

# Installation Instruction for ProfIC Vario 1 Anion

ProfIC Vario 1 Anion is a Professional IC Vario system for the fully automatic determination of anions or cations with sequential suppression. «ProfIC Vario 1» safely masters all routine tasks in ion chromatography. It is simple to use and extremely reliable.



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## 1. Delivery Package

Delivered with ProfIC Vario 1 Anion package:

Nr	Article no.	Article designation
<b>IC</b>		
1	2.940.1500	Professional IC Vario ONE/SeS/PP
<b>Detector</b>		
1	2.850.9010	IC Conductivity Detector
<b>Sample processor</b>		
1	2.858.0020	Professional Sample Processor
<b>Optional</b>		
1	6.6059.312	MagIC Net 3.1 Professional CD
1	6.6059.313	MagIC Net 3.1 Multi
1	6.2041.760	Sample rack 54 x 11 mL + 1 x 300 mL
1	6.2041.440	Sample rack 148 x 11 mL + 3 x 300 mL
1	6.2743.040	Sample tubes 2.5 mL
1	6.2743.050	Sample tubes 11 mL
1	6.2743.070	Stopper with perforation
1	6.1030.420	Metrosep A Supp 15 - 150/4.0
1	6.1030.500	Metrosep A Supp 15 Guard/4.0
1	6.1052.420	Metrosep C Supp 1 – 150/4.0
1	6.1052.500	Metrosep C Supp 1 Guard/4.0
1	6.2842.200	MSM-HC Rotor C
1	6.2832.000	MSM Rotor A
1	6.2842.000	MSM-HC Rotor A
1	6.2844.000	MSM-LC Rotor A
1	6.2842.020	Adapter Vario to MSM and MSM-LC
1	2.941.0010	Eluent Production Module
1	6.5330.130	IC Equipment: LQH Station

## 2. Installation

Following is a detailed description of how to install ProfIC Vario 1 Anion.

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 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 you connect a new Metrohm instrument via USB connection to the PC, the driver is installed and a window will pop up in MagIC Net, asking you if you'd like to store this device in your configuration, please confirm this request. 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 handle, place the detector block in the instrument and connect the detector cable, remove the transport locking screws, connect the leak sensor cable and connect the drainage tubing.

In continuation, 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. When the tube is too long, please shorten it, because it is important to have a high level difference for the liquid to drain.

The power cable and USB cable (6.2151.020) are plugged 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)

In the box with the Accessory Kits ONE, you will find all the accessories for setting up the Eluent bottle. Please lead the aspiration tube for the Eluent through the M8 stopper, the earring and the eluent cap. 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

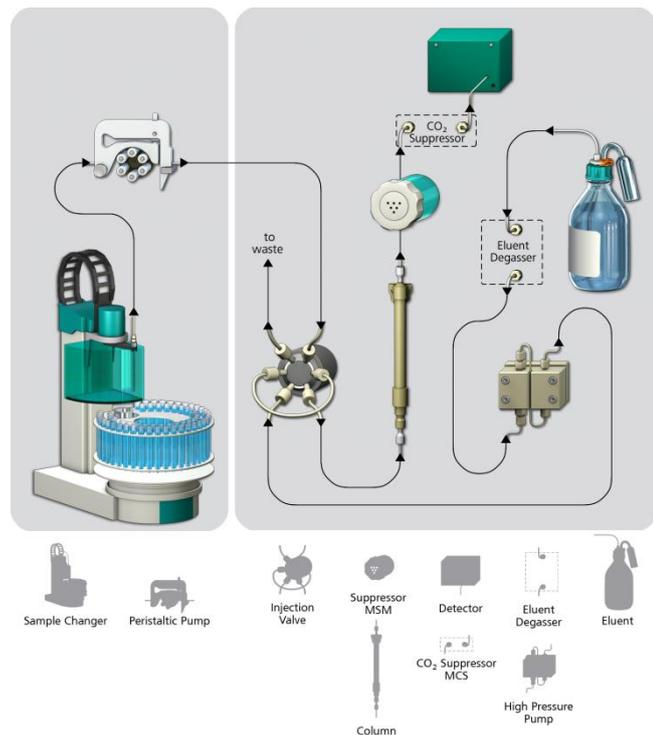
For a detailed description, please refer to the 858 Professional Sample Processor manual. In general, you will have to do the following: Plug in the Swing Head connection cable and the power supply cable. The controller cable (6.2151.000) is plugged into the plug "Contr." on the 858 and connected to 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 have to 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 (for detailed instructions please refer to the 858 Professional Sample Processor manual).

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

Insert the pump tubing (white/white 6.1826.360) into the peristaltic pump and connect the aspiration side to the needle via a PEEK capillary (6.1831.160) (see also 858 manual).

## 2.5. Interconnection of devices

The whole setup of the ProfIC Vario 1 Anion packet is depicted here:



Prepare and degas an eluent suitable for the column you want to use (see column manual).

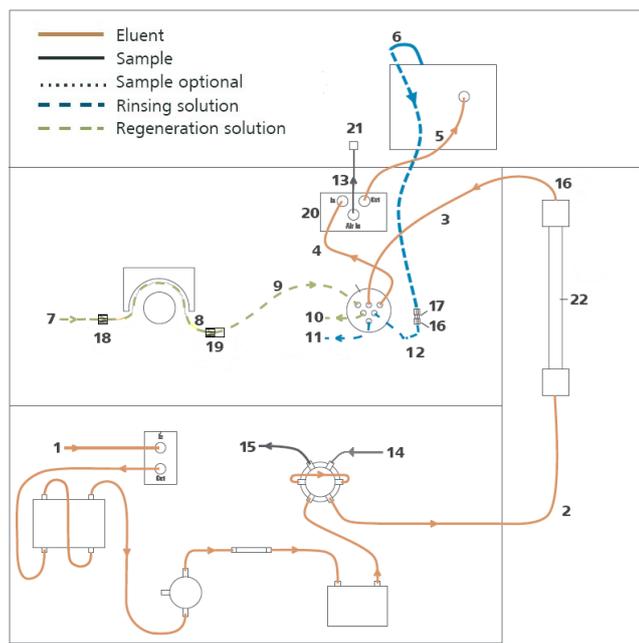
Provide the regeneration solution for the MSM Suppressor (100 mmol/L sulfuric acid for anions or 70 mmol/L  $\text{Na}_2\text{CO}_3$ , 70 mmol/L  $\text{NaHCO}_3$  for cations).

## 2.6. 940 Professional IC Vario

Capillaries are connected according to the following list and the diagram below:

1. Connection to the eluent bottle
2. Capillary to Column inlet – 0.25 mm ID
3. MSM inlet capillary – labeled with *In*
4. MSM outlet capillary – labeled with *Out* can be connected to the MCS or directly to the detector using a coupling (6.2744.040)
5. Detector inlet capillary
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 (8). This pump tubing is, on the other side, relied to the regeneration solution capillary of the MSM - labeled with *regenerant* - with a security lock and filter (19)
8. Peristaltic pump tubing with orange/yellow stoppers (6.1826.420)
9. MSM regeneration inlet capillary – labeled with *Regenerant*
10. MSM regeneration solution outlet capillary – labeled with *Waste reg.* – to be connected to the waste collector
11. MSM rinsing solution outlet capillary – labeled with *Waste rins.* - to be connected to the waste collector
12. MSM rinsing solution inlet capillary - labeled with *Rinsing solution* – connected to the detector outlet capillary with a coupling (6.2744.040)
13. MCS air aspiration capillary – connected to the  $\text{CO}_2$  - adsorber cartridge
14. Sample aspiration capillary – PTFE, 0.5 mm ID
15. Sample outlet capillary – PTFE, 0.5 mm ID, to be placed into the waste collector
16. PEEK pressure screw short (6.2744.070)
17. Coupling 2 x UNF 10/32 PEEK (6.2744.040)
18. Coupling nozzle - UNF 10/32 (6.2744.034)
19. Pump tubing connector with security lock and filter (6.2744.180)
20. PEEK pressure screw long (6.2744.090)
21. Luer coupling – connect with short PEEK pressure screw to  $\text{CO}_2$  - adsorber cartridge
22. The UNF 10/32 coupling (6.2744.040) is installed instead of the column to rinse the system with eluent. After rinsing the column is installed.



In order to transfer the sample to the IC device, place a PTFE capillary (6.1803.030) of suitable length (~1 m) between the peristaltic pump tubing outlet of the sample processor and the valve of the IC instrument. The sample injection is at position 1 of the valve (see diagram of chapter 2.6, capillary number 14). A counter current flow of the sample with regard to the eluent flow is recommended in order to minimize diffusion and carry over. Make sure that all outlet capillaries are put into the waste collector.

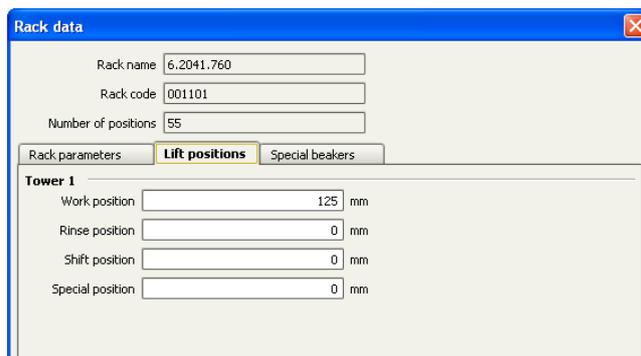
### 3. MagIC Net

#### 3.1. Configuration

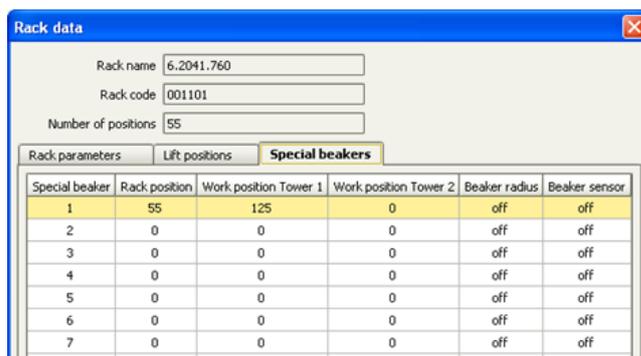
Now please connect the USB cables from the instruments and turn their power on. Connected USB devices are automatically recognized when MagIC Net is started. After confirmation of the automatically generated requests, the devices and columns are stored in the configuration. The devices are predefined 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).

In the window configuration, the 940 Professional IC Vario, the 858 Professional Sample Processor and the column are visible. Add and define the eluent and the suppressor solution.

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



Also define a special beaker for rinsing the needle. Fill a beaker with ultrapure water and place it at the defined position on the rack.



#### 3.2. Method adjustment

The method for this configuration can be found in the example method folder in the installation folder of MagIC Net. In the window method, import the method for ProfIC Vario 1 Anion 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\_1 \_Anion.imet

In the window method, open the ProfIC Vario 1 Anion method and assign the following equipment: Assign the suppressor solution to the IC peristaltic pump and set the speed rate to 1, define the rack of the connected sample processor, assign the eluent to the IC pump and assign the column to the analysis. Adjust the temperature of the column oven to 45°C. Check the analytes in the components table and adapt if necessary. Perform a method test and save the method.

#### 3.3. Purge of the system

Before inserting the column, 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, please flush the system for about 10 minutes and get rid of 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.

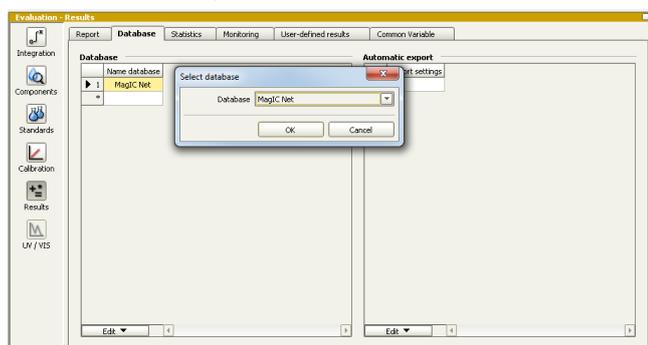
Now insert and rinse the precolumn for 10 minutes by leading the outlet directly into the waste. Afterwards connect the analytical column and flush it likewise for 10 minutes. Only afterward the column is completely connected to the flow path of the eluent (see also 940 manual). Start the peristaltic pump and adjust the pressure of the lever on the tubing, in order to see the droplets of suppressor regeneration solution drop into the waste collector.

In order to start the equilibration, go to the window work place, load the anion method, 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. Now please add the correct Database in the Evaluation window (Evaluation - Results - Database) for the method.

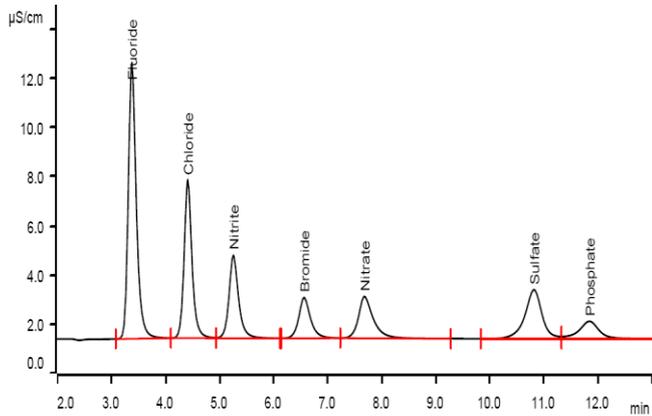


In the window work place, set up a "determination series", describing your samples by ident, vial number, sample type (standard, blank, or sample etc.). After putting the analyte solutions onto the rack, press "start".

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

#### 4. Exemplary measurement

Fluoride, chloride, nitrite, bromide nitrate, sulfate, and phosphate were measured as exemplary standard anions (5 mg/L). With Metrosep A Supp 15 - 150/4.0, sulfate elutes faster than phosphate.

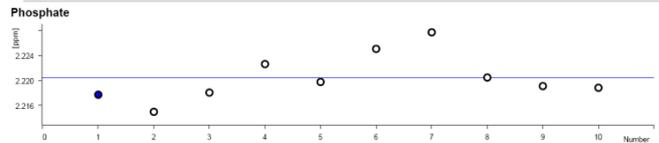


For the calibration, the average peak areas of 3 injections were evaluated. Within the concentration range of 1 - 20 mg/L, a quadratic curve type was used for evaluation. Correlation coefficients and standard deviations are listed in the following table. The calibration curve for fluoride is shown as an example.

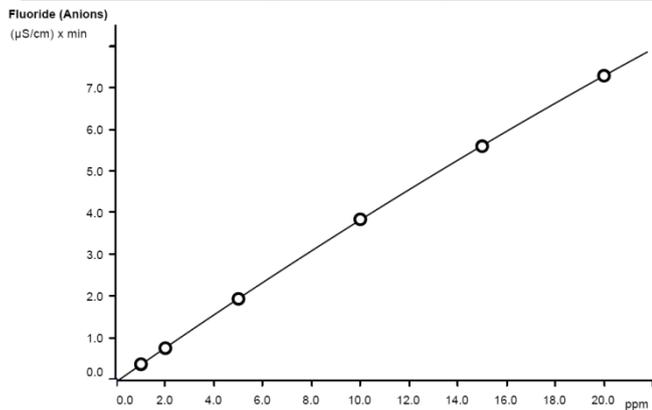
Function:	$A = -0.0583533 + 0.0204404 \times Q - 5.23881E-6 \times Q^2$
Relative standard deviation	0.414%
Correlation coefficient	0.999993
Curve type	Quadratic
Weighting	1

The precision of 10 injections of a 2 mg/L solution of standard anions was determined. The results are shown in the following table and an exemplary trend chart is shown for phosphate.

Ion	Standard deviation	
	relative [%]	absolute [mg/L]
Fluoride	0.005	0.264
Chloride	0.013	0.652
Nitrite	0.014	0.709
Bromide	0.008	0.387
Nitrate	0.012	0.569
Sulfate	0.001	0.052
Phosphate	0.004	0.168



	Correlation coefficient	Percentage standard deviation [%]
Fluoride	0.999993	0.414
Chloride	0.999979	0.739
Nitrite	0.999938	1.279
Bromide	0.999936	1.316
Nitrate	0.999942	1.254
Sulfate	0.999967	0.946
Phosphate	0.999974	0.845



## 5. Optional equipment

### 5.1. Liquid Handling Station

The Liquid Handling Station (LQH Station) consists of two function units: The rinsing and the dilution unit. As an add-on it is mainly useful for rinsing the needle on the inside and outside, thus minimizing contamination.

The following kit is needed:

Nr	Article no.	Article designation
1	6.5330.130	IC Equipment: LQH Station



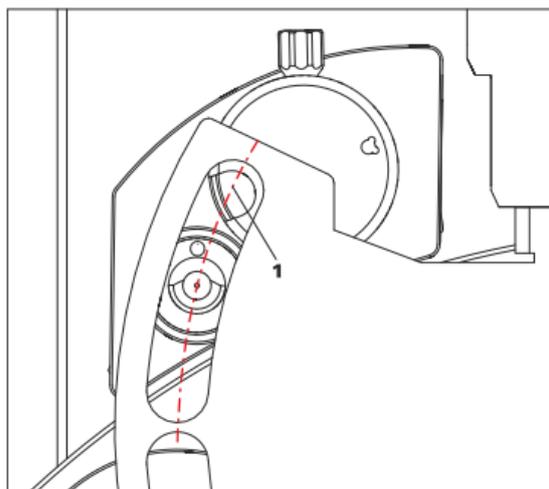
The kit includes:

Nr	Article no.	Article designation
1	6.1014.200	Metrosep I Trap 1 - 100/4.0
1	6.1602.160	Eluent bottle cap GL 45
1	6.1608.070	Eluent bottle /2 L / GL 45
1	6.1619.000	Adsorber tube for Dosing Unit
1	6.1624.000	Adapter SGJ 14
1	6.1826.390	Pump tubing LFL (yellow/yellow) 3 stoppers
1	6.1831.180	PEEK capillary i.D. 0.5 mm, 3 m
1	6.2744.010	Pressure screw 5x
1	6.2744.034	Coupling nozzle UNF 10/32
1	6.2841.120	Liquid Handling Station left

The installation of the LQH Station is done in two steps: First mount and align the Liquid Handling Station on the left hand side of the Sample Processor. To accomplish this, remove the sample rack and place the Liquid Handling Station on the black rail of the Sample Processor. Secure it temporarily in

place with the screw and then loosen the small screws of the foot. The rack is replaced on the Sample Processor and the small screws are fixed in a way that the approximate distance between LHS and rack is 0.5-1 mm.

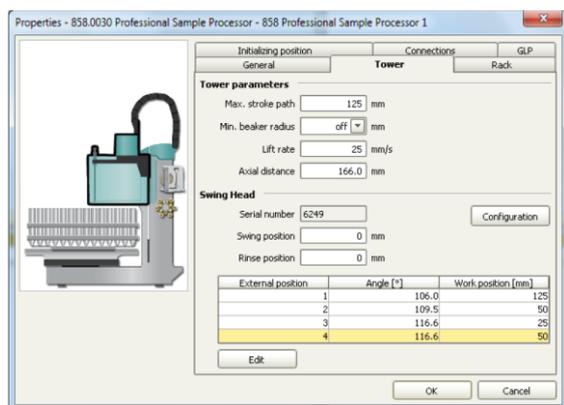
Now the Liquid Handling Station needs to be aligned with the retaining plate. For this, loosen the big screw again and move the Station underneath the retaining plate. Looking from above you should now be able to see the small hole of the rinsing unit and part of the big hole of the dilution vessel, similar to the following image.



When you have found the correct position, please tighten the screw to fix the LQH Station completely to the Sample Processor.

In a second step, the work positions for the sample tube need to be defined in the configuration.

Please go to the configuration of the Sample Processor. Under Tower it is possible to define external positions of the swing head. For rinsing purposes, only the External Position 1 (small inner tube) and the External Position 2 (outer tube of rinsing unit) have to be defined. The proposed angles are only guiding values; they need to be adapted for every system separately. This can be done easily by adjusting the angles in the manual control window. As soon as you have found the correct angles, make sure to save them in the configuration. The work positions are fixed for all of the different setups.



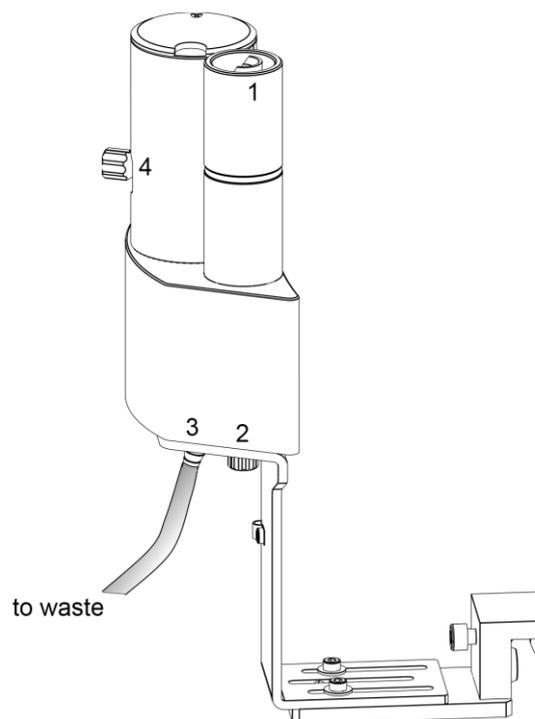
Depending on the available parts, the water supply to the Liquid Handling Station is managed differently. The inner tube of the rinsing unit is meant to be filled constantly with fresh Ultrapure Water, so the aspiration needle can be thoroughly cleaned from the outside.

All possibilities have the waste tube in common, Number 3 in the following image. Please fix the PVC tubing (6.1801.120) on the disposal connector on the bottom of the Liquid Handling Station.

If there is a peristaltic pump canal free, there is the possibility to connect a water bottle with a peristaltic pump tubing and lead a capillary to the PEEK pressure screw on the bottom of the Liquid Handling Station (Number 2 on the following schemata). Between the peristaltic pump and the LQH Station, please install an I-Trap (6.1014.200) into the flow path to cleanse the water before it goes into the IC system.

Another possibility arises with a Dosino:

Similar to the setup with the peristaltic pump before, connect one of the Dosino ports with a capillary to the PEEK pressure screw (Nr. 2) on the Liquid Handling Station. Then use the Dosino to push water from below into the rinsing unit when needed. Here, it is recommended to install an I-Trap (6.1014.200) into the flow path of the water, in order that the water is cleansed from all impurities that could build in the water reservoir.



Number 4 of the picture above shows the attachment point of a capillary in case of a dilution feature and Number 1 indicates the rinsing entity.

In the time program you can treat the external positions like a special beaker: Just move to the wanted angle, go into work position and start the Dosino or the peristaltic pump. Make sure to always dispose the waste in the external position 2.

## 5.2. 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.

## 5.3. Alternative MSM rinsing and regeneration methods

For alternative suppressor rinsing and regeneration methods and setups, please refer to the AB-395.