

Metrohm IC Driver 2.2 for Empower™



6.6070.220

Tutorial

8.0102.8009EN / 2025-10-06



Metrohm AG
CH-9100 Herisau
Switzerland
+41 71 353 85 85
info@metrohm.com
www.metrohm.com

Metrohm IC Driver 2.2 for Empower™

6.6070.220

2.2

Tutorial

Technical Communication
Metrohm AG
CH-9100 Herisau

This documentation is protected by copyright. All rights reserved.

This documentation is an original document.

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.

Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g. conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

Neither Waters Technologies Corporation nor any of its affiliates makes any warranties, either express or implied, regarding the enclosed, including merchantability or fitness for a particular purpose. The exclusion of implied warranties is not permitted by some states. The above exclusion may not apply to you. There may be other rights that you may have which vary from state to state. Waters Technologies Corporation and its affiliates exclude any warranty coverage for incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Table of contents

1	Overview	1
2	Preconditions	2
3	Starting Empower™	3
3.1	Configuring the system	5
3.2	Removing an instrument	13
4	Setting up a chromatographic system	16
5	Creating a project	24
6	Status panel	28
6.1	Viewing the Status panel	28
6.2	Initialization states	29
6.3	Customizing the Status panel	30
7	Creating an instrument method	32
8	Adjusting the instruments	35
8.1	General	35
8.1.1	Status panel and manual control	35
8.1.2	Instrument parameters	35
8.1.3	Time program	36
8.2	IC instrument	38
8.2.1	Status panel and manual control	38
8.2.2	Instrument parameters	40
8.2.3	Time program	44
8.3	Conductivity detector	46
8.3.1	Manual control	46
8.3.2	Instrument parameters	46
8.3.3	Time program	47
8.4	Eluent Production Module	47
8.4.1	Level sensor modes	47
8.4.2	Manual control	48
8.4.3	Instrument parameters	48
8.5	Dosino	51
8.5.1	Status panel	51
8.5.2	Manual control	52
8.5.3	Instrument parameters	55
8.5.4	Time program	57



17 Importing example methods	133
18 Troubleshooting	135
19 Restrictions	141
Index	143

1 Overview

Metrohm IC Driver for Empower™ is a software driver for integrating Metrohm IC instruments in Empower™ 3 FR3 or higher.

For Empower™ you can select between different interfaces:

- QuickStart Interface
- Pro Interface
- Walk-up Interface

The focus of this tutorial is on the Pro Interface.

2 Preconditions

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

- The software 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 (*Metrohm IC Driver 2.2 for Empower™ Installation 8.0102.8011EN*).

3 Starting Empower™

Starting Empower™

- 1 Connect the Metrohm instruments via USB to the computer.
Connect the Metrohm instruments to the power supply unit.
- 2 Switch the computer 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 18, page 135.*

- 5 Enter your Empower™ user name and password.
Click on **[OK]**.

 A screenshot of the 'Login' dialog box in the Empower software. The dialog has a title bar with 'Login' and a close button. On the left is a small version of the Empower logo. The main area contains three input fields: 'User Name:', 'Password:', and 'Database:'. The 'Database' dropdown menu is currently set to 'MET_EMPOWER'. Below the fields, there is a note: 'Enter User Name and Password to gain access to the database.' and a larger note: 'NOTE: Pressing 'OK' will log the user in with their default user type and user interface. Pressing 'Advanced' allows the user to select from their allowed user types and user interfaces.' At the bottom, there are four buttons: 'OK', 'Cancel', 'Advanced >>', and 'Help'.


The following window appears:




NOTE

If you have a client/server installation, select your database.

Empower™ consists of 3 program parts:

- Configure the System 
 - *Setting up a chromatographic system*
 - *Creating a project*
 - *Importing example methods*

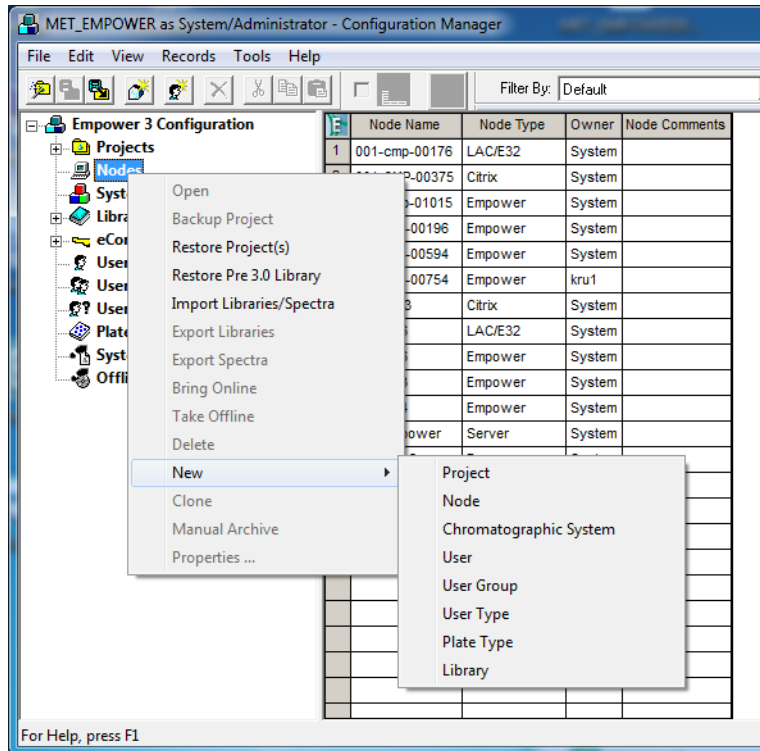
- Run Samples 
 - Carry out the following actions in this program part:
 - *Creating an instrument method*
 - *Adjusting the instruments*
 - *Creating an offline method*
 - *Creating a processing method*
 - *Forming a method set*
 - *Running samples*
 - *Measuring cations*
 - *Equilibrating the system*
- Browse Projects
 - Carry out the following actions in this program part:
 - *Evaluating recorded data*

3.1 Configuring the system

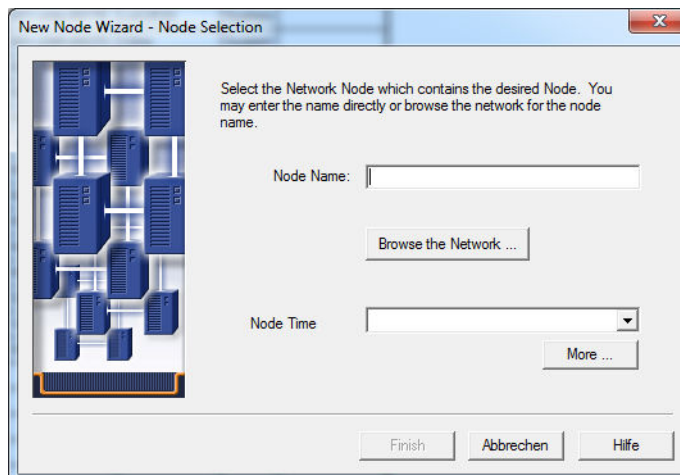
Creating a node

Usually the required node already exists. If the node does not exist, create a new node.

- 1 Go to **Nodes** in the configuration manager.
- 2 To create a new node (i.e. where your instruments are connected to the computer), right-click on the table. Click on **New ► Node**.




- 3 Enter the name of the node.
select your time zone.
Click on **[Finish]**.



Configuring DHCP

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

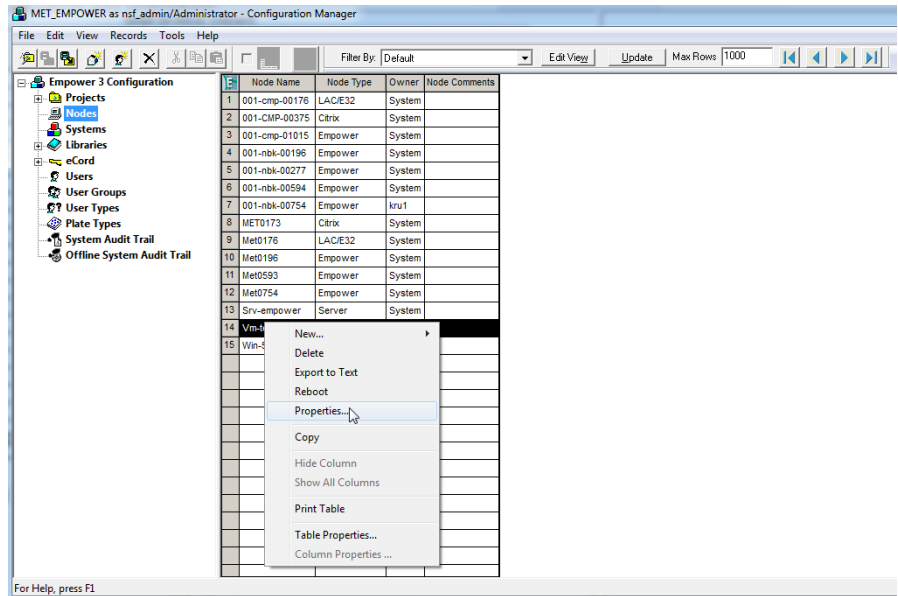


The configuration manager opens. Its icon appears and flashes in the lower task bar of your screen. 

2 Go to **Nodes**.

Select a node. Right-click on the respective node. Open the **Properties** menu item of the connected instrument.

3.1 Configuring the system



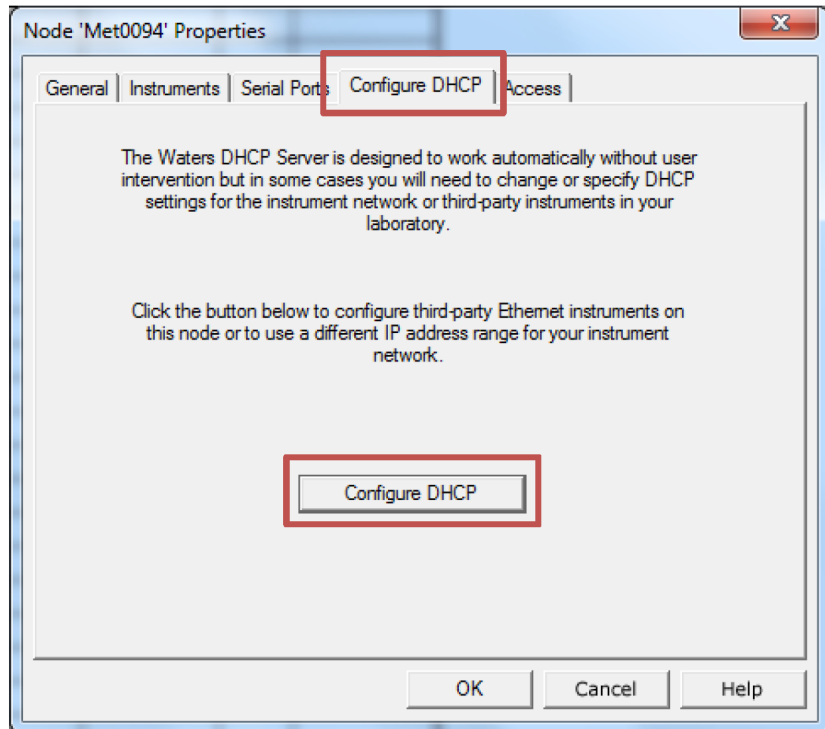
The connection to the node is established.



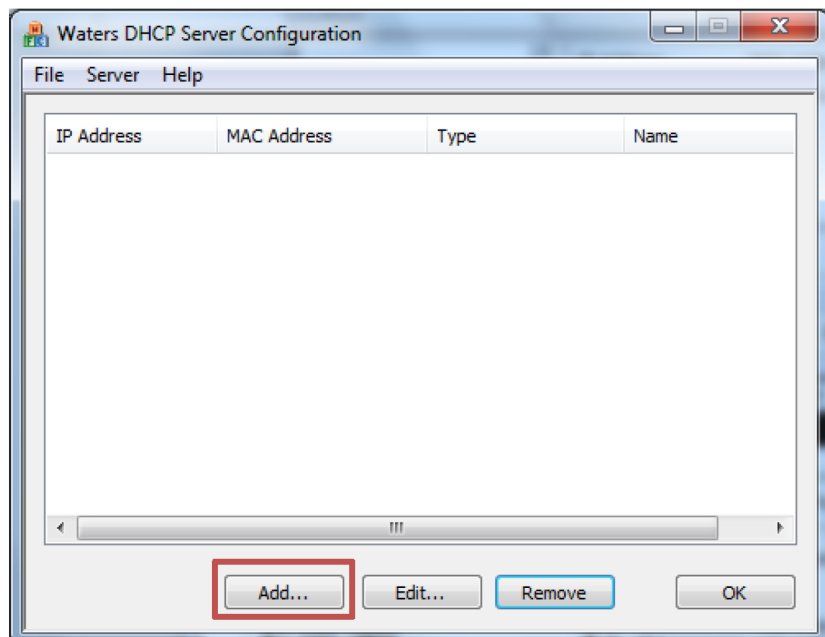
NOTE

If the node does not exist yet, create a new node (see "Creating a node", page 5).

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



- 4 Click on **[Add...]**.



- 5 Enter the following parameters:



NOTE

If several systems are added, the **IP address** and the **MAC address** have to differ.
Switch on all systems that are configured on the DHCP Server.

Table 1 DHCP server configuration

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 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**:

For the **947 UV/VIS Detector**, the serial number is the last **12** characters (including leading 0s) printed on the serial number sticker on the back of the instrument.

For **all other instruments**, the serial number is the last **6** characters (including leading 0s) printed on the serial number sticker on the back of the instrument.



NOTE

You cannot find the serial number of the IC Sample Center on the instrument. If you need to know the number of your IC Sample Center, contact your regional Metrohm service representative.

Prefix the serial numbers with the following abbreviations:

Table 2 Prefixes of serial numbers

Instrument	Prefix
IC instrument, e.g. 940, 930	IC=

Instrument	Prefix
Professional IC Sample Processor, e.g. 858, 919	SP=
IC Sample Center, e.g. 889	SC=
Professional Detector Vario (stand-alone), e.g. 945	DT=
Professional UV/VIS Detector, e.g. 944, 947	UV=
Eluent Production Module, e.g. 941	EL=

**NOTE**

Extension modules (2.942.XXX0) and MSB instruments (e.g. Dosi-nos) are recognized automatically. You do not have to configure extension modules and MSB instruments.

If you use multiple instruments, combine them. *See chapter 19, page 141* for possible combinations and limitations. In this case, separate the serial numbers by a space. The order of the different modules is freely selectable.

Table 3 Serial numbers – Examples

Instrument	Serial number
IC only	IC=003127
SP only	SP=003534
SC only	SC=100062
DT only	DT=004101
UV 944 only	UV=021101
UV 947 only	UV=001000174040
Combination	IC=003127 SC=100062 DT=004101 UV=001536 EL=100897

Example:

Add IP Address

IP Address: 000 . 000 . 000 . 001

MAC Address: 00 - 00 - 00 - 00 - 00 - 01

Instrument Type: Metrohm IC

Serial Number/
Unique Name: IC=003127 SC=100062 DT=(

OK Cancel

6 Enter the values.

Click on **[OK]**.

7 In the appearing window, click on **[OK]**.

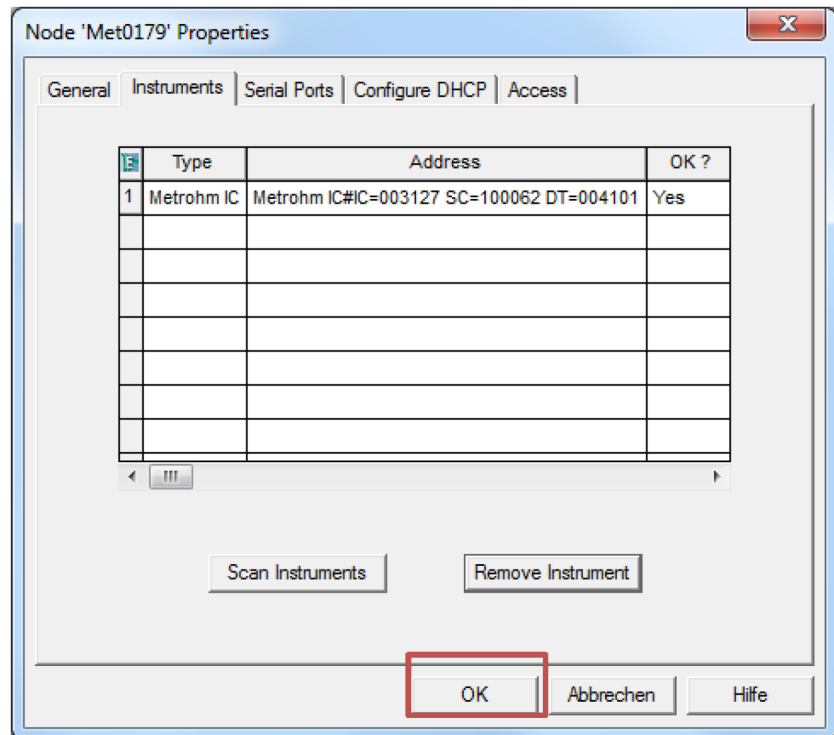
Waters DHCP Server Configuration

File Server Help

IP Address	MAC Address	Type	Name
0.0.0.1	00-00-00-00-00-01	Metrohm IC	IC=003127 SC=100

Add... Edit... Remove OK

8 In the appearing window, click on **[OK]**.

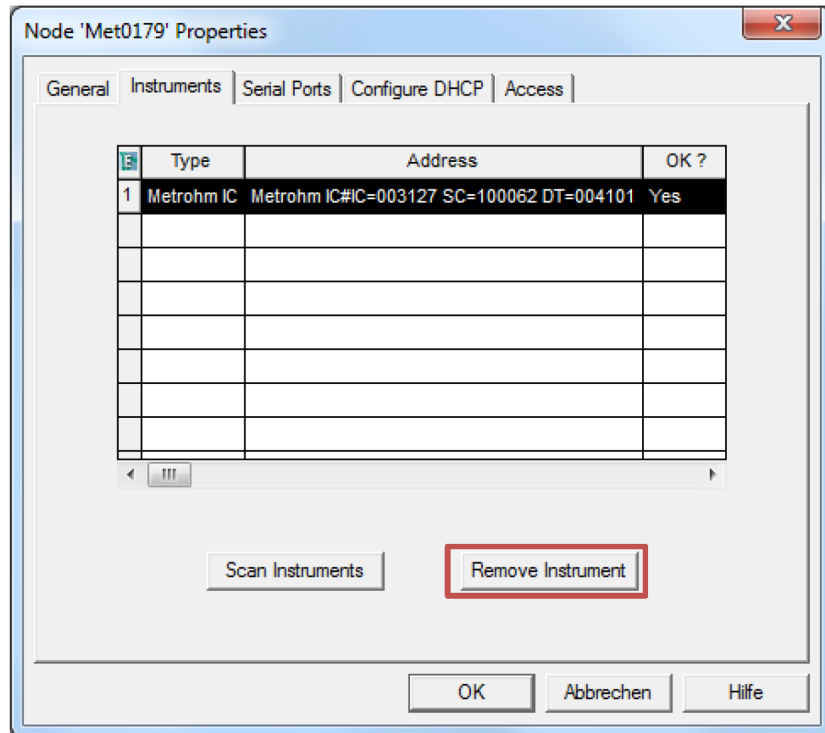
**NOTE**

Configure all modules that you need for your determination. You cannot add modules to an existing system.

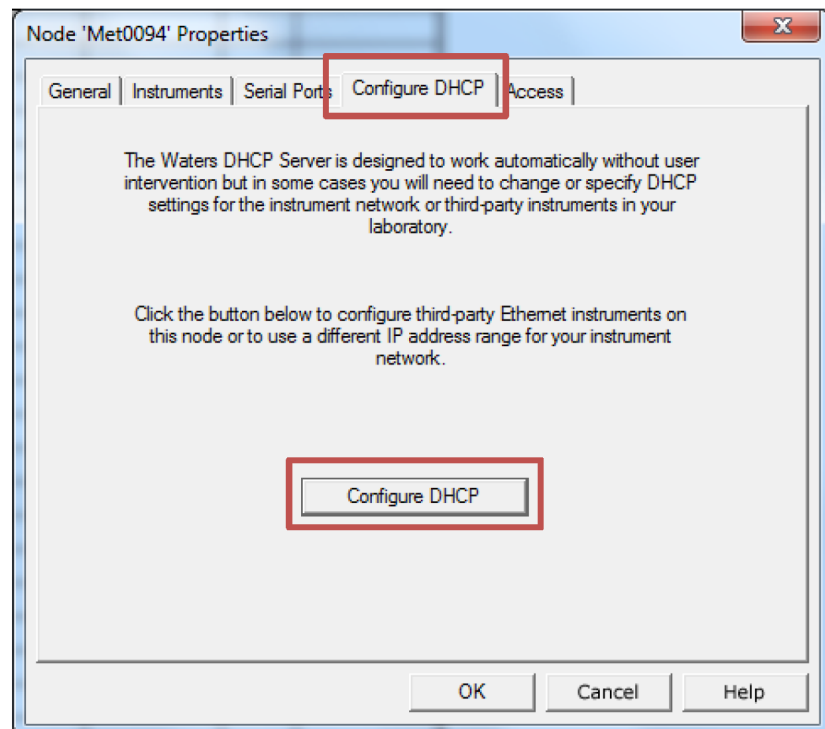
3.2 Removing an instrument

- 1 To remove an unused instrument, click on the number of the corresponding row.

Click on **[Remove Instrument]**.

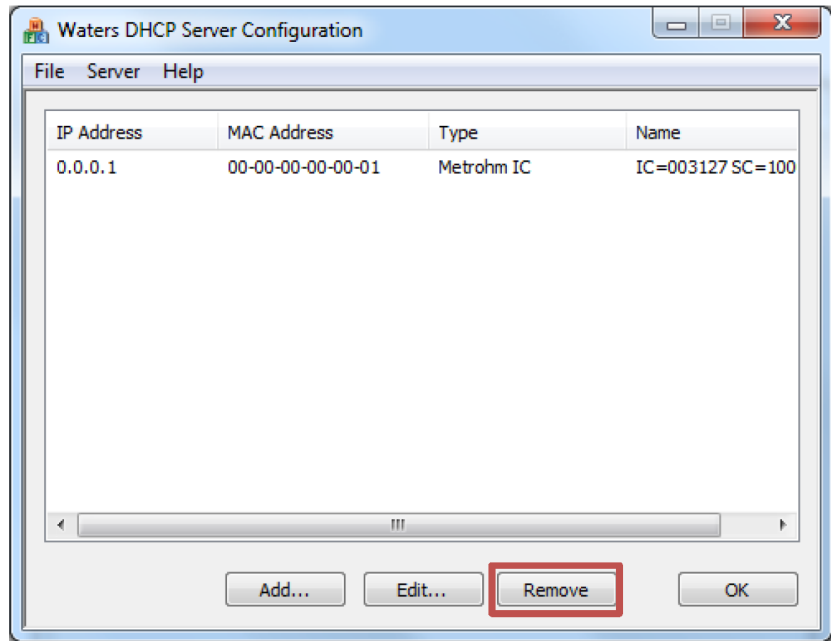


- 2 Click on **[Configure DHCP]** on the **Configure DHCP** tab.



- 3 Select the instrument you want to remove.

Click **[Remove]**.

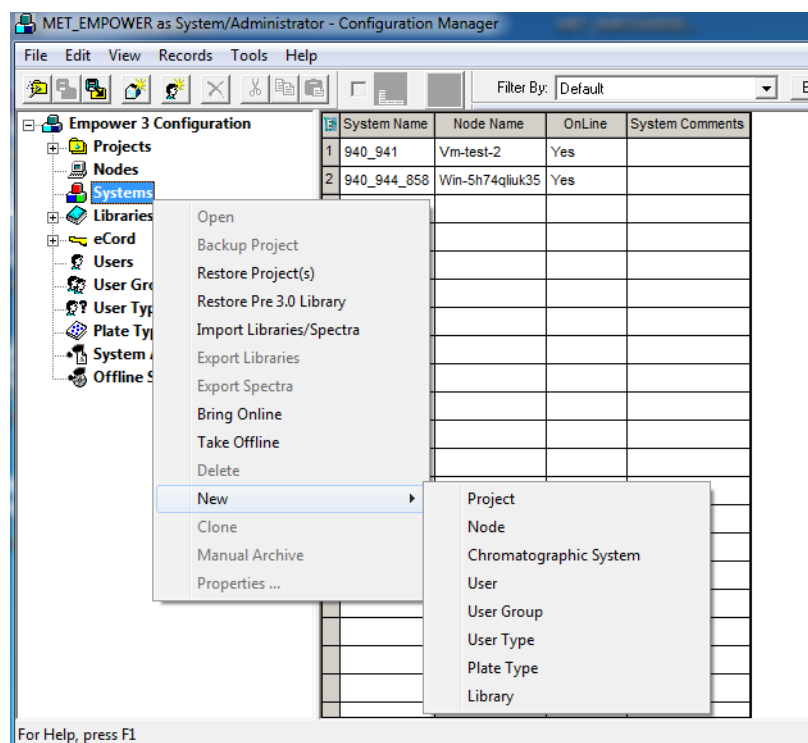


4 Restart the computer.

4 Setting up a chromatographic system

1 Go to **Systems**.

To create a new system, select the menu item **New ► Chromatographic System**.



2 Select **Create New System**.

Click on **[Next]**.

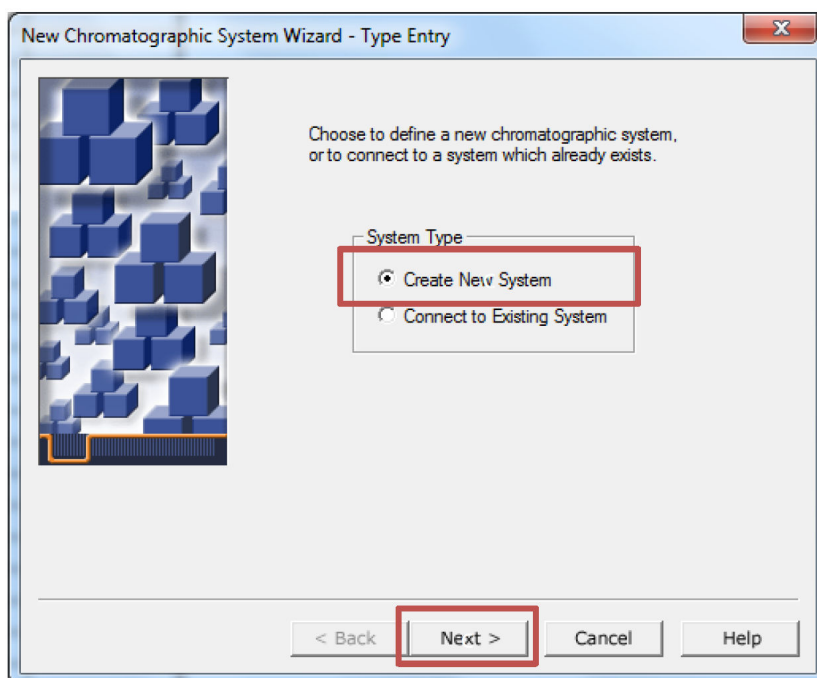


Table 4 System Type – Detailed explanations

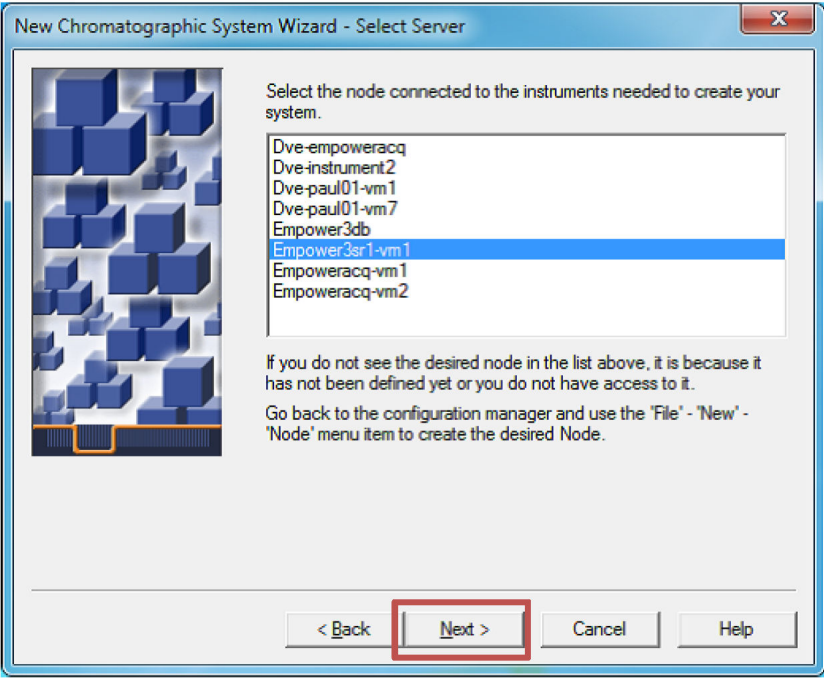
Field	Explanation
Create New System	You create a new chromatographic system by using available instruments connected to an acquisition server. It is not necessary that the system is directly connected to your Empower™ workstation.
Connect to Existing System	You can access the selected chromatographic 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 In the appearing window, click on **[Next]**.

4 In a client/server system, select the acquisition server.

Select a **node** on which the **Metrohm IC Driver for Empower™** was installed.

Click on **[Next]**.



5 Select an instrument from the **Available Instruments** list.

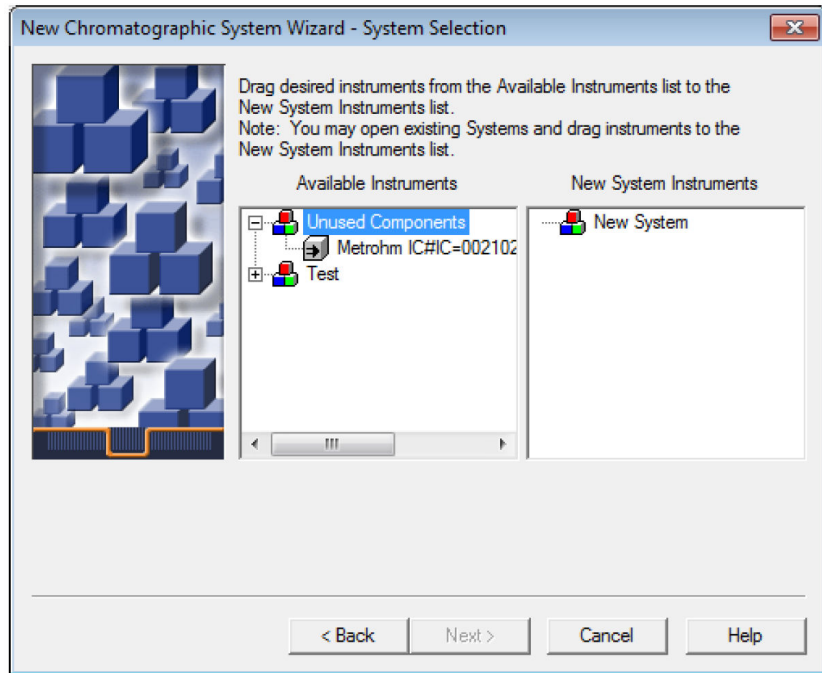
Drag the instrument to the list beneath **New System Instruments**.

You can use instruments from the **Unused Components** and an existing system. If the instrument is not in the **Available Instruments** list, click on **[Cancel]** and check the properties of the **acquisition server**.

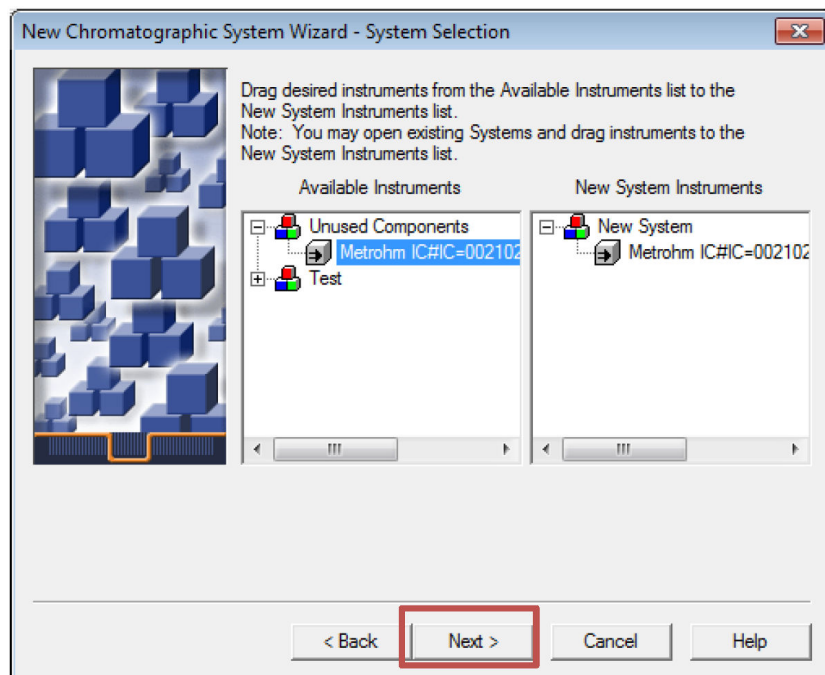


NOTE

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

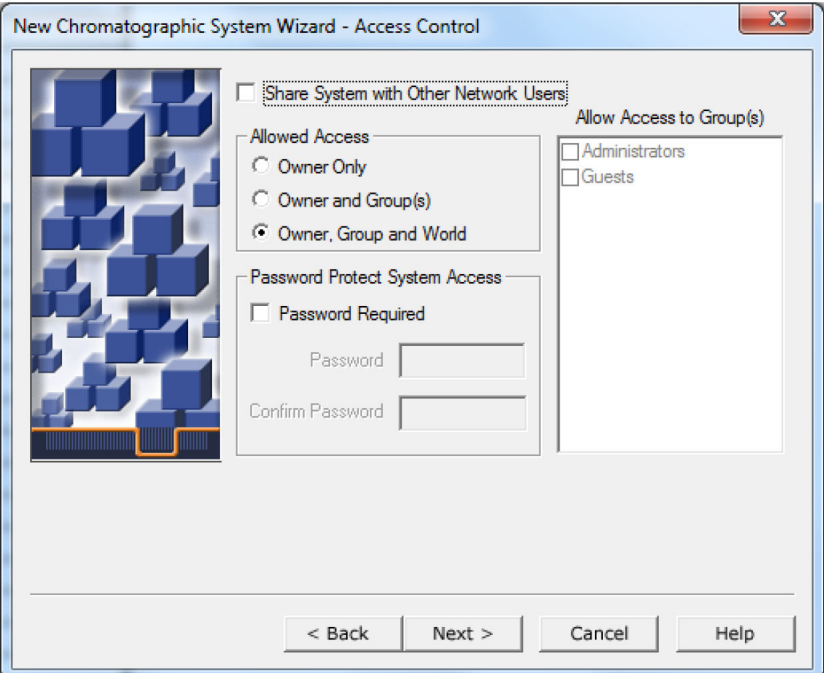


Click on **[Next]**.



- 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 5 Share System with Other Network Users

Field	Explanation
Share System with Other Network Users	Other network users (determined by the access option you select (see table 6, page 20)) can use the system. If you select this option, consider password-protecting the system to limit its use to authorized users.

Table 6 Allowed Access

Field	Explanation
Owner Only	The owner of the chromatographic system and users with administrator rights can access the selected chromatographic system.

Field	Explanation
Owner and Group(s)	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. Notice: To modify a chromatographic system, you need access to the chromatographic system and its acquisition server .
Owner, Group and World	All users in the database can operate the selected chromatographic system.

Table 7 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 8 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.

Click on **[Finish]** to complete the setup of the new chromatographic system.

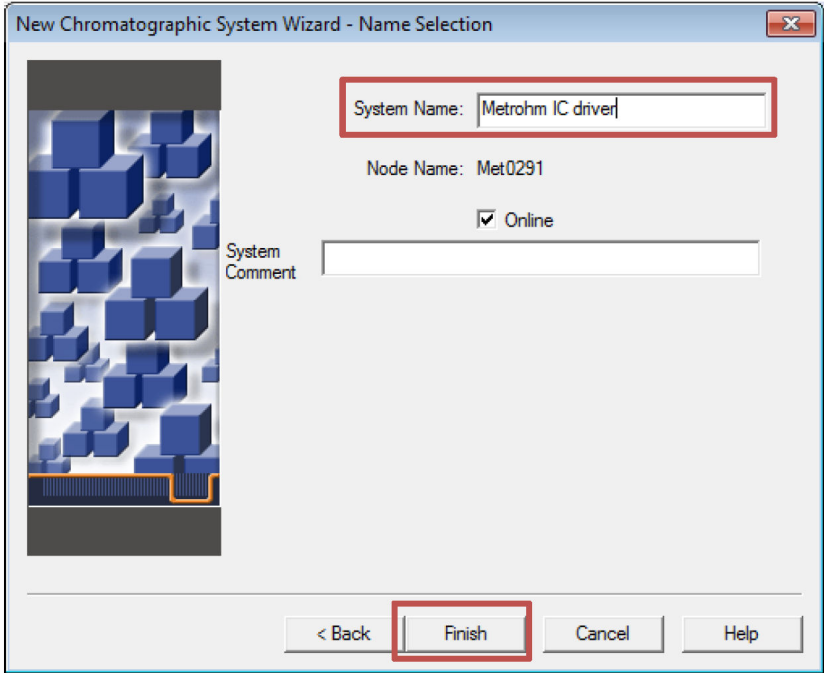


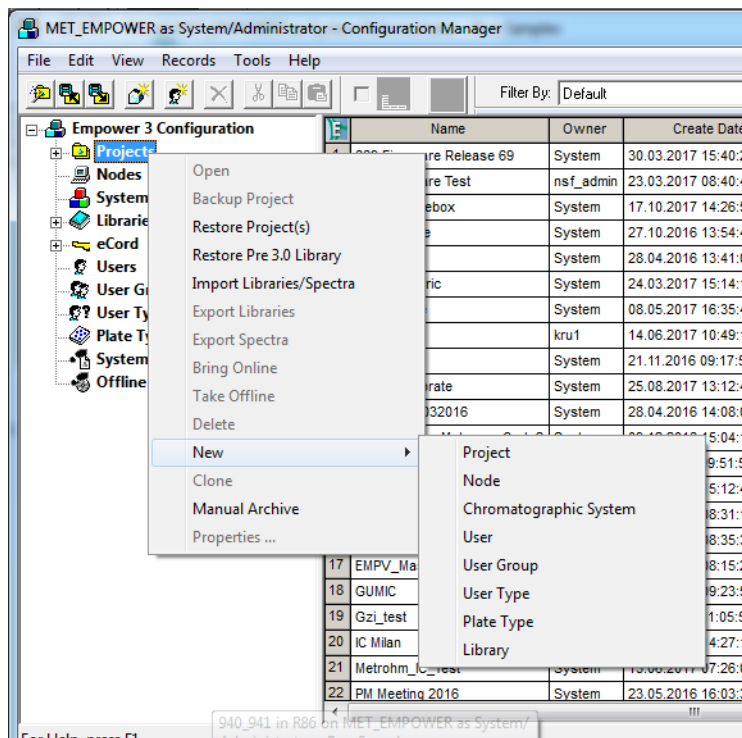
Table 9 Detailed explanations

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.

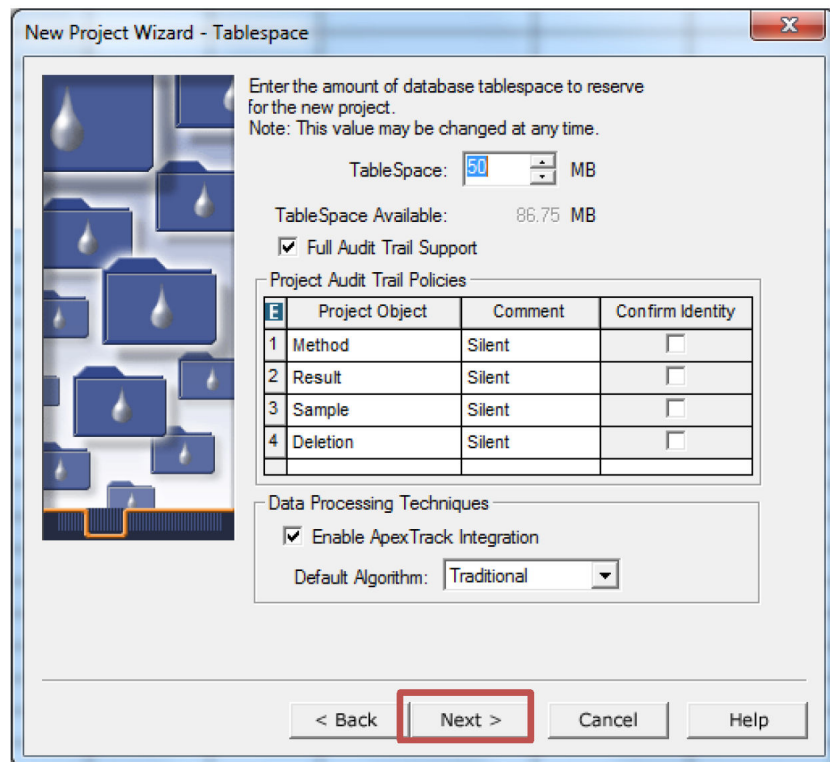
Close the wizard.

5 Creating a project

- 1 Select the menu item **New ► Project**.



- 2 The **Tablespace** window appears.
Click on **[Next]**.



New Project Wizard - Tablespace

Enter the amount of database tablespace to reserve for the new project.
Note: This value may be changed at any time.

TableSpace: 50 MB

TableSpace Available: 86.75 MB

Full Audit Trail Support

Project Audit Trail Policies

	Project Object	Comment	Confirm Identity
1	Method	Silent	<input type="checkbox"/>
2	Result	Silent	<input type="checkbox"/>
3	Sample	Silent	<input type="checkbox"/>
4	Deletion	Silent	<input type="checkbox"/>

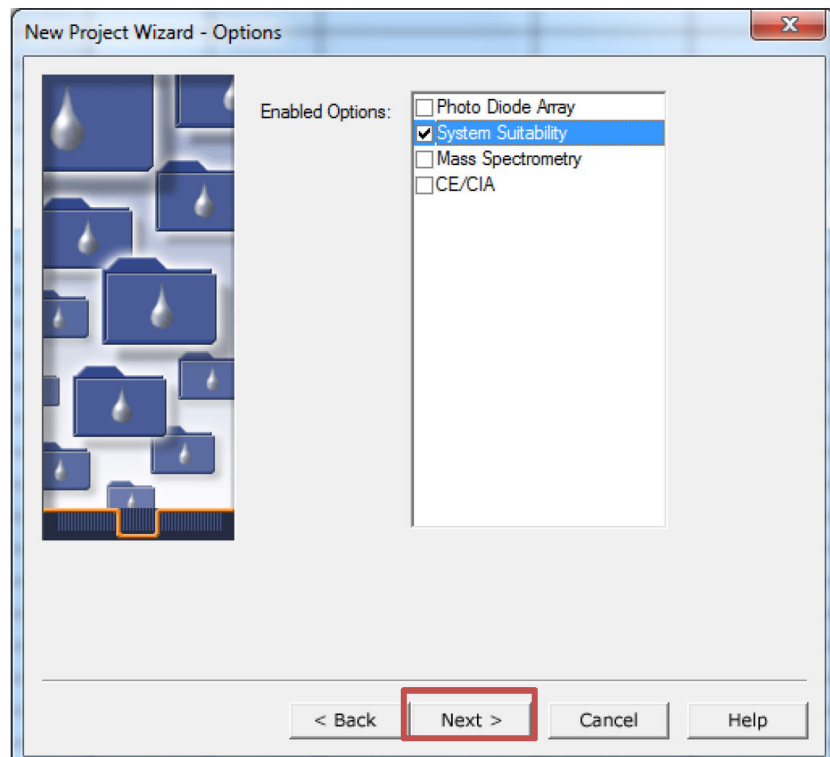
Data Processing Techniques

Enable ApexTrack Integration

Default Algorithm: Traditional

< Back Next > Cancel Help

3 Click on **[Next]**.



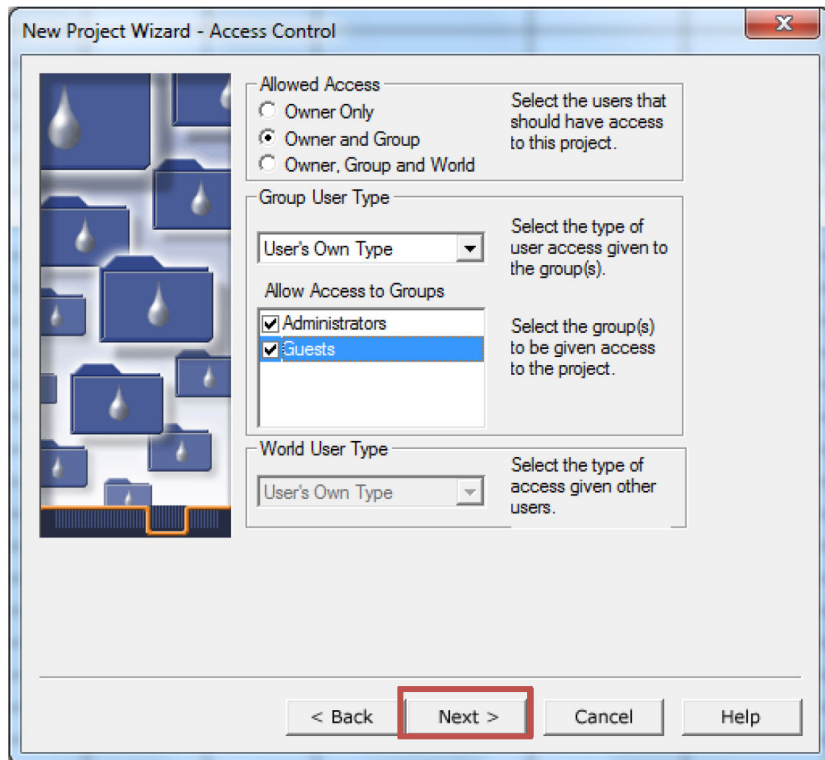
New Project Wizard - Options

Enabled Options:

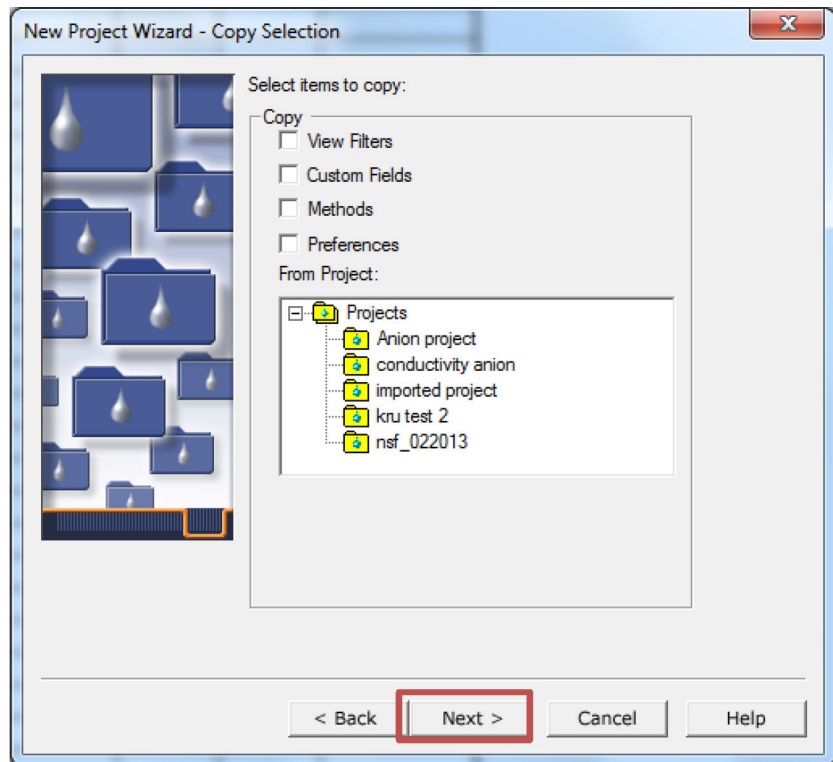
- Photo Diode Array
- System Suitability
- Mass Spectrometry
- CE/CIA

< Back Next > Cancel Help

- 4 Click on **[Next]**.

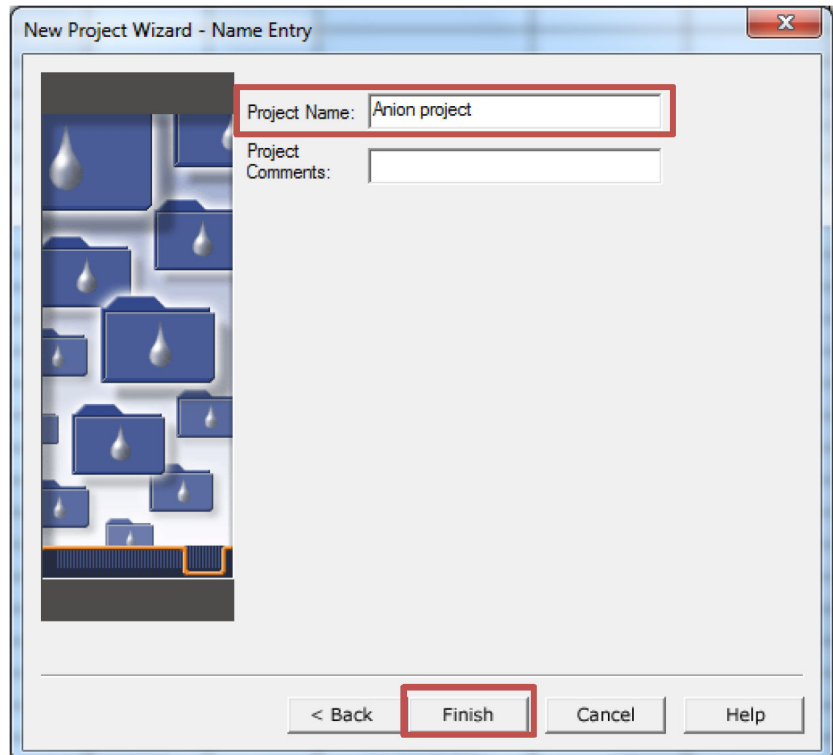


- 5 In the Projects tree view, select an appropriate project for already existing settings.
Click on **[Next]**.



6 Enter a **Project Name**.

Click on **[Finish]**.



6 Status panel


The **Status** panel displays the current instrument status of all connected instruments and their components.

6.1 Viewing the Status panel

- 1 In the Empower™ start window, go to **[Run Samples]**.



- 2 Select your chromatographic system and the desired project. For further information, refer to *page 32*.

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

The **Status** panel is located in the lower left part of the **Run Samples** window.

6.2 Initialization states



NOTE

While the Metrohm IC Driver for Empower™ is establishing instrument connection, the instrument status is moving back and forth. Wait until the instrument status is stable (**IDLE**) before you carry out any other actions. If you click somewhere during connection, the window might freeze.

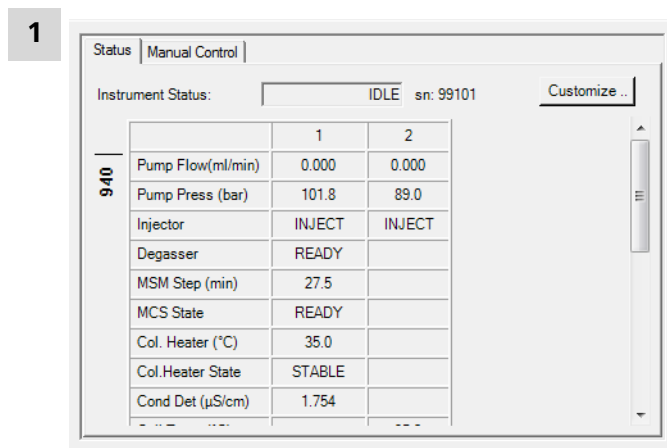
The following instrument status exist:

- **Resetting {instrument name} to defaults.**
The modules of the instrument are set to the default values. The default values are the values that appear in the **Manual Control** tab after initializing the system.
- **Failed to reset {instrument name} to defaults.**
Powercycle (see "Powercycling the system ", page 138) the instrument and try again to establish a connection. If powercycling the instrument does not help, contact your regional Metrohm service representative.
- **Initializing {instrument name}.**
The rack, the lift and, if present, the robotic arm of the sample changer are reset. The rack code is read out and the respective rack data is transferred to the sample changer.
- **Failed to initialize {instrument name}.**
Powercycle (see "Powercycling the system ", page 138) the instrument and try again to establish a connection. If powercycling the instrument does not help, contact your regional Metrohm service representative.
- **Creating instrument inventory.**
The Metrohm IC Driver for Empower™ creates a list with all modules (e.g. extension modules, dosing units, pumps, suppressors) that are part of the connected instrument.
- **Connecting: remaining: {Serial number}**
The Metrohm IC Driver for Empower™ is establishing connection to the instrument.
Example: Connecting: remaining: EL=002118

- **Failed to connect to {instrument name}.**
 For the Professional IC Sample Processor a timeout after 180 seconds is integrated.
 For the IC Sample Center, a timeout after 30 seconds is integrated.
 This state occurs if connection could not be established after 180, respectively 30 seconds.
 Powercycle (see "Powercycling the system ", page 138) the instrument and try again to establish a connection. If powercycling the instrument does not help, contact your regional Metrohm service representative.
- **Checking {instrument name} integrity.**
 The Metrohm IC Driver for Empower™ checks whether all expected modules are present in the connected instrument. Therefore, the Metrohm IC Driver for Empower™ compares the list of modules created during inventory with the modules that should be present according to the article number of the instrument.
- **{Instrument name} integrity check failed.**
 According to the inventory, the connected instrument does not contain all modules that are required.
 Go to the **Message Center** for further information.

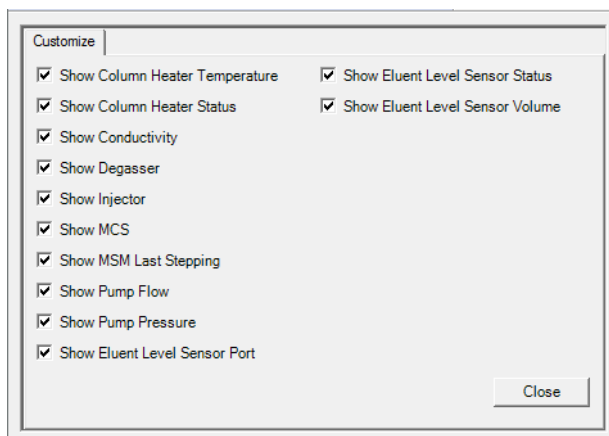
All connected instruments are initialized. The instruments do not pass through all states during initialization. After successful initialization, the instrument status is **IDLE**.

6.3 Customizing the Status panel



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

2



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



NOTE

Grad Flow (ml/min) shows only the flow of the high-pressure gradient. It does not show the flow of the Dose-in gradient.

For information regarding the numbering of the modules in the **Status** panel, refer to *chapter Numbering of the modules, page 130*.

7 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.

This manual shows how to create an instrument method by using the pro interface. For a quick setup 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]**.

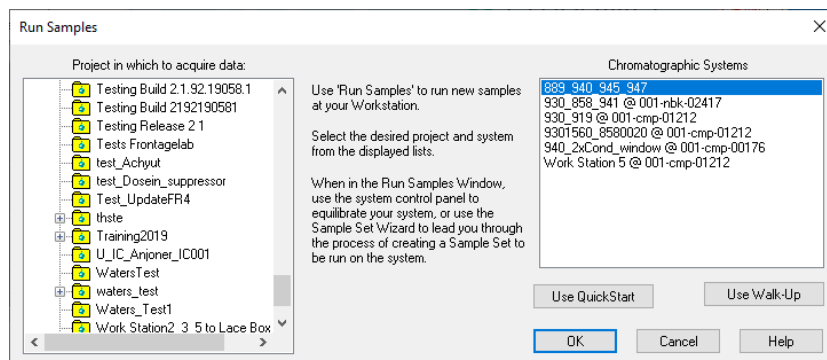



- 2 Select your chromatographic system and the desired project.

In a local installation, you can only select chromatographic systems that are stored on the computer you are currently using. These systems are labeled with the **systemname**.

In a client/server-system you can select chromatographic systems that are stored on any client in the network. These systems are labeled with **systemname@computername**.

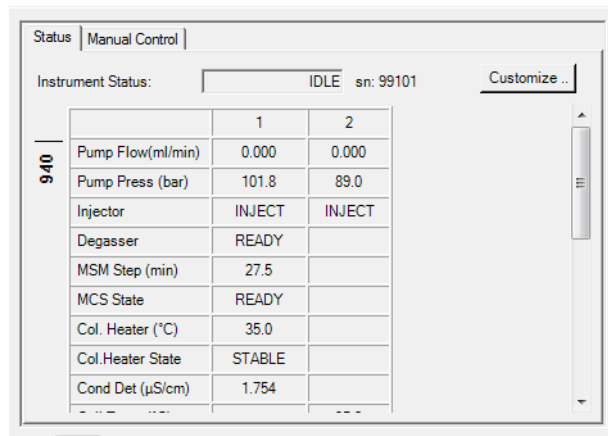
Click on **[OK]**.



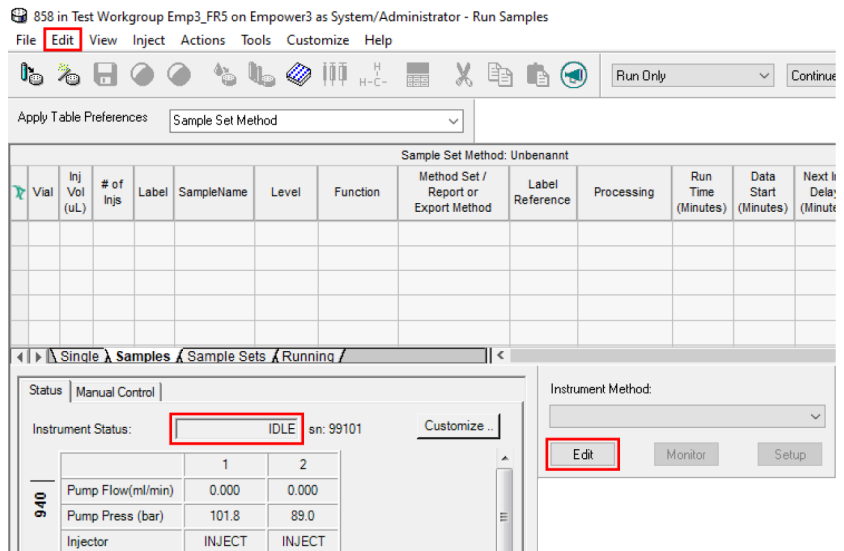
A **Run Samples** session is initiated. The corresponding icon in the task bar appears. 

- 3 Wait until the instrument status changes from **INITIALIZING** to **IDLE** (see chapter 6, page 28). This may take several minutes.

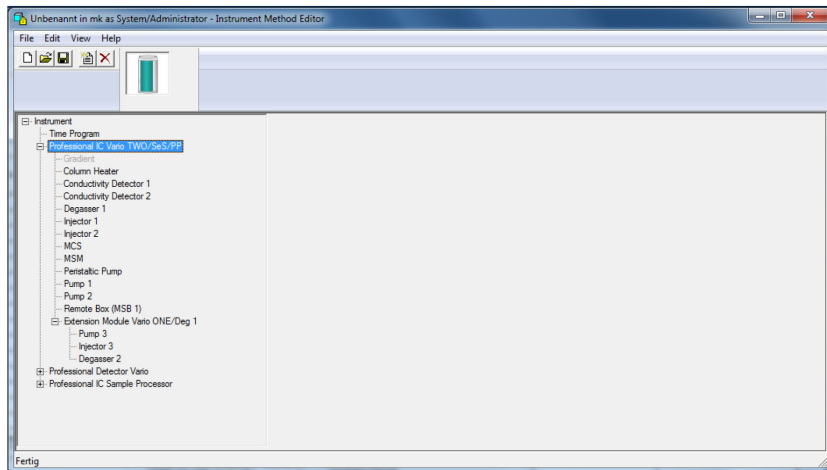
If the instrument does not become **IDLE**, refer to chapter 18, page 135.



- 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 8.1.2, page 35 ff.).



8 Adjusting the instruments

Screenshots that show instrument parameters are examples. You can set other values that are suitable for your application.

8.1 General

8.1.1 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 16, page 130*.

Manual control

Under **Manual Control**, operate all hardware components individually (only when no measurement is running). The **Manual Control** tab is located next to the **Status** panel.

8.1.2 Instrument parameters

Setting the instrument parameters



NOTE

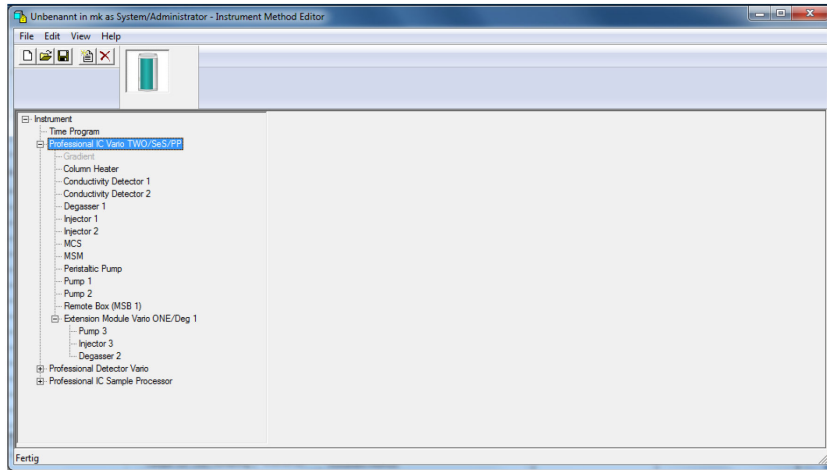
Instrument parameters are sent to the instruments as soon as you start the method.

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

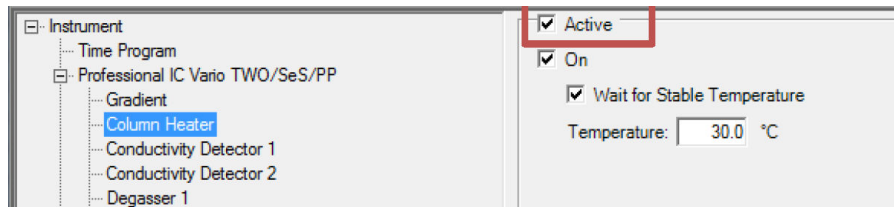


NOTE

The selection option depends on the instrument type.

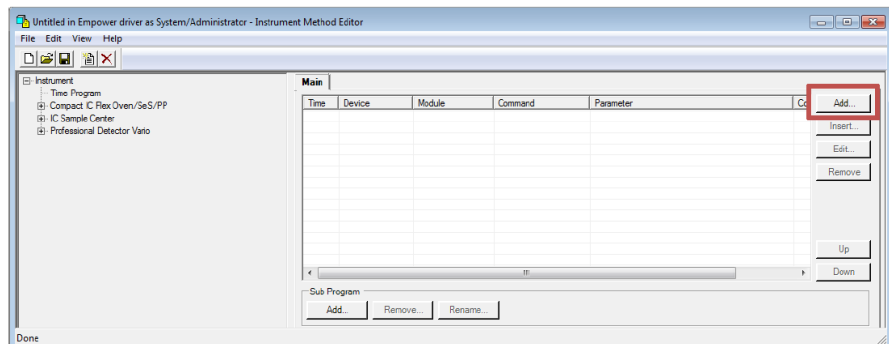


- 2 To set the parameters for an instrument, activate the instrument by checking the check box **Active**.



8.1.3 Time program

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

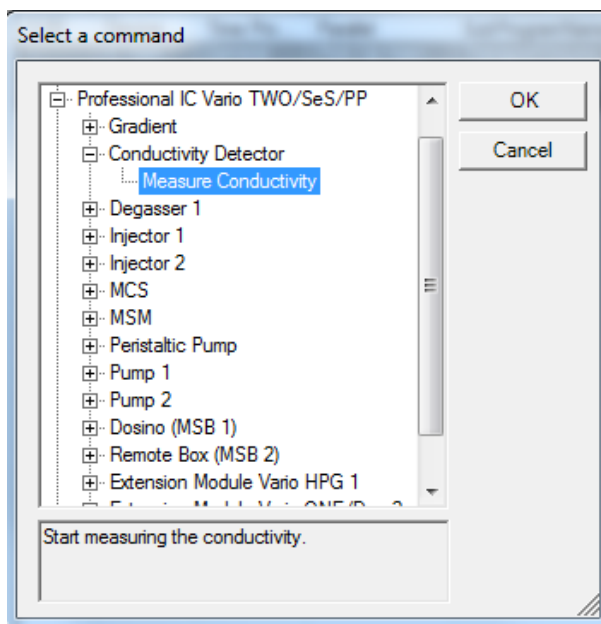


Select commands with **[Add...]**.

Time program – Example

To start a simple time program, 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 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...]**.

Example

Time	Device	Module	Command	Parameter	
---	Professional IC Sample Proce...	Peripheral Tower	Move rack	Move = Sample Position, ShiftRate = 20 (1/s), ShiftDirection = Auto, SwingRate = 55 (1/s)	Add...
---	Professional IC Sample Proce...	Peripheral Tower	LF	LF position = Work Position, Manual position = 0 (mm), LF rate = 25 (mm/s)	Insert...
0.00	Compact IC Flex SeS/PP/Deg	Injector	Switch	SwitchTo = Fil	Edit...
3.00	Professional IC Sample Proce...	Peristaltic Pump	On/Off	On = True, Rate = 3	Remove
3.00	Professional IC Sample Proce...	Peristaltic Pump	On/Off	On = False, Rate = 3	
3.00	Compact IC Flex SeS/PP/Deg	Injector	Switch	SwitchTo = Inject	
3.00	Compact IC Flex SeS/PP/Deg	Conductivity Detector	Measure Conductivity		
---	Professional IC Sample Proce...	Peripheral Tower	Move rack	Move = Rack Position, Number = 55, ShiftRate = 20 (1/s), ShiftDirection = Auto, SwingRate =	
0.00	Professional IC Sample Proce...	Peristaltic Pump	On/Off	On = True, Rate = 3	
2.00	Professional IC Sample Proce...	Peristaltic Pump	On/Off	On = False, Rate = 3	

- 4 Save your instrument method.

Device independent time program commands

Device-independent commands are commonly used to execute subprograms. Use subprograms to create more complex time programs.

Device independent

Parallel

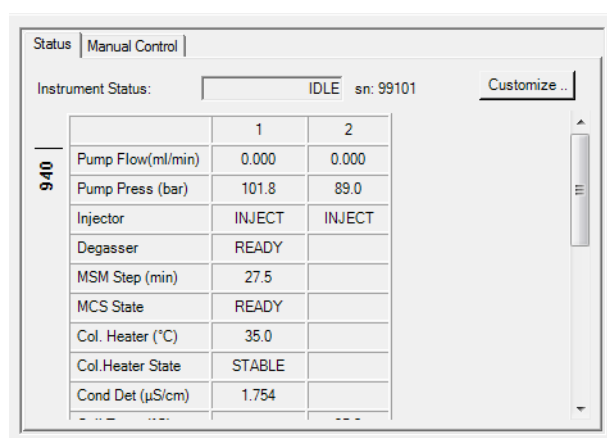
Calls a subprogram which is processed parallel to the invoking program.

Sequence	Calls a subprogram. The invoking program is halted. It is continued when the subprogram is finished.
Loop	Calls a subprogram which is passed through n times.
Wait	Holds the program schedule.

8.2 IC instrument

8.2.1 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.

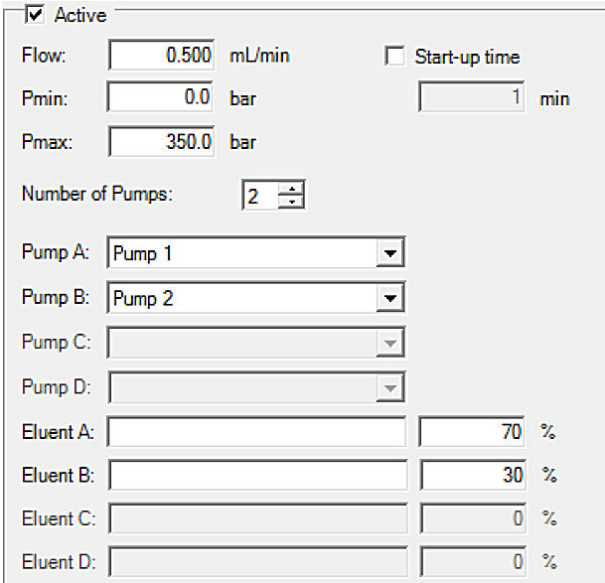
Column Heater	
State	State of the column heater.
Temperature	
Set	To change the temperature, enter a new value and click on [Set] .
On/Off	Switches the column heater on and off. The grayed out button indicates the current state.
Degasser	
State	State of the degasser.
Injector	
Start Position	Current position of the injection valve.

Inject/Fill	Click on [Inject] or [Fill] to switch between the positions. The grayed out button indicates the current state.
MCS	
State	State of the MCS.
MSM	
Last Stepping	Time that has elapsed since the last stepping.
Step Time	Current time interval between 2 sequential automatic rotor stepping operations.
Step	Moves the rotor one step to the next position.
Set	To change the step time, enter a new value and click on [Set] .
On/Off	Switches the MSM on and off. The grayed out button indicates the current state.
Peristaltic Pump	
State	State of the peristaltic pump.
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Set	To change the rate, enter a new value and click on [Set] .
On/Off	Switches the peristaltic pump on and off. The grayed out button indicates the current state.
Pump	
State	State of the high-pressure pump.
Actual Pressure	Current pressure in the system.
Flow	Current flow of the high-pressure pump.
P min	Current value for the minimum permitted pressure in the system. If the actual pressure is lower than P min, the pump is switched off. A warning and a [Reset] button appear. Click on [Reset] . Restart the pump with [On] . Adjust the flow or P min and apply the new values with [Set] . Corresponding messages appear in the Message Center .

P max	<p>Current value for the maximum permitted pressure in the system.</p> <p>If the actual pressure is higher than P max, the pump is switched off. A warning and a [Reset] button appear. Click on [Reset]. Restart the pump with [On]. Adjust the flow or P max and apply the new values with [Set].</p> <p>Corresponding messages appear in the Message Center.</p>
Set	To change flow, P min or P max, enter a new value and click on [Set] .
On/Off	Switches the high-pressure pump on and off. The grayed out button indicates the current state.

8.2.2 Instrument parameters

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

Gradient	<p>The following explanations apply only to 940 instruments.</p> <p>A pump can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.</p> <p>By default, the gradient is disabled. Check the check box Active to use a gradient.</p> 
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.

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

**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%. Otherwise, a warning is displayed and the entered values are not accepted.

Column heater	
On	Determines whether the column heater is switched on or off when you start the hardware.
Wait for Stable Temperature	If activated, a determination does 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.

Degasser	A degasser can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.
On	Determines whether the degasser is switched on or off when you start the hardware.

Injector	An injector can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.
Position	Position of the injection valve when you start the hardware. <ul style="list-style-type: none"> ▪ Inject Switches the valve to Inject.



	<ul style="list-style-type: none"> ▪ Fill Switches the valve to Fill. ▪ Maintain Current The valve remains in its current position.
--	--

MCS	<p>An MCS can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.</p>
On	<p>Determines whether the MCS is switched on or off when you start the hardware.</p>

MSM	<p>An MSM can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.</p>
Automatic stepping to next position during equilibration	<p>If activated, 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.</p>
Interval	<p>Time interval between 2 sequential automatic rotor stepping operations.</p>
Dosino regeneration ▶	
Dosing device	<p>Dosino that regenerates the suppressor.</p>

	The following parameters are only visible if a dosing device has been selected.
Dosing Port	Port for regeneration solution.
Volume	Volume of suppressor regeneration solution 1 or suppressor regeneration solution 2 in milliliters.
Time	Time in minutes for which the suppressor chamber is used.
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. Metrohm recommends to use a 2 mL dosing unit for suppressor regeneration with a Dosino.

For MSM regeneration with a Dosino, Metrohm recommends the following port assignment:

Table 10 Port assignment

Port	Use
1	Regenerating the rotor with solution 1.
2	Aspirating solution 1 (e.g. H ₂ SO ₄).
3	Rinsing the rotor with solution 2.
4	Aspirating solution 2 (e.g. ultrapure water).

Peristaltic	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.
On	Determines whether the peristaltic is switched on or off when you start the hardware.
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.



Pump	A high-pressure pump can also be part of an extension module. In this case, the parameters are exactly the same as described in this section.
On	Determines whether the pump is switched on or off when you start the hardware.
Flow	Flow of the high-pressure pump.
P min	Minimum permitted pressure in the system.
P max	Maximum permitted pressure in the system.
Use start-up time	If activated, a start-up time for reaching the defined flow rate can be defined.

8.2.3 Time program

The actions that 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** (see chapter 8.3.3, page 47).

Gradient	Only one high-pressure gradient per time program is possible.
Gradient ▶	
Time	Moment when the gradient command is executed.
Eluent A–D	Proportion in the mixing ratio for each eluent. Ensure that the total of all eluent proportions is 100%. Otherwise, a warning is displayed and the entered values are not accepted.

Curve	<p>Curve form with which the previous entry in the gradient table moves to the current entry.</p> <ul style="list-style-type: none"> ▪ Linear If the flow is not modified, then the proportion of eluent changes in a linear fashion. If the flow and the proportion of the eluents is modified, then the proportion of the eluents and the flow change in a linear fashion. The mixing ratio changes in a nonlinear fashion. ▪ Step If the flow is not modified, then the proportion of the eluent remains at its current value up to the point in time of the next command line. Then the proportion changes to the value of the next command line at once. If the flow and the proportion of the eluents is modified, then the proportion of the eluents and the flow of the pump remain at their current value up to the point in time of the next command line. Then they change to the value of the next command line at once. The mixing ratio changes in the same way. ▪ Convex 1–4/Concave 1–4 If the flow is not modified, then the proportion of the eluent changes along the selected curve. If the flow and the proportion of the eluents is modified, then the flow changes along the selected curve. The proportion of eluents changes along the selected curve. The mixing ratio changes in a nonlinear fashion.
Flow	Flow rate at which the gradient step is executed.
On/Off	Switches all pumps that are part of the high-pressure gradient on and off.
Flow	Sum of the flows of all pumps that are part of the high-pressure gradient.
Degasser	
On/Off	Switches the degasser on or off.
Injector	
Switch	The injector positions Fill and Inject are possible. The time program command Switch changes the injector position.
MCS	
On/Off	Switches the MCS on or off.
MSM	



Step	Moves the rotor one step to the next position.
Peristaltic Pump	
On/Off	Switches the peristaltic pump on or off.
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Pump	
On/Off	Switches the high-pressure pump on or off.
Flow	Flow of the high-pressure pump.
Measure Pressure	Measures the system pressure.

8.3 Conductivity detector

The conductivity detector is available as stand-alone detector (945 Professional Detector Vario – Conductivity) or as internal detector (IC Conductivity Detector, 2.850.9010). The parameters are exactly the same for both detectors.

8.3.1 Manual control

Conductivity detector	
Conductivity	Displays the current conductivity (read-only).

8.3.2 Instrument parameters

Conductivity detector	
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	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. 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.

8.3.3 Time program**Conductivity Detector****Measure Conductivity**

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

8.4 Eluent Production Module

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

8.4.1 Level sensor modes

With the Eluent Production Module, you can either monitor or produce eluent. These options are determined by the presence of a dosing device.

You can use a level sensor in full mode or empty mode. These options are determined by the rod length.

Each combination of production/monitoring and full mode/empty mode is possible.

- **Production Full**
A dosing device is selected. The level sensor is equipped with a short rod.
The sensor 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. The **Full** mode is activated for level sensors that are installed on a waste canister, for example.

Eluent production

Active

Mode:

Dosing device:

Eluent volume: mL

Waiting time: min

Monitoring:

	Name	Concentration	Unit	Target concentration	Unit
▶	Na ₂ CO ₃	64	mmol/L	3.2	mmol/L
	NaHCO ₃	20	mmol/L	1	mmol/L
*					

Mode

(see chapter 8.4.1, page 47)

- Full
- Empty

Dosing device

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.

Notice:

A Dosino that is used as eluent production Dosino, must be connected to the Eluent Production Module.

A Dosino that is connected to an Eluent Production Module can only be used as eluent production Dosino.

Eluent volume

Only selectable in **Empty** mode.

Eluent volume in milliliters to be produced.

Waiting time

Only selectable in **Empty** mode.

Time in minutes that must elapse before data for a determination is recorded again with the newly produced eluent.

Concentration

Concentration of the respective component in the concentrate or in the eluent. Select in which unit the concentration is displayed in the report.

Target Concentration

This parameter is relevant for **Full** and **Empty** mode. Define this parameter after defining a dosing device.

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.

Select in which unit the target concentration is displayed in the report.

Procedure of the eluent production

The port assignment is fixed.



Table 11 Port assignment

Port	Use
1	Concentrate
2	H ₂ O / UPW
3	Eluent
4	Waste

Table 12 Procedure of eluent production

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 ₂ O	Adding H ₂ O in order to improve the subsequent mixing of concentrate and H ₂ O						
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 ₂ O						
8	2	aspirating H ₂ O	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						
11		Repeating steps 1 to 10 or interrupting	<table border="0"> <thead> <tr> <th>Empty Mode</th> <th>Full Mode</th> </tr> </thead> <tbody> <tr> <td>Repeating in the workplace if eluent volume not achieved</td> <td>Repeating in the workplace if sensor = 0</td> </tr> <tr> <td>Interrupting in the workplace if eluent volume achieved. The waiting time until the next determination is observed</td> <td>Interrupting in the workplace if sensor = 1</td> </tr> </tbody> </table>	Empty Mode	Full Mode	Repeating in the workplace if eluent volume not achieved	Repeating in the workplace if sensor = 0	Interrupting in the workplace if eluent volume achieved. The waiting time until the next determination is observed	Interrupting in the workplace if sensor = 1
Empty Mode	Full Mode								
Repeating in the workplace if eluent volume not achieved	Repeating in the workplace if sensor = 0								
Interrupting in the workplace if eluent volume achieved. The waiting time until the next determination is observed	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.

Monitoring	
Mode	(see chapter 8.4.1, page 47) <ul style="list-style-type: none"> ▪ Full ▪ Empty
Monitoring ►	
Display Message	A message is displayed in the Message Center if the level sensor responds.
Record Message	A message is recorded in the postrun report if the level sensor responds.
Finish determination and stop device	The ongoing determination is finished and the instruments are stopped if the level sensor responds.
Cancel determination and stop device	The ongoing determination is canceled automatically and all instruments are immediately stopped if the level sensor responds.

8.5 Dosino

8.5.1 Status panel



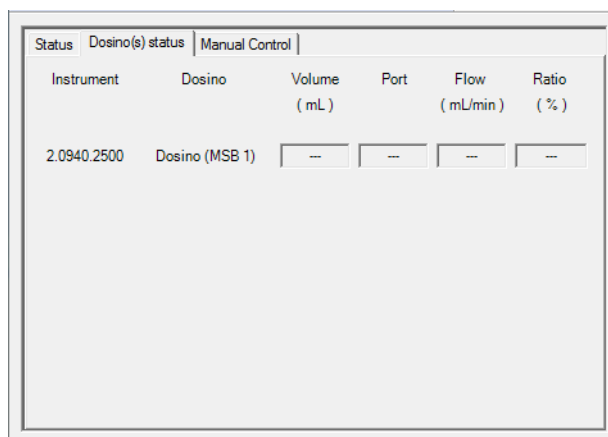
NOTE

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.

The **Dosino(s) Status** panel displays the status of the Dosino.



8.5.2 Manual control

Aspirate	Aspirates the specified volume via the defined port. There is no automatic filling beforehand or afterwards.
Volume	Volume to aspirate.
Port	Port for aspirating the sample.
Filling rate	Rate for aspirating the sample.
Start/Stop	Start or stop the Dosino command. The grayed out button indicates the current state.
Dosing	Doses the specified volume via the defined port. There is automatic filling beforehand or afterwards.
Volume	Volume to dose and fill in the cylinder.
Port	Port for dosing the sample.
Dosing rate	Rate for dosing the sample.
Filling rate	Rate for filling the cylinder after dosing the sample.
Advanced	Define further parameters for the dosing ports and tubings (<i>see menu "Advanced", page 53</i>).
Start/Stop	Start or stop the Dosino command. The grayed out button indicates the current state.



<p>Empty</p> <p>Advanced</p> <p>Start/Stop</p>	<p>Empties the cylinder and all tubings of the dosing unit.</p> <p>Define further parameters for the dosing ports and tubings (<i>see menu "Advanced", page 53</i>).</p> <p>Start or stop the Dosino command. The grayed out button indicates the current state.</p>
<p>Fill</p> <p>Port</p> <p>Filling rate</p> <p>Advanced</p> <p>Start/Stop</p>	<p>Fills the cylinder via the specified port.</p> <p>Port for filling the cylinder.</p> <p>Rate for filling the cylinder.</p> <p>Define further parameters for the dosing ports and tubings (<i>see menu "Advanced", page 53</i>).</p> <p>Start or stop the Dosino command. The grayed out button indicates the current state.</p>
<p>Prepare</p> <p>Advanced</p> <p>Start/Stop</p>	<p>Rinses the cylinder and all tubings of the dosing unit with the solution that is connected to the fill port.</p> <p>Define further parameters for the dosing ports and tubings (<i>see menu "Advanced", page 53</i>).</p> <p>Start or stop the Dosino command. The grayed out button indicates the current state.</p>
<p>Advanced</p>	<p>Parameters for each dosing port and for the tubing that is connected to the dosing unit.</p>



Dosino Advanced

Tubing Parameters [Serial Number = 72454] - [Volume = 2 ml]

Dosing port	Port	Length (cm)	Diameter (mm)	Dosing Rate (ml/min)
1	Port 1	40.0	2.0	Maximum
2	Port 3	0.0	2.0	Maximum
Fill	Port 2	25.0	2.0	Maximum
Special	Port 4	0.0	2.0	Maximum

Preparation Parameters

Dosing Port for Prepare/Empty: Dosing Port 1

Valve

Rotating Direction: Automatic

Not Over: Port 4

Tubing parameters ►

The serial number and the volume of the dosing unit are displayed (read-only).

The tubing parameters are important for the correct execution of the commands **Prepare** and **Empty** because they take the volumes of the tubing connections into account.

Port

Port to be used as the dosing port. Assign a port 1–4 to each dosing port.

Length

Length of the tubing on the dosing port.

Diameter

Diameter of the tubing on the dosing port.

Dosing Rate

Rate at which the command takes place. The maximum dosing rate depends on the cylinder volume of the dosing unit used (see table 13, page 55). When the function is carried out, the rate will automatically be decreased to the highest possible value.

Preparation Parameters ►

Dosing Port for Prepare/Empty

Dosing port through which the cylinder content is ejected during preparation and emptying. Dosing port for the **Prepare** and **Empty** commands is always **Dosing Port 1**.

Valve ►

Rotating Direction

Rotating direction of the valve disk.

- Ascending
The valve disk rotates in the direction of ascending port numbers.
- Descending
The valve disk rotates in the direction of descending port numbers.

Not over

- Automatic
The valve disk rotates in the direction with the shortest path.
- Not Over
The valve disk does not cross the specified port during rotation.

This field gets activated if you select the rotating direction **Not Over**. The selected port is not crossed during rotation.

Table 13 Maximum dosing rate for the dosing unit in relation to the cylinder volume

Cylinder volume	Maximum rate
2 mL	6.67 mL/min
5 mL	16.67 mL/min
10 mL	33.3 mL/min
20 mL	66.6 mL/min
50 mL	166 mL/min

8.5.3 Instrument parameters

Dosino

Hardware

Serial Number: 72444

Cylinder Volume: 2 mL

Tubing Parameters

Dosing Port	Port	Length	Diameter	Dosing Rate
1:	Port 1	40.0 cm	2.0 mm	Maximum mL/min
2:	Port 3	0.0 cm	2.0 mm	Maximum mL/min
Fill:	Port 2	25.0 cm	2.0 mm	Maximum mL/min
Special:	Port 4	0.0 cm	2.0 mm	Maximum mL/min

Valve

Rotating Direction: Automatic

Not Over: Port 4

Preparation Parameters

Dosing Port for Prepare/Empty: Dosing Port 1

Hardware ►**Serial Number**

Serial number of the dosing unit.



Cylinder Volume	Cylinder volume for the dosing unit in milliliter.
Tubing Parameters ►	
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.
Valve ►	
Rotating Direction	<p>Rotating direction of the valve disk.</p> <ul style="list-style-type: none"> ▪ Ascending The valve disk rotates in the direction of ascending port numbers. ▪ Descending The valve disk rotates in the direction of descending port numbers. ▪ Automatic The valve disk rotates in the direction with the shortest path. ▪ Not Over The valve disk does not cross the specified port during rotation.
Not Over	This field gets activated if you select the rotating direction Not Over . The selected port is not crossed during rotation.
Preparation Parameters ►	
Dosing Port for Prepare/Empty	Dosing port through which the cylinder content is ejected during preparation and emptying. Dosing port for the Prepare and Empty commands is always Dosing Port 1 .

**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 IC Sample Center is not possible.



**NOTE**

Dosino default settings do normally not require any modification.

**NOTE**

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

8.5.4 Time program

Dosino	
Dosing ►	Doses the specified volume via the defined port. There is automatic filling beforehand or afterwards.
Port	Port for dosing the sample.
Volume input	Volume to dose and fill in the cylinder. <ul style="list-style-type: none"> ▪ Manual volume Define the volume in the parameter Volume. ▪ Injection volume The injection volume is defined in the sequence.
Volume	User defined volume to dose. This option is only active if the volume input Manual volume is selected.
Dosing Rate	Rate for dosing the sample.
Filling Rate	Rate for filling the cylinder after dosing the sample.
Aspirate ►	Aspirates the specified volume via the defined port. There is no automatic filling beforehand or afterwards.
Port	Port for aspirating the sample.
Volume input	Volume to aspirate. <ul style="list-style-type: none"> ▪ Manual volume Define the volume in the parameter Volume. ▪ Injection volume The injection volume is defined in the sequence.
Volume	User defined volume to aspirate. This option is only active if the volume input Manual volume is selected.



Rate	Rate for aspirating the sample.
Fill ▶	Fills the cylinder via the specified port.
Port	Port for filling the cylinder.
Rate	Rate for filling the cylinder.
Eject to end ▶	Ejects the entire content of the cylinder via the specified port. The piston moves to the maximum volume mark.
Port	Port for ejecting the entire content of the cylinder.
Rate	Rate for ejecting the sample.
Eject to stop ▶	Ejects the entire content of the cylinder via the specified port. The piston moves over the maximum volume mark to the stop point. Only use this function to eject air bubbles.
Port	Port for ejecting the entire content of the cylinder.
Rate	Rate for ejecting the sample.
Exchange position ▶	Fills the cylinder via the specified port and switches the valve disk to the exchange position.
Port	Port for filling the cylinder.
Rate	Rate for filling the cylinder.
Change port ▶	The valve rotates to the specified port.
Port	The valve is switched to the defined port.
Prepare	Rinses the cylinder and all tubings of the dosing unit with the solution that is connected to the fill port.
Empty	Empties the cylinder and all tubings of the dosing unit.
Dose-in gradient ▶	
Time	Moment when the gradient command is executed.
Ratio	Proportion in the mixing ratio from the Dosino to the flow of the high-pressure pump.
Curve	<ul style="list-style-type: none"> ▪ Linear The proportion of the eluent from the Dosino changes in a linear fashion.



Flow	<ul style="list-style-type: none"> ▪ Step The proportion of the eluent from the Dosino remains at its current value up to the point in time of the next command line. Then the proportion changes to the value of the next command line at once.
Total volume	Flow rate at which the gradient is executed.
Total volume	Total volume that is needed for the Dose-in gradient.

8.6 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.

For the parameters of the Remote Box, the following entries are possible:

- 0 = Output line deactivated
- 1 = Output line activated
- * = Retain the status of the output line
- p = set pulse (pulse length = 200 ms).



NOTE

Metrohm recommends to mask the irrelevant lines with an asterisk * so as not to alter these line conditions.

8.6.1 Manual control

Remote Box	
Input Signal	<p>Current pattern for the input signal of exactly 8 bits (read only) (see chapter 8.6, page 59).</p> <p>The output lines are numbered from right to left: 7-6-5-4-3-2-1-0</p> <p>Example:</p> <p>Input signal = 01110001</p> <p>Input lines 7, 3, 2, 1 are inactive.</p> <p>Input lines 6, 5, 4, 0 are active</p>



Output Signal	Current pattern for the output signal of exactly 14 bits (read only) (see chapter 8.6, page 59).
Output Signal	Input of the binary pattern for the output signal (see chapter 8.6, page 59). 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 5 on active. ****0***** : Sets the status of output line 9 on inactive.

8.6.2 Instrument Parameters

Remote Box	
Output signal	Input of the binary pattern for the output signal of exactly 14 bits (see chapter 8.6, page 59). 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.
Pulse Length	Length of the impulses.

8.6.3 Time program

Remote Box	
Scan Lines ►	Waits until a defined input signal is detected.
Input signal	Input of the binary pattern for the input signal of exactly 8 bits (see chapter 8.6, page 59). The output lines are numbered from right to left: 7-6-5-4-3-2-1-0 Examples: *****1 : Sets the status of input line 0 on active. ****0*** : Sets the status of input line 3 on inactive.
Timeout	If activated, the time program is continued as soon as either the requested input signal has been received or the defined waiting time has expired. If not activated, then the time program waits indefinitely for an input signal.
Set Lines ►	Sets the defined remote signal.

Output signal	<p>Input of the binary pattern for the output signal of exactly 14 bits (<i>see chapter 8.6, page 59</i>).</p> <p>The output lines are numbered from right to left: 13-12-11-10-9-8-7-6-5-4-3-2-1-0</p> <p>Examples:</p> <p>*****1***** : Sets the status of output line 9 on active.</p> <p>****0***** : Sets the status of output line 5 on inactive.</p>
----------------------	--

8.7 Amperometric detector

The amperometric detector is available as stand-alone detector (945 Professional Detector Vario – Amperometry) or as internal detector (IC Amperometric Detector, 2.850.9110). The parameters are exactly the same for both detectors.

8.7.1 Manual control

Operate the amperometric detector individually in the manual control.

Amperometric detector	
Cell	Current state of the amperometric cell (on/off).
Charge	Displays the charge (read-only).
Current	Displays the current (read-only).
Potential	Displays the potential (read-only).
Cell Temp.	Temperature of the detector cell.
Set	To change the cell temperature, enter a new value and click on [Set] .
On/Off	Switches the amperometric cell on and off. Previously, an instrument method must be loaded to define mode and potential. The grayed out button indicates the current state.

8.7.2 Instrument parameters

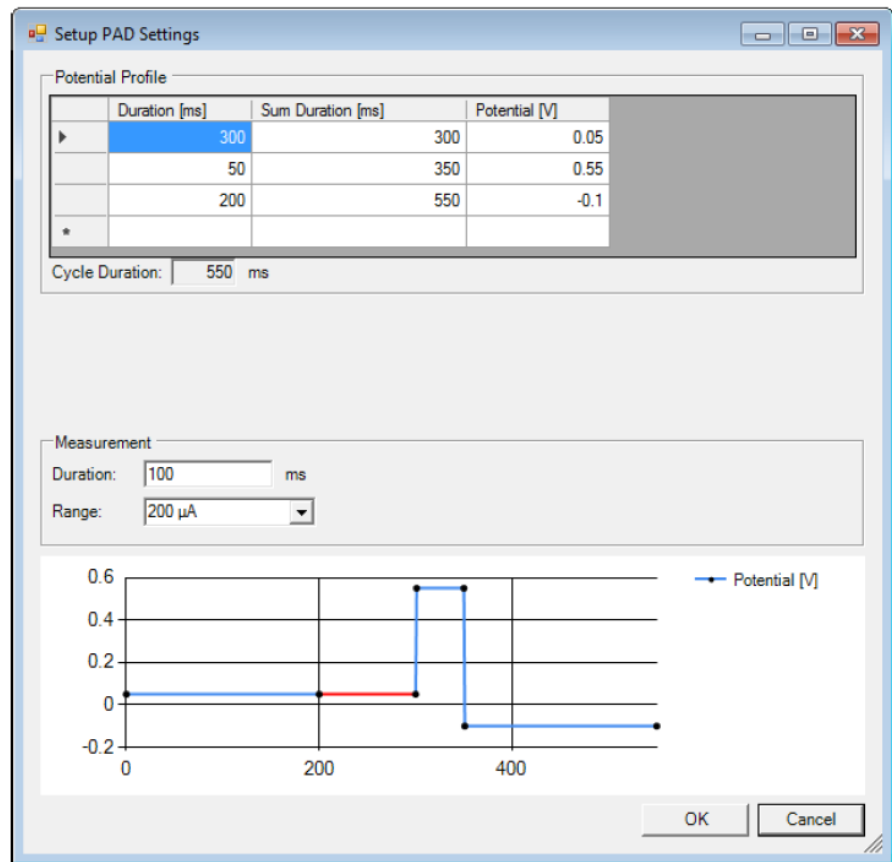
Amperometric detector	
Mode	<p>Measuring mode that is set when you start the method.</p> <p>To change the parameters, select the desired mode. Click on [Settings...].</p>



<p>Temperature</p> <p>Wait for Stable Temperature</p>	<ul style="list-style-type: none"> ▪ DC Measurement with constant potential. Settings for DC mode: (see menu "Setup DC Mode", page 62) ▪ PAD Measurement with several potential steps. Settings for PAD mode: (see menu "Setup PAD Settings", page 63) ▪ flexIPAD Measurement with flexible potential steps (levels, ramps) and integration. Settings for flexIPAD mode: (see menu "Setup FlexIPAD Settings", page 64) <p>Temperature that is set in the detector when you start the hardware.</p> <p>If activated, a determination does not start until the set temperature has been reached and is stable.</p> <p>If deactivated, the sequence of a determination is not 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.</p>
<p>Setup DC Mode</p> <p>DC Potential</p> <p>Range</p> <p>Damping</p>	<p>Potential of the working electrode in comparison to the reference electrode.</p> <p>Measuring range.</p> <p>auto: Automatic setting of the measuring range. This selection is not allowed with damping activated.</p> <p>If selected, disturbing influences are damped. Noise on the baseline is decreased.</p>



Setup PAD Settings

**Potential Profile ▶**

All potential steps are shown in the graph. The measurement is marked with a red line in the graph.

Duration

Duration of the potential step.

Sum Duration

Cumulative duration of potential steps 1–n (n = number of the applied potential step).

Potential

Potential of the step.

Cycle Duration

Total duration of the potential profile (sum of the durations of the individual steps).

Measurement ▶**Duration**

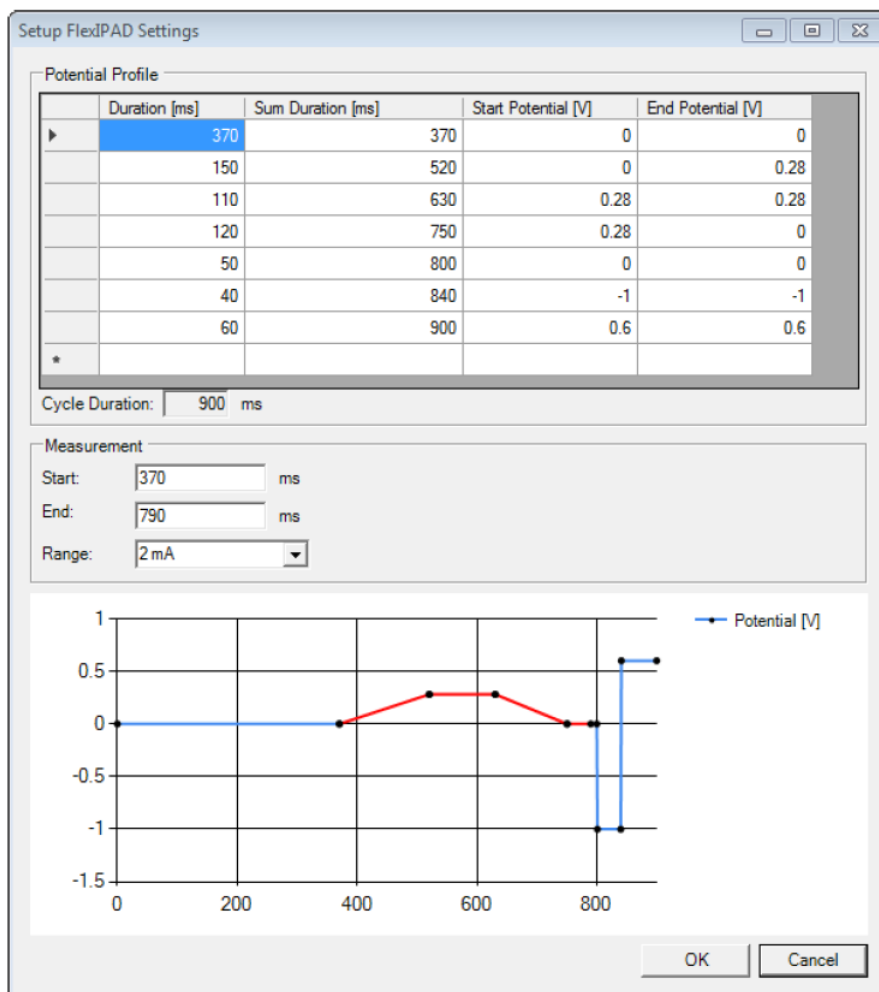
Duration of the measurement.

Range

Selection of the measuring range.



Setup FlexIPAD Settings



Potential Profile ▶

All potential steps are shown in the graph. The measurement is marked with a red line in the graph.

Duration

Duration of the potential step.

Sum Duration

Cumulative duration of potential steps 1–n (n = number of the applied potential step).

Start Potential

Start potential of the step.

End Potential

Terminal potential of the step.

Cycle Duration

Total duration of the potential profile (sum of the durations of the individual steps).

Measurement ▶

Start	Start time of the measurement within the profile.
End	Ending time point of the measurement within the profile.
Range	Measuring range of the detector.

8.7.3 Time program

Amperometric Detector	
Measure Current	Measures the current.
Measure Charge	Measures the charge.
Cell On/Off	Switches the amperometric cell on and off.

8.8 UV/VIS detector

8.8.1 Manual control

Operate the UV/VIS detector individually in the manual control.

Absorbance Detector	
Channels	Displays the channels that have been defined in the instrument parameters (<i>see chapter 8.8.2, page 68</i>).
Spectrum ►	
Integration Duration (Int. Duration [ms])	Time until the next reading of each diode in milliseconds. To set the integration duration, refer to <i>Adjust the lamp settings, page 67</i> .
Intensity Level	Intensity level of the VIS-lamp. 944 Professional UV/VIS Detector Vario has a range from 1 to 8. 947 Professional UV/VIS Detector Vario has a range from 1 to 12. To set the intensity level and the integration duration, refer to <i>Adjust the lamp settings, page 67</i> .
Spectrum	Select a spectrum type and click on [View] to update the spectrum. <ul style="list-style-type: none"> ▪ Baseline The last baseline spectrum that has been recorded. ▪ Intensity Current intensity spectrum. Use the intensity spectrum to adjust the position of the UV-lamp with the 947 UV/VIS Detector (<i>see 8.0947.8001 Manual 947 Professional UV/VIS Detector Vario</i>).



	<ul style="list-style-type: none"> Absorbance Current absorbance spectrum.
Reset Baseline	Records a new baseline spectrum.
Auto Adjust	(see "Adjust the lamp settings", page 67)

UV-lamp	
State	Current state of the UV-lamp (on/off).
Operating hours	Recorded lamp hours.
Reset	Resets the recorded lamp hours of the UV-lamp to 0. Execute this step after replacing the UV-lamp. In the appearing dialog, enter the password MIC9100 to confirm that you want to reset the lamp hours.
On/Off	If you do not need the UV-lamp, switch it off to save operating hours. The grayed out button indicates the current state.

**NOTE**

If you use the 947 Professional UV/VIS Detector Vario with a UV-lamp, then adjust the position of the UV-lamp after the initial start-up or after replacing the UV-lamp or VIS-lamp (see 8.0947.8001 Manual 947 Professional UV/VIS Detector Vario). Therefore, set the **Spectrum** to **Intensity spectrum**. Click on **[View]**.

If you use the 944 Professional UV/VIS Detector Vario or the 947 Professional UV/VIS Detector Vario without UV-lamp, it is not necessary to adjust the UV-lamp.

VIS-lamp	
State	Current state of the VIS-lamp (on/off).
Operating hours	Recorded lamp hours.
Reset	Resets the recorded lamp hours of the VIS-lamp to 0. Execute this step after replacing the VIS-lamp. In the appearing dialog, enter the password MIC9100 to confirm that you want to reset the lamp hours.
On/Off	If you do not need the VIS-lamp, switch it off to save operating hours. The grayed out button indicates the current state.



Adjust the lamp settings



CAUTION

The lamp settings **must not** be adjusted except in the following cases:

- After first start-up, if the check of the intensity spectrum shows a cut-off.
- After the replacement of the UV-lamp or VIS-lamp, if the check of the intensity spectrum shows a cut-off.

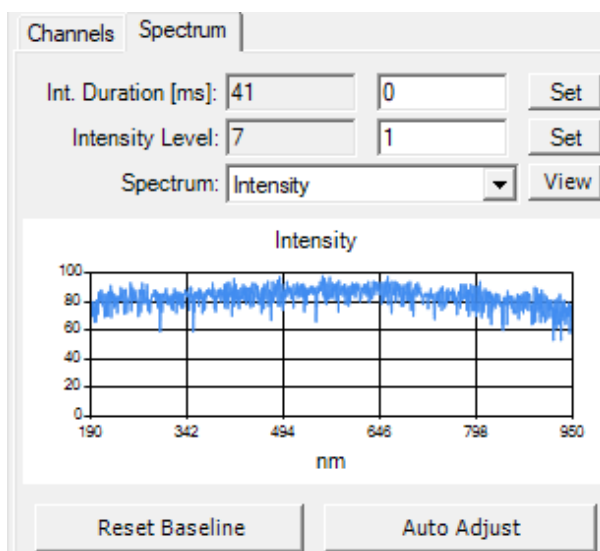
Manual adjustment

1 Enter the following parameters for the UV/VIS detector (see menu "Absorbance Detector", page 65):

- Integration Duration (Int. Duration)
- Intensity level

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

Select a spectrum type and click on **[View]** to update the spectrum.



NOTE

Refer to the following manuals for more information:

- 947 Professional UV/VIS Detector Vario (8.0947.8001EN)
- MagIC Net 4.0 (8.102.8088EN)

- 2 Click on the **[Set]** buttons next to **Int. Duration** and **Intensity Level**.
- 3 A dialog 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]**.
- 4 Click on **[View]** to update the spectrum type.
A new intensity spectrum is displayed.

Auto Adjust

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

Preconditions:

- The UV-lamp has been switched on 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.

- 1 To adjust the lamp settings automatically, click on **[Auto Adjust]**.
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.



NOTE

Refer to the following manuals for more information: *944 Professional UV/VIS Detector Vario (8.944.8001EN)*, *947 Professional UV/VIS Detector Vario (8.0947.8001EN)*

8.8.2 Instrument parameters

Absorbance detector

Active

Channels:

	Wavelength [nm]	Bandwidth [nm]
▶ 1	254	5
*		

Measuring Duration: ms

Use Reference Channel

Wavelength: nm

Bandwidth: nm

Channel 1–8 ▶

Number of a channel. When writing a time program, you have to select a channel by its number. You can measure up to 8 channels in parallel.

For the 944 Professional UV/VIS Detector Vario and the 947 Professional UV/VIS Detector Vario **MW**, it is possible to select 1 to 8 channels. For the 947 Professional UV/VIS Detector Vario **SW**, it is possible to select 1 channel.

Wavelength [nm]

Wavelength of the channel in nanometer.

Bandwidth [nm]

Subtracting and adding the bandwidth to the wavelength gives the actually measured wavelengths.

Example:

Wavelength = 390 nm, Bandwidth = 5 nm

The channel comprises the interval 385–395 nm.

The absorbance is the average of all measured data points within the selected interval.

Measuring Duration

Measurement duration per data point in milliseconds.

Use Reference Channel

Determines whether a reference channel is used in the determination.

The reference channel corrects spectra by compensating lamp effects (drift, flicker).



	If you do not use a reference channel, the properties previously defined for a reference channel are retained.
UV-lamp	
On	Determines whether the lamp is switched on or off when you start the hardware.
VIS-lamp	
On	Determines whether the lamp is switched on or off when you start the hardware.

8.8.3 Time program

Absorbance Detector	
Reset Baseline	Records a new baseline spectrum at the indicated time point. Reset the baseline before starting a sequence.
Measure Single Channel ▶	Starts measuring the absorbance in a channel at the indicated time point until the end of the determination.
Channel	Select a channel that you defined in the instrument parameters (<i>see chapter 8.8.2, page 68</i>). Enter the number of the respective channel.
Measure Spectra ▶	Constantly measures spectra. The series of spectra results in 3D-data.
Wavelength Start	Lower limit of the wavelength range in which the spectrum is to be measured.
Wavelength End	Upper limit of the wavelength range in which the spectrum is to be measured.

8.8.4 Running an analysis with UV/VIS detector

During a run (*see chapter 12, page 108*), the live display in the **Run Samples** section shows the measured single channels and/or the lowest wavelength of measured spectra.

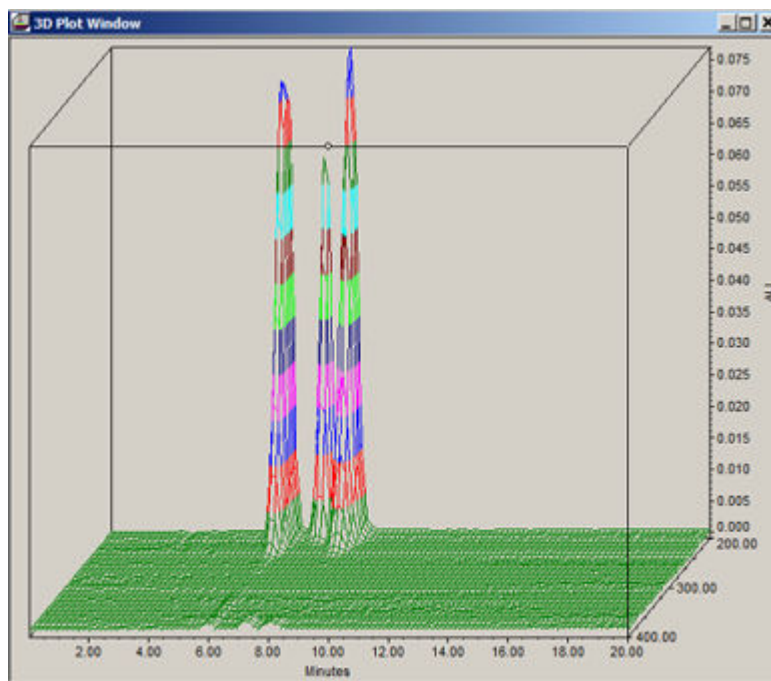
To customize channels for monitoring, right-click on the live display, select **Properties ▶ Review**. In the **Customize Channels** window, select the desired plot type and channels in the tabs **2D Channels** or **3D**.

To immediately review recorded data, right-click on the live display and select **Review**. For example, access 3D-data with right-click on the Absorbance Detector Spectrum and select **Review**."



**NOTE**

3D-data are only available, if the time program contains the command **Measure Spectra** (see menu "Absorbance Detector", page 70).



8.9 Professional IC Sample Processor

8.9.1 Manual control

Operate the Professional IC Sample Processor individually in the manual control.

Peristaltic Pump	
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Set	To change the rate, enter a new value and click on [Set] .
Start/Stop	Start or stop the peristaltic pump. The grayed out button indicates the current state.
Peripherals Tower	



Rack position	Position on the rack. Click on the [Start] button behind Rack move to move the rack.
Lift position	Lift position in mm. Click on the [Start] button behind Lift move to move the lift.
Arm position	Position (angle) of the robotic arm on the tower. Click on the [Start] button behind Arm position to move the robotic arm.
<hr/>	
Rack	
Initialize	Initializes the rack. The rack, the lift and the robotic arm are reset, the rack code is read out and the respective rack data is transferred to the sample changer. If the Professional IC Sample Processor generates an error, initializing the rack could be the first trial to solve the error.
<hr/>	
Tower Stirrer	
Rate	Stirring rate when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Set	To change the stirring rate, enter a new value and click on [Set] .
Start/Stop	Start or stop the tower stirrer. The grayed out button indicates the current state.

8.9.2 Instrument parameters

Peristaltic Pump	
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. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
<hr/>	
Peripherals Tower	
Lift positions ►	Configure the lift positions to use them in the time program (<i>see chapter 8.9.3, page 74</i>).

Swing Head		
External position	Angle [°]	Work position [mm]
1	115.0	120
2	60.0	0
3	60.0	0
4	60.0	0

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.

Shift Height on which rack shifts take place.

The lift is located underneath the **Shift** position: Each time the rack shifts, the lift moves to the **Shift** position.

The lift is located above **Shift** position: The rack shifts at the current lift position.

The shift position must be high enough to ensure safe movement across the entire rack 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.

Swing Head ► Configure the external positions to use them in the time program (*see chapter 8.9.3, page 74*).

External position Number of the external position.

Angle Swing angle of the respective external position.

To define the correct angles, proceed as described in *chapter 8.9.4, page 76*.

Work position Immersion depth of the respective external position.



NOTE

The lift positions depend on the used racks and sample vessels.



Tower Stirrer	
On	Determines whether the tower stirrer is switched on or off when you start the hardware.
Rate	Stirring rate when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.

8.9.3 Time program

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

Peristaltic Pump	
On/Off ▶	
Pump On	Switches the peristaltic pump on or off.
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.

Peripherals Tower	
Move rack ▶	Moves the sample changer to the specified position by rotating the rack.
Target ▶	
Move	<ul style="list-style-type: none"> ▪ Sample Position Rack position that is defined in the sample table. ▪ Rack Position Position on the rack. Define the position in the parameter Number.
+1	Use this function for example to calibrate an AnCat system. Refer to <i>chapter 8.11.6, page 97</i> for more information about the +1 function. This option is only active if the position Sample Position has been selected.
Number	Define which position should be used as Rack position . This option is only active if the position Rack Position has been selected.
Parameters ▶	
Shift Rate	Speed at which the rack rotates.



Shift Direction	<p>Direction in which the rack rotates.</p> <ul style="list-style-type: none"> ▪ Auto The shift direction with the smallest rotation angle is selected automatically. ▪ + Movement is in the direction of ascending rack positions. Whether this movement is clockwise or counterclockwise depends on the individual rack. ▪ - Movement is in the direction of descending rack positions. Whether this movement is clockwise or counterclockwise depends on the individual rack.
Swing Rate	<p>Rate of the robotic arm when moving to a position.</p> <p>This option is only active if a rack with multiple rows is attached.</p>
Lift ▶	
Lift position	<p>Moves the sample changer to the specified lift position.</p> <p>Configure the lift positions and external positions in the instrument parameters (see menu "Peripherals Tower", page 72).</p> <ul style="list-style-type: none"> ▪ Work Position Usually at this lift position the sample is taken. ▪ Home Position The home position is usually the uppermost stop of the lift. ▪ Rinse Position This lift position is used for rinsing. ▪ Shift Position Height on which rack shifts take place. The lift is located underneath the Shift position: Each time the rack shifts, the lift moves to the Shift position. The lift is located above Shift position: The rack shifts at the current lift position. The shift position must be high enough to ensure safe movement across the entire rack at any time. ▪ Special Position This additional definable position can be used e.g. during pipetting so that the tip is just immersed in the sample solution. ▪ Manual Position Additional position that does not have to be configured in the instrument parameters. ▪ External pos 1–4 Positions on the Liquid Handling Station.
Manual position	<p>Define the manual position.</p> <p>This option is only active if the lift position Manual position is selected.</p>
Lift rate	<p>Speed at which the lift moves.</p>
Swing ▶	<p>Moves the robotic arm of the sample changer to the specified position.</p>



Swing	<ul style="list-style-type: none"> ▪ Relative Angle Rotate the rack relative to the current position by the angle indicated. This can be used, for example, to remove vial caps automatically. ▪ External pos 1–4 Positions on the Liquid Handling Station.
Swing angle	<p>Angle by which the robotic arm is to be swung relative to the current position.</p> <p>This option is only active if the swing option Relative Angle has been selected.</p>
Swing rate	<p>Rate of the robotic arm when swinging to an external position or a particular angle.</p>
<hr/>	
Tower Stirrer	
On/Off ▶	
Stirrer On	Switches the stirrer on or off.
Rate	<p>Stirring rate when you start the hardware.</p> <p>Negative value: The peristaltic pump rotates counterclockwise.</p> <p>Positive value: The peristaltic pump rotates clockwise.</p>

8.9.4 External positions

The external positions on the Liquid Handling Station depend on the exact position of the Liquid Handling Station. Therefore, configure these lift positions individually for each instrument.

4 external positions can be defined:

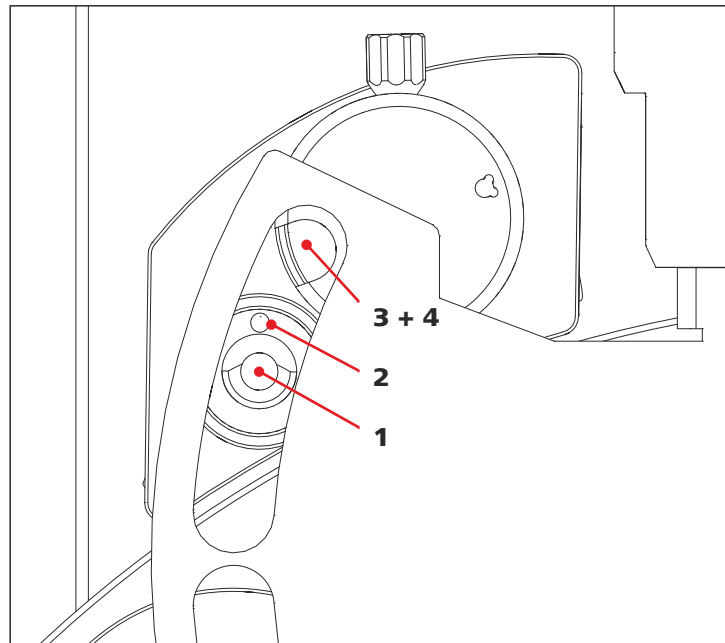


Figure 1 Positions on the Liquid Handling Station

1 Rinsing unit – Rinse

3 Dilution unit

External positions 3 and 4 have the same angle setting. The difference between them lies in their immersion depths (Work position).

2 Rinsing unit – Disposal

4 Dilution unit

External positions 3 and 4 have the same angle setting. The difference between them lies in their immersion depths (Work position).

The standard position for the dilution unit is external position 4.



NOTE

Refer to the following manual for further information about the Liquid Handling Station: *8.108.8011 Liquid Handling Station*



NOTE

Do not change the angle if the needle is positioned in the Liquid Handling Station or in a vial. Lift the needle above the rim of the Liquid Handling Station or any vial before executing a swing command. Otherwise, the needle collides with the Liquid Handling Station or a vial and the needle breaks.

Example: Define the lift position Rinsing unit – Rinse

- 1** Set the lift position to 0 mm in **Manual Control ▶ Peripherals Tower** (see chapter 8.9.1, page 71).

Click on **[Start]** behind **Lift move**.

- 2** Enter the estimated angle for the external position 1 (105 °) in **Manual Control ▶ Peripherals Tower**.

See table *External positions*, page 76 for the estimated angles for each external position.

Click on **[Start]** behind **Arm move**.

The arm of the Professional Sample Processor moves to the entered position.

- 3** Check whether the needle is centered over the position **Rinsing unit – Rinse**.

- 4** Repeat steps 1–3 until you find the correct position.

- 5** Enter the correct angle value in the instrument parameters (see chapter 8.9.2, page 72).

Enter the work position (125 mm) in the instrument parameters.

See table *External positions*, page 76 for the work position for each external position.

- 6** Repeat this procedure for all positions on the Liquid Handling Station.



NOTE

The angles for the external positions on the Liquid Handling Station depend on the exact position of the Liquid Handling Station. Use the estimated angles in the following table as starting points to find the correct position. Do not apply the estimated angles without checking whether they are correct and adjusting them if necessary.

Table 14 *Estimated angles and work positions*

External position	Estimated angle	Work position
1	105 °	125 mm

External position	Estimated angle	Work position
2	110 °	50 mm
3	116°	25 mm
4	116°	25 mm

8.10 IC Autosampler plus

8.10.1 Manual control

Operate the IC Autosampler plus individually in the manual control.

Peristaltic Pump	
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Set	To change the rate, enter a new value and click on [Set] .
Start/Stop	Start or stop the peristaltic pump. The grayed out button indicates the current state.
Peripherals Tower	
Rack position	Position on the rack. Click on the [Start] button behind Rack move to move the rack.
Lift position	Lift position in mm. Click on the [Start] button behind Lift move to move the lift.
Rack	
Initialize	Initializes the rack. The rack and the lift are reset, the rack code is read out and the respective rack data is transferred to the sample changer. If the IC Autosampler plus generates an error, initializing the rack could be the first trial to solve the error.
Tower Stirrer	
Rate	Stirring rate when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.



Set	To change the stirring rate, enter a new value and click on [Set] .
Start/Stop	Start or stop the tower stirrer. The grayed out button indicates the current state.

8.10.2 Instrument parameters

Peristaltic Pump	
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. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Peripherals Tower	
Lift positions ►	Configure the lift positions to use them in the time program (<i>see chapter 8.10.3, page 81</i>).
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.
Shift	Height on which rack shifts take place. The lift is located underneath the Shift position: Each time the rack shifts, the lift moves to the Shift position. The lift is located above Shift position: The rack shifts at the current lift position. The shift position must be high enough to ensure save movement across the entire rack 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.
Tower Stirrer	
On	Determines whether the tower stirrer is switched on or off when you start the hardware.
Rate	Stirring rate when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.



8.10.3 Time program

Peristaltic Pump	
On/Off ▶	
Pump On	Switches the peristaltic pump on or off.
Rate	Rate of the peristaltic pump when you start the hardware. Negative value: The peristaltic pump rotates counterclockwise. Positive value: The peristaltic pump rotates clockwise.
Peripherals Tower	
Move rack ▶	Moves the sample changer to the specified position by rotating the rack.
Target ▶	
Move	<ul style="list-style-type: none"> ▪ Sample Position Rack position that is defined in the sample table. ▪ Rack Position Position on the rack. Define the position in the parameter Number.
+1	Use this function for example to calibrate an AnCat system. Refer to <i>chapter 8.11.6, page 97</i> for more information about the +1 function. This option is only active if the position Sample Position has been selected.
Number	Define which position should be used as Rack position . This option is only active if the position Rack Position has been selected.
Parameters ▶	
Shift Rate	Speed at which the rack rotates.
Shift Direction	Direction in which the rack rotates. <ul style="list-style-type: none"> ▪ Auto The shift direction with the smallest rotation angle is selected automatically. ▪ + Movement is in the direction of ascending rack positions. Whether this movement is clockwise or counterclockwise depends on the individual rack. ▪ - Movement is in the direction of descending rack positions. Whether this movement is clockwise or counterclockwise depends on the individual rack.
Swing Rate	Rate of the rack when moving to a position. This option is only active if a rack with multiple rows is attached.



Lift ▶	
Lift position	<p>Moves the sample changer to the specified lift position.</p> <p>Configure the lift positions in the instrument parameters (<i>see chapter 8.10.2, page 80</i>).</p> <ul style="list-style-type: none"> ▪ Work Position Usually at this lift position the sample is taken. ▪ Home Position The home position is usually the uppermost stop of the lift. ▪ Rinse Position This lift position is used for rinsing. ▪ Shift Position Height on which rack shifts take place. The lift is located underneath the Shift position: Each time the rack shifts, the lift moves to the Shift position. The lift is located above Shift position: The rack shifts at the current lift position. The shift position must be high enough to ensure save movement across the entire rack at any time. ▪ Special Position This additional definable position can be used e.g. during pipetting so that the tip is just immersed in the sample solution. ▪ Manual Position Additional position that does not have to be configured in the instrument parameters.
Manual position	<p>Define the manual position.</p> <p>This option is only active if the lift position Manual position is selected.</p>
Lift rate	<p>Speed at which the lift moves.</p>
Tower Stirrer	
On/Off ▶	
Stirrer On	<p>Switches the stirrer on or off.</p>
Rate	<p>Stirring rate when you start the hardware.</p> <p>Negative value: The peristaltic pump rotates counterclockwise.</p> <p>Positive value: The peristaltic pump rotates clockwise.</p>

8.11 IC Sample Center

8.11.1 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 IC Sample Center in the same manner.

- 1 Enter parameters for the IC Sample Center.
- 2 Click on **[Set]**.
- 3 A dialog 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.

Compressor	
On/Off	Switches the compressor on and off. The grayed out button indicates the current state.
Cooling	
Temperature	Current temperature of the thermostat.
Set	To change the temperature, enter a new value and click on [Set] .
On/Off	Switches the cooling on and off. The grayed out button indicates the current state.
General	
Wash	Start and stop the washing procedure.
Reset device	Reset the instrument from an ERROR status to the READY status.
Injector	
Configuration ►	

Sample Loop	Volume of the sample loop of the injection valve in microliter. Notice: If you operate the instrument in 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 <i>889 Sample Center manual (8.889.8001)</i> .
Volume	To change the sample loop volume, enter a new value and click on [Set] (see chapter 8.11.1, page 83).
Manual control ►	
Inject/Fill	Position of the injection valve. The grayed out button indicates the current state. Click on [Inject] or [Fill] to switch between the positions.

**NOTE**

The range of the injection volume depends 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 = $0.5 \times$ sample loop volume
- Pickup: max. injection volume = $(\text{sample loop volume} - 3 \times \text{needle volume}) / 2$

Needle	
Configuration ►	
Needle to valve	Whole volume, from the needle tip to the injection valve, in microliter.
Volume	To change the needle volume, enter a new value and click on [Set] (see chapter 8.11.1, page 83).
Manual control ►	
Position	Current needle position and selection of a (different) needle position. <ul style="list-style-type: none"> ▪ 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 is 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.

Height	<ul style="list-style-type: none"> Exchange position: Movement of the needle to the exchange position. <p>Vertical distance of the needle tip from the bottom of the vial or the cavity of the microtiter plate. Current value of the needle height and input of a (different) needle height.</p>
Rack	
Configuration ►	
Left rack / Right rack	Current rack type.
Left rack type / Right rack type	To change the rack type, select a new rack and click on [Set] .
Manual control ►	
Position	<p>Current rack position.</p> <ul style="list-style-type: none"> Home Front <p>Moves the rack to exchange position in order to exchange the racks.</p>
Move to position	To change the rack position, select a new position and click on [Start] .

Syringe	<div style="border: 1px solid #ccc; padding: 10px;"> <p>Syringe: <input type="text" value="500"/> <input type="text" value="500"/> <input type="button" value="v"/> μL</p> <p>Buffer Loop: <input type="text" value="1000"/> <input type="text" value="1000"/> μL</p> <p>Volume: <input type="button" value="Set"/></p> <p>Manual control</p> <p><input type="button" value="v"/> <input type="text" value="Fill"/></p> <p>Volume: <input type="text" value="1"/> <input type="text" value="1"/> μL</p> <p>Port: <input type="text" value="Waste"/> <input type="button" value="v"/> <input type="text" value="Needle"/></p> <p>Speed: <input type="text" value="Slow"/> <input type="button" value="v"/> <input type="text" value="Normal"/></p> <p>Syringe: <input type="button" value="Start"/></p> </div>
----------------	--



Syringe	Volume of the syringe in microliter.
Buffer Loop	Volume of the buffer loop in microliter. The Buffer Loop Volume is between 1 μL and 9,999 μL .
Volume	<p>Notice:</p> <p>The buffer loop volume and the syringe volume have to match. Check that the volumes correspond to one of the combinations:</p> <ul style="list-style-type: none"> ▪ Syringe volume = 250 μL Buffer loop volume = 500 μL ▪ Syringe volume = 500 μL Buffer loop volume = 1,000 μL ▪ Syringe volume = 1,000 μL Buffer loop volume = 2,000 μL <p>To change the volume of the syringe and the buffer loop, enter a new buffer loop volume. Select the corresponding syringe volume from the drop-down list. Click on [Set] (see chapter 8.11.1, page 83).</p>
Manual control ►	
Command	<p>Required action of the syringe.</p> <ul style="list-style-type: none"> ▪ Fill ▪ Eject ▪ Aspirate ▪ Dispense
Volume	Volume in μL if the command Aspirate or Dispense was selected.
Port	<p>Current position of the syringe valve and selection of a (different) position of the syringe valve.</p> <ul style="list-style-type: none"> ▪ Needle: Port to the needle. ▪ Wash: Port to the wash container. ▪ Waste: Port to the waste container.
Speed	Speed at which the syringe plunger is moved when carrying out the selected command.
Syringe	Click on [Start] to apply the selected parameters.

**NOTE**

Refer to the following manual for further information about the IC Sample Center: *889 IC Sample Center (8.889.8001EN)*



8.11.2 Instrument parameters



NOTE

Needle or rack commands are processed if the door of the IC Sample Center is closed. If the door is open, the state of the module changes to **Error**. The red LED on the IC 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 18, page 135).



NOTE

Set further parameters for the IC Sample Center in the **Manual Control** (see chapter 8.11.1, page 83).

Compressor On	Determines whether the compressor is switched on or off when you start the hardware.
Cooling On Temperature	Determines whether the cooling is switched on or off when you start the hardware. Temperature for the cooling when you start the hardware.
Injector Position	Position of the injection valve when you start the hardware. <ul style="list-style-type: none"> ▪ Inject Switches the valve to Inject. ▪ Fill Switches the valve to Fill. ▪ Maintain Current The valve remains in its current position.
Needle Needle Height	Vertical distance of the needle tip from the bottom of the vial or the cavity of the microtiter plate.

**NOTE**

Refer to the following manual for further information about exchanging the needle: *889 IC Sample Center (8.889.8001EN)*

Rack	
Type	Rack type for the left rack and right rack.

**NOTE**

Define the rack in the **Instrument Method Editor** and in the tab **Define Plates for Sample Method**. Ensure that you select 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.

8.11.3 Time program

Compressor	
Compressor ▶	
On/Off	Switches the compressor on or off.

General	
Full Loop Injection ▶	
Rinsing volume	Volume for rinsing.
Needle height	Distance of the needle tip from the bottom of the vial.
Syringe speed	Speed at which the syringe plunger is moved when carrying out the selected command.
Air segment	If selected, then an air segment separates the sample from the content of the wash bottle (usually UPW).

Headspace pressure	If selected, then overpressure is channeled in through the air needle. This ensures that no air or steam bubbles form while aspirating the sample. Only select this option if you use vials with septa.
Wash after injection	If selected, then the washing procedure is carried out after the injection.
Partial Loop Injection ►	
Injection Volume	<ul style="list-style-type: none"> ▪ From sample data ▪ Fixed volume
Volume	<p>Define the injection volume manually.</p> <p>Maximum injection volume = 0.5 x sample loop volume</p> <p>The sample loop volume is defined in the manual control of the IC Sample Center (see menu "Injector", page 83).</p> <p>Refer to the manual 8.889.8001 IC Sample Center for further information regarding the injection volume.</p> <p>This option is only active if the the injection volume Fixed volume is selected.</p>
Rinsing volume	Volume for rinsing.
Needle height	Distance of the needle tip from the bottom of the vial.
Syringe speed	Speed at which the syringe plunger is moved when carrying out the selected command.
Air segment	If selected, then an air segment separates the sample from the content of the wash bottle (usually UPW).
Headspace pressure	If selected, then overpressure is channeled in through the air needle. This ensures that no air or steam bubbles form while aspirating the sample. Only select this option if you use vials with septa.
Wash after injection	If selected, then the washing procedure is carried out after the injection.
Pick Up Injection ►	
Injection Volume	<ul style="list-style-type: none"> ▪ From sample data ▪ Fixed volume
Volume	<p>Define the injection volume manually.</p> <p>Maximum injection volume = 0.5 x sample loop volume</p> <p>The sample loop volume is defined in the manual control of the IC Sample Center (see menu "Injector", page 83).</p>



	<p>Refer to the manual 8.889.8001 IC Sample Center for further information regarding the injection volume.</p> <p>This option is only active if the the injection volume Fixed volume is selected.</p>
Transport volume	Volume of transport solution in units of the syringe volume (1–9 x syringe volume).
Needle height	Distance of the needle tip from the bottom of the vial.
Syringe speed	Speed at which the syringe plunger is moved when carrying out the selected command.
Air segment	If selected, then an air segment separates the sample from the content of the wash bottle (usually UPW).
Headspace pressure	If selected, then overpressure is channeled in through the air needle. This ensures that no air or steam bubbles form while aspirating the sample. Only select this option if you use vials with septa.
Wash after injection	If selected, then the washing procedure is carried out after the injection.
Wait for Injection ►	
max. waiting time	If activated, then the time program is continued as soon as either the injection valve of the IC Sample Center has switched to Inject or the waiting time has expired.
Wash	Performs the washing procedure.
<hr/>	
Injector	
Switch ►	
Switch to	<ul style="list-style-type: none"> ▪ Inject Switches the valve to Inject. ▪ Fill Switches the valve to Fill. ▪ Maintain Current The valve remains in its current position.
<hr/>	
Needle	
Move ►	
Position	<ul style="list-style-type: none"> ▪ Top Vertical movement of the needle to the top.

Height	<ul style="list-style-type: none"> ▪ Bottom Vertical movement of the needle to the bottom. If the needle is located above a rack position, it is moved to the bottom so far that the distance between the needle tip and the bottom of the vial specified in the parameter 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. <p>Vertical distance of the needle tip from the bottom of the vial or the cavity of the microtiter plate.</p> <p>Only active if the position Bottom has been selected.</p>
Rack	
Move to position ►	<i>(see chapter 8.11.6, page 97)</i>
Position	<ul style="list-style-type: none"> ▪ Sample Position Rack position that is defined in the sample table. ▪ Rack Position Position on the rack. Define the position in the parameter Vial. ▪ Exchange Position Moves the rack to exchange position in order to exchange the racks.
+1	<p>Use this function for example to calibrate an AnCat system.</p> <p>Refer to <i>chapter 8.11.6, page 97</i> for more information about the +1 function.</p> <p>This option is only active if the position Sample Position has been selected.</p>
Vial	<p>Define which position should be used as Rack position.</p> <p>Input format: Left / Right; Row; Column</p> <p>Example: LB2</p> <p>The actual input range depends on the selected rack type (<i>see menu "Rack", page 88</i>).</p> <p>Refer to <i>chapter 8.11.6, page 97</i> for more information regarding the rack positions.</p> <p>This option is only active if the position Rack Position has been selected.</p>
Syringe	
Aspirate ►	
Port	<p>Port for aspirating the sample.</p> <ul style="list-style-type: none"> ▪ Needle ▪ Wash



Speed	<ul style="list-style-type: none"> ▪ Waste <p>Speed at which the syringe plunger is moved.</p> <ul style="list-style-type: none"> ▪ Fast ▪ Normal ▪ Slow <p>This option is only active if the port Needle has been selected.</p>
Volume	<p>Volume to aspirate. The maximum volume that can be aspirated depends on the current position of the syringe plunger.</p>
Change Port ▶	
Port	<p>The syringe valve port rotates to the selected position.</p> <ul style="list-style-type: none"> ▪ Needle ▪ Wash ▪ Waste
Dispense ▶	
Port	<p>Port for dispensing the sample.</p> <ul style="list-style-type: none"> ▪ Needle ▪ Wash ▪ Waste
Volume	<p>Volume to dispense. The maximum volume that can be dispensed depends on the current position of the syringe plunger.</p>
Eject ▶	
Port	<p>Port for ejecting the content of the syringe.</p> <ul style="list-style-type: none"> ▪ Needle ▪ Wash ▪ Waste
Speed	<p>Speed at which the syringe plunger is moved.</p> <ul style="list-style-type: none"> ▪ Fast ▪ Normal ▪ Slow <p>This option is only active if the port Needle has been selected.</p>
Fill ▶	
Port	<p>Port for filling the syringe.</p> <ul style="list-style-type: none"> ▪ Needle ▪ Wash ▪ Waste

Speed

Speed at which the syringe plunger is moved.

- Fast
- Normal
- Slow

This option is only active if the port **Needle** has been selected.

**NOTE**

For further information about the injection modes refer to the *889 Sample Center manual (8.889.8001)*.

8.11.4 Importing predefined plates

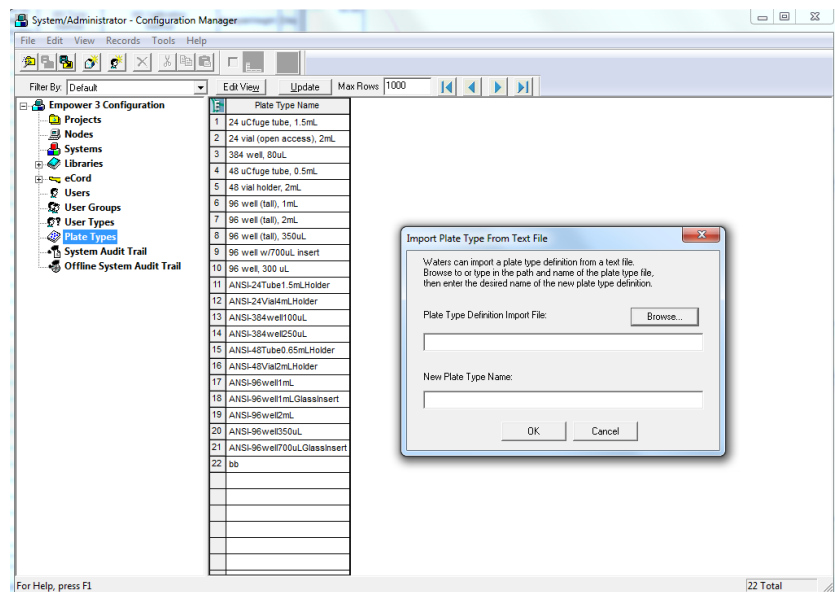
1 Go to the **Configure the System** section.

2 Go to **Plate Types**.

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

Enter a name for the new plate type.

Click on **[Browse]**.



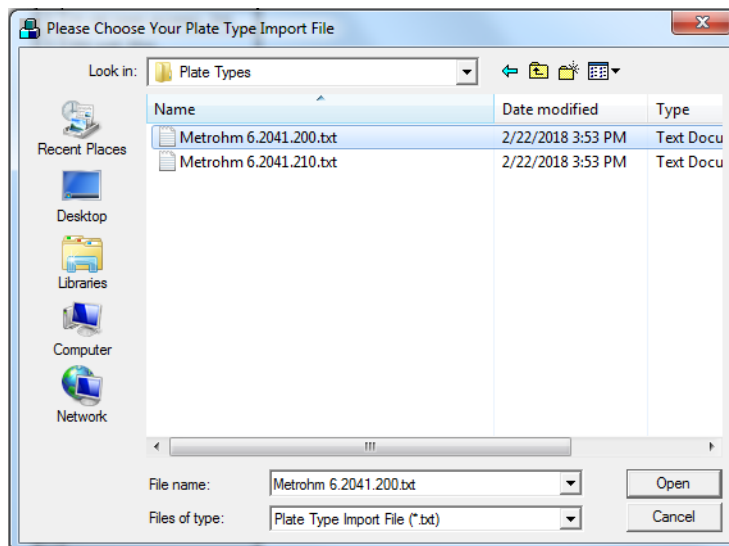
3 Navigate to the installation medium. Open the folder **Plate Types**.

Select a file.

**NOTE**

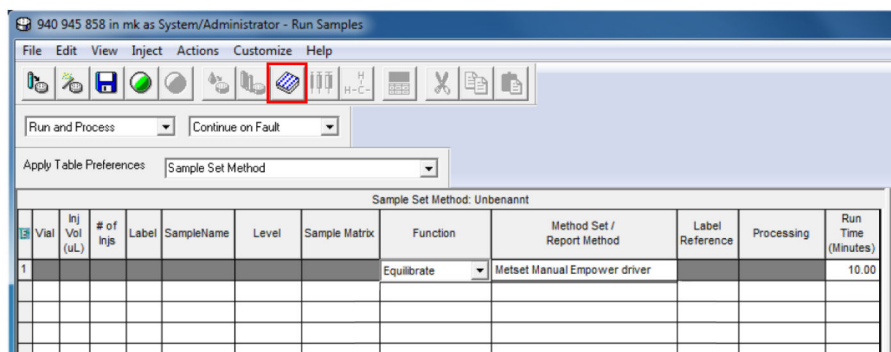
Metrohm 6.2041.200 contains a predefined plate with 48 vials.
 Metrohm 6.2041.210 contains a predefined plate with 12 vials.

Click on **[Open]**.



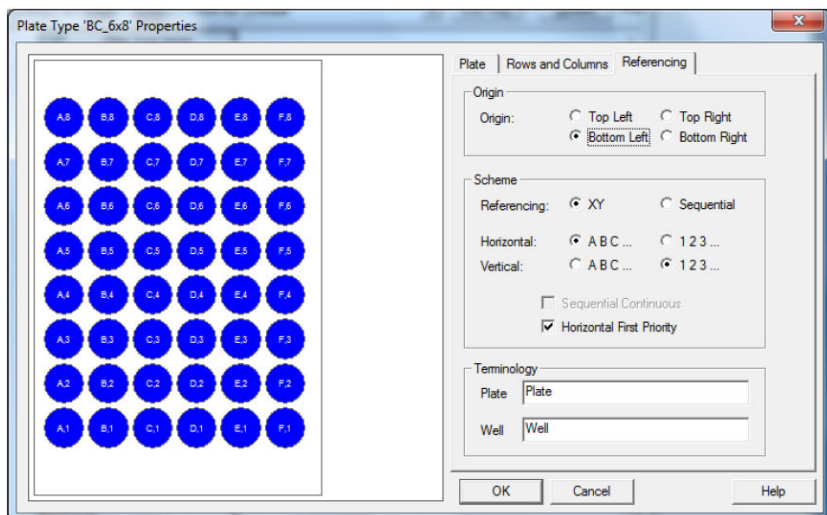
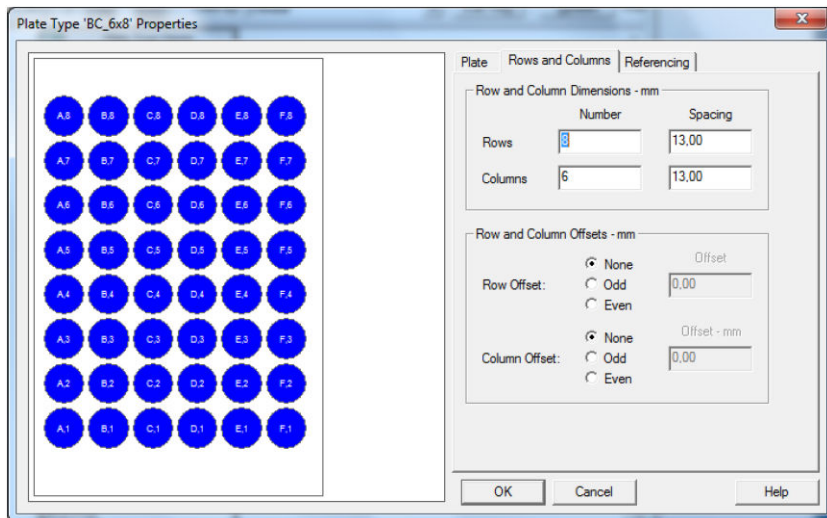
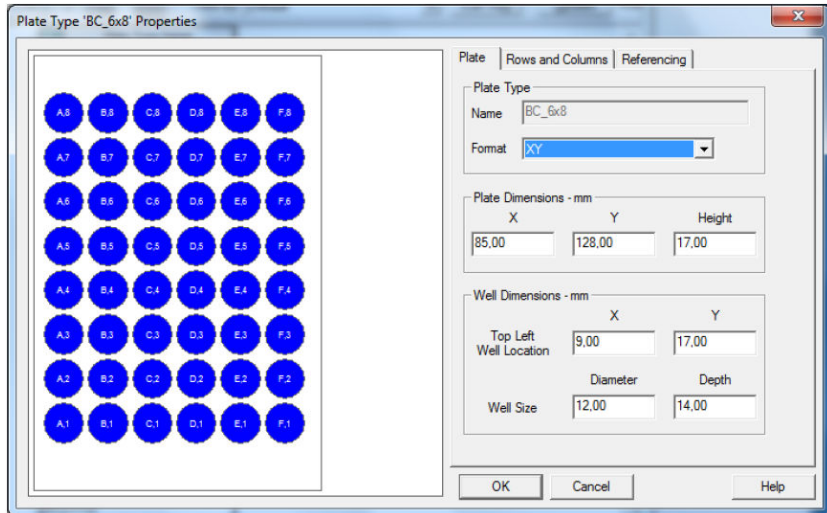
4 Go to the **Run Samples** section.

Click on the plates symbol.



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

2





- 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

9 Creating an offline method



NOTE

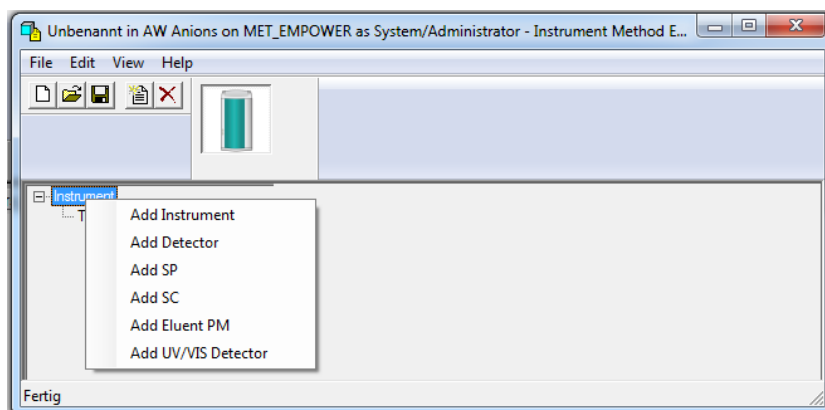
Metrohm does not recommend to create an offline method. Use an online method whenever possible.

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

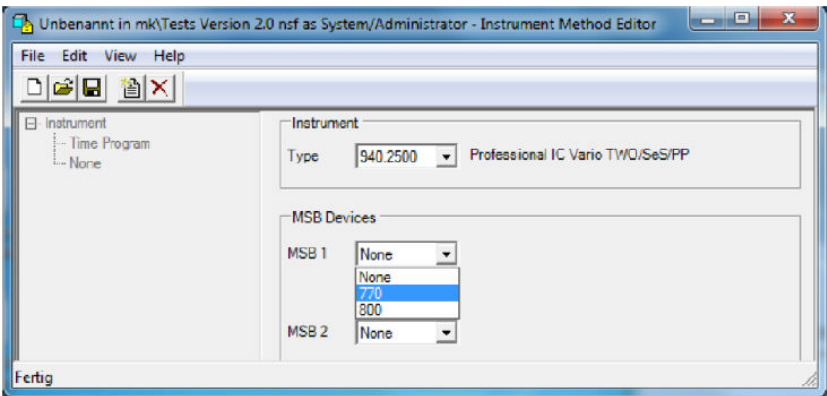
- When creating an offline method, no instrument must be connected to the computer. If an instrument is connected to the computer, setting up an offline method is not possible.
- Ensure that the configuration of the node and the system correspond with the real system you want to connect to the computer 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 Disconnect all Metrohm instruments connected to the computer.
- 2 Create a new node (see "Creating a node", page 5).
- 3 Insert the parameters for the DHCP. If 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 3.1, page 5).

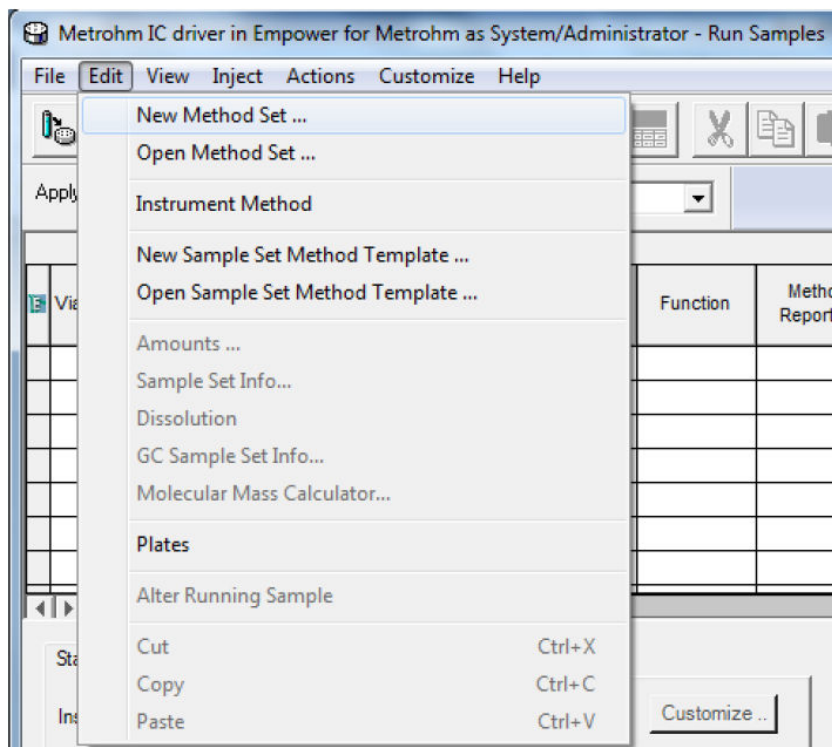


NOTE

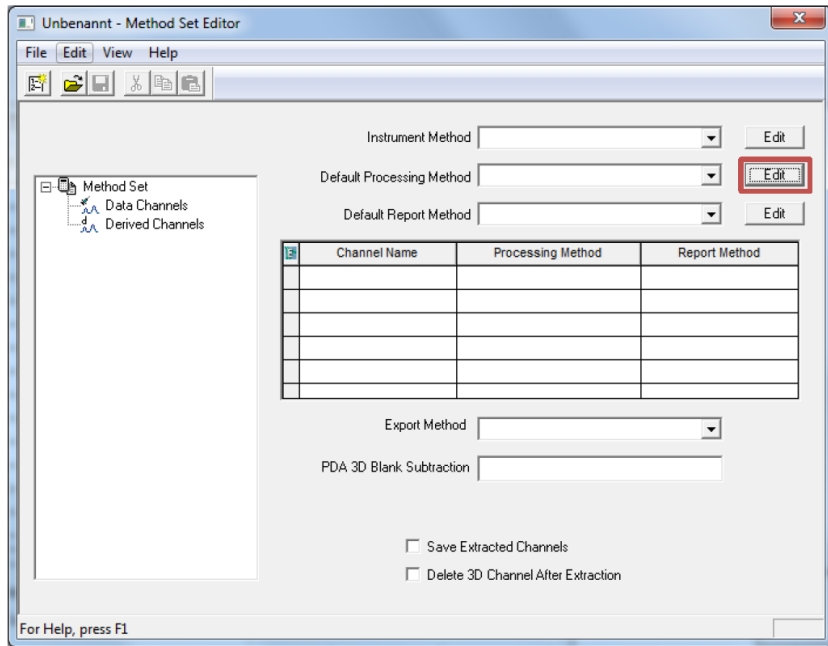
It is not possible to select the amount of detectors.
A single channel IC instrument contains always 1 amperometric detector and 1 conductivity detector.
A dual channel IC instrument contains always 2 amperometric detectors and 2 conductivity detectors.

10 Creating a processing method

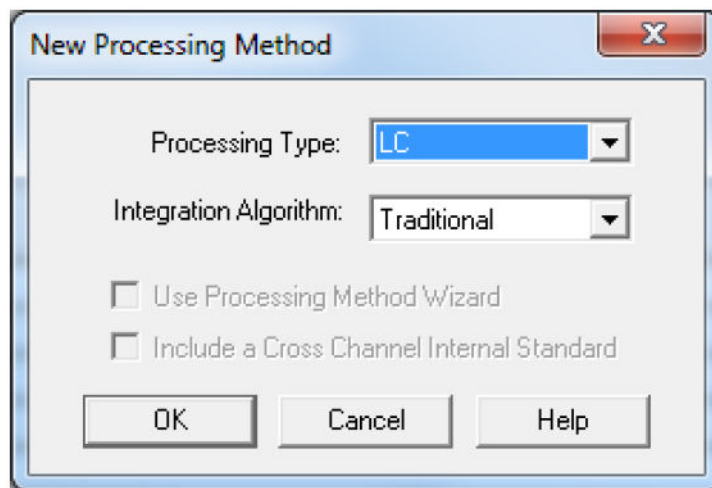
- 1 Click on **Edit ► New Method Set**.



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



The following window appears.

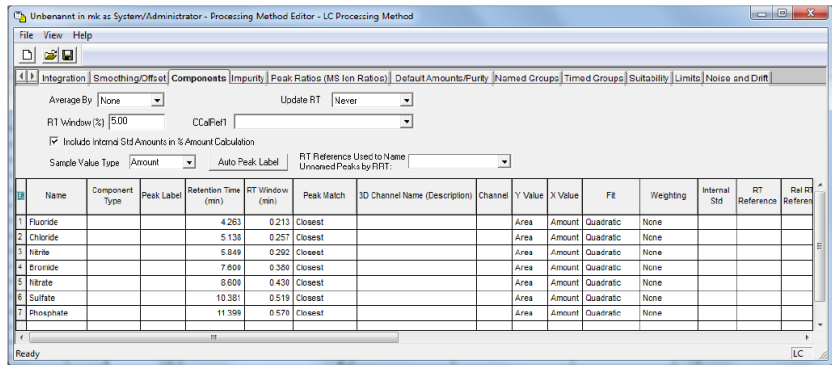


3 Select the processing type and the integration algorithm.
Click on **[OK]**.

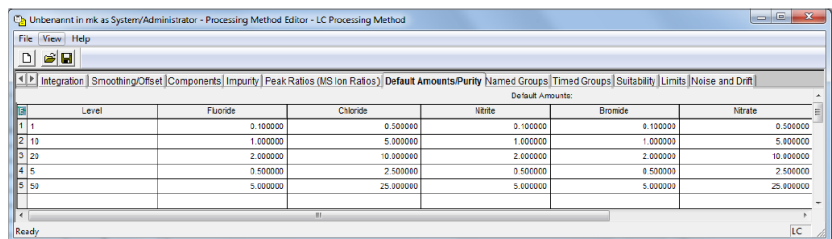
4 Open the tab **Components** to perform the following actions:

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

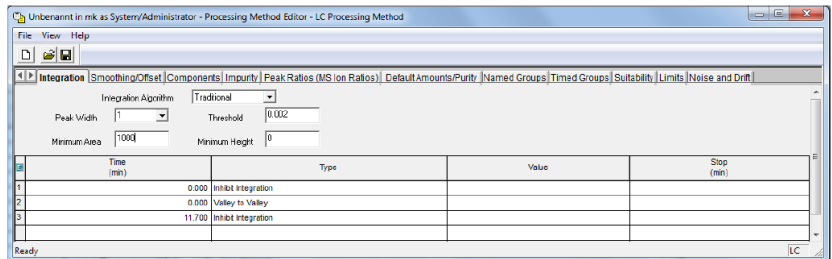
Adjust the processing method later. It is not necessary to fill in all parameters. It is possible to start with the default settings.



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



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



- 7 Click on the save icon  to save the processing method.

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

Save current Processing Method

Names:
Anion_proc2
Glucose
IN1239_proc1
sugars

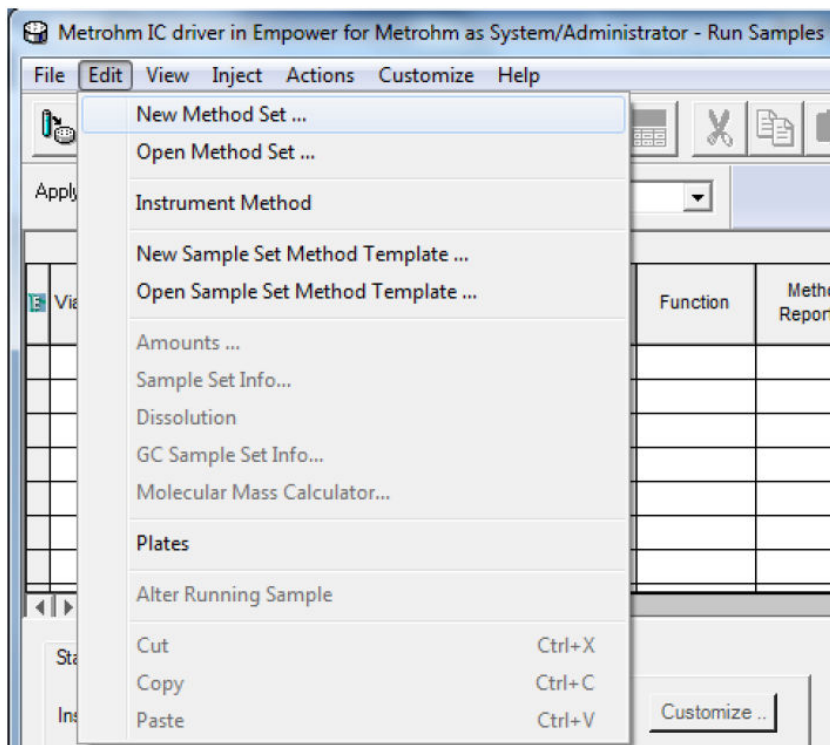
Name: Procmet Manual Empower driver

Method Comments:

Save Cancel Help

11 Forming a method set

- 1 Click on **Edit ► New Method Set...**



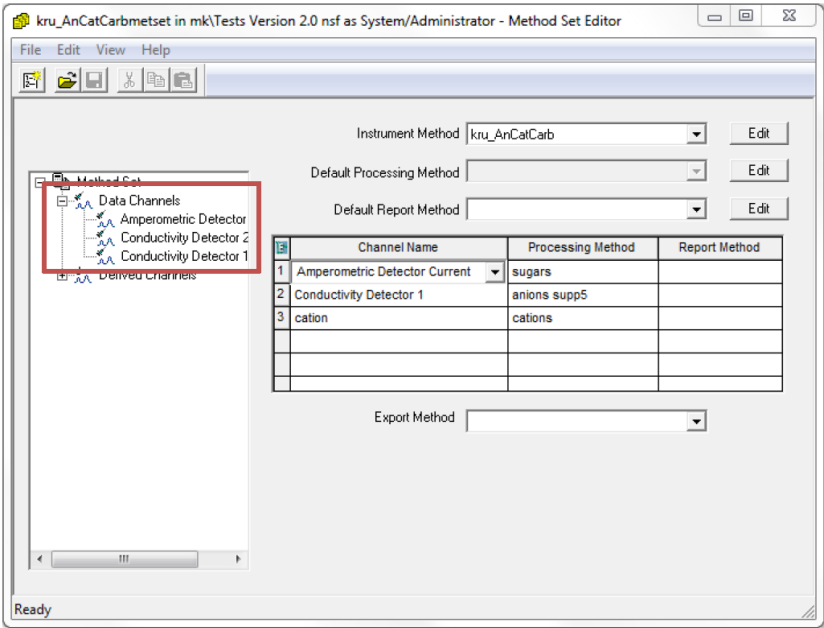
- 2 Select your **Instrument Method** for the method set.

Default Processing Method, Default Report Method and **Export Method** are optional.



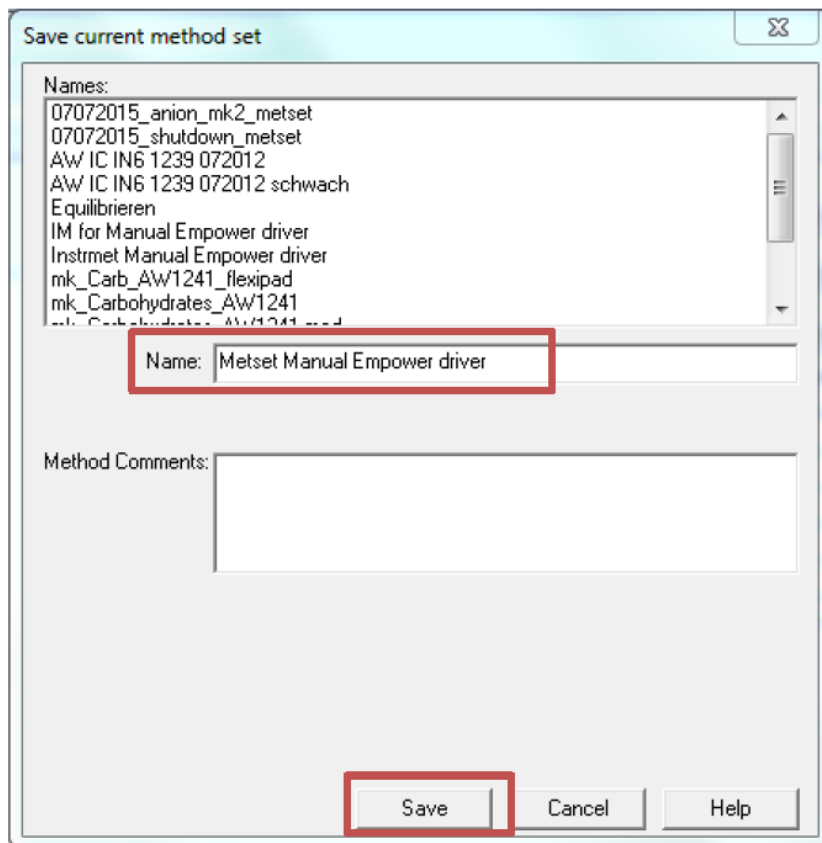
NOTE

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



3 Click on the save icon  to save the method.

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



12 Running samples

12.1 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 18, page 135*.

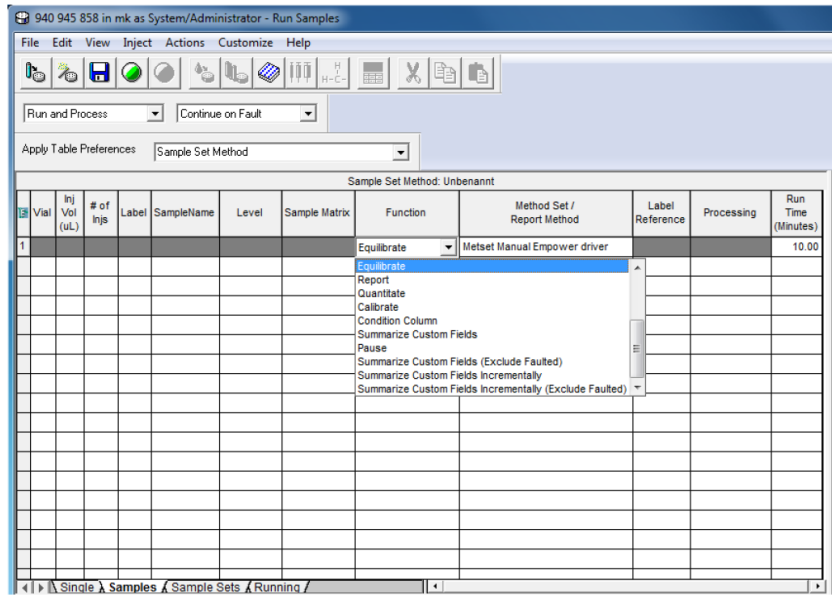
The screenshot shows a software window titled 'Status | Manual Control'. At the top, it displays 'Instrument Status: IDLE sn: 99101' and a 'Customize ...' button. Below this is a table with two columns labeled '1' and '2'. The table lists various instrument parameters and their current values for both channels.

	1	2
Pump Flow(ml/min)	0.000	0.000
Pump Press (bar)	101.8	89.0
Injector	INJECT	INJECT
Degasser	READY	
MSM Step (min)	27.5	
MCS State	READY	
Col. Heater (°C)	35.0	
Col.Heater State	STABLE	
Cond Det (µS/cm)	1.754	

1 Start filling in the sample table.


- Start with a line for the equilibration of the system. Use the **Equilibrate** function for this. For further information about the equilibration of the system, refer to *chapter 14, page 119*.

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



2 Create a sample table according to your needs.


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

3 To start the series, click on the run icon  (only if the instrument status is **IDLE**).

4 Enter a name for the sample set.
Click on **[Run]**.

**NOTE**

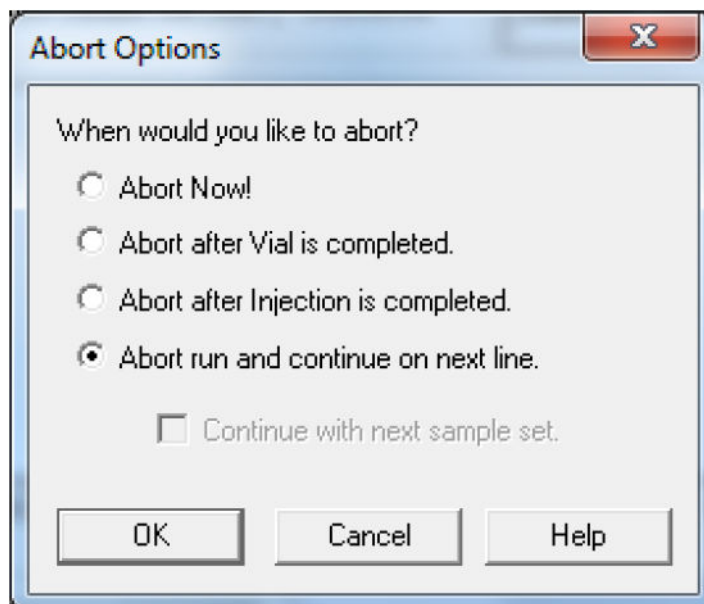
For information regarding the shutdown method, *refer to chapter 12.2, page 112.*

When your baseline is stable, abort the run with  and select **Abort run and continue on next line**. 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** panel are frozen.

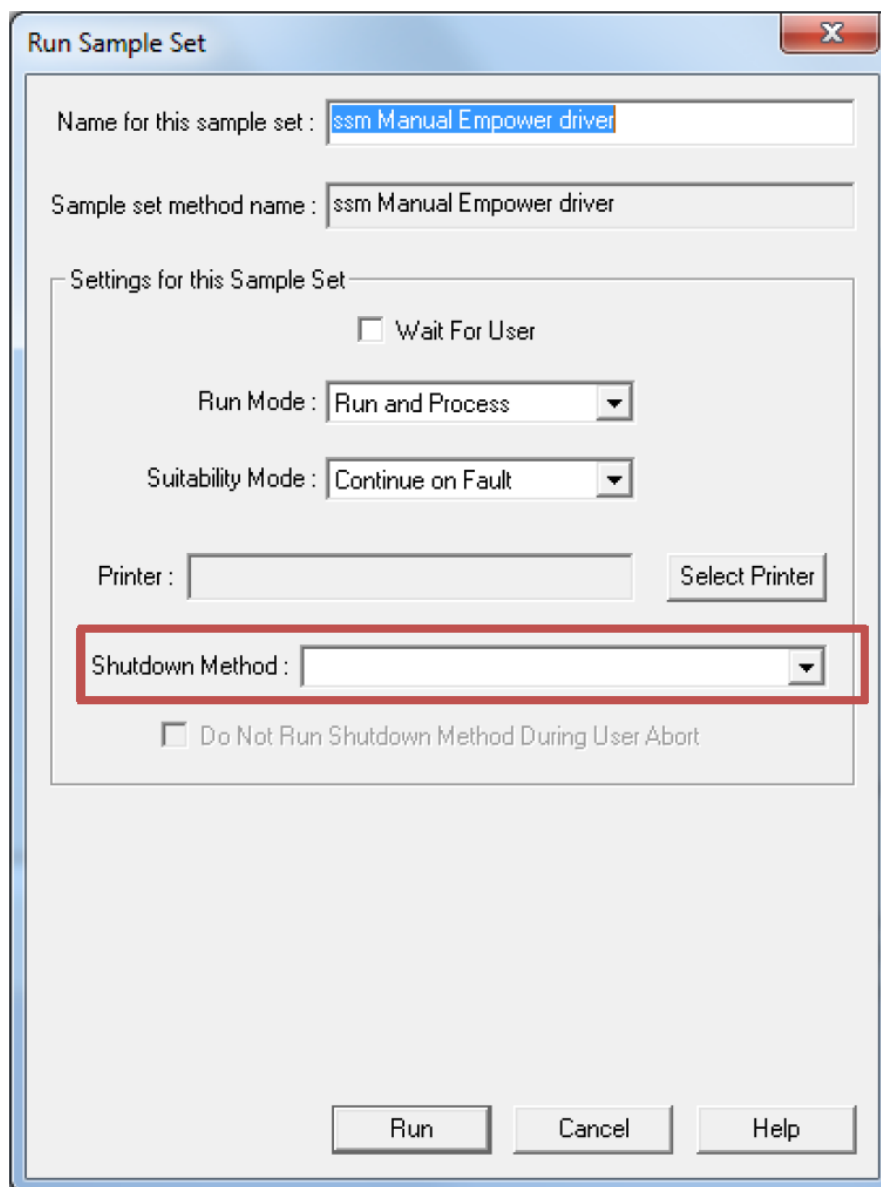
- **Abort after Vial is completed:** The run stops after completing all injections from the current vial on the current row in the samples table. The modules do not stop.
- **Abort after Injection is completed:** The run stops after completing the current injection. The modules do not stop.
- **Abort 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 12.2, page 112*) and do not activate the option **Do not Run Shutdown Method During User Abort**, the shutdown method is executed subsequently.

12.2 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.



The screenshot shows a dialog box titled "Run Sample Set". It contains the following fields and controls:

- Name for this sample set :
- Sample set method name :
- Settings for this Sample Set:
 - Wait For User
 - Run Mode :
 - Suitability Mode :
 - Printer :
 - Shutdown Method :** (highlighted with a red box)
 - Do Not Run Shutdown Method During User Abort
- Buttons:

Creating a shutdown method

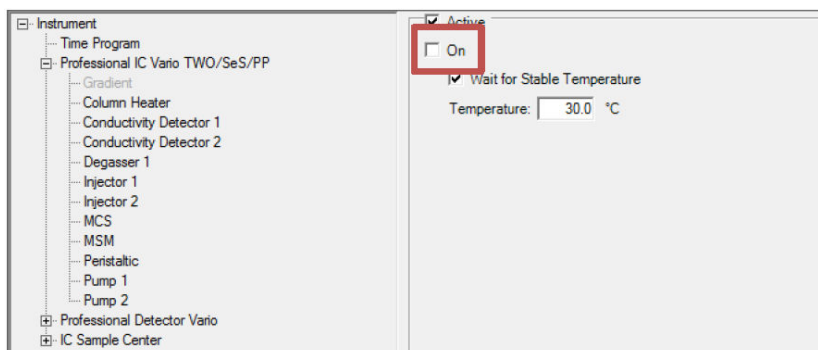
To create a shutdown method, proceed as follows (example):

- 1 Create a new instrument method (*see chapter 8, page 35*).
- 2 Switch off the following instruments by unchecking the check box **On**:

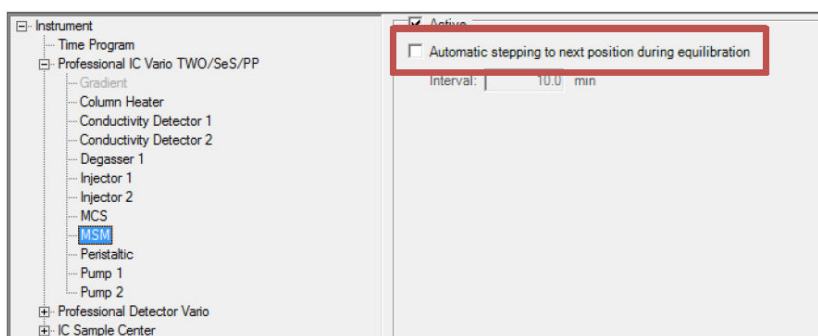
- Column Heater
- Degasser
- MCS
- Peristaltic
- Pumps

**NOTE**

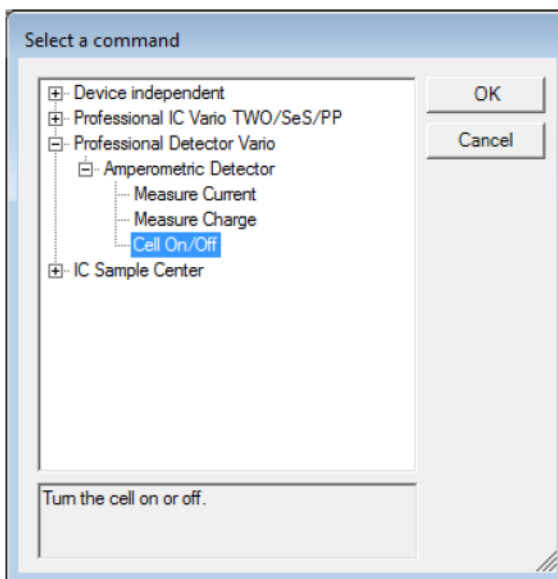
Do not uncheck the check box **Active**.



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



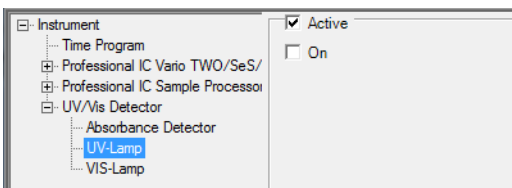
- 4 If you use the amperometric detector, open the **Time Program**.
- 5 Click on **[Add]**.
- 6 Go to **Professional Detector Vario ► Amperometric Detector ► Cell On/Off**.



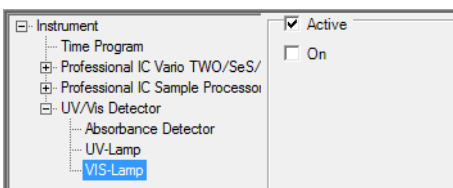
7 Uncheck **Cell On** and click **[OK]**.

8 If you use the UV/VIS detector, open **UV/VIS detector**.

9 Open **UV-Lamp** and uncheck the check box **On**.



10 Open **VIS-Lamp** and uncheck the check box **On**.



11 Save the instrument method.

Restrictions

When using a shutdown method, consider 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 fails. Example: The command **Move to position** in the time program in the picture is not executed and the time program fails.

Time	Device	Module	Command	Parameter	
0.00	Professional De...	Amperometric De...	Cell On/Off	On = False	Add...
---	IC Sample Center	Rack	Move to position	Move = Rack Position , Position =	Insert...
					Edit...
					Remove

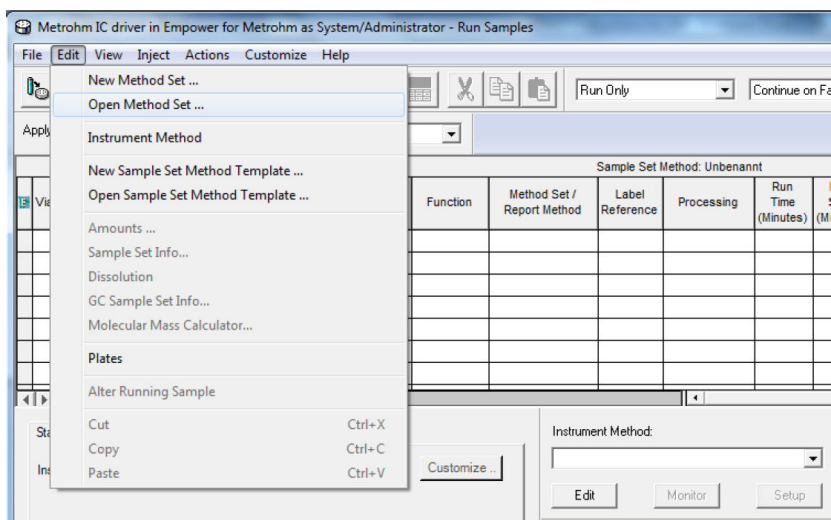
- If you use a shutdown method at the end of a sequence in a dual system, an instrument failure occurs. Use a normal instrument method instead of a shutdown method. Set the instrument parameters for the last sample line in the same way as you would set them in the shutdown method.

13 Measuring cations

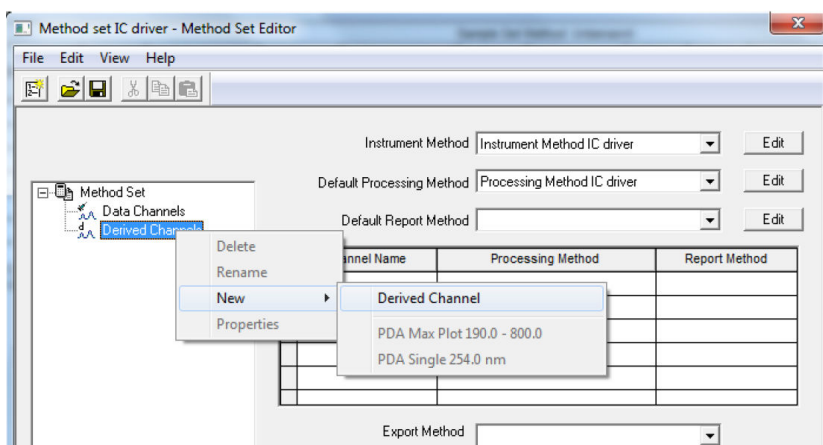
For a non-suppressed cation determination, the peaks in the live display are negative. In the analysis results, the chromatograms are displayed correctly (with positive peaks) if you use a derived channel. For anion determination, the peaks are always positive.

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.

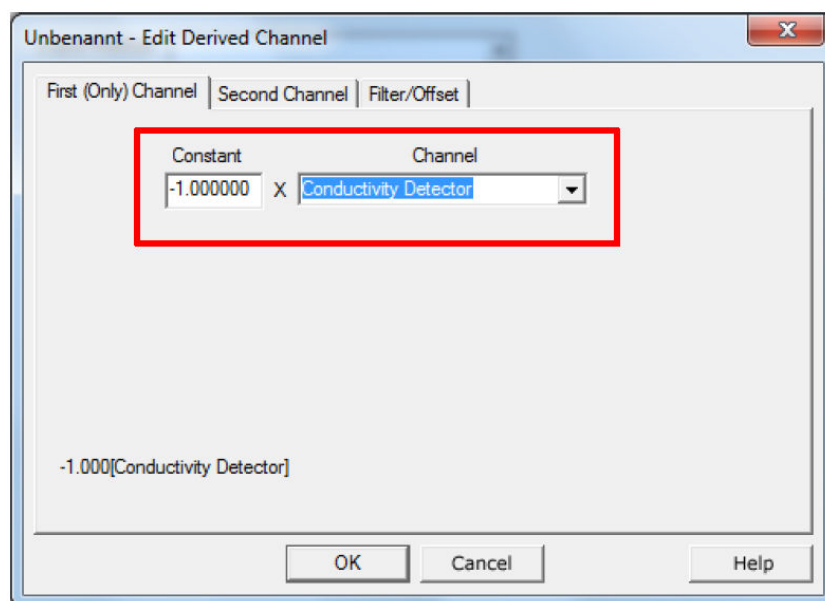
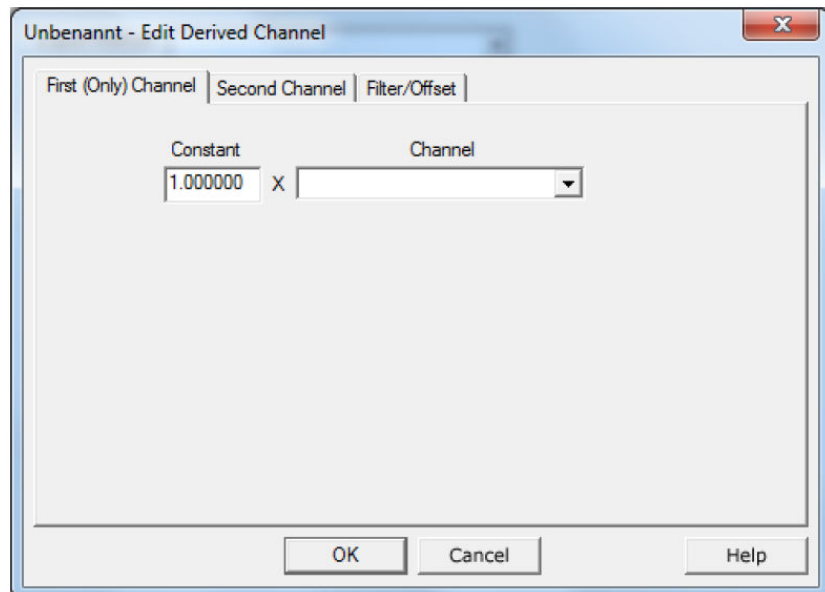
- 1 Click on **Edit ► Open Method Set...** to open the desired method set.



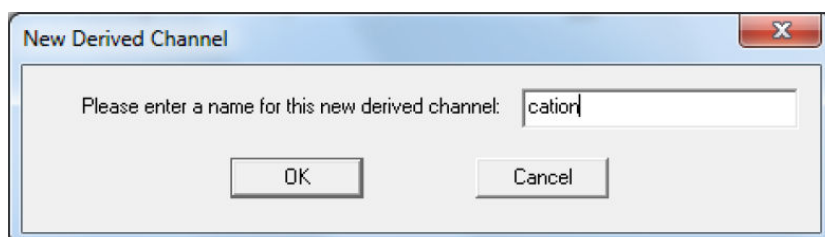
- 2 Right-click on **Derived Channels ► New ► Derived Channel** to create a derived channel.



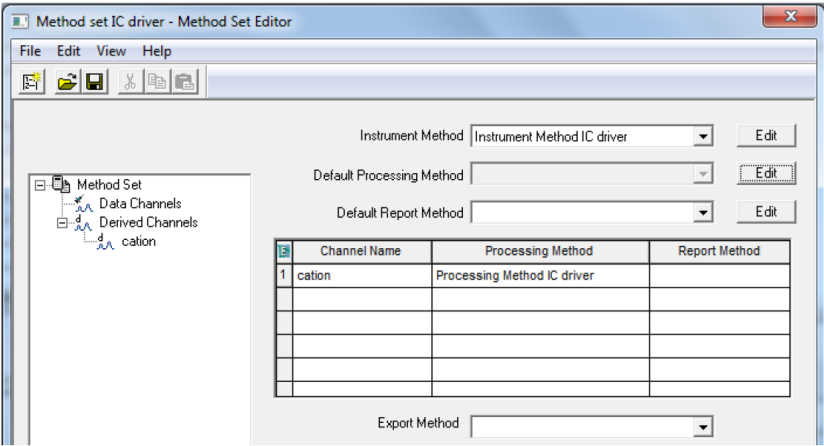
- 3 For the derived channel, the conductivity needs to be multiplied by **-1** to obtain the inverse:



- 4 Name the derived channel.

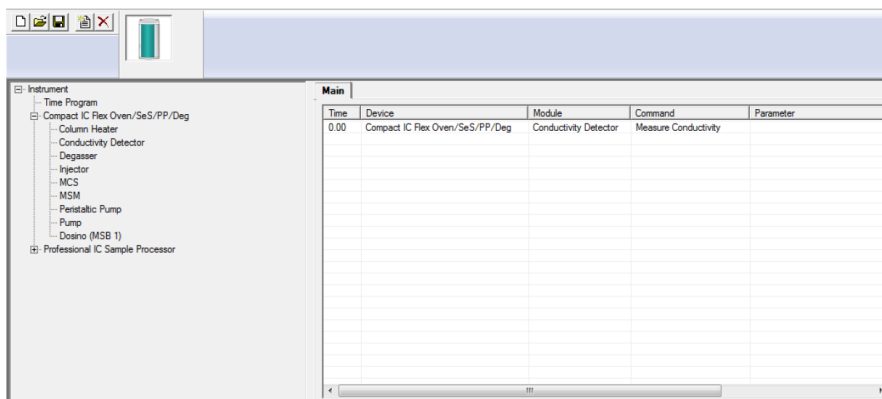


5 select a processing method for the cation channel.



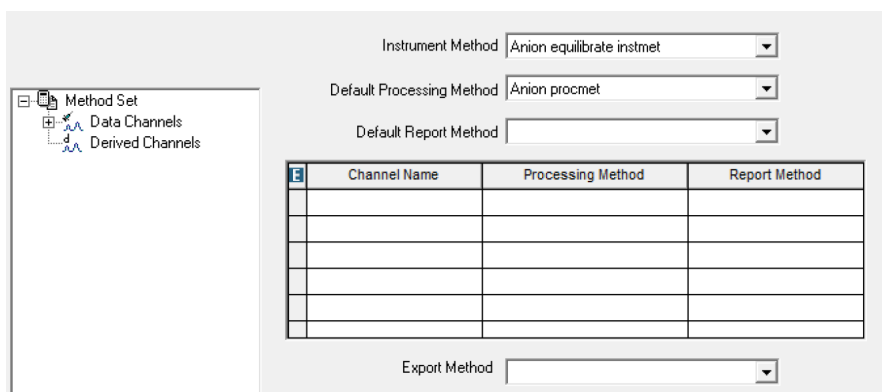
14 Equilibrating the system

You can use the method that 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 are executed. The other commands of the time program are not executed.



Additionally it might be useful to create an equilibration method. 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**. Run this method set in the first line of each sample table.

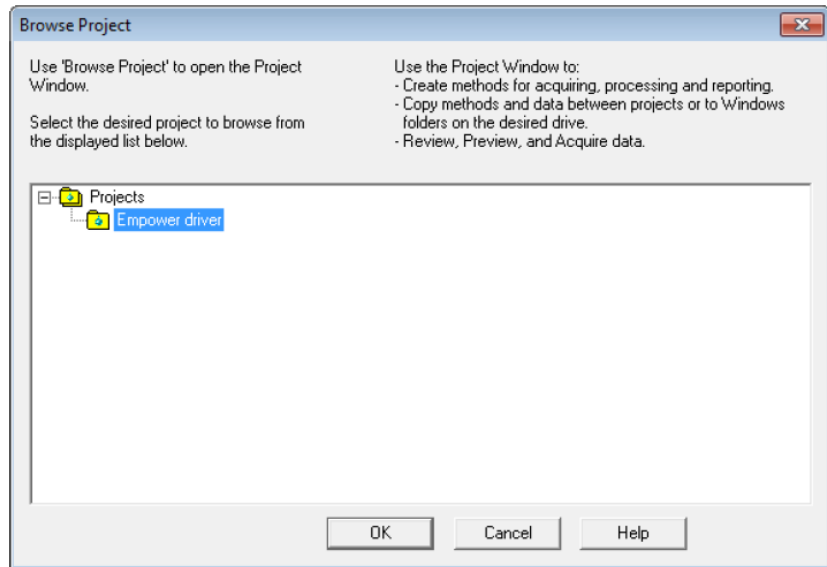


15 Evaluating recorded data

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



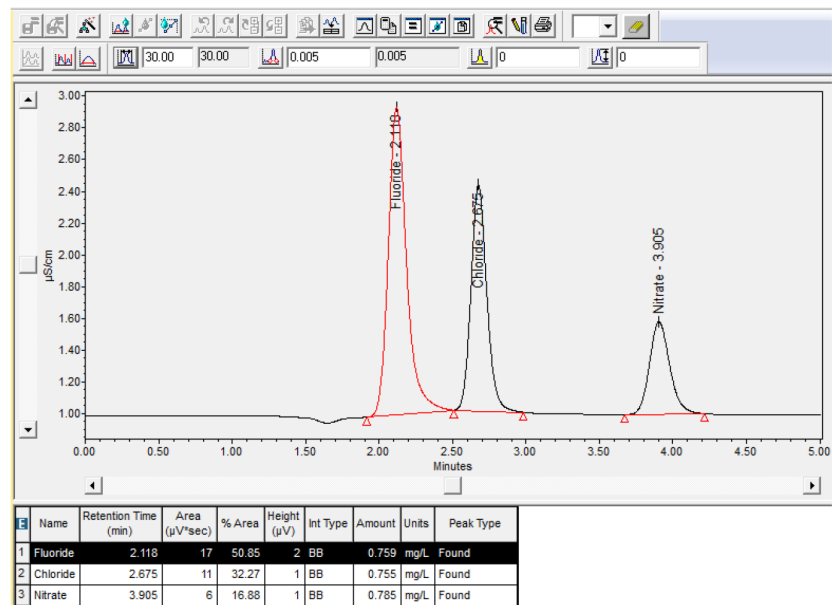
- 2 Select the desired project in the project tree.
Click on **[OK]**.



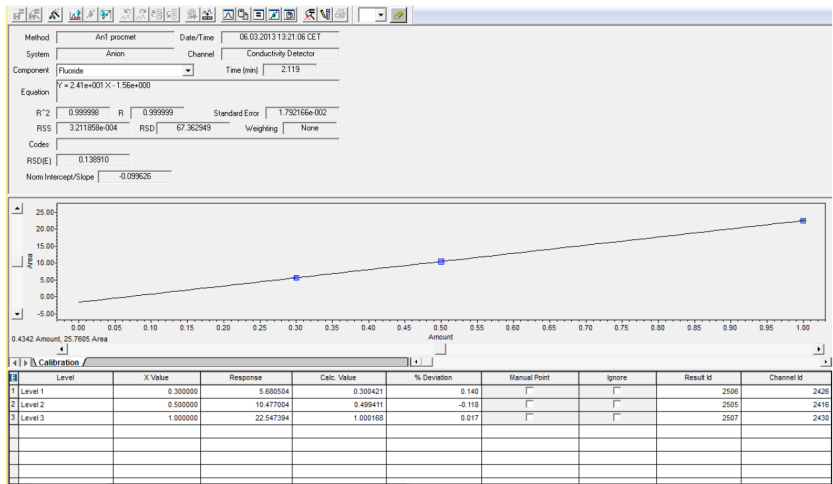
3 Right-click on the name of the sample set and select **Review**.

Filter By: Default Edit View

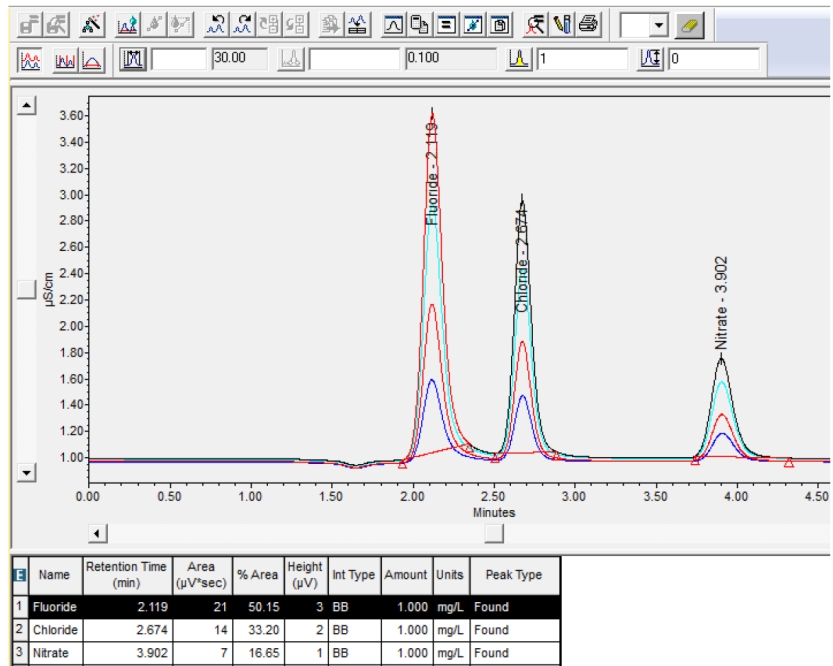
Sample Set Name	Sample Set Start Date	System Name
1 testuvcondwith iodide	06.11.2017 09:20:05 CET	940_944_858
2 test	03.11.2017 16:30:37 CET	940_944_858
3 iodidewith uv	03.11.2017 16:02:07 CET	940_944_858
4 smpleset_940_941_02112017	02.11.2017 15:53:05 CET	940_941
5 smpleset_HP	26.10.2017 11:25:44 CEST	940_944



The  icon shows the calibration.



4 To load several results into the review, highlight the results and open the **Review** window. Use the  icon to overlay curves.



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

Metrohm_details in multidet_system on Empower3 as System/Administrator - Report Publisher

File Edit View Tools Layout Help

100%

Chromatograms

- Zeroed Baseline Chromatograms
- Tables
 - LC Calibration Curves
 - LC Calibration Point Tables
 - LC Calibration Avg. Point Tables
- Fraction Tables
- Instrument Methods
 - Gradient Information
 - Instrument Method Group
 - Isocratic Method
- Processing Methods
- Report Methods
- Export Methods
- Method Sets
- Sample Set Methods
- System Information
 - System Information Group
- Sample Sets
- Sample Components
- Comp Status Reports
- Post Run Reports
 - Brief Report
 - Full Report
 - Summary Report
- eCord Information
- Drawing Objects
- Special Information
- Fields
- Result Custom Fields

Instrument Method: Instmet_889UVVIS_Drift

Stored: 12/10/2021 11:30:13 AM CET

Method Information

Method Comments
 Method Modified User System
 Method Locked No

System Information

General Information

System Name 889_940_945_947
 System Comments
 Node 001-cmp-01189
 System Create Date 12/6/2021 11:36:09 AM CET

Metrohm IC Post Run Report

Sample: OQ Drift_Noise Vial: L:A,1 Inj: 1

DHCP configuration

DHCP configuration Metrohm IC#SC=100062 UV=001000174040 IC=099101 DT=004101

IC System Information

- 8 Double-click on the corresponding fields to apply the information directly to the report.

Example for Post Run Report

Instrument Method: Instmet_889UVVIS_Drift

Stored: 12/10/2021 11:30:13 AM CET

Method Information

Method Comments
 Method Modified User System
 Method Locked No
 Method Id 1152
 Old Id
 Method Version 1
 Method Edit User
 Source S/W Info Empower 3 Software Build 3471 SPs Installed: Service Release 5 DB ID: 3118059012

Metrohm IC Instrument Setup

General Information

Format Version 0

Ion Chromatograph

Gradient

Active No
 Flow 0.500(mL/min)
 Minimum Pressure 0.00(bar)
 Maximum Pressure 350.00(bar)
 Use Start-up Time No
 Start-up Time 1(min)
 Number of Pumps 2

Column Heater

Active Yes
 On No
 Wait for stable temperature No
 Temperature 30.0(°C)

Conductivity Detector

Active No
 Temperature Coefficient 2.3(%/°C)
 Thermostat 40(°C)
 Cell Constant 17.1(1/cm)

Corresponding information is displayed for all modules.

Time Program (Main)

Main						
Time (min)	Device	Module	Command	Parameter	Comment	
1	UV/Vis Detector	Absorbance Detector	Reset Baseline			
2	UV/Vis Detector	Absorbance Detector	Measure Single Channel	Channel = 1		
3	UV/Vis Detector	Absorbance Detector	Measure Single Channel	Channel = 2		



System Information

General Information
System Name 889_940_945_947
System Comments
Node 001-cmp-01189
System Create Date 12/6/2021 11:36:09 AM CET
Instrument: Metrohm IC
Type Metrohm IC
Address Metrohm IC#SC=100062 UV=001000174040 IC=099101 DT=004101
OK ? Yes
Serial Number
Last Serviced
Next Service Due
Prom Version
Comments
Details Vendor Metrohm AG, Ionenstrasse, Herisau, Switzerland; Type IC;
Driver 2.2.93.21340; MethodEditor 2.2.93.21340; StatusPanel
2.2.93.21340
Optional Pump Head
Manufacturer Waters Corp., 34 Maple Street, Milford, MA 01757. USA
Purchase Order #
Owners Equip #
Location
Operators Guide
Detector Cell Size
Installation Start
Site OK? No
Installation materials OK? No
Electrical OK? No
Fluidic OK? No

Metrohm IC Post Run Report

Sample: OQ Drift Noise Vial: L:A,1 Inj: 1

DHCP configuration

DHCP configuration Metrohm IC#SC=100062 UV=001000174040 IC=099101 DT=004101

IC System Information

IC name Professional IC Vario TWO/SeS/PP
 IC type 2.940.2500
 IC program version 5.940.0101
 IC serial number 99101

IC Dosino(s)

Dosino 1 name Dosino 1 (MSB 1)
 Dosino 1 connection MSB 1
 Dosino 1 type 800
 Dosino 1 serial number 76598
 Dosino 2 name Dosino 2 (MSB 2)
 Dosino 2 connection MSB 2
 Dosino 2 type 800
 Dosino 2 serial number 11339

IC Column(s)

Column 2 Type OQ Capillary
 Column 2 Serial Number 0085.0026
 Column 2 Order Number 6.1831.170
 Column 2 Particle Size 1(µm)
 Column 2 Length 1(mm)
 Column 2 Inner Diameter 1(mm)

IC Pump(s)

Pump 1 Type	Standard	Pump 2 Pressure Max	500(bar)
Pump 1 Serial Number	19319	Pump 2 Correction Factor	1
Pump 1 Flow Range Min	0.01(mL/min)	Pump 3 Type	Standard
Pump 1 Flow Range Max	5.00(mL/min)	Pump 3 Serial Number	34656
Pump 1 Pressure Max	350(bar)	Pump 3 Flow Range Min	0.01(mL/min)
Pump 1 Correction Factor	1	Pump 3 Flow Range Max	5.00(mL/min)
Pump 2 Type	Standard	Pump 3 Pressure Max	500(bar)
Pump 2 Serial Number	19311	Pump 3 Correction Factor	1
Pump 2 Flow Range Min	0.01(mL/min)		
Pump 2 Flow Range Max	5.00(mL/min)		

IC Conductivity Detector(s)

Conductivity Detector Serial Number 29126
 Conductivity Detector Cell Constant 17.1(1/cm)
 Conductivity Detector Thermostat 40(°C)

Detector System Information

Detector name Professional Detector Vario
 Detector type 2.945.0030
 Detector program version 5.940.0101
 Detector serial number 4101

Detector Conductivity Detector(s)

Conductivity Detector Serial Number 28287
 Conductivity Detector Cell Constant 16.4(1/cm)
 Conductivity Detector Thermostat 40(°C)

Detector Amperometric Detector(s)

Amperometric Detector Serial Number 12854
 Amperometric Detector Cell Type

UV/VIS Detector System Information

Product name Professional UV/VIS Detector Vario - MW
 Type 1.947.0020
 Firmware revision 59470101
 Serial number 001000174040
 UV Lamp Operating Hours 256(h)
 VIS Lamp Operating Hours 1196(h)
 Integration Duration 35(ms)
 Intensity Level 12
 Measuring Duration 315(ms)

SC System Information

SC name	IC Sample Center	Syringe volume	500(µL)
SC type	889.0020	Buffer loop volume	1000(µL)
SC program version	0840.100-1.31	Sample loop volume	100(µL)
SC serial number	100062	Needle to valve volume	15(µL)
Left rack type	48 Vials		
Right rack type	None		

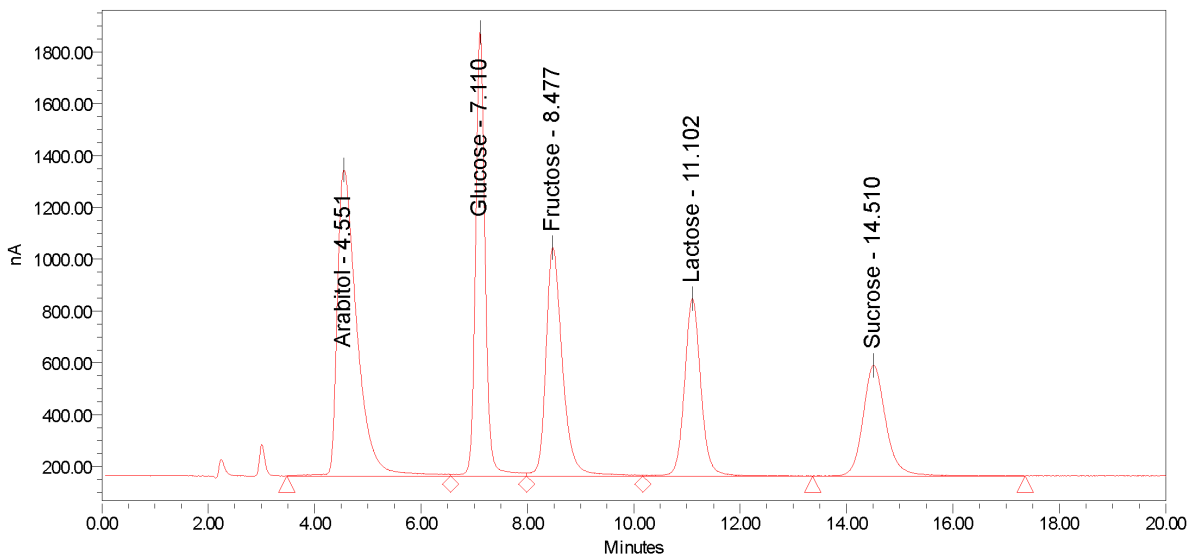
Example for determination



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	Arabinol	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		

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.

16 Numbering of the modules

The numbering of each module depends 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 second extension module has to be connected to the first extension module. The third extension module has to be connected to the second extension module. The numbering of the modules begins with the IC instrument and continues with the extension modules according to their position in the daisy chain.

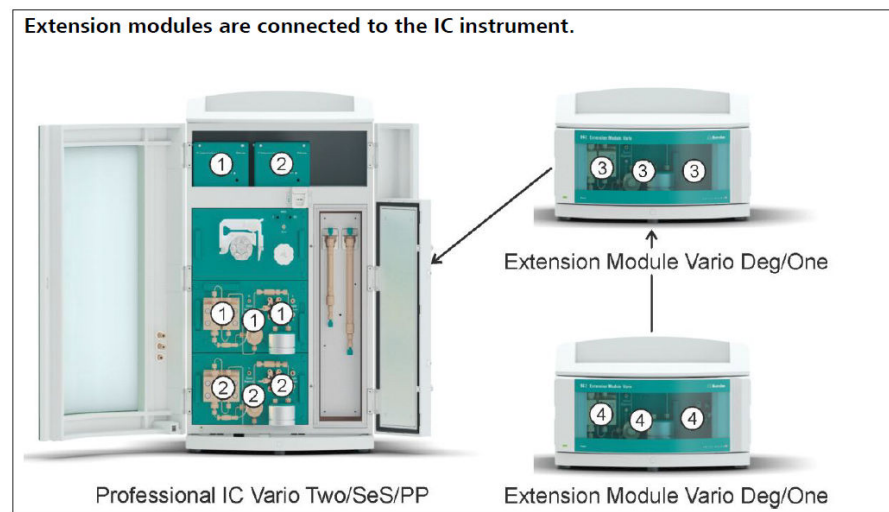


NOTE

The numbering is fixed. 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.



Example

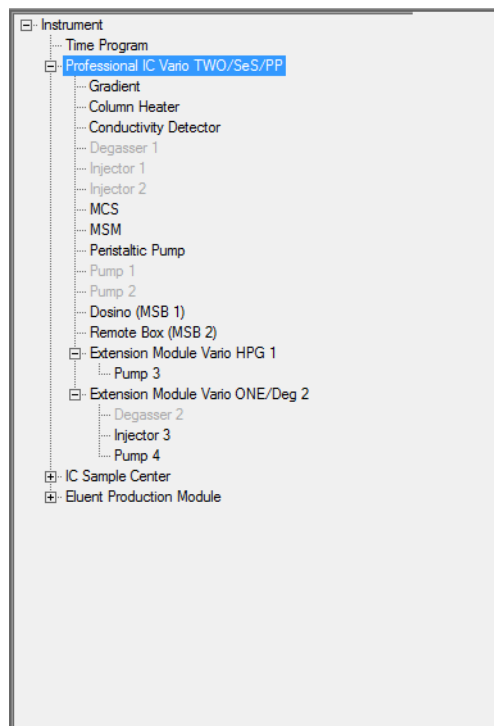
The following **Status** panel shows an instrument configuration with a dual channel IC instrument and 2 extension modules.

Status Dosino(s) status Manual Control				
Instrument Status: IDLE sn: 06106 Customize ..				
	1	2	3	4
940 Pump Flow(ml/min)	0.000	0.000	0.000	0.000
Pump Press (bar)	68.7	71.5	5.6	68.7
Injector	FILL	FILL		INJECT
MSM Step (min)	115.2			
MCS State	READY			
Col. Heater (°C)	45.0			
Col. Heater State	STABLE			
Cond Det (µS/cm)	25.218			

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

Column 3 shows the state of the first extension module.

Column 4 shows the state of the second 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 third injector in the system. Extension module 1 does not contain an injector. You can see this in the **Status** panel.

17 Importing example methods

- 1 Go to **[Configure the System]** in the Empower™ start window.




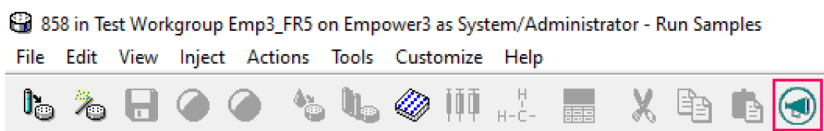
- 2 Go to **File ► Restore Project(s)** or click on the restore project(s) icon.

18 Troubleshooting

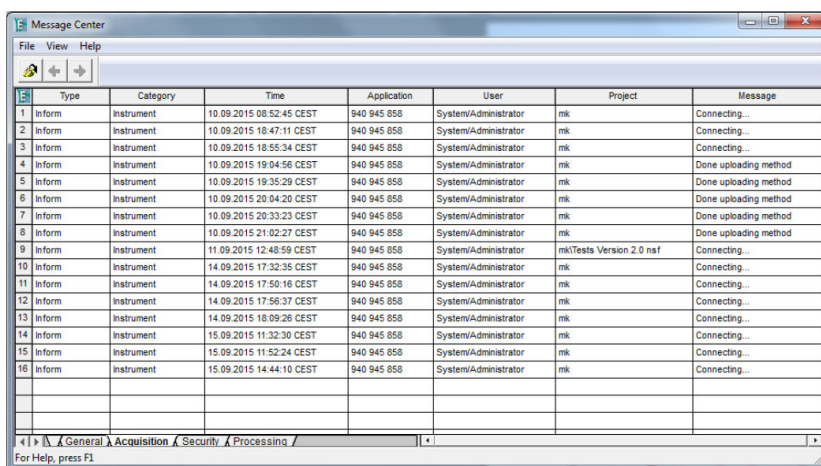
Message Center

- 1 Errors are documented in the **Message Center**.

Double-click on the Message Center icon  in the task bar to open the **Message Center**.



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



Type	Category	Time	Application	User	Project	Message	
1	Inform	Instrument	10.09.2015 08:52:45 CEST	940 945 858	System/Administrator	mk	Connecting...
2	Inform	Instrument	10.09.2015 18:47:11 CEST	940 945 858	System/Administrator	mk	Connecting...
3	Inform	Instrument	10.09.2015 18:55:34 CEST	940 945 858	System/Administrator	mk	Connecting...
4	Inform	Instrument	10.09.2015 19:04:56 CEST	940 945 858	System/Administrator	mk	Done uploading method
5	Inform	Instrument	10.09.2015 19:35:29 CEST	940 945 858	System/Administrator	mk	Done uploading method
6	Inform	Instrument	10.09.2015 20:04:20 CEST	940 945 858	System/Administrator	mk	Done uploading method
7	Inform	Instrument	10.09.2015 20:33:23 CEST	940 945 858	System/Administrator	mk	Done uploading method
8	Inform	Instrument	10.09.2015 21:02:27 CEST	940 945 858	System/Administrator	mk	Done uploading method
9	Inform	Instrument	11.09.2015 12:48:59 CEST	940 945 858	System/Administrator	mk Tests Version 2.0 nsf	Connecting...
10	Inform	Instrument	14.09.2015 17:32:35 CEST	940 945 858	System/Administrator	mk	Connecting...
11	Inform	Instrument	14.09.2015 17:50:16 CEST	940 945 858	System/Administrator	mk	Connecting...
12	Inform	Instrument	14.09.2015 17:56:37 CEST	940 945 858	System/Administrator	mk	Connecting...
13	Inform	Instrument	14.09.2015 18:09:28 CEST	940 945 858	System/Administrator	mk	Connecting...
14	Inform	Instrument	15.09.2015 11:32:30 CEST	940 945 858	System/Administrator	mk	Connecting...
15	Inform	Instrument	15.09.2015 11:52:24 CEST	940 945 858	System/Administrator	mk	Connecting...
16	Inform	Instrument	15.09.2015 14:44:10 CEST	940 945 858	System/Administrator	mk	Connecting...

Table 15 Remedy for errors in the Message Center

Message	Remedy / Explanation
Timed out after x ms waiting for the Auto Adjustment Procedure to finish.	<p>Retry the auto adjustment.</p> <p>Contact your regional Metrohm service representative.</p>
Cannot aspirate x ml. Correct the volume.	<p>The piston is in a position where it cannot aspirate the defined volume.</p> <p>Aspirate a smaller volume or perform an Eject to end command before aspirating.</p>
Conflicting gradient commands found in time programs.	<p>Correct the method. Use only one high-pressure gradient per time program.</p>

Message	Remedy / Explanation
The method configuration does not match the instrument configuration.	Adapt the instrument method.
An error occurred in	Powercycle the system. Contact your regional Metrohm service representative.
Failed to switch MSMAutoStep off.	The run is aborted. Try again, to run the method. Contact your regional Metrohm representative.
High-pressure pump has overpressure.	Lower the flow rate in the method or manual control. Adjust the maximum pressure in the method or manual control.
High-pressure pump has underpressure.	Increase the flow rate in the method or manual control. Adjust the minimum pressure in the method or manual control.
Sample Processor specific error	Powercycle the system. Contact your regional Metrohm service representative.
This system is not suitable for manual injection.	With a Metrohm IC, manual injection is not possible. Use automated injection with a sample changer.
Unable to parse serial numbers.	Check that the instruments are entered correctly in the DHCP configuration (<i>see "Configuring DHCP", page 6</i>).
An unexpected error occurred during execution of	Powercycle the system. Contact your regional Metrohm representative.
An error occurred in module	Powercycle the system. Contact your regional Metrohm representative.
Could not find Sample Center with serial number	Check whether the serial number in the configuration is correct. Use the internal serial number for the IC Sample Center. You cannot find the serial number of the IC Sample Center on the instrument. Contact your regional Metrohm service representative to confirm the serial number.

Message	Remedy / Explanation
Could not open Sample Center with serial number	<p>Check whether the instrument is powered on.</p> <p>Check whether the instrument is connected correctly.</p> <p>Powercycle the system.</p>
Sample Center error	<p>Powercycle the system.</p> <p>Contact your regional Metrohm service representative.</p>
Error during Sample Center reset.	<p>The IC Sample Center cannot be reset.</p> <p>Powercycle the system. This has the same effect as resetting the Sample Center in the manual control.</p> <p>If the message appears frequently, contact your regional Metrohm representative.</p>



NOTE

Some messages contain a module with a number, e.g. high-pressure pump 1. In the **Message Center**, the labeling of the modules starts with 0 instead of 1. This means that for example, high-pressure pump 1 is labeled as high-pressure pump 0. High-pressure pump 2 is labeled as high-pressure pump 1.

Powercycling the system

If a system failure occurs or if the connection is lost, proceed as follows to stop all processes and restart Empower™:

- 1** Close Empower™.
- 2** Switch off all Metrohm instruments.
- 3** Shut down and restart the computer.
- 4** Switch on all Metrohm instruments.
- 5** To restart Empower™, click on the corresponding icon on the desktop.
- 6** Open **Run Samples**.

Debugging

If a problem occurs with no known solution or no apparent reason, debugging is an instrument to gain information about the problem. Data is logged during debugging. Debug levels from 0 to 5 exist. The profoundness of logged data depends on the selected debug level.



NOTE

The higher the debug level is, the more data is logged. Extensive logging may slow down the Metrohm IC Driver for Empower™. Therefore, set the debug level only as high as necessary.

If no problems occur, Metrohm recommends to set the debug level to 0 to optimize the performance of the Metrohm IC Driver for Empower™.

If a problem with no known solution appears, set the debug level to 1 and increase it incrementally if necessary. Carry out the following procedure.

Collecting information required for support

Precondition:

The instrument is **IDLE**.



NOTE

If you increase the debug level and start the Metrohm IC Driver for Empower™ afterwards, the instrument might not become **IDLE**. Therefore, only increase the debug level, after the instrument is **IDLE**.

1 Setting the debug level

- Type **regedit** in the Windows search.
- Navigate to the following value:
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Waters\Instruments\Metrohm IC\DebugLevel
- Right-click on the value. Select **Modify...**
- In the appearing dialog, enter **1** as debug level in the input field **Value data**.
- Reproduce the problem.

The log files are created.

2 Collecting the log files



NOTE

Collect the log files immediately after reproducing the problem. The log files are overwritten after some time.

The log files are stored under **C ► Temp ► Metrohm**.
Copy the whole folder and create a ZIP file.

3 Contacting your regional Metrohm service representative

Provide the following data to your regional Metrohm service representative:

- Log files
- Description of the problem
- Time and date when the problem occurred
- Instrument method
Preferably in the original format or alternatively as PDF report.
- Message center entries that are related to the problem
Message and date and time of the message as screenshot or message center export.
- Information about software and hardware
 - Empower™ version
 - Metrohm IC Driver for Empower™ version
 - Used instruments
 - Type of computer
 - Instruments that are not used but connected to the computer
 - Is it a newly installed or an existing system?

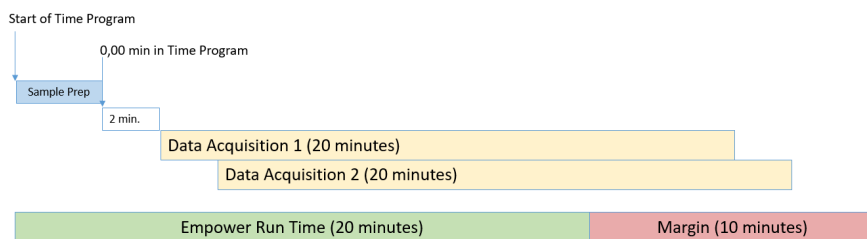
Your regional Metrohm service representative informs you if a higher debug level is required. In this case, repeat the procedure with the required debug level.

4 Resetting the debug level

After debugging, set the debug level to 0 again.

19 Restrictions

- 1 DHCP configuration may maximally include the following modules:
 - 1 sample changer (889 IC Sample Center or 858 Professional Sample Processor or 919 IC Autosampler plus)
 - 1 945 Professional Detector Vario
 - 1 Professional UV/VIS Detector (944 Professional UV/VIS Detector Vario or 947 Professional UV/VIS Detector Vario)
 - 1 941 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 (930 Compact IC Flex or 940 Professional IC Vario)
- If logging is turned on, it is necessary to exclude the folder **C:\Temp\Metrohm\Log** from the scans of the antimalware software.
- 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 from the end of the run time. Otherwise the whole run aborts. 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, continue data acquisition 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
- Only one high-pressure gradient per time program is possible.
- 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.
- If you enter an invalid value in the instrument parameters, a warning appears. In this case, do not save the method. Enter a valid value.
- A script error occurs irregularly in the **Run Samples** section of dual systems. Close and restart **Run Samples** when the error occurs.

Index

A

- Amperometric detector
 - Instrument parameters 61
 - Manual control 61
 - Time program 65
- Analysis
 - Starting 108

C

- Cations
 - Measuring 116
- Chromatographic system
 - Setting up 16
- Column heater
 - Instrument parameters 41
 - Manual control 38
- Conductivity detector
 - Instrument parameters 46
 - Manual control 46
 - Time program 47
- Configuring
 - System 5

D

- Degasser
 - Instrument parameters 41
 - Manual control 38
 - Time program 45
- Dosino
 - Instrument parameters 55
 - Manual control 52
 - Status panel 51
 - Time program 57

E

- Eluent Production Module
 - Instrument parameters 48
 - Level sensor modes 47
 - Manual control 48
- Equilibrating 119
- Example method
 - Importing 133

G

- Gradient
 - Instrument parameters 40
 - Time program 44

H

- High-pressure pump
 - Instrument parameters 44
 - Manual control 39
 - Time program 46

I

- IC Autosampler plus
 - Instrument parameters 80
 - Manual control 79
 - Time program 81
- IC instrument
 - Instrument parameters 40
 - Manual control 38
 - Status panel 38
 - Time program 44
- IC Sample Center
 - Instrument parameters 87
 - Manual control 83
 - Plates 93, 95, 97
 - Time program 88
- Initialization states 29
- Injector
 - Instrument parameters 41
 - Manual control 38
 - Time program 45
- Instrument
 - Removing 13
- Instrument method
 - Creating 32
- Instrument parameters 35
 - Amperometric detector 61
 - Conductivity detector 46
 - Dosino 55
 - Eluent Production Module .. 48
 - IC Autosampler plus 80
 - IC instrument 40
 - IC Sample Center 87
 - Professional IC Sample Processor 72
 - Remote Box 60
 - UV/VIS detector 68

L

- Level sensor modes 47

M

- Manual control 59
 - Amperometric detector 61
 - Conductivity detector 46

- Dosino 52
- Eluent Production Module .. 48
- IC Autosampler plus 79
- IC instrument 38
- IC Sample Center 83
- Professional IC Sample Processor 71
- UV/VIS detector 65

MCS

- Instrument parameters 42
- Manual control 39
- Time program 45

Measuring

- Cations 116

Message Center 135

Method set

- Creating 105

Module

- Numbering 130

MSM

- Instrument parameters 42
- Manual control 39
- Time program 45

N

Node

- Creating 5

Numbering

- Module 130

O

Offline method

- Creating 99

P

Peristaltic pump

- Instrument parameters 43
- Manual control 39
- Time program 46

Plates

- Defining 95
- Importing 93

Powercycling

- System 138

Processing method

- Creating 101

Professional IC Sample Processor

- External position 76
- Instrument parameters 72
- Manual control 71

Index

Time program 74
Project
 Creating 24

R

Recorded data
 Evaluating 120
Remote Box 59
 Instrument parameters 60
 Manual control 59
 Time program 60
Removing
 Instrument 13
Restrictions 114, 141
Running
 Samples 108

S

Sample table
 Creating 108

Samples
 Running 108
Shutdown method
 Creating 112
 Using 112

Software

 Starting 3
Status panel 28, 35
 Customizing 30
 Dosino 51
 IC instrument 38
 Viewing 28

System

 Configuring 5
 Equilibrating 119
 Powercycling 138

T

Time program 36
 Amperometric detector 65

Conductivity detector 47
Dosino 57
Example 36
IC Autosampler plus 81
IC instrument 44
IC Sample Center 88
Professional IC Sample Processor 74
Remote Box 60
UV/VIS detector 70
Troubleshooting 135

U

UV/VIS detector
 Analysis 70
 Instrument parameters 68
 Manual control 65
 Time program 70