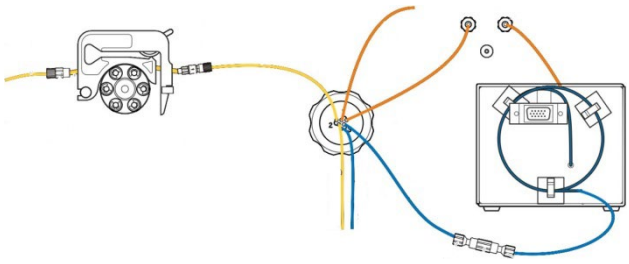
Metrohm

Application Bulletin 800105018EN

Installation Instruction for Alternative MSM Regeneration Methods

The introduction of STREAM (Suppressor Treatment of Reused Eluent After Measuring) for the Vario and Flex generation IC instruments along with the possibility for Dosino Regeneration of the MSM highlights the need for a more thorough explanation of the different techniques of MSM suppressor regeneration. This Application Bulletin explains the different techniques in detail.



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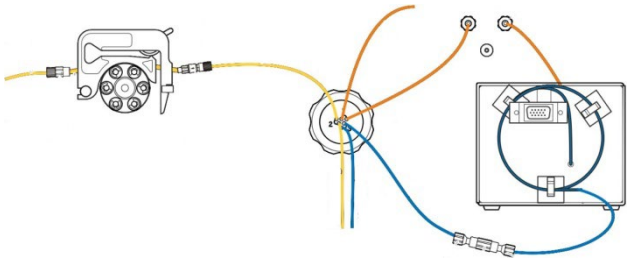
1. STREAM

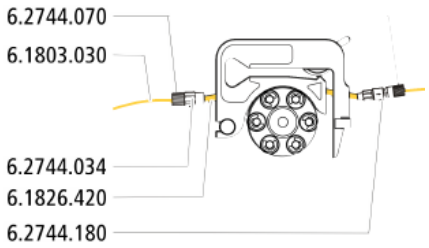
The concept of STREAM was introduced in 2013 with the introduction of the 940/930 IC instrument series. STREAM uses the detector outlet as the rinsing solution for the MSM suppressor, reducing waste output by half. Also, the speed of the peristaltic pump used to transport the regeneration solution (100 mmol/L H_2SO_4) is reduced from 3 to 1, which is sufficient for regeneration of the suppressor and reduces the consumption of acid to one-third of its usual amount.

1.1. Installation

The detector outlet of the suppressed channel is directly connected to the MSM suppressor capillary *rinsing solution* with the help of a coupling (6.2744.040) and two PEEK pressure screws (6.2744.014).



The regeneration solution (100 mmol/L H_2SO_4) is prepared and filled into the 1 L (6.1608.020) glass bottle delivered in the Accessory Kit: Vario/Flex SeS (6.5000.020) or Vario/Flex ChS (6.5000.030). The bottle attachment used to close the bottle and a PTFE capillary (ID 0.5 mm / 6.1803.030) is inserted through one of the UNF holes, immersed in the liquid, and then fixed in this position. The other end of the PTFE capillary is connected to the peristaltic pump tubing with orange/yellow stoppers (6.1826.420) using a PEEK pressure screw and the coupling nozzle - UNF 10/32 (6.2744.034). Subsequently, connect the MSM suppressor capillary labelled with *regenerant solution* to the other end of the peristaltic pump tubing, using the pump tubing connector with security lock and filter (6.2744.180) and a PEEK pressure screw. The pump tubing is secured on the peristaltic pump tubing holder as shown in the following image.



2. Traditional installation, rinsing of MSM with UPW

Traditionally, ultrapure water (UPW) was used as a rinsing solution for the MSM suppressor. This technique is still used in cases where the eluent is modified (e.g., for post-column reactions, PCR) after the MSM suppressor, or is used for further analysis like coupled detection techniques.

New IC instruments only include accessories for the STREAM setup; therefore, these additional spare parts are necessary for the traditional MSM setup:

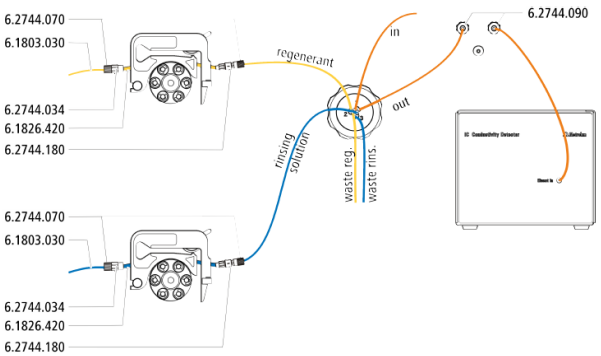
Nr	Article no.	Article designation
1	6.1602.150	Bottle attachment / GL 45 - 3 × UNF 10/32
1	6.1608.020	Glass bottle / 1000 mL / GL 45
1	6.1803.030	PTFE capillary 0.5 mm ID / 3 m
1	6.1826.420	PharMed® pump tubing (orange/yellow), 3 stoppers
1	6.2744.180	pump tubing connector with security lock and filter
1	6.2744.034	coupling nozzle - UNF 10/32

2.1. Installation

The regeneration solution of 100 mmol/L H_2SO_4 is prepared and filled into the 1 L (6.1608.020) glass bottle delivered in the Accessory Kit: Vario/Flex SeS (6.5000.020) or Vario/Flex ChS (6.5000.030). The second 1 L glass bottle is filled with ultrapure water.

The following setup needs to be made for both the acid and the water channel.

The bottle attachment used to close the bottle and a PTFE capillary (ID 0.5 mm / 6.1803.030) is inserted through one of the UNF holes, immersed in the liquid, and fixed in this position. The other end of the PTFE capillary is connected to the peristaltic pump tubing with orange/yellow stoppers (6.1826.420) using a PEEK pressure screw and the coupling nozzle - UNF 10/32 (6.2744.034). Subsequently, connect the MSM suppressor capillary labelled with either *regenerant solution* or *rinsing solution* to the other end of the respective peristaltic pump tubing, using the pump tubing connector with security lock and filter (6.2744.180) and a PEEK pressure screw. The pump tubings are secured on the peristaltic pump tubing holders as shown in the following graphic.



3. Dosino Regeneration

The IC equipment: Dosino Regeneration enables the transfer of the regeneration solution for the suppressor by means of a Dosino instead of the peristaltic pump.

It can be combined with the STREAM setup (which is recommended), the transfer of the rinsing solution with the peristaltic pump (i.e., traditional setup), or the rinsing solution can likewise be transported using the same Dosino.

3.1. Delivery Package for Dosino Regeneration

Delivered with IC equipment: Dosino Regeneration (6.5330.190):

Nr	Article no.	Article designation
Equipment set		
1	6.1580.120	807 Dosing Unit 2 mL
1	6.1602.160	Eluent bottle cap 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	6.2057.210	Holder for Dosino to IC instruments
1	6.2744.080	M6 thread / UNF 10/32 adapter
1	6.2821.120	Inline filter 2 µm
Additionally necessary		
1	2.800.0010	800 Dosino

3.2. Installation

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

3.2.1. Installation of the IC and other components

Please refer to one of the other installation instructions for more details about the installation of the IC, Sample Processor, or software.

3.2.2. IC Equipment: Dosino Regeneration (6.5330.190)

If not already mounted, please mount the holder for Dosino (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. Be careful to avoid crushing any preinstalled capillaries or eluent tubing.

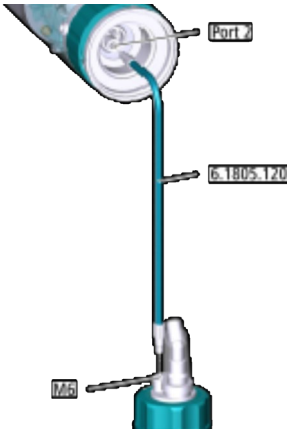
The Dosino is placed on the 807 Dosing Unit 2 mL, and together they are installed on the holder for Dosinos using the thread adapter (6.1618.020). After making sure the IC system is turned off, the Dosino cable is then plugged into a free MSB position on the IC.

Now prepare the regeneration solution bottle. Remove all accessories from the FEP aspiration tubing (6.1829.020) and lead it from the top through the M6 hole of the eluent bottle cap. Cut the tubing to the appropriate depth of the bottle you are using for your regeneration solution with the help of a capillary cutter. Pour a solution of 500 mmol/L H_2SO_4 into the bottle.

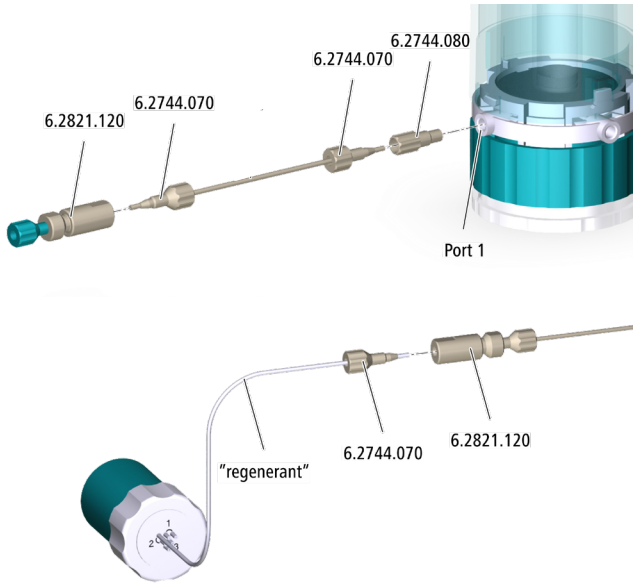
Note: *A higher concentration of sulfuric acid is needed for the Dosino Regeneration setup than for the traditional regeneration with the peristaltic pump. This is due to the fluoride peak which widens and loses height over time if too low a regeneration concentration is used. This results in a decrease in sensitivity.*

Afterwards, close the M8 hole with the M8 stopper in order to avoid any direct air contact. Fill the adsorber tube delivered with the 807 Dosing Unit (6.1580.120) with some cotton and adsorber material. The adsorber is then placed in the SGJ opening of the bottle cap using the adapter (6.1624.000).

Now connect the FEP tubing (6.1805.120) to port 2 of the 807 Dosing Unit and to the M6 hole of the eluent bottle cap for the regeneration solution as shown below.



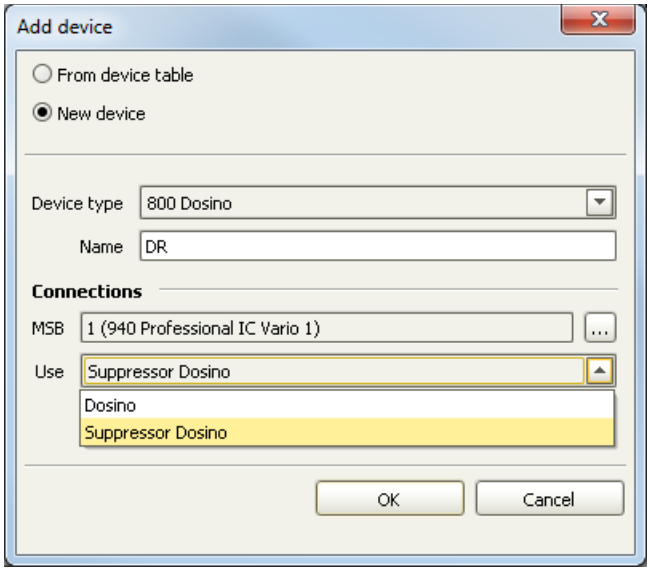
Finally, the 807 Dosing Unit needs to be connected to the MSM inlet capillary (labeled with *regenerant*). For this, tighten the M5 thread / UNF 10/32 adapter (6.27744.080) on port 1 of the 807 Dosing Unit. Lead the MSM capillary *regenerant* through one of the ducts for capillaries on the IC (between base tray and instrument or between the bottle holder and instrument) in the shortest way possible to reach the Dosino. For cleaning purposes, an inline filter (6.2821.120) needs to be installed between the Dosino and MSM (the filter needs exchanging on a regular basis). For this, cut the *regenerant* capillary at an appropriate length with a capillary cutter. Install this FEP capillary between the 807 Dosing Unit port 1 and the inline filter with two PEEK pressure screws. The other end of the inline filter is attached to the original MSM capillary *regenerant* as shown in the following schematic.



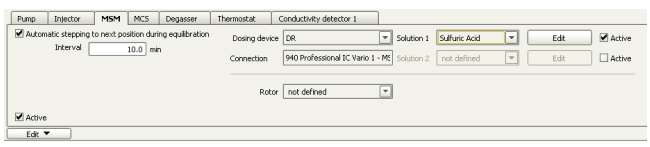
The standard setup with the Dosino Regeneration is meant to be used with the STREAM suppressor rinsing.

3.2.3. Method adjustment

The regeneration Dosino will be dedicated for MSM regeneration purposes and cannot be used for any other function, except rinsing of the MSM. To integrate the Dosino Regeneration into the MagIC Net method, the Dosino needs to be designated as a suppressor Dosino as shown here:

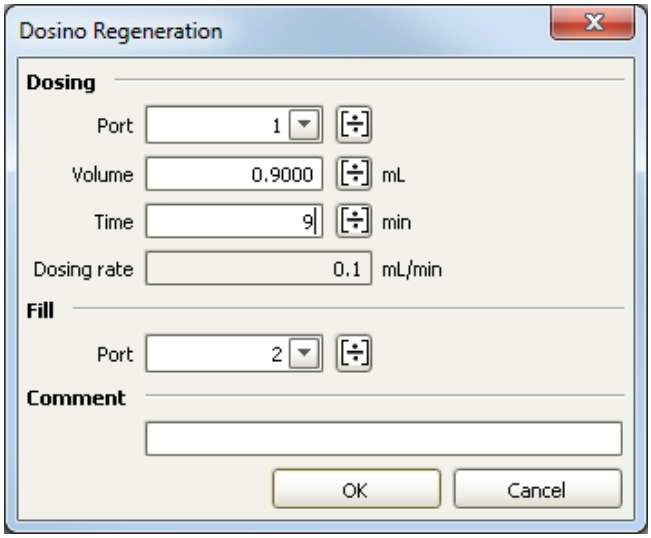


The Dosino then needs to be linked to the MSM:



The parameters for the Dosino Regeneration can be altered with the “Edit” button.

As a default the following parameters are set:



If you alter these parameters, be careful to designate a dosing time approximately 1 minute shorter than the automatic stepping time. This is in order to give the Dosino sufficient time to refill before the next dosing step takes place. The regeneration dosage is always triggered by the step of the MSM. The maximal dosing rate is set to 2 mL/min.

3.3. Dosino Regeneration without STREAM

If the eluent is further used for another analysis, or if the eluent is modified with e.g., a PCR reagent, there is also the possibility to transfer the rinsing solution (UPW) for the MSM suppressor with the Dosino used for Dosino Regeneration.

If this is required, the following parts are needed for installation:

No.	Article no.	Article designation
1	6.1602.160	Eluent bottle cap GL 45
1	6.1608.020	Glass bottle / 1000 mL / GL 45
1	6.1624.000	Adapter SGJ 14 for 6.1619.XXX Adsorber tube
1	6.1619.000	Adsorber tube
1	6.1805.120	FEP tubing / M6 / 100 cm
1	6.1829.020	FEP aspiration tube M6, 0.5 m
1	6.2744.080	M6 thread / UNF 10/32 adapter
1	6.2821.120	Inline filter 2 µm
1	6.1808.280	Adapter Dosino port 4, M6 inner

3.3.1. Installation

The installation of the 807 Dosing Unit and Dosino Regeneration equipment is described above.

For the installation of the additional water supply, please fill the 1 L glass bottle with UPW, remove all accessories from the FEP aspiration tubing (6.1829.020), and lead this tubing from the top through the M6 hole of the eluent bottle cap. Cut

the tubing to the appropriate depth of the bottle you are using for your rinsing solution with the help of a capillary cutter.

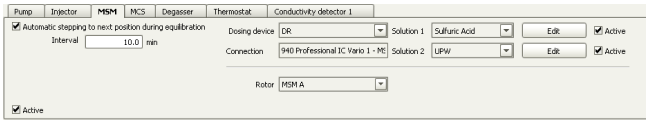
Close the M8 hole with the M8 stopper in order to avoid any direct air contact. Fill the adsorber tube delivered with the 807 Dosing Unit (6.1580.120) with some cotton and adsorber material. The adsorber is then placed in the SGJ opening of the bottle cap using the adapter (6.1624.000).

Next, connect the FEP tubing (6.1805.120) to port 4 of the 807 Dosing Unit (using the adapter 6.1808.280 for port 4, M6 inner) and to the M6 hole of the eluent bottle cap for the rinsing solution.

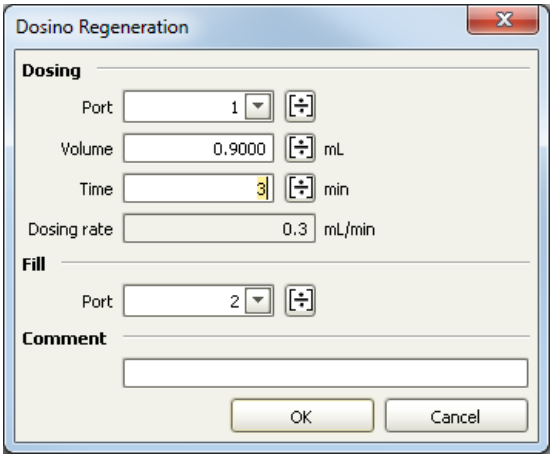
Finally, the 807 Dosing Unit must be connected to the MSM inlet capillary (labeled with *rinsing solution*). For this, tighten the M5 thread / UNF 10/32 adapter (6.27744.080) on port 3 of the 807 Dosing Unit. Lead the MSM capillary *rinsing solution* through one of the ducts for capillaries on the IC (between the base tray and instrument or between the bottle holder and instrument) in the shortest way possible to reach the Dosino. For cleaning purposes, an inline filter (6.2821.120) needs to be installed between the Dosino and MSM (and exchange the filter on a regular basis). For this, cut the *rinsing solution* capillary at an appropriate length with a capillary cutter. Install this FEP capillary between the 807 Dosing Unit port 3 and the inline filter with two PEEK pressure screws. The other end of the inline filter is attached to the original MSM capillary *rinsing solution*.

3.3.2. Method adjustment

In addition to the method adjustments in section 3.2.3, the rinsing also needs to be programmed. It is important to dose the UPW in two steps—the first filling of the 807 Dosing Unit cleans the DU of residual acid, and the second filling serves to truly rinse out any remaining excess acid in the MSM chamber. These two rinsing steps and the regeneration step need to be performed within the automatic stepping time of the MSM (minus 2 minutes). Therefore the recommended settings are:



For solution 1, the sulfuric acid:



For solution 2, ultrapure water: