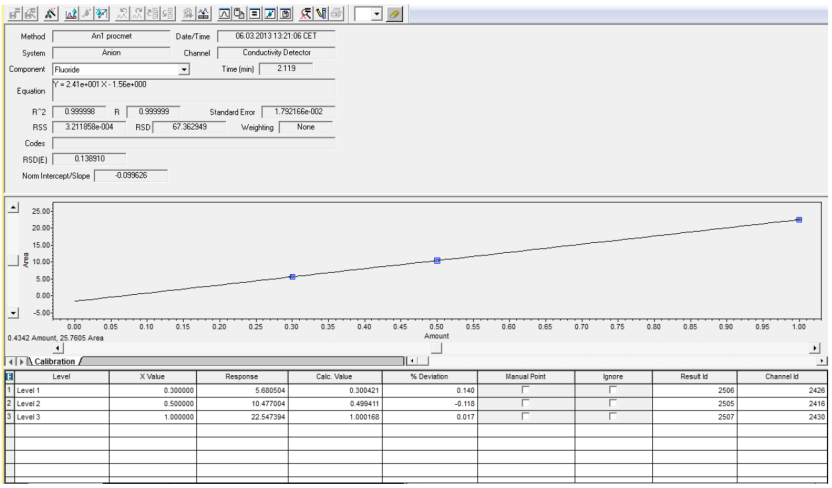
3





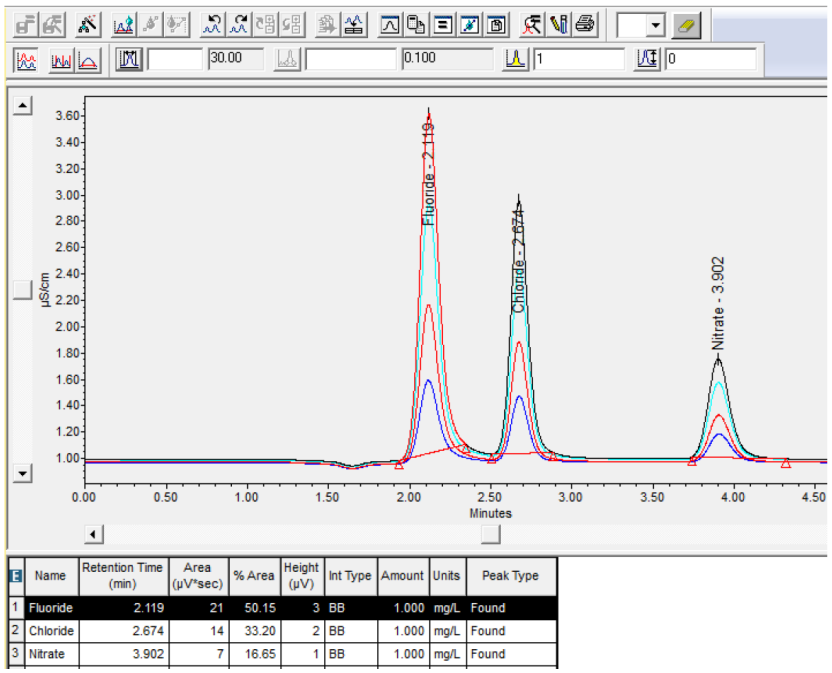
Right-click on the name of the **sample set** and choose **review**.

4



The  icon shows the calibration.

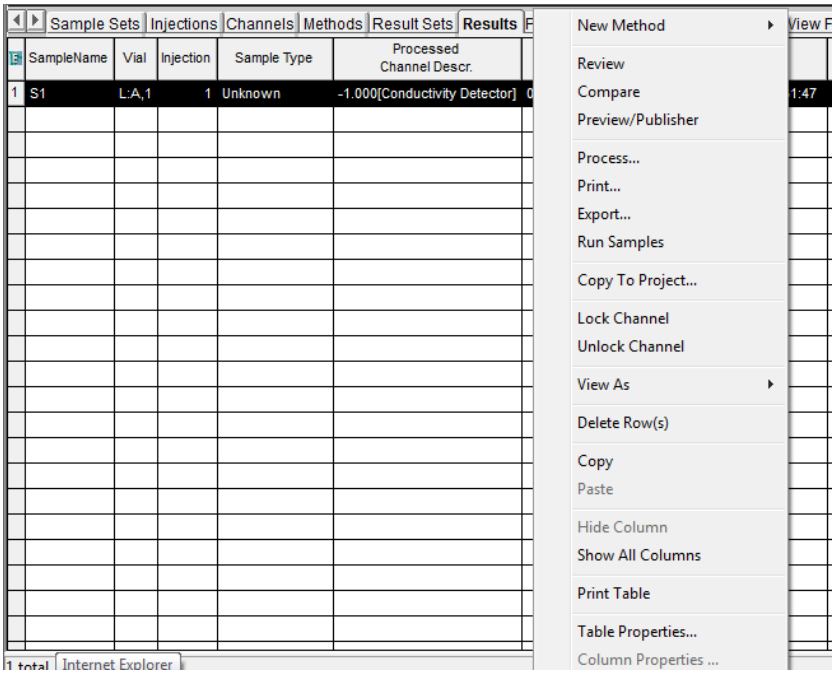
5



	Name	Retention Time (min)	Area (µV*sec)	% Area	Height (µV)	Int Type	Amount	Units	Peak Type
1	Fluoride	2.119	21	50.15	3	BB	1.000	mg/L	Found
2	Chloride	2.674	14	33.20	2	BB	1.000	mg/L	Found
3	Nitrate	3.902	7	16.65	1	BB	1.000	mg/L	Found

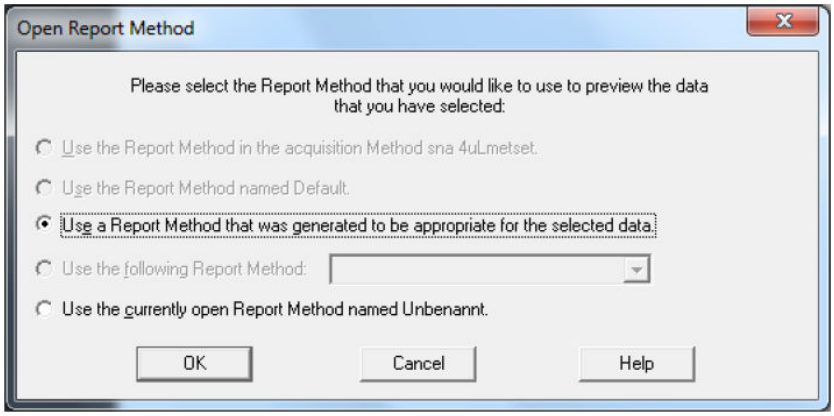
Load several results into the review by highlighting them and then opening the review window. Use the  icon to overlay curves.

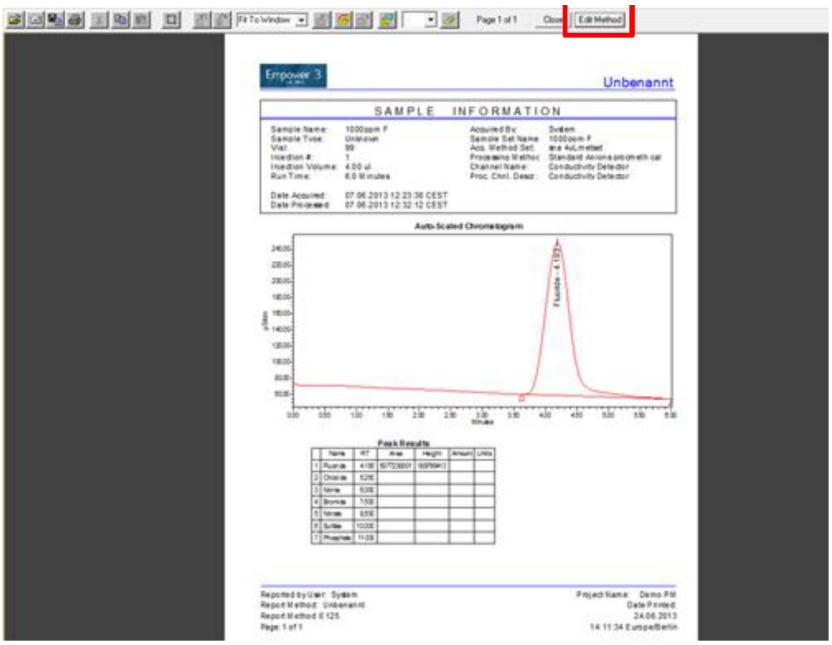
6



For a report, right-click on the desired sample and select **Preview/Publisher**.

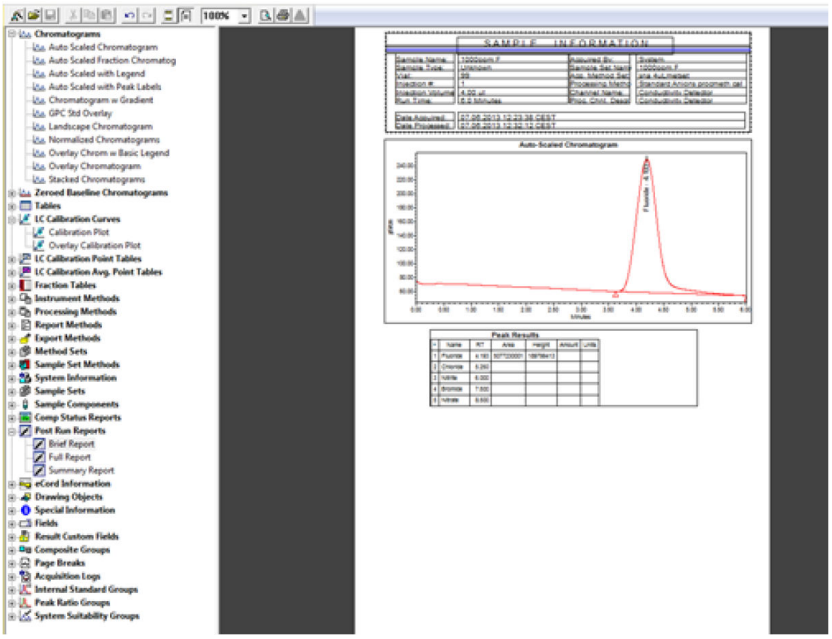
7





A selection window appears in which you can select an appropriate **Report Method**:

8



Modify the report as required by using the **Edit Method** button.

9 Apply the information directly to the report by double-clicking on the corresponding fields.

Example

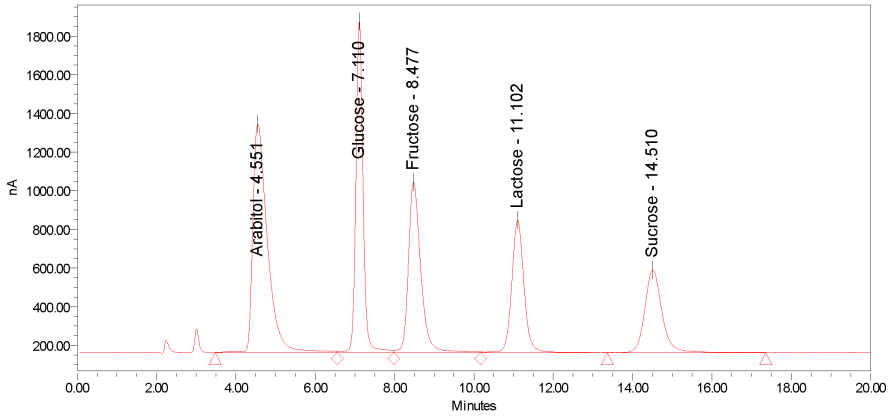
Empower 3 SOFTWARE

test post run

SAMPLE INFORMATION

Sample Name:		Acquired By:	System
Sample Type:	Unknown	Sample Set Name:	20150910R55_3channel_Dosino
Vial:	5	Acq. Method Set:	sugar_anion_cation_Dosino
Injection #:	1	Processing Method:	sugars
Injection Volume:	10.00 ul	Channel Name:	Amperometric Detector Current
Run Time:	20.0 Minutes	Proc. Chnl. Descr.:	Amperometric Detector Current
Date Acquired:	10.09.2015 20:33:27 CEST		
Date Processed:	10.09.2015 21:01:57 CEST		

Auto-Scaled Chromatogram



Peak Results

	Name	RT	Area	Height	Amount	Units
1	Arabitol	4.551	30449798800	1181569303		
2	Glucose	7.110	21338658969	1714166068		
3	Fructose	8.477	19057920018	881502361		
4	Lactose	11.102	14693041605	685646072		
5	Sucrose	14.510	12826958095	428109807		

Reported by User: System
Report Method: test post run
Report Method ID: 2200
Page: 1 of 4

Project Name: mk
Date Printed:
15.09.2015
15:40:27 Europe/Zurich

DHCP configuration

DHCP configuration Metrohm IC#IC=099101 SP=006465 UV=007111 EL=004127

IC System Information

IC name	Professional IC Vario TWO/SeS/PP
IC type	0940.2500
IC program version	5.940.0100
IC serial number	99101

IC Column(s)

Column 1 Type	Metrosep A Supp 4 - 250/4.0
Column 1 Serial Number	4160825059
Column 1 Order Number	6.1006.430
Column 1 Particle Size	9(µm)
Column 1 Length	250(mm)
Column 1 Inner Diameter	4(mm)
Column 2 Type	Metrosep A Supp 4 - 250/4.0
Column 2 Serial Number	4160825100
Column 2 Order Number	6.1006.430
Column 2 Particle Size	9(µm)
Column 2 Length	250(mm)
Column 2 Inner Diameter	4(mm)

IC Pump(s)

Pump 1 Type	Standard	Pump 2 Serial Number	19311
Pump 1 Serial Number	19319	Pump 2 Flow Range Min	0.01(mL/min)
Pump 1 Flow Range Min	0.01(mL/min)	Pump 2 Flow Range Max	5.00(mL/min)
Pump 1 Flow Range Max	5.00(mL/min)	Pump 2 Pressure Max	350(bar)
Pump 1 Pressure Max	350(bar)	Pump 2 Correction Factor	1
Pump 1 Correction Factor	1		
Pump 2 Type	Standard		

IC Conductivity Detector(s)

Conductivity Detector Serial Number	3217
Conductivity Detector Cell Constant	16.7(1/cm)
Conductivity Detector Thermostat	40(°C)

IC Amperometric Detector(s)

Amperometric Detector Serial Number	8530
Amperometric Detector Cell Type	Wall-Jet Cell

Sample Processor System Information

Sample Processor name	Professional IC Sample Processor
Sample Processor type	0858.0020

Reported by User: Katinka Ruth (kru1) — Project Name: R90
Report Method: Unbenannt — Date Printed: 12.03.2018
Report Method ID1 10 0 — 16:02:41 Europe/Berlin
Page: 1 of 2

Sample Processor program version	5.858.0012
Sample Processor serial number	6465

Sample Processor Rack Information

Sample Processor rack name	6.2041.760
Sample Processor rack code	1101
Sample Processor number of positions	55

Eluent PM System Information

Eluent PM name	Eluent Production Module
Eluent PM type	0941.0010
Eluent PM program version	5.846.0022
Eluent PM serial number	4127

UV/VIS Detector System Information

UV Lamp Operating Hours	784(h)
VIS Lamp Operating Hours	785(h)
Integration Duration	14(ms)
Intensity Level	6
Measuring Duration	994(ms)

Among many other things, the report can contain the chromatogram, the calibration curve, instrument parameters (e.g. information on the column and the cell used) as well as the time program.

NOTE

For more detailed information on reprocessing and reporting, refer to Empower® manuals from Waters.

14 Numbering of the modules

The numbering of each module is depending on its position in the daisy chain. The daisy chain defines how multiple modules are wired together in sequence.

- For the **IC instrument** this means: The upper module always gets the number 1, the lower module number 2 (for pumps and injectors).
- For the **extension modules** this means: Only 1 extension module can be connected directly to the IC instrument. The 2nd extension module has to be connected to the 1st. The 3rd extension module has to be connected to the 2nd. The numbering of the modules begins with the IC instrument and continues with the extension modules according to their position in the daisy chain.

NOTE

The numbering is fix. You cannot change it manually.

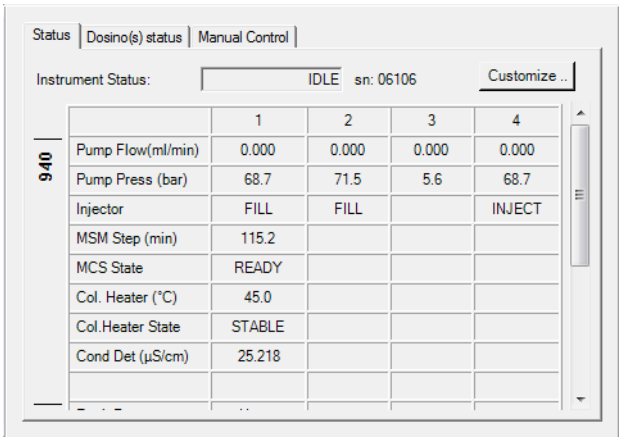
The following illustrations show the numbering of the modules for different system configurations.

In the status panel, all modules with the same number are listed in 1 column.

Extension modules are connected to the IC instrument.

Example

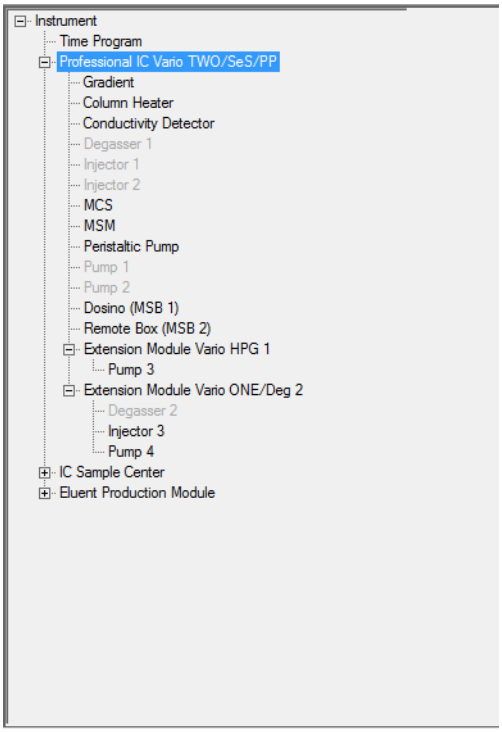
The following status panel shows an instrument configuration with a dual channel IC Instrument and 2 extension modules.



Columns 1 and 2 show the state of the IC instrument.

Column 3 shows the state of the 1st extension module.

Column 4 shows the state of the 2nd extension module.



The instrument method editor shows the modules in a tree structure.

NOTE

The numbering of the modules in the instrument editor does not equal the numbering in the status panel.

In the instrument method editor, the existing modules are counted.

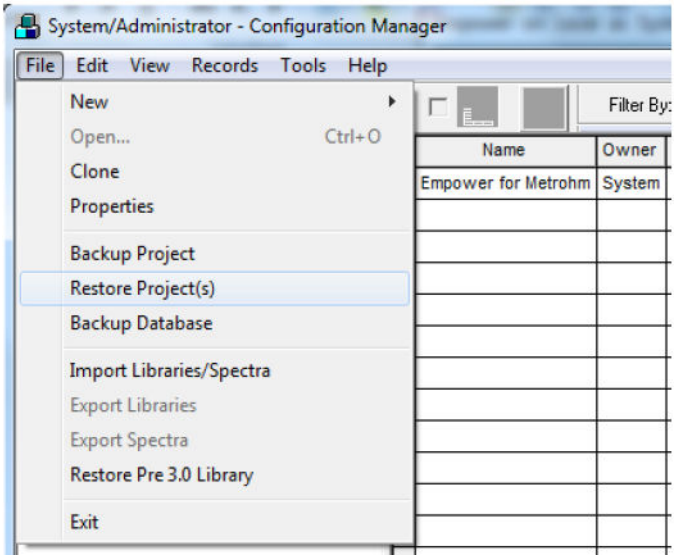
Example: The extension module 2 is on position 4 in the daisy chain and in the status panel. The injector of the extension module 2 is labeled with number 3 (not 4 as the extension module itself). The reason for this is that the injector of extension module 2 is the 3rd injector in the system. Extension module 1 does not contain an injector. You can see this in the status panel.

15 Importing example methods

1

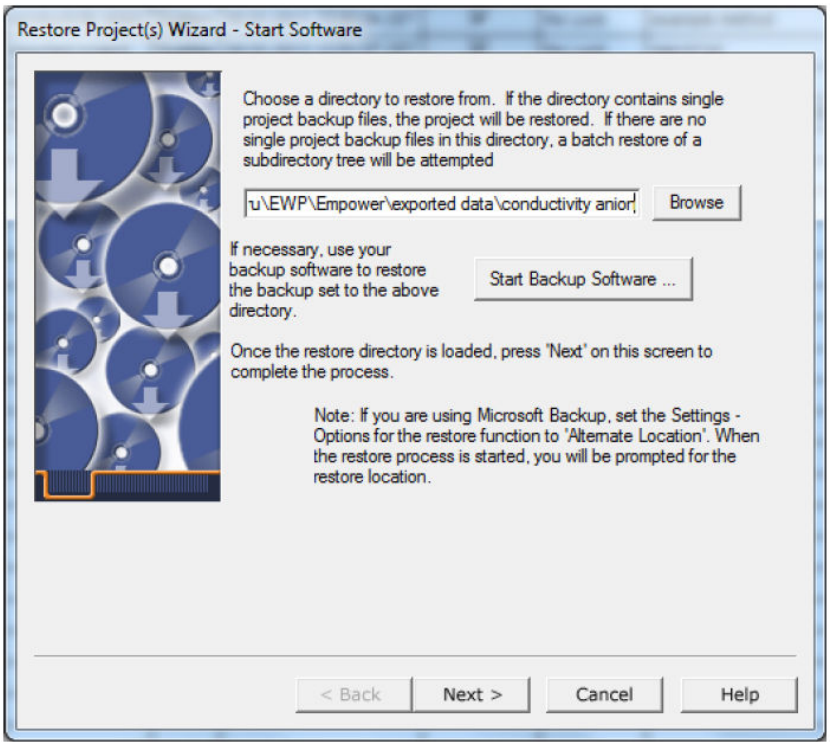
Go to **[Configure the System]** in the Empower® start window.

2



Go to **File** ▸ **Restore Project(s)** or click on the **[Restore Project(s)]** button.

3



[Browse] to find the desired project.

4 Click on **[Next]** until finished.

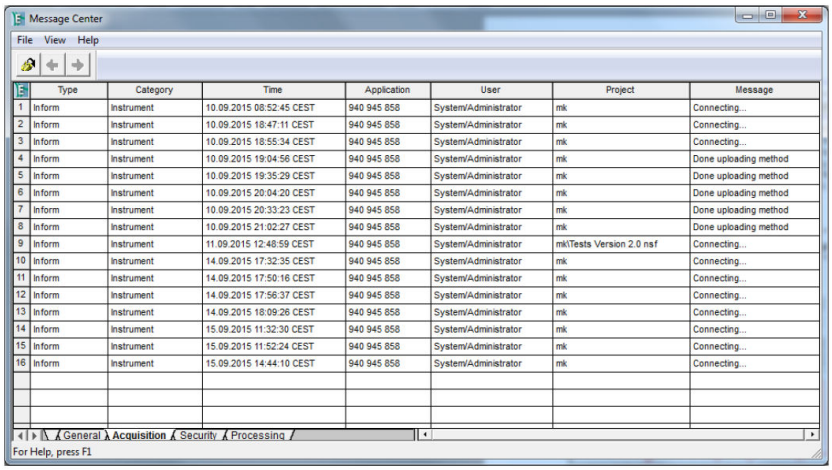
The imported project does not only contain exemplary chromatograms, but also all instrument methods and processing methods that were used to record them.

16 Troubleshooting

Message Center

1 Double-clicking on the **E** in the task bar opens the Message Center, in which error messages are documented.

2



A list of all current messages appears (example list).

Stopping the process

If a system failure occurs or if the connection is lost, proceed as follows to restart Empower® :

1 Close Empower®.

2 Power down all Metrohm instruments.

3 Power down and restart the PC.

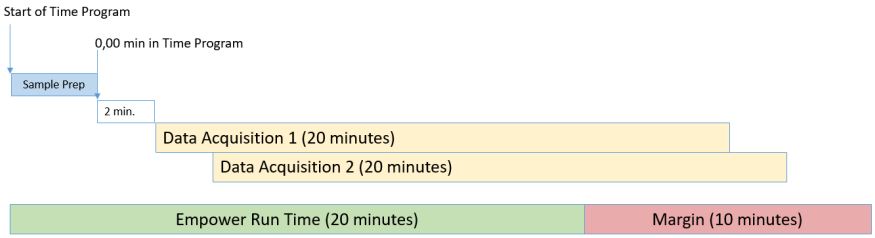
4 Power up all Metrohm instruments.

5 Restart Empower® by clicking on the corresponding icon on the desktop.

6 Open **Run Samples**.

17 Restrictions

- 1 DHCP Configuration may maximally include the following modules:
  - 1 Sample changer (889 Sample Center or 858 Sample Processor)
  - 1 Professional Detector Vario
  - 1 Professional UV/VIS Detector
  - 1 Eluent production module
  - The number of MSB instruments (e.g. dosinos) depends on the number of available ports (according to the system configuration).
  - 1 IC instrument
- The total run time must not exceed the Empower run time plus 10 minutes. Therefore, the last data acquisition has to start within 10 minutes from the beginning of the run time. The last data acquisition has to end within 10 minutes after the end of the run time. Otherwise the whole run will abort. Sample preparation is part of the total run time. Therefore, the following steps must not take more than 10 minutes in total.
  - Sample preparation
  - Lags between sample preparation and data acquisition
  - Lags between several data acquisitions
  - Gradient profile data acquisition



- If an instrument is busy for more than 10 minutes after the end of data acquisition, an instrument error occurs. In some cases it is necessary to run the instrument for more than 10 minutes after recording the needed data. To avoid the error, leave data acquisition on until the end of the time program.
- Metrohm IC instruments do not support the following Empower sample options. If selected, they generate an error.
  - Inject immediate standards
  - Inject immediate samples
  - Condition column

- Do not edit a method, if the following conditions are fulfilled.
  - Use of 940 instrument with an internal conductivity detector.
  - New method with an internal amperometric detector.

  If you edit the method, the amperometric detector is not shown in the status panel. Therefore, it is not possible to control the amperometric detector.
- If logging is turned on, it is necessary to exclude the folder **C:\Temp \Metrohm\Log** from the scans of the antimalware software.
- Powercycle the system monthly to avoid an instrument failure due to an overflow of the data counter.
- You can only use an already existing instrument method with the same system configuration the instrument method has been created with.
- Only switch between 2 instrument methods, when you use the same instruments in both methods.
  When you use different instruments in 2 methods, stop the system between the 2 methods.
- It is necessary to check manually if the driver reads all connected instruments correctly in a new system or after a restart.
- A script error occurs irregularly in the **Run Samples** section of dual systems. Close and restart **Run Samples** when the error occurs.

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