Metrohm

Application Bulletin 349

Installation Instruction for a Dose-in Gradient System

The Dose-in Gradient can be used together with Compact IC as well as with Professional IC systems for the fully automatic determination of anions or cations with suppression. The Dose-in Gradient setup is highly flexible and up to different 5 solutions can be combined into one eluent for your IC system. The gradient profile is created by one high pressure pump working at a constant flow rate, and one or more Dosinos which deliver the additional solutions to be mixed into the main eluent flow. The portion of solution delivered by the Dosino(s), which ultimately determine the eluent concentration, can be easily programmed in MagIC Net. It is simple to use, flexible and very reliable.

Table of contents

1. Recommended equipment

No.	Article no.	Article designation
Instruments		
1	2.930.2560*	930 Compact IC Flex Oven/Ses/PP/Deg
1	2.850.9010	IC Conductivity Detector
1	2.858.0020	858 Professional Sample Processor - Pump
1	2.800.0020**	800 Dosino
Software		
1	6.6059.311	MagIC Net 3.1 Compact
Accessories		
1	6.5330.150	IC equipment: Dose-in Gradient Anions
or		
1	6.05300.000	IC equipment: Dose-in Gradient Cations
1	6.3032.xx0**	Dosing Unit
Optional depending on analysis		
1	6.2041.440	Sample rack 148 x 11 mL + 3 x 300 mL
1	6.2041.760	Sample rack 54 x 11 mL + 1 x 300 mL
1	6.2743.050	Sample tubes 11 mL
1	6.2743.070	Stopper with perforation
1	6.1031.420	Metrosep A Supp 16 - 150/4.0
1	6.1031.500	Metrosep A Supp 16 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	6.2832.000	MSM Rotor A
1	6.2842.000	MSM-HC Rotor A
1	6.2842.200	MSM-HC Rotor C
1	6.2842.020	Adapter Vario to MSM and MSM-LC
1	2.941.0010	Eluent Production Module
1	6.5330.090	IC Equipment: Additional eluent for 941
1	6.5330.130	IC Equipment: LQH Station
1	6.5330.190	IC Equipment: Dosino Regeneration

** Can be any 930 Compact IC Flex or 930 Compact IC Flex system with suppression module*

*** Quantity depends on the number of solutions to be added, the right choice of the Dosing Unit volume is best to be defined in accordance to the AW which is the starting point of the application.*

2. IC Equipment: Dose-in Gradient Anions/Cations

IC equipment: Dose-in Gradient Anions (6.5330.150) IC equipment: Dose-in Gradient Cations (6.5300.0000)		
1 or 1	6.1014.000 6.1015.000	Metrosep A Trap 1 - 100/4.0 Metrosep C Trap 1 - 100/4.0
1	6.1602.160	Eluent bottle cap GL 45
1	6.16008.070	Eluent bottle / 2 L / GL 45
1	6.1618.020	Thread adapter S 40 to GL 45
1	6.1624.000	Adapter SGJ 14 for 6.1619.XXX Adsorber tube
1	6.1805.120	FEP tubing / M6 / 100 cm
1	6.1829.020	FEP aspiration tube M6, 0.5 m
1	6.1831.030	PEEK capillary 0.75 mm i.d., 3 m
1	6.1831.120	PEEK capillary 0.25 mm i.d., 45 cm
1	6.1834.090	Connecting tubing for degasser pump, 125 cm
1	6.2053.030	Mounting ribbon to 6.2744.340, 25 x 60 mm
1	6.2057.210	Holder for Dosino to IC instruments
1	6.2744.070	Pressure screw short
1	6.2744.080	M6 thread / UNF 10/32 adapter
1	6.2744.340	6-port adapter 4 x UNF 10/32, 2x UNF 1/4-28
1	6.2744.350	PEEK pressure screw 14 mm, 3 pcs.

The Dosing Unit and Dosino for the addition of the second solution into the main eluent are not included in the kit. This, because the volume of the Dosing Unit depends on the application (the smaller, the more accurate but big enough so

no refill during the chromatogram is required) and as the Dosino is an instrument, it can never be included in kits.

For the junction of more than two solutions, more Dosing Units, Dosinos and accessories are required. For each additional solution, the following parts need to be ordered:

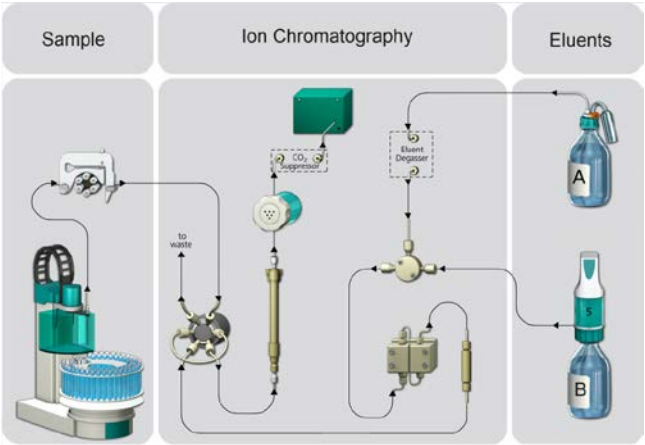
1	2.800.0020	800 Dosino
1	6.3032.xx0	Dosing Unit
1	6.1602.160	Eluent bottle cap GL 45
1	6.16008.070	Eluent bottle / 2 L / GL 45
1	6.1618.020	Thread adapter S 40 to GL 45
1	6.1624.000	Adapter SGJ 14 for 6.1619.XXX Adsorber tube
1	6.1805.120	FEP tubing / M6 / 100 cm
1	6.1829.020	FEP aspiration tube M6, 0.5 m
1	6.1831.030	PEEK capillary 0.75 mm i.d., 3 m
1	6.2744.070	Pressure screw short
1	6.2744.080	M6 thread / UNF 10/32 adapter
1	6.2057.210*	Holder for Dosino to IC instruments

** two Dosinos fit onto one holder. If more than two Dosinos are installed with the setup, also one additional holder needs to be ordered.*

3. Installation

Following is a detailed description of how to install a Dose-in Gradient system, mixing two solutions into one eluent. If a higher then binary gradient is needed, the additional Dosinos are simply installed like the first one and added to the 6-port adapter used for junction purposes.

The whole setup will in the end look like this:



Here, a T-connector is drawn, in reality, a 6-port adapter is installed in this place, so more than just two solutions can be joined.

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

3.1. Installation of the software

All programs must be shut down first. Make sure no Metrohm instrument is connected to the PC. Install MagIC Net**.** All standard directories proposed by the program should be accepted.

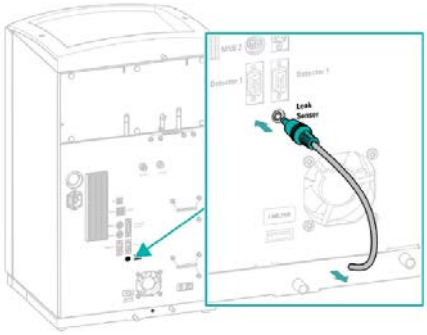
From now on, every new Metrohm instrument connected to the PC will automatically be recognized and its driver will be installed. A window will pop up in MagIC Net, asking if you would like to store this device in your configuration. The names will be checked later in this installation instruction but it is recommended to use the proposed instrument names.

3.2. Accessory Kit: Vario/Flex Basic (6.5000.000)

Using the Accessory Kit Vario/Flex Basic, which is delivered with the IC instrument, install the 930 Compact IC Flex. Place the detector block in the instrument and connect the detector cable in the back of the instrument. Remove the transport locking screws, connect the leak sensor cable and connect the drainage tubing.

Plugging in the leak sensor connection cable

The leak sensor connection cable is coiled up in the base tray.



Remove the transport locking screws

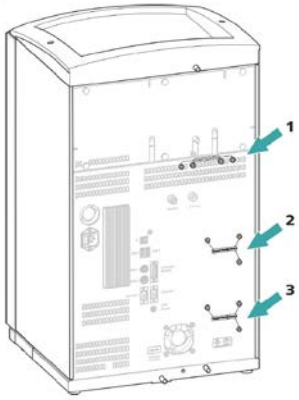
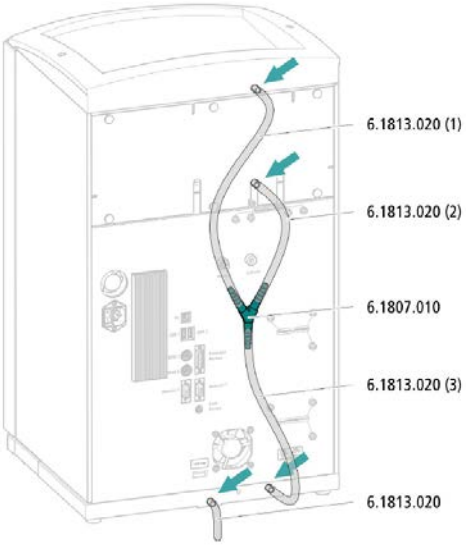


Figure 6 Removing the transport locking screws

1 Transport locking screws For the vacuum pump.	**2 Transport locking screws** For the high-pressure pump.
3 Transport locking screws For an additional high-pressure pump in the bottom drawer.	

Connecting the drainage tubing



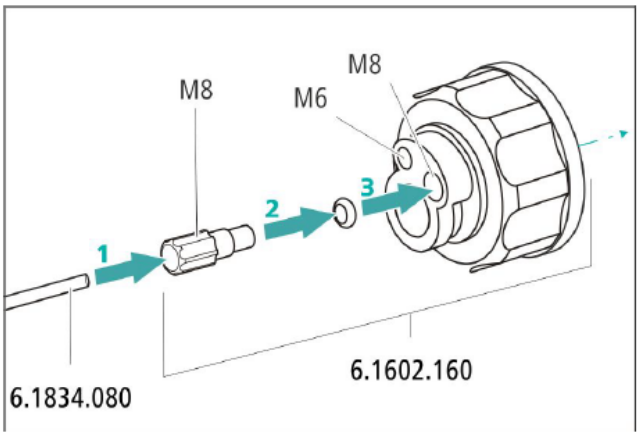
Then mount the holder for Dosinos (6.2057.210) on the IC by removing the bottle holder on top of the instrument, placing the Dosino holder on the side of the IC and remounting the bottle holder on top.

In continuation, set up the waste collector by assembling the cap and screwing it onto the vessel. Then hang the waste collector with its holder on one of the sides of the IC. Make sure you have an unobstructed view to the collector, so you can later observe the droplets coming out of the capillaries 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.

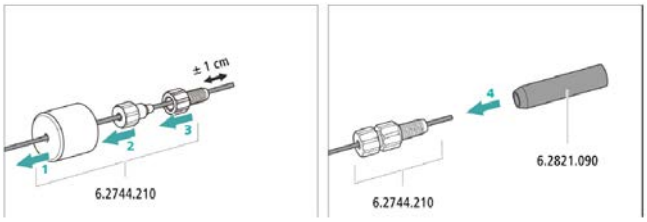
The power cable and USB cable for connection of the IC to the PC (6.2151.020) are plugged into the rear of the Compact IC Flex. Please don't switch on the instrument yet. This step will follow after the completed installation.

3.3. Accessory Kit: Vario/Flex ONE (6.5000.010)

In the box with the Accessory Kit 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 O-ring and the eluent cap.



Then fix the white weight (6.2744.210), the adapter (6.2744.210) and the aspiration filter (6.2821.090) on the eluent aspiration tube, all the while being careful not to touch the filters 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 930 Compact IC Flex manual for a detailed description.

3.4. Dosing Unit for Gradient

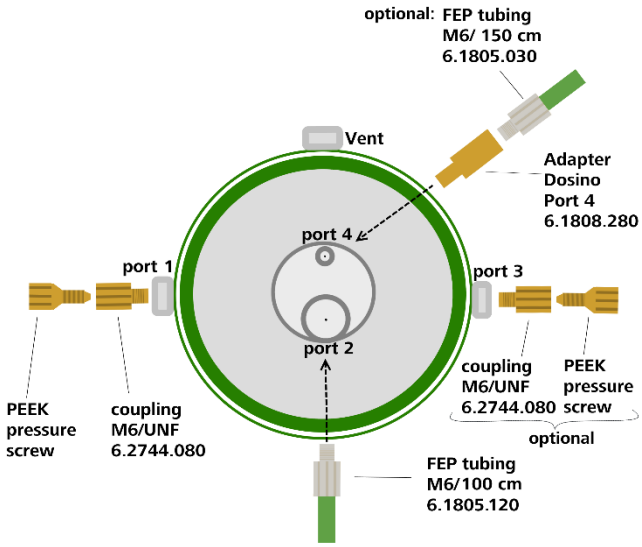
Fix the Dosing Unit with the Dosino on top of the Dosino Holder of the IC. For this, place the Dosing Unit over the free hole of the Dosino holder and fix it from the bottom with the thread adapter (6.1618.020). Then, place the Dosino on top and lock the Dosing Unit to its motor. The Dosino has to be plugged into the MSB1 of the 930 Compact IC Flex.

Port 1 of the Dosing Unit will be connected to the 6-port adapter with the help of a PEEK capillary, 0.75 mm i.d., two PEEK pressure screws and a coupling M6/UNF for the connection at the Dosing Unit port.

Port 2 of the Dosing Unit is directly linked to the 2 L bottle, containing Eluent B with the FEP tubing 6.1805.120.

Port 3 of the Dosing Unit can be connected to the waste collector (optional).

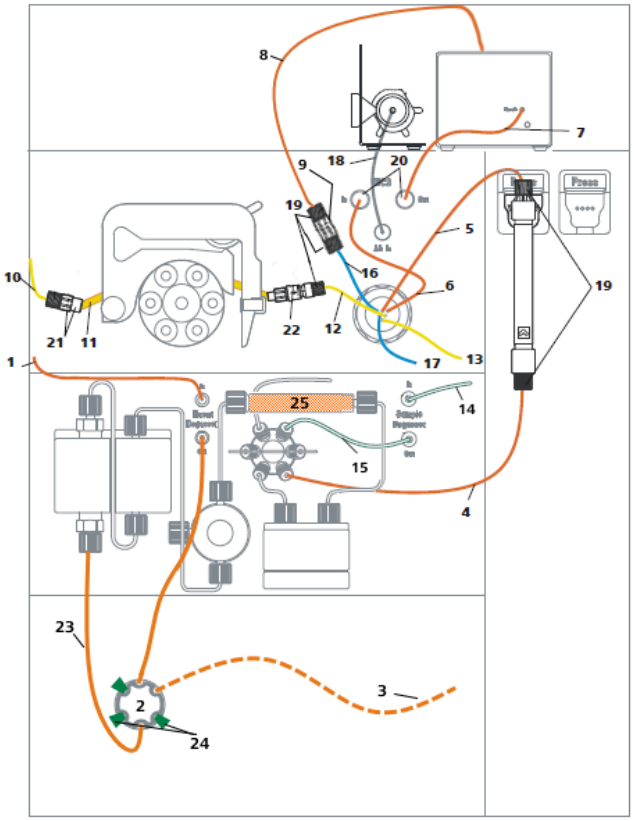
Finally, port 4 of the Dosing Unit can be connected to a bottle filled with UPW or 20% MeOH for additional rinsing (optional).



3.5. 930 Compact IC Flex

Capillaries are connected according to the following list and the diagram below. In this case the suppressor is regenerated via peristaltic pumps, if the Dosino Regeneration is applied, please refer to the AB-395:

1. Connection from the eluent bottle A
2. 6-port adapter (6.2744.340)
3. Connecting capillary to 6-Port-Distributor (use part of 6.1831.030) with Dosing Unit Port 1 (use the adapter for M6 thread / UNF (6.2744.080))
4. Connecting Capillary from Injection Valve to Separation Column
5. Connecting capillary from Separation Column to Suppressor
6. MSM outlet capillary – labeled with *Out,* which has to be connected to the MCS with a long PEEK pressure screw (6.2477.090)
7. Capillary from MCS to anion detector, a long PEEK pressure screw (6.2744.090) is used for the MCS connection
8. Detector outlet capillary connected to the MSM inlet capillary (16) – labeled with *rinsing solution*
9. Coupling (6.2744.040)Capillary from Regenerant Solution
10. Regeneration solution aspiration capillary – PTFE, 0.5 mm ID, connected to the bottle with 100 mmol/L sulfuric acid
11. Peristaltic pump tubing with orange/yellow stoppers (6.1803.030)
12. MSM regeneration inlet capillary – labeled with ‘regenerant’
13. MSM regeneration solution outlet capillary – labeled with ‘waste reg.’ to be connected to the waste collector
14. Connecting capillary (6.1831.160) from Sample Processor peristaltic pump to Sample Degasser (installation of Sample Degasser is optional and not recommended!)
15. Connecting Capillary from Sample Degasser to Injection Valve (installation of Sample Degasser is optional and not recommended!)
16. MSM rinsing solution inlet capillary - labeled with ‘rinsing solution’
17. MSM rinsing solution outlet capillary – labeled with ‘waste rins.’ to be connected to the waste collector
18. Connecting Capillary from Cartridge to MCS
19. High Pressure PEEK Screws
20. MCS and Sample Degasser In-/Outlet
21. Tubing Olives
22. Tubing Olives with inline filter
23. Connecting eluent tubing (6.1834.090) from 6-port adapter (6.2744.340) to high pressure pump
24. Stopper (green, PEEK)
25. Trap column (for mixing purposes)



Make sure that all outlet capillaries are put into the waste collector and prepare the appropriate eluents for your column and gradient choice. Fill them into the respective 2 L eluent bottles. The eluent bottle cap (6.1602.160) for the eluent B is equipped with the adsorber tube (6.1619.000), delivered with the Dosing Unit, using the adapter for adsorber tube (6.1624.000). Furthermore, the FEP aspiration tubing to canister (6.1819.110) is passed through the M6 hole in the cap and installed such as it to reaches the bottom of the eluent B bottle. The O-ring which is not used in this hole can be inserted into the M8 hole and the Thread adapter M8 outer / M6 inner (6.1808.090) is screwed on the M8 hole for further use.

(M8 = bigger hole, M6 = smaller hole)

Likewise, prepare the regeneration solution for the MSM and fill it into the 1 L bottle to be aspirated via the peristaltic pump tubing to the suppressor.

After the completed installation, the 6-port adapter can be fixed on the high pressure pump with the mounting ribbon (6.2053.030) which has to be cut to the optimal dimensions in order not to block access to the screws of the high pressure pump.

3.6. 858 Professional Sample Processor

It is recommended to work with a Sample Processor when operating an instrument with Gradient. It is of uttermost importance that the injection of the sample happens always at exactly the same moment of the gradient profile. This can only be guaranteed when using the appropriate sample transfer.

3.6.1. Cable connections

In the back of the 858 Professional Sample Processor, please plug in the controller cable (6.2151.000, Cable USB A – mini-DIN 8-pin) into the corresponding Contr. plug. This cable is then plugged into a USB port on the back of the IC.

Then, plug in the Swing Head connection cable on the tower, connect the power cable and turn on the IC.

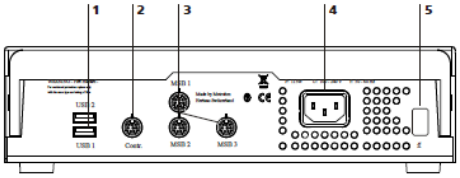


Figure 4 Connector strip

1	**USB connectors**	2	**Controller connector** For the connection to the PC or Touch Control.
3	**MSB connector** For stirrers, dosing devices, Remote Box.	4	**Mains connection**
5	**Type plate** Contains specifications concerning mains voltage and serial number.		

3.6.2. Hardware installations

For a detailed installation description, please refer to the 858 Professional Sample Processor manual. In general, as soon as the IC is powered on and recognized by the software, the sample processor initializes and lifts its Swing Head.

Afterwards, the sample needle (6.2846.010) is installed together with the needle holder (6.2833.030) on the swing head of the 858 Professional Sample Processor.

Now, mount the retaining plate and the safety shield (for detailed instructions please refer to the 858 Professional Sample Processor manual).

3.6.3. Liquid Handling

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

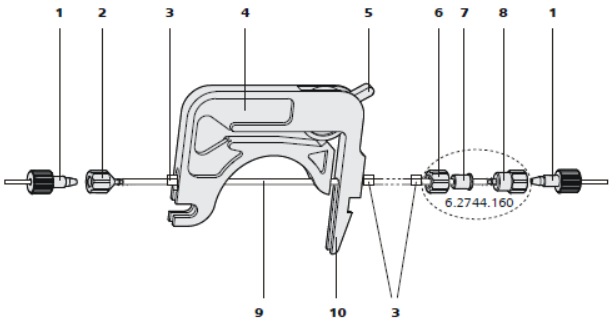


Figure 31 Installing the pump tubing

1	**PEEK pressure screws, short (6.2744.070)**	2	**Tubing olive (6.2744.030)**
3	**Stopper** The colors of the stopper indicate the inner diameter of the pump tubing.	4	**Tubing cartridge (6.2755.000)**
5	**Contact pressure lever**	6	**Union nut**
7	**Adapter**	8	**Tubing olive**
9	**Pump tubing**	10	**Snap-action lever**

4. MagIC Net configuration

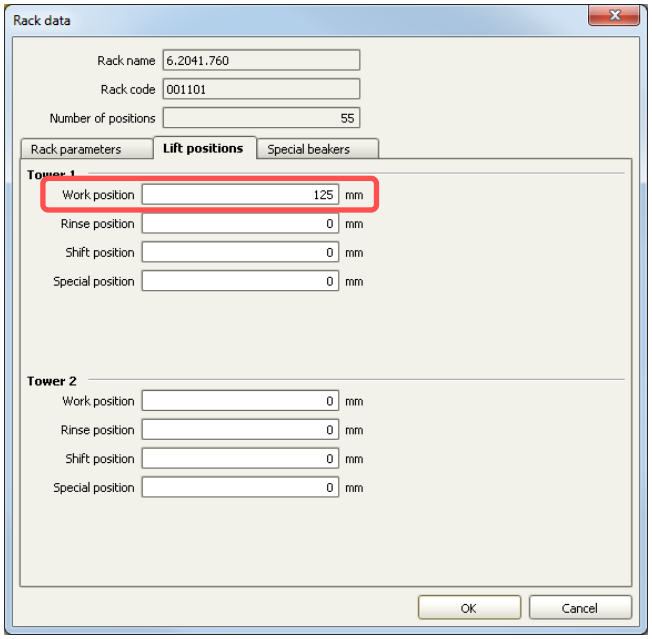
The IC is connected to the computer via its controller cable and the power is turned on. The drivers of all the instruments are automatically installed.

Connected USB devices are automatically recognized when MagIC Net is started. After confirmation of the pop-up windows, the devices and columns are stored in the configuration. The devices in most methods are predefined as “930 Compact IC Flex 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). The column and Dosing Unit solution can be named freely.

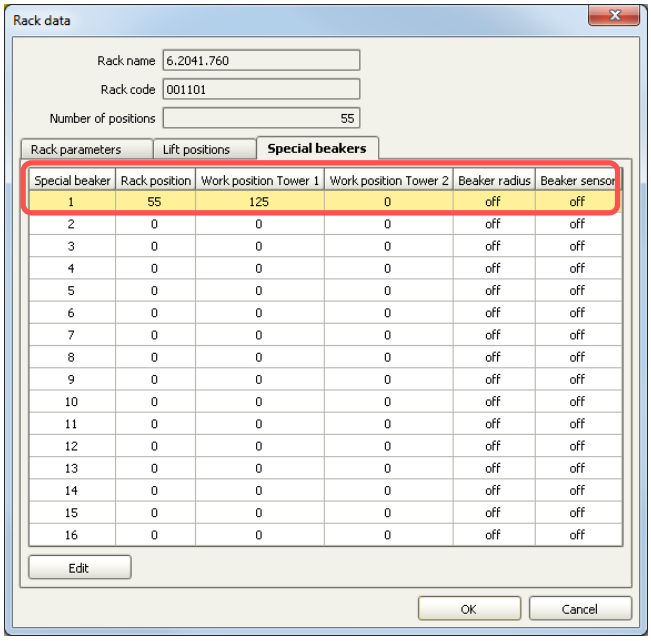
Add and define the eluent and the suppressor solution in the configuration window and register the rotor with its serial number.

4.1. 858 Professional Sample Processor

For the rack, the work position needs to be defined. For this purpose open the rack data of the sample processor and adapt the rack parameters depending on the rack (e.g. 125 mm for rack 6.2041.760).



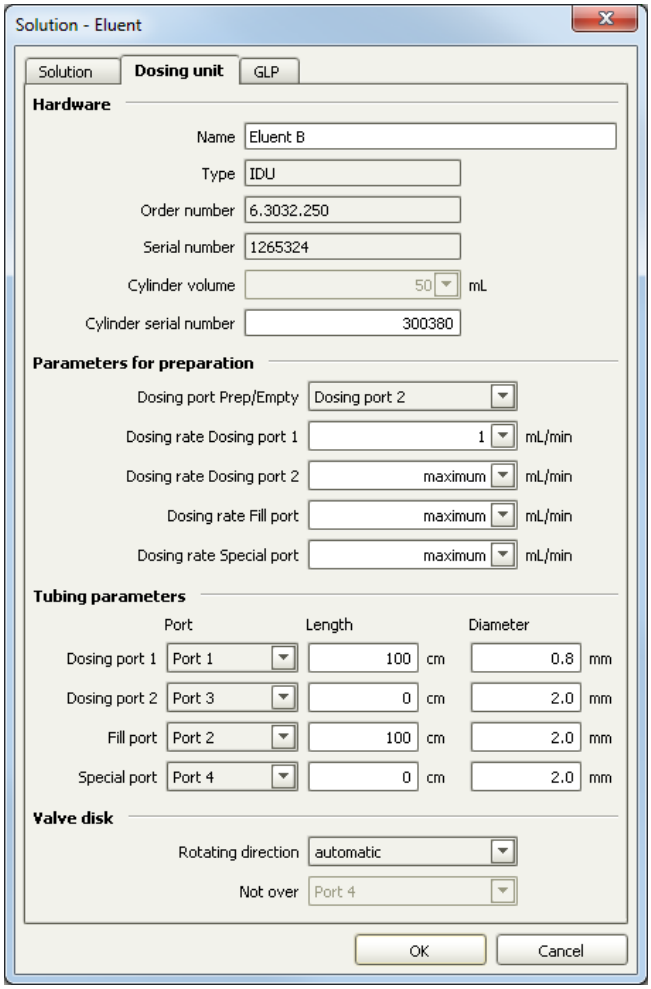
Also define one or more special beakers for rinsing the needle. Fill the appropriate beaker(s) with ultrapure water and place it/them at the defined position(s) on the rack.



Special beaker	Rack position	Work position Tower 1	Work position Tower 2	Beaker radius	Beaker sensor
1	55	125	0	off	off
2	0	0	0	off	off
3	0	0	0	off	off
4	0	0	0	off	off
5	0	0	0	off	off
6	0	0	0	off	off
7	0	0	0	off	off
8	0	0	0	off	off
9	0	0	0	off	off
10	0	0	0	off	off
11	0	0	0	off	off
12	0	0	0	off	off
13	0	0	0	off	off
14	0	0	0	off	off
15	0	0	0	off	off
16	0	0	0	off	off

4.2. Dosino solution

The solution for the Dosing Unit needs to be adapted to the following values:



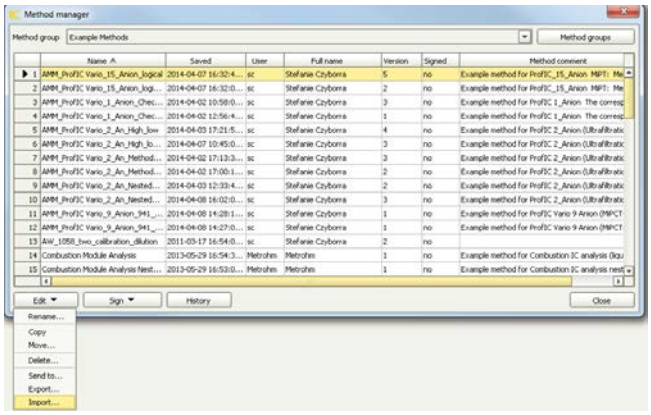
If the optional tubing has been connected to Port 3 and 4, please enter the correct values in the length and diameter fields.

After the values have been adapted, prepare the Dosing Unit in order to have all capillaries and tubing filled with eluent.

4.3. Import of a Gradient method

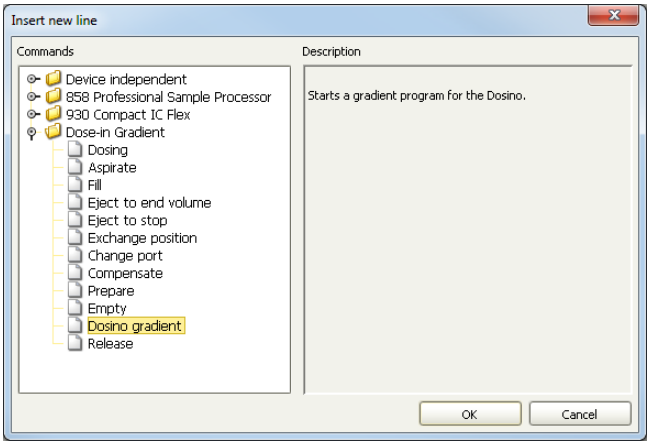
From an appropriate Application Work import the method into MagIC Net. As the gradient profile is very dependent on which analytes need to be separated, look for the analytes in the literature database and add additionally the search word “gradient”. It is always recommended to start with adapting a method extracted from an Application Work, as developing a completely new one is very time consuming and demands quite some experience.

Transferring a gradient profile from one technique (e.g. Low Pressure Gradient) to a Dose-in Gradient profile is not as simple as one may think. It is therefore recommended to start directly with a Dose-in Gradient profile as starting point.



Adapt the method to your system by adjustment of the instrument type(s) and name(s). Then link the eluent A to the “eluent” field for the high pressure pump. This eluent will be the eluent running during the equilibration phase, therefore it is recommended to choose the lower concentrated one for this function.

The gradient profile itself has to be added in the time program, recommendable starting at the same time as the data acquisition. If the profile is started before the liquid handling part is finished, this can lead to retention time shifts, depending on the sample position on the rack.

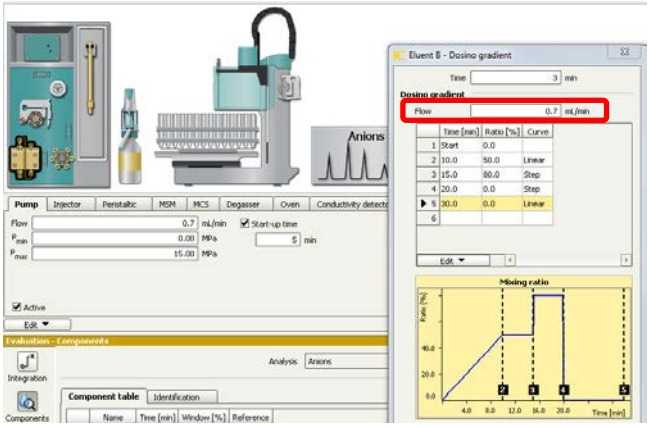


The start parameters of the gradient profile should be the same as the ones defined in the “devices” section of the method. Two different curve types exist, either linear, which will change the eluent gradually or step gradients for abrupt changes in the eluent composition.

It is also recommended to come back to the starting eluent mix for 7-10 minutes before starting the next determination. This helps to avoid retention time shifts due to the full equilibration back to the standard eluent

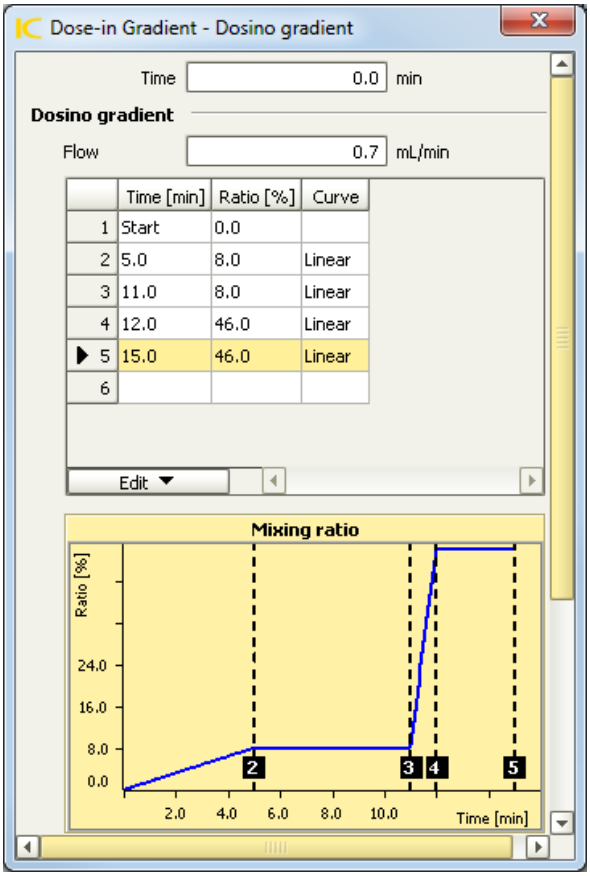
If more than one eluent are added via a Dosino, multiple Dose-in Gradient profiles need to be created and best started simultaneously, one for each Dosino/Dosing Unit.

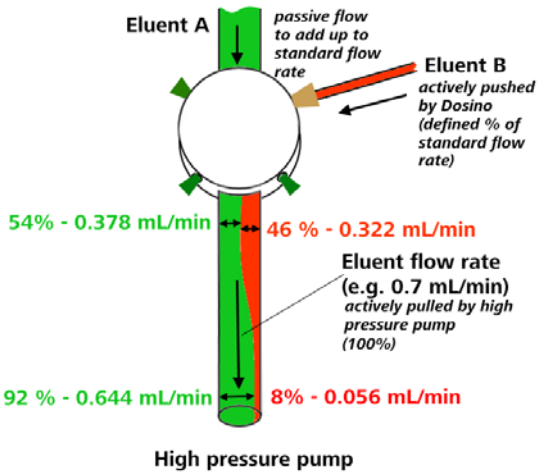
An example profile can be seen in the following picture:



The eluent composition (eluent A+B) is being defined by the total flow rate (here 0.7 mL/min) and the dosing percentage of the Dosino (eluent B). The rest of the 100% is filled with eluent A.

For example for a following gradient profile, the eluent will be composed like shown in the graph.





It is possible to run 100% of eluent A – which is (per default) happening during the equilibration phase. Nevertheless, it is not recommended to run more than 95% of eluent B, as the Dosino will be pushing an accurate 0.7 mL/min and if the high pressure pump is not pulling the exact 0.7 mL/min, the eluent B will be pushed into the eluent A bottle.

For ternary – quintary gradients, the total of the different dosing percentages of the Dosinos need to sum up to a maximum of 95% of the total flow. The “missing” 5% will always be filled in from eluent A.

4.4. 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 930 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 method, and press “Start HW”.

Equilibrate the system until the baseline is stable.

4.5. Starting a determination series

Please put the analyte solutions on the rack.

In the window workplace in MagIC Net, set up a “determination series”, describing your samples by ident, sample position and sample type (standard, blank, or sample etc.).

When running a gradient with IC it is recommended to always run a Blank/UPW sample as first line of the sample series. This run is needed additionally for equilibration purposes.

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

5. Exemplary measurement

Data from AW IC6-1243-062015: Biogenic amines separated with a Dose-in Gradient on the C Supp 1 - 250/4.0

Biogenic amines normally have a long retention time. Using the Dose-in Gradient in combination with the cation suppressor the late eluting biogenic amines can be accelerated. A step gradient is applied in this application work. Putrescine, Cadaverine and Histamne were quantified next to the standard cations within 30 minutes.

Instruments

1	2.930.2460	930 Compact IC Flex Oven/SeS/Deg
1	2.850.9010	IC Conductivity Detector
1	2.889.0020	889 IC Sample Center - cool
2	2.800.0020	800 Dosino
1	6.3032.120	Dosing Unit 2 mL
1	6.3032.210	Dosing Unit 10 mL
1	6.1052.430	Metrosep C Supp 1 - 250/4.0
1	6.1052.500	Metrosep C Supp 1 Guard/4.0
1	6.2842.200	MSM-HC C
1	6.0059.311	MagIC Net 3.1 Compact

Solutions

Eluent A	$c(HNO_3)$ = 5 mmol/L $c(Rb^+)$ = 50 µg/L
Eluent B	$c(HNO_3)$ = 25 mmol/L $c(Rb^+)$ = 50 µg/L
Suppressor solution for regeneration	$c(Na_2CO_3)$ = 70 mmol/L $c(NaHCO_3)$ = 70 mmol/L
Suppressor solution for rinsing	Detector effluent (STREAM)

Standard preparation

In ultra-pure water [mg/L]

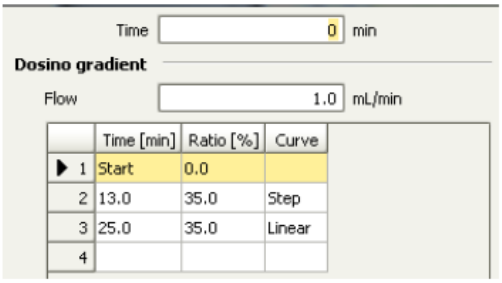
Standard	1	2	3	4
Lithium	0.1	0.2	0.4	1
Sodium	0.5	1	2	5
Ammonium	0.5	1	2	5
Potassium	1	2	4	10
Magnesium	1	2	4	10
Calcium	1	2	4	10
Putrescine	1	2	4	10
Cadaverine	1	2	4	10
Histamine	1	2	4	10

Parameters

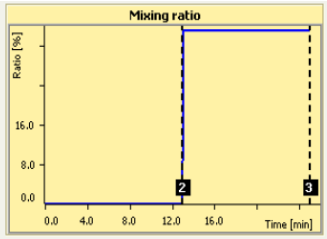
Flow rate eluent	1.0 mL/min
P_{max}	15 MPa
Temperature column	40°C
Recording time	29 min
Injection volume	100 µL
Detection	conductivity
Cell constant	16.7 (1/cm)
Detector thermostat	40°C
Temp. coefficient	2.3%/°C
MSM autostep interval	17 min
MSM Dosino Regeneration*	Volume 5 mL, Time 15 min, flow rate 0.333 mL/min
MCS	on

*MSM regeneration with peristaltic pump is also possible. It requires tubing 6.1826.420 with flow rate 1

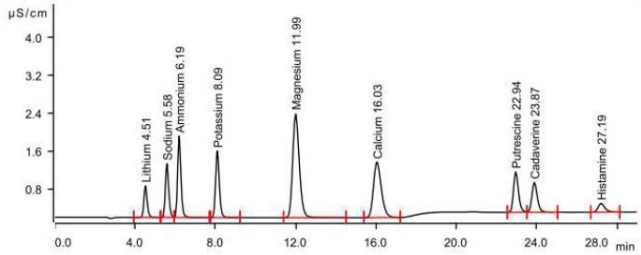
Gradient Profile



	Time [min]	Ratio [%]	Curve
1	Start	0.0	
2	13.0	35.0	Step
3	25.0	35.0	Linear
4			



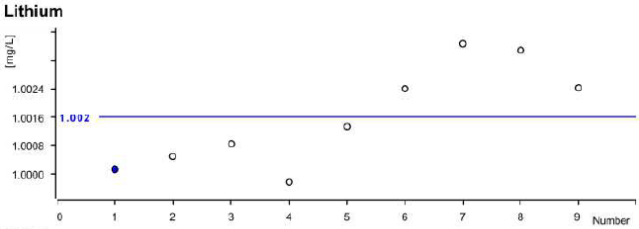
Standard 1



Peak number	Retention time min	Area (µS/cm) x min	Height µS/cm	Concentration mg/L	Component name
1	4.512	0.1241	0.666	0.099	Lithium
2	5.580	0.2173	1.138	0.493	Sodium
3	6.188	0.3349	1.717	0.496	Ammonium
4	8.088	0.3053	1.406	0.984	Potassium
5	11.988	0.8397	2.187	0.987	Magnesium
6	16.032	0.5321	1.172	0.995	Calcium
7	22.942	0.2466	0.856	0.977	Putrescine
8	23.868	0.1977	0.633	0.988	Cadaverine
9	27.187	0.0712	0.183	0.978	Histamine

Repeatability of the results was proven by a 9-fold repetition of standard level 4. Here, examples for lithium, sodium and histamine are shown.

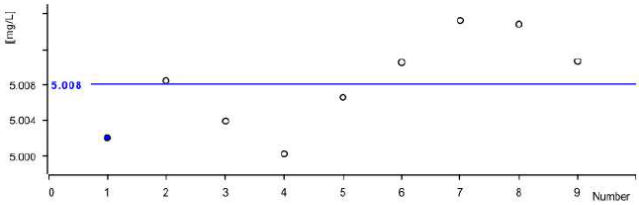
Lithium



Statistics

Mean value:	1.002 mg/L	Absolute standard deviation:	0.001 mg/L
Minimum:	1.000 mg/L	Relative standard deviation:	0.144 %
Maximum:	1.004 mg/L	Number of determinations:	9

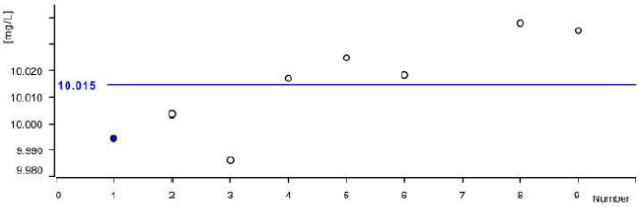
Sodium



Statistics

Mean value:	5.008 mg/L	Absolute standard deviation:	0.005 mg/L
Minimum:	5.000 mg/L	Relative standard deviation:	0.106 %
Maximum:	5.015 mg/L	Number of determinations:	9

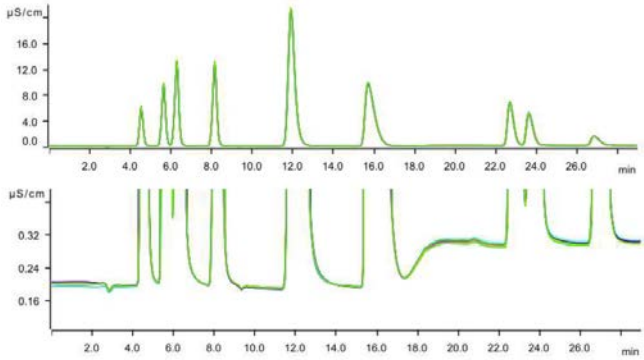
Histamine



Statistics

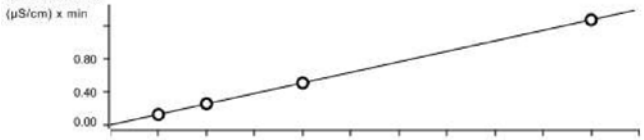
Mean value:	10.015 mg/L	Absolute standard deviation:	0.019 mg/L
Minimum:	0.086 mg/L	Relative standard deviation:	0.198 %
Maximum:	10.038 mg/L	Number of determinations:	9

Overlay of the 9-fold injection of standard 4 with a zoom on the baseline rise caused by the gradient-induced conductivity change:



Calibration of all cations and amines was linear. Here, three examples are shown.

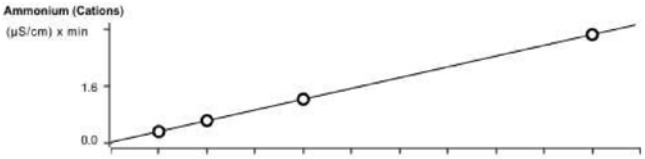
Lithium (Cations)



Function: . . . . . A = - 1.69550E-3 + 0.0126908× Q
Relative standard deviation . . . . . 0.365604 %
Correlation coefficient 0.999995

Sample type	Index	Conc.	Volume	Dilution	Sample amount	Area	Ident
Standard 1	1	0.100	100.0	1.0	1.0	0.124050	Cadaverine, Histamine, Putrescine Mix
Standard 2	1	0.200	100.0	1.0	1.0	0.254333	Cadaverine, Histamine, Putrescine Mix
Standard 3	1	0.400	100.0	1.0	1.0	0.504730	Cadaverine, Histamine, Putrescine Mix
Standard 4	1	1.000	100.0	1.0	1.0	1.267542	Cadaverine, Histamine, Putrescine Mix

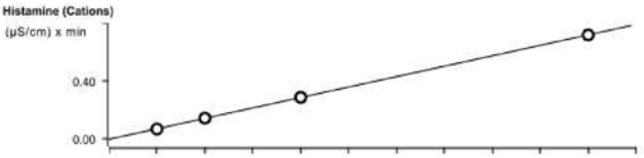
Ammonium (Cations)



Function: . . . . . A = 0.0345056 + 6.05894E-3× Q
Relative standard deviation . . . . . 0.209990 %
Correlation coefficient 0.999998

Sample type	Index	Conc.	Volume	Dilution	Sample amount	Area	Ident
Standard 1	1	0.500	100.0	1.0	1.0	0.334936	Cadaverine, Histamine, Putrescine Mix
Standard 2	1	1.000	100.0	1.0	1.0	0.643394	Cadaverine, Histamine, Putrescine Mix
Standard 3	1	2.000	100.0	1.0	1.0	1.246076	Cadaverine, Histamine, Putrescine Mix
Standard 4	1	5.000	100.0	1.0	1.0	3.063717	Cadaverine, Histamine, Putrescine Mix

Histamine (Cations)



Function: . . . . . A = 1.14080E-3 + 7.16411E-4× Q
Relative standard deviation . . . . . 0.500739 %
Correlation coefficient 0.999991

Sample type	Index	Conc.	Volume	Dilution	Sample amount	Area	Ident
Standard 1	1	1.000	100.0	1.0	1.0	0.071201	Cadaverine, Histamine, Putrescine Mix
Standard 2	1	2.000	100.0	1.0	1.0	0.145610	Cadaverine, Histamine, Putrescine Mix
Standard 3	1	4.000	100.0	1.0	1.0	0.288493	Cadaverine, Histamine, Putrescine Mix
Standard 4	1	10.000	100.0	1.0	1.0	0.717157	Cadaverine, Histamine, Putrescine Mix

6. 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:

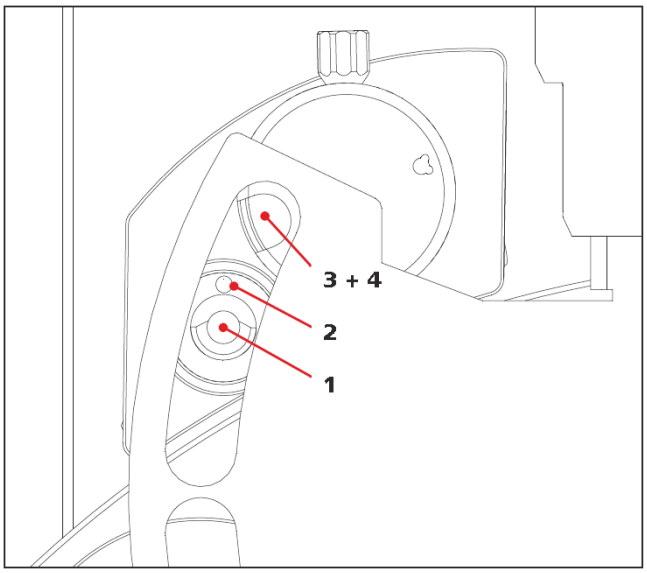
Nr	Article no.	Article designation
1	6.5330.130	IC Equipment: LQH Station

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.

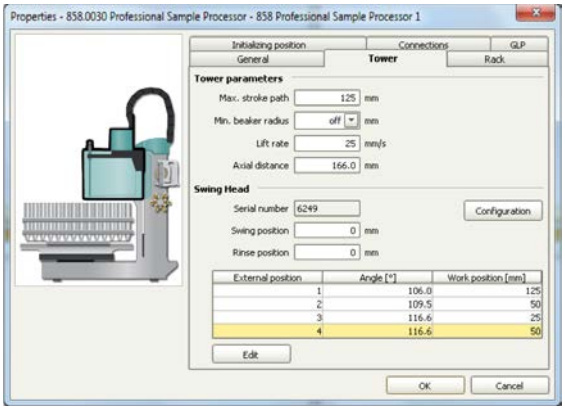
Now the Liquid Handling Station needs to be aligned with the retaining plate. For this, loosen the big screw again and move the Station underneath the retaining plate. Looking from above you should now be able to see the small hole of the rinsing unit and part of the big hole of the dilution vessel,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



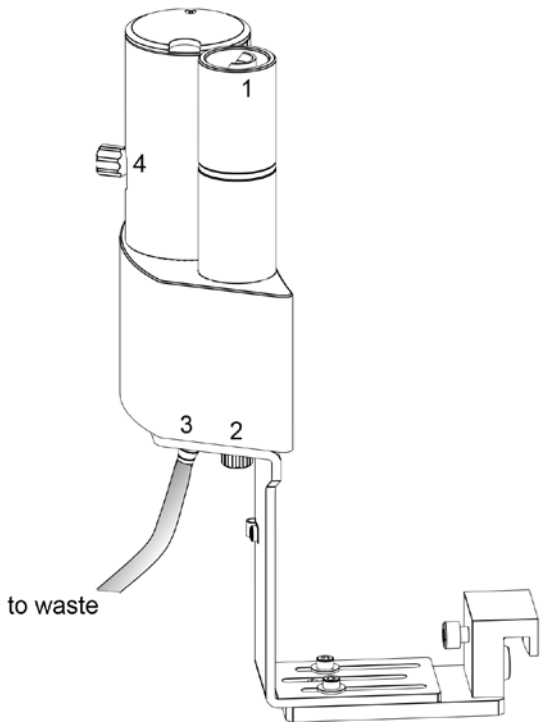
Depending on the available parts, the water supply to the Liquid Handling Station is managed differently. The inner tube of the rinsing unit is meant to be filled constantly with fresh Ultrapure Water, so the aspiration needle can be thoroughly cleaned from the outside.

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 free peristaltic pump channel, 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.

6.1. 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.

6.2. Alternative MSM rinsing and regeneration methods

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