

# Installation Instruction for ProfIC Vario 6 AnCat

The ProfIC Vario 6 AnCat is a Professional IC Vario system with Inline Dilution and Inline Ultrafiltration for the fully automatic and parallel determination of anions and cations in very high concentrations in matrices containing particles. This system enables users to dilute the sample and eliminate bacteria or particles prior to the analysis.



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## 1. Delivery Package

Delivered with ProfIC Vario 6 AnCat package:

Nr	Article no.	Article designation
1	2.940.2500	Professional IC Vario TWO/SeS/PP
2	2.850.9010	IC Conductivity Detector

### Sample processor

1	2.858.0020	Professional Sample Processor - Pump
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### Accessories

1	2.741.0010	741 Magnetic Stirrer
1	2.800.0010	800 Dosino
1	6.5330.120	IC Equipment: Inline Dilution
1	6.05330.010	IC Equipment: Inline Ultrafiltration 2 – pull mode

### Optional

1	6.6059.4*	MagIC Net 4.* Professional (* newest MagIC Net version)
1	6.2041.760	Sample rack 54 × 11 mL + 1 × 300 mL
1	6.2041.440	Sample rack 148 × 11 mL + 3 × 300 mL
1	6.2743.050	Sample tubes 11 mL
1	6.2743.070	Stopper with perforation
1	6.xxxx	Metrosep A Supp column depending on application
1	6.xxxx	resp. Metrosep A Supp Guard column
1	6.xxxx	Metrosep C Supp column depending on application
1	6.xxxx	resp. Metrosep C Supp Guard column
1	6.2832.000	MSM Rotor A
1	6.2842.000	MSM-HC Rotor A
1	6.2842.020	Adapter sleeve, MSM
1	2.941.0010	Eluent Production Module
1	6.5330.090	IC Equipment: Additional Level Sensor
1	6.2769.110	Sensor Empty 2 L
2	2.800.0010	800 Dosino
1	6.1580150	807 Dosing Unit 5 mL
1	6.1580120	807 Dosing Unit 2 mL
2	6.2744.080	M6 thread / UNF 10/32 coupling
1	6.1808.030	Round glass bottle / 1000 mL/ GL45

## 2. Installation

Following is a detailed description of how to install a ProfIC Vario 6 AnCat.

We strongly recommend that the individual steps are carried out in the order given below.

### 2.1 Installation of the software

All programs must be shut down first. Make sure that no Metrohm instrument is connected to the PC. Install MagIC Net with the help of the MagIC Net CD. The Microsoft Installation Wizard is accepted and executed. All the standard directories proposed by the program should be accepted. Restart Windows.

Now as soon as a new Metrohm instrument is connected to the PC via USB, the driver is installed and a window will pop up in MagIC Net asking if you'd like to store this device in your configuration. If you do, please answer with yes. The names will be checked later in this installation instruction.

### 2.2 Accessory Kit: Vario/Flex Basic (6.5000.000)

Using the Accessory Kit Vario/Flex Basic, install the Professional IC Vario. Remove the handle, place the detector blocks in the instrument, and connect the detector cables (anion detector into the "Detector 1" socket, and cation detector to "Detector 2"). Then remove the transport locking screws, connect the leak sensor cable, and connect the drainage tubing.

Next, set up the waste collector by assembling the cap and screwing it onto the vessel. Then hang the waste collector holder on the side of the IC so you can observe the droplets coming out of the capillaries later connected to the collector. Attach the waste tube to the vessel and lead it to the waste canister. If the tube is too long, please shorten it, because it is important to have a high level difference for the liquid to drain.

Plug the power cable and USB cable (6.2151.020) into the rear of the Professional IC Vario. Please don't switch on the instrument yet. This step will follow after the completed installation.

### 2.3 Accessory Kit: Vario/Flex ONE (6.5000.010)

all the accessories for setting up the eluent bottles are found in the two boxes with the Accessory Kits ONE. Please lead the aspiration tubes for the eluents through the M8 stopper, the O-ring, and the eluent caps. Then fix the white weight (6.2744.210), the adaptor (6.2744.210), and the aspiration filter (6.2821.090) on the eluent aspiration tube, all the while being careful not to touch the filter and its connections with bare hands in order to avoid cross contamination. Also fix the filled adsorber tube on the eluent cap. Please refer to the 940 Professional IC Vario manual for a detailed description.

## 2.4 858 Professional Sample Processor

For a detailed description, please refer to the 858 Professional Sample Processor manual. In general, you will have to do the following: plug in the Swing Head connection cable and the power supply cable. The controller cable (6.2151.000) is plugged into the plug “Contr.” on the 858 Professional Sample Processor and connected to the IC device via USB. The Sample Processor initializes and lifts its Swing Head once the IC device it is connected to is recognized by the software. For this, you must plug the USB cable of the IC into the PC and turn it on. Afterwards, it is possible to mount the retaining plate, the needle, and the safety shield.

Please remove one element of the guide chain close to the Swing Head by using a screwdriver to unfix it. In its place, connect the transfer tubing with holder 2× M6 / 10 mL (6.1562.130). Then, connect one end of the transfer tubing onto the swing arm, where the aspiration tip is connected with the help of the adapter UNF 10/32 outer / M6 inner (6.2744.200).

For the following installations, please shut down the IC again and disconnect the 858 Professional Sample Processor from the power supply.

### 2.4.1 Liquid Handling Station (LQH Station)

The Liquid Handling Station consists of two functional units. The rinsing unit is equipped with a two-pipe system and is used for rinsing the sample tube from the inside and outside. The second unit is used for dilution of samples and standards. In the present case, both units will be used.

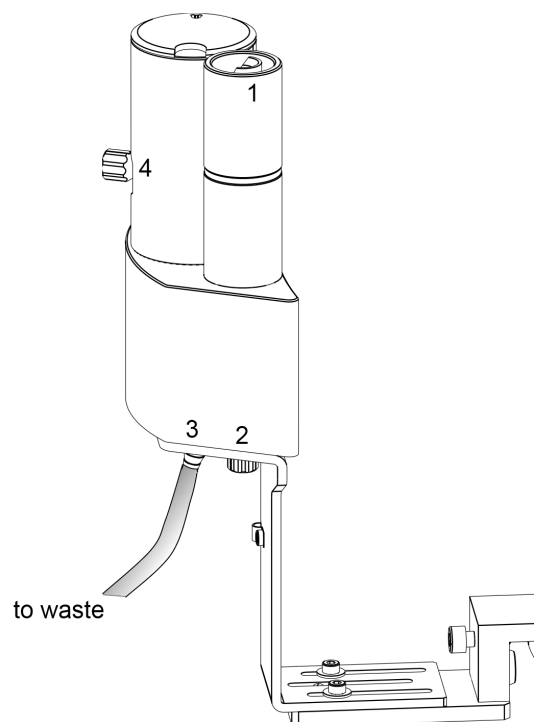
Before adding the Liquid Handling Station onto the Sample Processor, insert the stirrer into the socket of the LQH Station. This is done according to the description in the Liquid Handling Station manual (chapter 2). Subsequently, it is mounted onto the left side of the Sample Processor. For installation instructions, please refer to the Liquid Handling Station manual. All parts are included in the IC Equipment: Inline Dilution (6.5330.120) set. Please make sure that the LQH Station is aligned properly before continuing the setup. All angle settings will be configured in a later step.

#### 2.4.1.1 Rinsing unit

The waste tubing (6.1801.120) is fixed at the bottom of the rinsing station to drain the wastewater.


Ultrapure water for rinsing will be supplied by the dilution Dosino. Fill the 2 L bottle with ultrapure water. The water will be needed for dilution and rinsing purposes and the installation of the Dosino and its connecting parts will be mentioned in the next section.

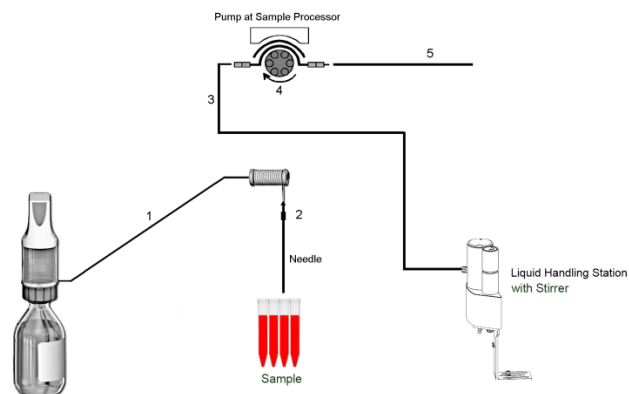
Please close the hole at bottom of the LQH Station (number 2 in the following image) with a stopper.



#### 2.4.1.2 Dilution unit and 800 Dosino

At port 1 of the 10 mL 807 Dosing Unit, please connect the loose end of the transfer tubing (6.1841.000). Port 2 is used for the ultrapure water supply; therefore please screw the FEP aspiration tubing (6.1819.110) into Port 2 on the bottom of the 807 Dosing Unit. Then fix the 807 Dosing Unit onto the second 2 L bottle with ultrapure water. Adjust the Dosino on top and connect its cable on the backside of the 858 Professional Sample Processor on MSB1. Please make sure that the 858 is switched off.

The stirrer cable is plugged into the -socket on the Tower. Capillary connections are carried out according to the following schematic.



1. Transfer Tubing with holder 2× M6 / 10 mL (6.1562.130) to be connected to Dosino port 1. The holder can be fixed as a chain element on the

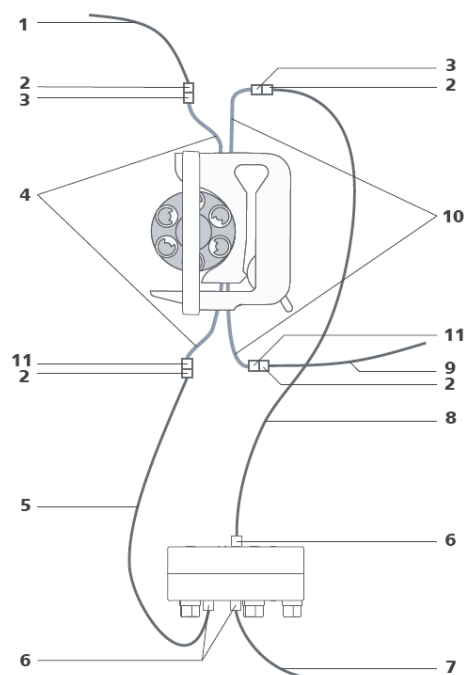
- Tower. The other end is fixed to Adapter UNF 10/32 outer / M6 inner (6.2744.200) (see number 2 below)
- Adapter UNF 10/32 outer / M6 inner (6.2744.200) for the connection between the needle and the transfer tubing
  - PTFE capillary 0.97 mm ID / 40 cm (6.1803.070) connected to the grey/grey pump tubing with a coupling nozzle (6.2744.034). Its other end is connected to position 1 on the side of the LQH Station with a PEEK pressure screw (6.2744.010)
  - Pump tubing LFL (gray/gray), 3 stoppers (6.1826.380)
  - The PTFE capillary 0.97 mm ID / 1 m (6.1803.080) is connected to the IC valve position 1. The other end is attached to the gray/gray pump tubing with the help of a nozzle coupling with security device (6.2744.160)

#### 2.4.2 Ultrafiltration cell

In this setup, an ultrafiltration cell is mounted after the dilution of the sample (side opening of Liquid Handling Station) before it enters the IC system. For this, please mount the cell holder which is included in the IC Equipment: Ultrafiltration 2 (6.05330.010) onto the Sample Processor on the right side of the Tower. For detailed instructions, please refer to the Ultrafiltration Cell manual.

The filter membrane is soaked in ultrapure water for preconditioning. After inserting the filter membrane and the sealing ring, the cell is tightly screwed together.

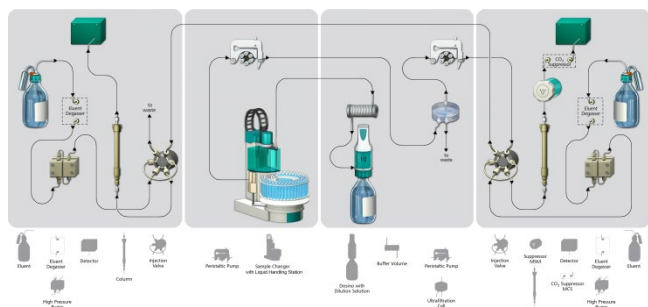
Capillary connections are shown in the following illustration. The flow must be higher at the sample side than at the filtrate side. That is why it is important to use wider pump tubing (gray/gray) and 0.97 mm ID capillaries on the sample side, and thinner pump tubing (yellow/orange) and the shortest possible 0.5 mm ID capillaries on the filtrate side. Only use the PVDF screws in combination with the UF cell as the material of the cell is prone to break with PEEK screws.



- PTFE capillary 0.97 mm ID / 40 cm (6.1803.070) connected to the side of the Liquid Handling Station (number 4 of chapter 2.4.1.1)
- PEEK pressure screw (6.2744.070)
- Coupling olive (6.2744.030)
- Pump tubing (6.1826.380) with gray/gray stoppers for conveying the sample
- PTFE capillary (6.1803.050) for conveying the sample from the peristaltic pump to the ultrafiltration cell (0.5 mm ID)
- PVDF pressure screw (6.2744.000) for connecting the capillaries to the ultrafiltration cell
- PTFE capillary (6.1803.080) for conveying the sample from the ultrafiltration cell to the waste collector (0.97 mm ID)
- PTFE capillary (6.1803.050) for conveying the filtrate from the ultrafiltration cell to the peristaltic pump
- PEEK capillary (6.1831.060) for conveying the filtrate from the peristaltic pump to the injection valve for anion analysis in the IC instrument
- Pump tubing (6.1826.320) with yellow/orange stoppers for conveying the filtrate
- Pump tubing connection with safety device (6.2744.160)

#### 2.5 Interconnection of devices

The complete setup of the ProfIC Vario 6 AnCat package is depicted here:



Prepare and degas two eluents suitable for the anion and cation columns you plan to use (see column manual).

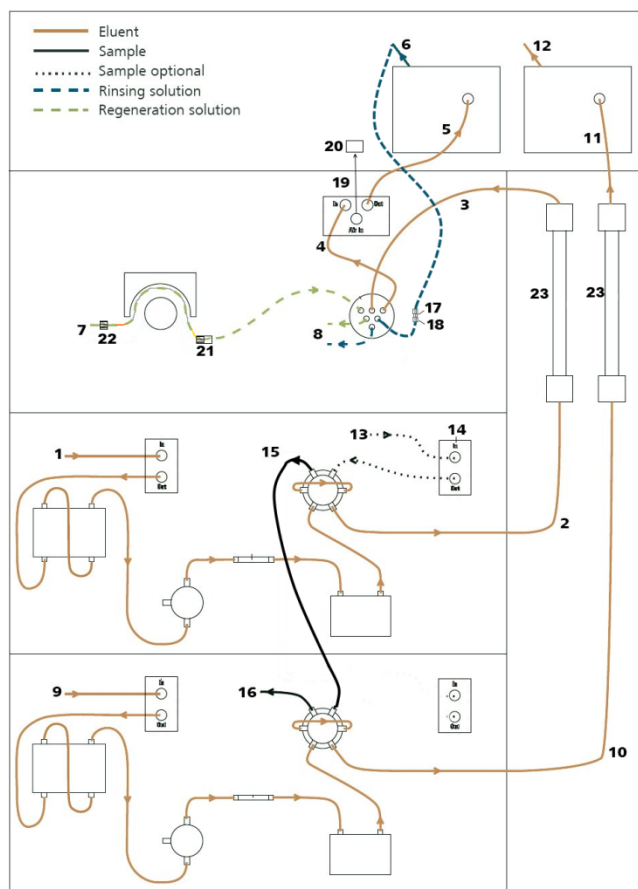
Provide the regeneration solution for the MSM Suppressor (100 mmol/L sulfuric acid).

## 2.6 940 Professional IC Vario

Capillaries are connected according to the following list and diagram:

1. Connection to the eluent bottle for anion determination
2. Capillary to anion separation column
3. MSM inlet capillary – labeled with *in*
4. MSM outlet capillary – labeled with *out*, which can be connected to the MCS with a long PEEK pressure screws (6.2477.090) or directly to the detector (5) using a coupling (6.2744.040)
5. Capillary from MCS to anion detector, long PEEK pressure screws (6.2744.090) are used for the MCS connection
6. Detector outlet capillary connected to the MSM inlet capillary – labeled with *rinsing solution* with the help of a coupling (6.2744.040)
7. Regeneration solution aspiration capillary – PTFE, 0.5 mm ID, connected to the bottle with 100 mmol/L sulfuric acid and the orange/yellow pump tubing (6.1826.420). This pump tubing is, on the other side, relayed to the regeneration solution capillary of the MSM – labeled with *regenerant* – with a security lock and filter (see number 21)
8. MSM regeneration and rinsing solution outlet capillaries – labeled with *waste reg.* and *waste rins.* – to be connected to the waste collector
9. Connection to the eluent bottle for cation determination
10. Capillary to cation separation column
11. Capillary from cation separation column to cation detector
12. Detector outlet capillary, connected to the waste collector

13. Sample aspiration capillary (PTFE, 0.97 mm ID), coming from the peristaltic pump tubing of the 858 Professional Sample Processor (number 5 in chapter 2.4.1.2) connected to the anion valve (position 1)
14. Optional sample degasser
15. Capillary connection (PTFE, 0.5 mm ID) between anion valve (position 2) and cation valve (position 1)
16. Capillary to the waste collector (PTFE, 0.97 mm ID)
17. Coupling 2× UNF 10/32 PEEK (6.2744.040)
18. PEEK pressure screw short (6.2744.070)
19. MCS air aspiration capillary – connected to the CO<sub>2</sub> - adsorber cartridge
20. Luer coupling – connect with short PEEK pressure screw to CO<sub>2</sub> - adsorber cartridge
21. Pump tubing connector with security lock and filter (6.2744.180)
22. Coupling nozzle – UNF 10/32 (6.2744.034)
23. The UNF 10/32 couplings (6.2744.040) are installed instead of the columns to rinse the system with eluent. After rinsing, the columns are installed.

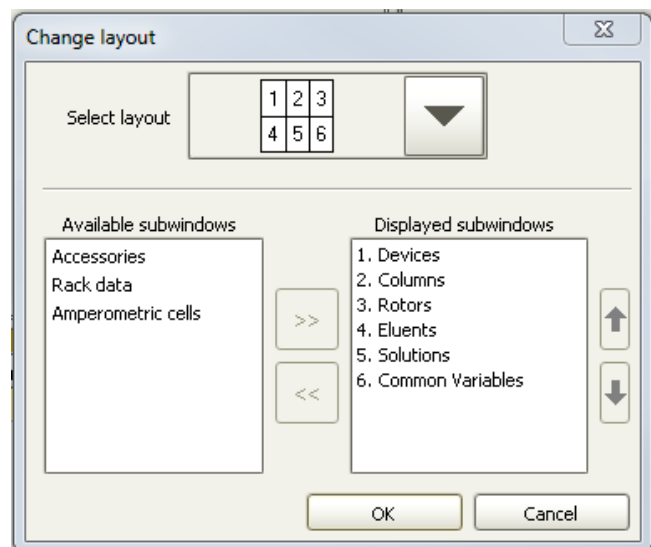


Make sure that all outlet capillaries (e.g., detector outlet, sample waste, suppressor waste, etc.) are put into the waste collector.

### 3. MagIC Net

#### 3.1 Configuration

Adjust the “view layout” of the configuration. Please configure it in the following way (the order of the sub windows is up to you):

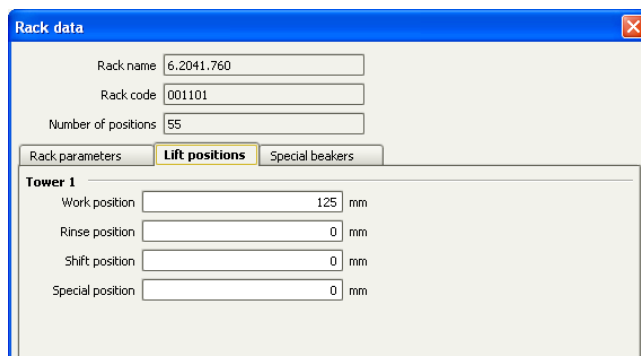


Now connect the USB cables from the instruments and turn their power on. Connected USB devices are automatically recognized when MagIC Net is started. After confirmation of the automatically generated requests, the devices and columns are stored in the configuration. The devices are predefined as “940 Professional IC Vario 1” and “858 Professional Sample Processor 1”. Name them accordingly if other names appear in your configuration (e.g., due to changed settings on your computer).

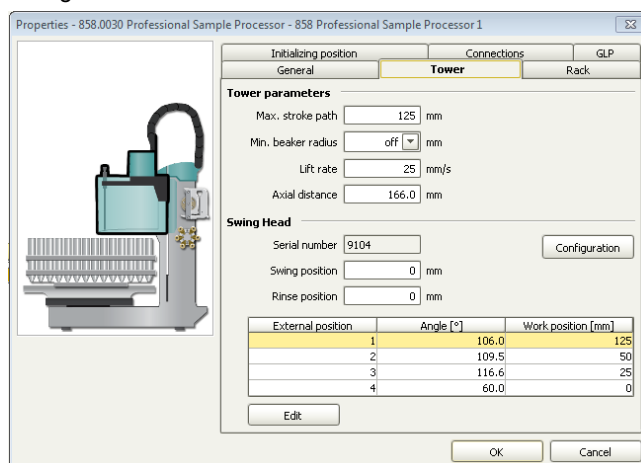
Accept the request to add the Dosino connected to the 940 Professional IC Vario, name the Dosino solution “UPW” (for ultrapure water), and choose “Dosino” in the “Use” dropdown menu.

In the window configuration, the 940 Professional IC Vario, the 858 Professional Sample Processor, and the columns Metrosep A Supp 15 - 150/4.0 and Metrosep C 4 - 150/4.0 are visible. Add and define the eluents, the suppressor solution, and the MSM Rotor.

The settings for the rack require a “work position” fitting to the respective rack (e.g., 125 mm for rack 6.2041.760).



When using the Liquid Handling Station, it is necessary to define external positions for the needle. This is done in the configuration of the Sample Processor in the subtab “Tower”. Define the external positions 1, 2, and 3 according to the picture below. Attention: the angles are only approximate values; for fine tuning, please use the manual control to find the correct values for this system and then adjust them in the configuration.



For the Dosino, the exact lengths and diameters of the tubings used need to be added for it to work properly. This can be done in the configuration as follows:

Solution	Dosing unit	GLP	
<b>Hardware</b>			
Name	UPW		
Type	IDU		
Order number	6.3032.120		
Serial number	1271200		
Cylinder volume	2 mL		
Cylinder serial number	27182		
<b>Parameters for preparation</b>			
Dosing port Prep/Empty	Dosing port 1		
Dosing rate Dosing port 1	10.0	mL/min	
Dosing rate Dosing port 2	maximum	mL/min	
Dosing rate Fill port	maximum	mL/min	
Dosing rate Special port	maximum	mL/min	
<b>Tubing parameters</b>			
	Port	Length	Diameter
Dosing port 1	Port 1	200.0 cm	2.0 mm
Dosing port 2	Port 3	0.0 cm	0.0 mm
Fill port	Port 2	25.0 cm	2.0 mm
Special port	Port 4	0.0 cm	0.0 mm
<b>Valve disk</b>			
Rotating direction	automatic		
Not over	Port 4		

Please add a common variable called: "end volume" and set its value to 8 mL.

### 3.2 Method adjustment

For this setup, the ProfIC Vario 6 Anion and Cation methods need to be adapted to suit the parallel AnCat analysis. First import the methods for ProfIC Vario 6 Anion and ProfIC Vario 6 Cation from the installation CD: Go to File → method manager and choose your method group. Afterwards, click on edit → import and choose the pathway on the installation CD:

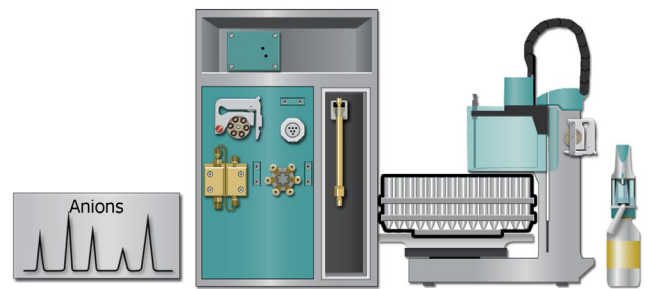
MagICNet\examples\methods\ ProfIC Vario \ProfIC Vario\_6\_Anion.imet and

MagICNet\examples\methods\ ProfIC Vario \ProfIC Vario\_6\_Cation.imet

In the window method, open the ProfIC Vario 6 Anion method and the ProfIC Vario 6 Cation method.

#### 3.1.1 Anion method

To begin, your devices sub window should look like this:

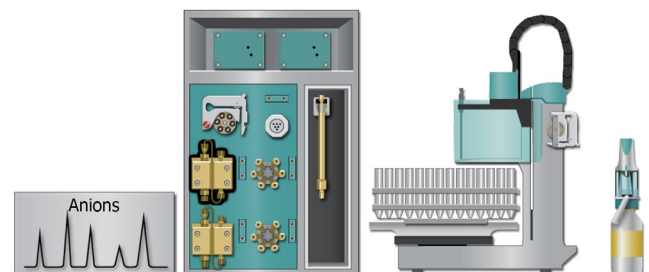


Open the menu of the 940 Professional IC Vario by using the right mouse button to click on the 940 device. In the window "Edit", please check that the name of the instrument is the one you have given your 2.940.2500 as you've added it to your configuration. If the name is different, please adapt it here. Change the module names as follows and save the changes.

Edit device	
Device	940 Professional IC Vario 1
Device type	940.1500 Professional IC Vario ONE/SeS/PP
<b>Module designations</b>	
Pump	Pump 1
Injector	Injector 1
Peristaltic	Peristaltic
MSM	MSM
MCS	MCS
Degasser	Degasser
Thermostat	Thermostat
Conductivity detector 1	Conductivity detector 1
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

Close the window and delete the 940 Professional IC Vario from your instrumentation.

Following this step, add a new device and choose the 2.940.2500 from your device table. Now, your devices sub window should look like this:



Assign the following equipment as described. Assign the suppressor solution to the IC peristaltic pump and set the speed rate to 1. Add your Rotor to the MSM and activate the automatic stepping at 10 minutes. Define the rack of the connected Sample Processor, assign the eluent to the anion IC pump (Pump 1), and define reasonable start-up times

(e.g., 2 minutes). Set the temperature of the column oven to 45 °C.

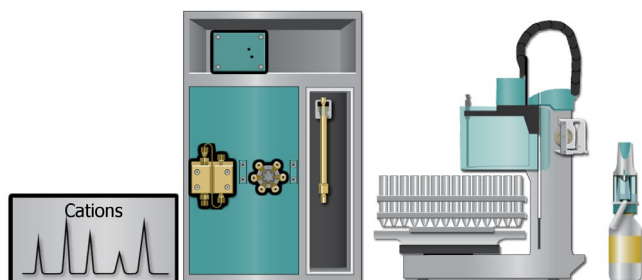
In the analysis, link the corresponding pump (Pump 1), data source (Conductivity Detector 1, Conductivity), injection valve (Injector 1), and column.

Deactivate all parts of the 940 that are not needed for the anion analysis (Detector 2, Pump 2, Injector 2)

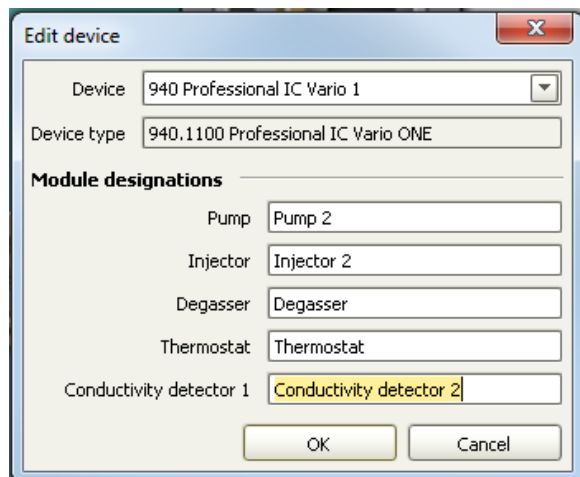
Perform a method test and save the method.

### 3.1.2 Cation method

For starters, your devices sub window should look like this:

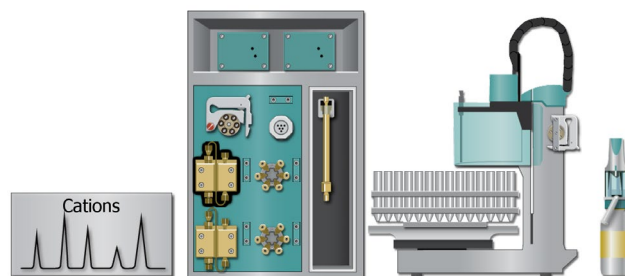


Open the menu of the 940 Professional IC Vario by using the right mouse button to click on the 940 device. In the window "Edit", please check that the name of the instrument is the one you have given your 2.940.2500 as you've added it to your configuration. If the name is different, please adapt it here. Change the module names as follows and save the changes.



Close the window and delete the 940 Professional IC Vario from your instrumentation.

Following this step, add a new device and choose the 2.940.2500 from your device table. Now, your devices sub window should look like this:



Now assign the following equipment. Define the rack of the connected sample processor, assign the eluent to the IC pump (Pump 2), and define a reasonable start-up time (e.g., 2 minutes). In the analysis, link the corresponding pump (Pump 2), (Conductivity Detector 2, Conductivity), injection valve (Injector 2), and column. Set the temperature of the column oven to 45 °C.

Deactivate all parts of the 940 Professional IC Vario that are not needed for the anion analysis (e.g., Detector 1, Pump 1, Injector 1, MSM, MCS, and Peristaltic Pump).

Perform a method test and save the method.

### 3.3. Purge of the system

Before inserting the columns, disconnect the Out capillary of the suppressor connection piece from the MCS or from the detector and put it into a waste beaker. The suppressor needs to be rinsed with the system first and its waste should not pass through the sensitive MCS and/or detector in the beginning, as loose particles could be flushed out.

Now flush the system for about 10 minutes to remove any air bubbles (by using the purge valve and syringe). During these 10 minutes, step the MSM three times in order to flush all three chambers.

As soon as the whole system is purged, reconnect the suppressor Out capillary back to the MCS or the detector.

Now insert and rinse the guard column for 10 minutes by leading the outlets directly into the waste. Afterwards, connect the analytical columns and flush them likewise for 10 minutes. Only then can the columns be completely connected to the flow path of the eluent (see the 940 Professional IC Vario manual for more information). Start the peristaltic pump and adjust the pressure of the lever on the tubing to see the droplets of suppressor regeneration solution drop into the waste collector. Rinse the Dosino and fill the transfer tubing by applying the "prepare" button under manual control.

To start the equilibration, load the methods in two separate workplaces and press "Start HW".

Equilibrate the system until the baseline is stable.

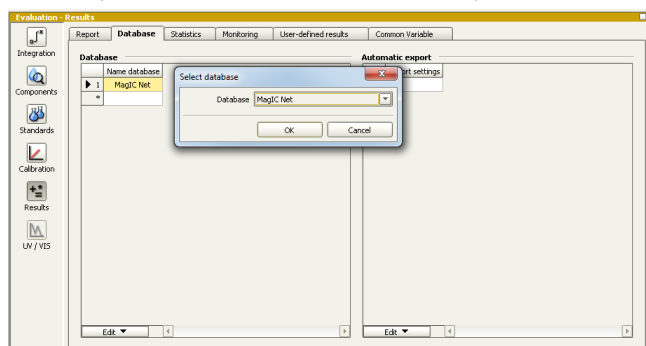
### 3.4. User-defined determination

In the window method, under evaluation, enter the ions and the concentrations of the required standards. You can either calibrate with a set of calibration standards, or you can calibrate with a single standard for anions and one for cations and dilute these two standards to different calibration levels.

If you wish to calibrate by diluting one standard solution, the standard with the highest concentration must be prepared and labeled as standard 1 in this method. All other standards have to be divisors of standard 1, e.g., all components of standard 2 have half the concentration of those in standard 1, all components of standard 10 have a tenth of the standard 1 concentration, and so on.

Always use the standard number as the factor that lies between the two solutions. Make sure to always fix the dilution factor = 1 for all the standards in your determination table.

Now please add the correct Database in the Evaluation window (Evaluation → Results → Database) for the method.



In the window workplace for anions, set up a “determination series” for the anions, describing your samples by ident, vial number, and sample type (standard, blank, or sample, etc.).

In the field dilution, indicate the dilution you wish to apply to your sample, e.g., “2” if you want to dilute your sample two times. If no dilution is required or a standard is measured, write 1. After putting the analyte solutions onto the rack, press “start”.

In the second workplace, set up a “determination series” for the cations, describing your samples by ident, vial number, and sample type (standard, blank, or sample, etc.).

As before, in the field dilution, indicate the dilution you wish to apply to your sample, e.g., “2” if you want to dilute your sample two times. If no dilution is required or a standard is measured, write 1. After putting the analyte solutions onto the rack, press “start”.

For evaluation and after recording the first chromatograms, check the retention times of your compounds. Since they depend on the performance of your columns, you may have to adjust them in your methods.

## 4. Optional equipment

### 4.1. Eluent Production Module

The 941 Eluent Production Module creates fresh new eluent out of eluent concentrate and ultrapure water. For installation instructions and further information, please refer to the 941 Eluent Production Module manual.

### 4.2. Alternative MSM rinsing and regeneration

For alternative suppressor rinsing and regeneration methods and setups, please refer to the Application Bulletin 800105018EN.

### 4.3. Acidification of cation samples

It is possible to adapt the setup according to the information provided by your Metrohm representative. Add a defined quantity of nitric acid relative to the diluted volume of the sample for cation analysis. For this, you will need the following equipment:

Quantity	Article no.	Article designation
1	2.800.0010	800 Dosino
1	6.1580120	807 Dosing Unit 2 mL
1	6.2744.200	Adapter UNF 10/32 outer / M6 inner
1	6.1808.030	Round glass bottle / 1000 mL / GL 45

The 1 L round glass bottle must be filled with 100 mmol/L nitric acid. Please screw the FEP aspiration tube M6, which can be found in the equipment of the 807 Dosing Unit (DU), on port 2 of the 2 mL 807 Dosing Unit, then fix the DU on top of the bottle with nitric acid. The Dosino is placed on top and plugged into an MSB port at the 858 Professional Sample Processor (Attention: the 858 must be turned **off!**).

The bottle with the Dosino should be placed on the left side of the Sample Processor, close to the Liquid Handling Station. For transfer of the nitric acid into the dilution compartment, connect a PEEK capillary (ID 0.5 mm; 6.1831.180, delivered with the 6.5330.180 IC Equipment: MiPT) cut to an appropriate length, with the help of a PEEK pressure screw and the adapter (6.2744.200) to port 1 of the 807 Dosing Unit. The other end of the capillary must be entered through the “Mickey Mouse”-like hole in the cover of the dilution unit and fixed in one of the ears (see following image for clarification).



Following the hardware installations, the method will need to be adapted.