850 Professional IC



Anion – MSM-HC – MCS – Prep 3 – 2.850.2180

Manual 8.850.8025EN





Metrohm AG CH-9101 Herisau Switzerland Phone +41 71 353 85 85 Fax +41 71 353 89 01 info@metrohm.com www.metrohm.com

850 Professional IC

Anion - MSM-HC - MCS - Prep 3 - 2.850.2180

Manual

8.850.8025EN 05.2009 zst

Teachware Metrohm AG CH-9101 Herisau teachware@metrohm.com

This documentation is protected by copyright. All rights reserved.

Although all the information given in this documentation has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please send us your comments using the address given above.

1	Introductio	n	1
	1.1	Instrument description	1
	1.2	Intended use	3
	1.3 1.3.1	About the documentation	
	1.4 1.4.1 1.4.2 1.4.3 1.4.4 1.4.5	Safety instructions General notes on safety Electrical safety Tubing and capillary connections Flammable solvents and chemicals Recycling and disposal	5 6 6
2	Overview o	of the instrument	8
	2.1	Front	8
	2.2	Rear	10
3	Installation		13
	3.1	About this chapter	13
	3.2	Initial installation	13
	3.3	Installation diagram	16
	3.4 3.4.1 3.4.2 3.4.3	Setting up the instrument Packaging Checks Location	19 19
	3.5	Capillary connections in the IC system	19
	3.6 3.6.1 3.6.2 3.6.3 3.6.4 3.6.5	Rear of the instrument Rollers and handle Positioning and connecting the detector Transport locking screws Leak sensor Drainage tubing	21 24 26
	3.7	Capillary and cable feed-throughs	29
	3.8 3.8.1	Eluent Connecting eluent bottle	
	3.9	Eluent degasser	36
	3.10 3.10.1 3.10.2		37

		3.11	Inline filter	42
		3.12	Pulsation damper	43
		3.13	Sample degasser	45
		3.14 3.14.1 3.14.2 3.14.3	Sample preparation module (SPM) Fields of application Connectors Inline sample preparation with the SPM	46 46
		3.15 3.15.1 3.15.2	Peristaltic pump Principle of the peristaltic pump Installing the peristaltic pump	52
		3.16 3.16.1 3.16.2 3.16.3	Injection valve Connecting the injection valve Mode of operation of the injection valve Selecting the sample loop	57 58
		3.17	Column thermostat	59
		3.18 3.18.1	High Capacity Metrohm Suppressor Module (MSM-HC) General information on the MSM-HC	62
		3.18.2 3.19 3.19.1 3.19.2 3.19.3	Metrohm CO ₂ suppressor (MCS)	65 65
		3.20	Conductivity detector	68
		3.21 3.21.1 3.21.2	Connecting the instrument Connecting the instrument to the PC Connecting the instrument to mains supply	71
		3.22	Guard column	72
		3.23	Separation column	74
4	Start-	up 4.1	Initial start-up	76 76
		4.2	Conditioning	
5	Onera	ation a	and maintenance	79
,	Opere	5.1	General information	
		5.1.1 5.1.2 5.1.3 5.1.4	Care	79 79 80
		5.2 5.2.1	Capillary connections Operation	80

	5.3	Door	81
	5.4 5.4.1 5.4.2	Eluent	81
	5.5 5.5.1 5.5.2	High pressure pump Protection Maintenance	82
	5.6 5.6.1	Inline filter	
	5.7	Inline sample preparation	95
	5.8	Rinsing the sample path	95
	5.9 5.9.1	Sample degasser Operation	
	5.10 5.10.1 5.10.2 5.10.3	Sample preparation module (SPM) Protection Operation Maintenance	97 97
	5.11 5.11.1 5.11.2	Peristaltic pump Operation Maintenance	103
	5.12 5.12.1	Injection valve	
	5.13	High Capacity Metrohm Suppressor Module	405
	5.13.1 5.13.2 5.13.3	(MSM-HC) Protection Operation Maintenance	106 106
	5.14 5.14.1 5.14.2	Metrohm CO₂ suppressor (MCS)	112
	5.15 5.15.1	Conductivity detector	
	5.16 5.16.1 5.16.2 5.16.3 5.16.4	Separation column Separating efficiency Protection Storage Regeneration	113 114 114
	5.17	Quality Management and validation with Metro	hm 115
6	Troublesho	oting	116
	6.1	Problems and their solutions	116

7	Technical s	specifications	121
	7.1	Reference conditions	121
	7.2	Instrument	121
	7.3	Leak sensor	121
	7.4	Ambient conditions	121
	7.5	Housing	122
	7.6	Eluent degasser	122
	7.7	High pressure pump	122
	7.8	Sample degasser	123
	7.9	Sample preparation module (SPM)	123
	7.10	Peristaltic pump	124
	7.11	Injection valve	124
	7.12	Column thermostat	124
	7.13	High Capacity Metrohm Suppressor Module (MSM-HC)	125
	7.14	Metrohm CO ₂ suppressor (MCS)	125
	7.15	Conductivity measuring system	125
	7.16	Mains connection	126
	7.17	Interfaces	127
	7.18	Safety specification	127
	7.19	Electromagnetic compatibility (EMC)	127
	7.20	Weight	128
8	Conformit	y and warranty	129
	8.1	Declaration of Conformity	129
	8.2	Quality Management Principles	130
	8.3	Warranty (guarantee)	131
9	Accessorie	es es	133
	9.1	Scope of delivery	133
	9.2	Optional accessories	144
	Index		146

Table of figures

Table of figures

Figure 1	Front 850 Professional IC – Anion – MSM-HC – MCS – Prep 3	8
Figure 2	Rear 850 Professional IC Anion – MSM-HC – MCS – Prep 3	10
Figure 3	Installation diagram 850 Professional IC – Anion – MSM-HC – MCS –	-
	Prep 3	17
Figure 4	Connection of capillaries with pressure screws	20
Figure 5	Rollers and handle	22
Figure 6	Handle as MPak holder	23
Figure 7	Removable rear panel	24
Figure 8	Connection for the leak sensor on the rear of the instrument	27
Figure 9	Drainage tubing	28
Figure 10	Capillary feed-throughs on the doors	30
Figure 11	Capillary feed-throughs base tray/covering plate	
Figure 12	Installing eluent bottle attachment	
Figure 13	Mounting aspiration filter	
Figure 14	Installing tubing weighting and aspiration filter	34
Figure 15	Eluent aspiration tubing fully equipped	
Figure 16	Eluent bottle – connected	35
Figure 17	Eluent degasser	
Figure 18	Capillary connections high pressure pump/purge valve	
Figure 19	High pressure pump – Connect inlet	
Figure 20	Deaerating the high pressure pump	
Figure 21	Connecting inline filter	
Figure 22	Pulsation damper – Connection	
Figure 23	Sample degasser	
Figure 24	SPM – Connectors	
Figure 25	Cation exchange with the SPM	49
Figure 26	Injection and sequential suppression	49
Figure 27	Measuring the sample	
Figure 28	Neutralization and preconcentration	
Figure 29	Injection and sequential suppression	
Figure 30	Peristaltic pump	
Figure 31	Installing the pump tubing	
Figure 32	Install pump tubing connection with filter	
Figure 33	Install pump tubing connection without filter	55
Figure 34	Injection valve – connected	57
Figure 35	Injection valve – Positions	
Figure 36	Column thermostat	60
Figure 37	MSM-HC – Connectors	63
Figure 38	MCS – connection	65
Figure 39	Adsorption cartridge holder	67
Figure 40	Conductivity detector front	
Figure 41	Conductivity detector rear	
Figure 42	Connection detector – MCS	
Figure 43	Removing piston	
Figure 44	Components of the piston cartridge	85

Table of figures

Figure 45	Tool for piston seal 6.2617.010	86
Figure 46	Removing the piston seal	87
Figure 47	Insert the piston seal into the tool	87
Figure 48	Inserting the piston seal into the pump head	88
Figure 49	Removing valves	89
Figure 50	Dismantling valve	90
Figure 51	Components of the inlet valve and outlet valve	91
Figure 52	Changing the filter	93
Figure 53	SPM – Components	99
Figure 54	Pump tubing connection – Changing the filter	105
Figure 55	MSM-HC – Components	108

1 Introduction

1 Introduction

1.1 Instrument description

The instrument **850 Professional IC – Anion – MSM-HC – MCS – Prep 3** (2.850.2180) is one of the model versions of the Professional IC line of instruments manufactured by the Metrohm Company. The Professional IC line of instruments is distinguished by:

- the intelligence of its components, which are able to monitor and optimize all functions and to provide documentation according to FDA requirements.
- its compactness.
- its flexibility. A suitable model version exists for every application.
 Individual instruments can be converted, expanded or modified to create a different instrument as needed.
- its **transparency**. All components are easily accessible and arranged in a clear manner.
- its **safety**. Chemicals and electronics are separated and a leak sensor is integrated in the wet end.
- its environmental compatibility.
- low noise emission.

The instrument is operated with **MagIC Net** software. It is connected via a USB connection to a PC on which MagIC Net is installed. The software automatically recognizes the instrument and checks its functional readiness. MagIC Net controls and monitors the instrument, evaluates the measured data and administers it in a database. The operation of MagIC Net is described in the online help or in the tutorial for MagIC Net.

The peristaltic pump and the sample preparation module (SPM) in the lower part of the instrument are used for the **inline sample preparation** – e.g. for *neutralization* or *cation exchange*.

The instrument contains the following components:

Eluent degasser

The eluent degasser removes gas bubbles and dissolved gases from the eluent. For degassing, the eluent flows into a vacuum chamber through a special fluoropolymer capillary.

High pressure pump

The intelligent and low pulsation high pressure pump pumps the eluent through the system. It is equipped with a chip on which its technical specifications and "life history" (operating hours, service data, ...) are saved.

Inline filter

Inline filters protect the separation column securely against possible contamination from the eluent. Inline filters can however also just as well be used for the purpose of protecting other sensitive components against contaminations in the solutions used. The fine 2 μ m material of the readily and easily replaceable filter platelets removes particles such as bacteria and algae from the solutions.

Pulsation damper

The pulsation damper protects the separation column from damage caused by pressure fluctuations when switching the injection valve, and reduces interfering pulsations during highly sensitive measurements.

Sample degasser

The sample degasser removes gas bubbles and disolved gases from the sample. For degassing, the sample flows into a vacuum chamber through a special fluoropolymer capillary.

Sample Preparation Module (SPM)

The SPM is used for inline sample preparation. Important applications involve the cation exchange or the neutralization of samples before sample feeding.

Peristaltic pump

The Peristaltic pump is used for pumping sample and auxiliary solutions. It can rotate in both directions.

Injection valve

The injection valve connects the eluent and sample path through rapid and precise valve switchover. A precisely measured amount of sample solution is injected and rinsed with eluent onto the separation column.

Column thermostat

The column thermostat controls the temperature of the column and eluent channel and thus ensures stable measuring conditions. It provides space for 2 separation columns.

High Capacity Metrohm Suppressor Module (MSM-HC)

The MSM-HC is used for chemical suppression with high capacity during anion analysis. It is pressure-stable, robust and resistant to solvents.

Metrohm CO₂ suppressor (MCS)

The MCS removes the CO_2 from the eluent flow. This reduces the background conductivity, improves the detection sensitivity and minimizes the injection and carbonate peaks.

1 Introduction

Conductivity detector

The conductivity detector continuously measures the conductivity of the liquid passing through and indicates these signals in digital form (DSP – Digital Signal Processing). The conductivity detector exhibits outstanding thermal stability and thus guarantees reproducible measuring conditions.

Separation column

The intelligent separation column is the heart of the ion chromatographic analysis. It separates the different components corresponding to their interactions with the column. The Metrohm analytical columns are equipped with a chip on which their technical specifications and their history (first use / setting up, operating hours, injections, ...) are saved.

1.2 Intended use

The **850 Professional IC – Anion – MSM-HC – MCS – Prep 3** is used for ion chromatographic determination of anions with **sequential suppression** and **inline sample preparation**:

Sequential suppression consists of:

- Chemical suppression by the High Capacity Metrohm Suppressor Module (MSM-HC) (see Chapter 3.18, page 62) and subsequent
- CO_2 suppression by the Metrohm CO_2 Suppressor (MCS) (see Chapter 3.19, page 65).

The use of this technology reduces background conductivity to a minimum and improves the detection accuracy.

If required, the instrument can also be used for the determination of cations and anions without suppression.

The present instrument is suitable for processing chemicals and flammable samples. The usage of the 850 Professional IC – Anion – MSM-HC – MCS – Prep 3 therefore requires that the user has basic knowledge and experience in the handling of toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories is also mandatory.

1.3 About the documentation

1.3 About the documentation



Caution

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which have to be followed by the user in order to ensure safe operation of the instrument.

1.3.1 Symbols and conventions

The following symbols and styles are used in this documentation:

()	C			
(5- 12)	Cross-reference to figure legend			
	The first number refers to the figure number, the second to the instrument part in the figure.			
1	Instruction step			
	Carry out these steps in the sequence shown.			
	Warning			
	This symbol draws attention to a possible life hazard or risk of injury.			
	Warning			
7	This symbol draws attention to a possible hazard due to electrical current.			
	Warning			
<u></u>	This symbol draws attention to a possible hazard due to heat or hot instrument parts.			
	Warning			
	This symbol draws attention to a possible biological hazard.			
	Caution			
	This symbol draws attention to a possible damage of instruments or instrument parts.			
•	Note			
	This symbol marks additional information and tips.			

4 -----

1 Introduction

1.4 Safety instructions

1.4.1 General notes on safety



Warning

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.4.2 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.



Warning

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.



Warning

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Mains voltage



Warning

An incorrect mains voltage can damage the instrument.

Only operate this instrument with a mains voltage specified for it (see rear panel of the instrument).

1.4 Safety instructions

Protection against electrostatic charges



Warning

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Always pull the mains cable out of the mains connection socket before connecting or disconnecting electrical appliances on the rear panel of the instrument.

1.4.3 Tubing and capillary connections



Caution

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.

1.4.4 Flammable solvents and chemicals



Warning

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. laboratory flue).
- Keep all sources of flame far from the workplace.
- Clean up spilled fluids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.4.5 Recycling and disposal



This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

The correct disposal of your old equipment will help to prevent negative effects on the environment and public health.

6

1 Introduction

More details about the disposal of your old equipment can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2.1 Front

2 Overview of the instrument

2.1 Front

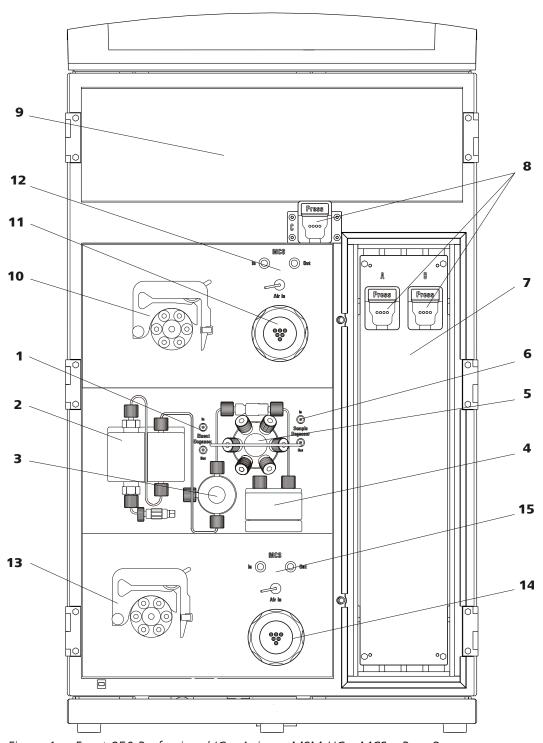


Figure 1 Front 850 Professional IC – Anion – MSM-HC – MCS – Prep 3

1 Eluent degasser *See Chapter 3.9*.

2 High pressure pump *See Chapter 3.10.*

2 Overview of the instrument

3 Purge valve

For deaerating the high pressure pump (see Chapter 3.10.1, page 37).

5 Injection valve

See Chapter 3.16.

7 Column thermostat

See Chapter 3.17.

9 Detector chamber

Space for the conductivity detector (see Chapter 3.20, page 68).

11 MSM-HC

See Chapter 3.18.

13 Peristaltic pump

See Chapter 3.15.

15 MCS

For sample preparation. See Chapter 3.19.

4 Pulsation damper

See Chapter 3.12.

6 Sample degasser

See Chapter 3.13. Use optional.

8 Column holder

For two separation columns (see Chapter 3.23, page 74) in the column thermostat and one outside the column thermostat.

10 Peristaltic pump

See Chapter 3.15.

12 MCS

See Chapter 3.19.

14 SPM sample preparation module

For sample preparation. See Chapter 3.14.

2.2 Rear

2.2 Rear

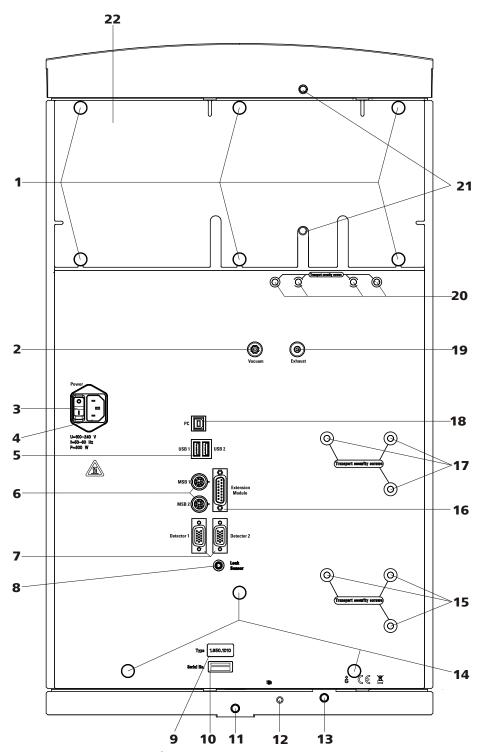


Figure 2 Rear 850 Professional IC Anion – MSM-HC – MCS – Prep 3

1 Knurled screws

For fastening the rear panel (2-22) and handle (5-2).

2 Vacuum connection

For connecting further degassing chambers in extension modules.

Labeled with Vacuum.

2 Overview of the instrument

3 Mains switch

For switching the instrument on and off.

I = ON

0 = OFF

5 USB connectors

2 USB connectors (labeled with *USB 1* and *USB 2*).

7 Detector connectors

2 detector connectors (labeled with *Detector 1* and *Detector 2* for connecting Metrohm detectors.

9 Instrument type

11 Drainage tubing connection

For connecting a drainage tubing 6.1816.020 (9-8).

13 Drainage tubing connection

For connecting a drainage tubing 6.1816.020 (9-**9**).

15 Transport locking screws

For securing the lower high pressure pump (18-4) when transporting the instrument (only necessary for instruments with two high pressure pumps).

17 Transport locking screws

For securing the high pressure pump (18-**4**) when transporting the instrument.

19 Waste air opening

For extracting the air from the vacuum chamber.

Labeled with Exhaust.

21 Drainage tubing connection

For connecting a drainage tubing 6.1816.020 (9-**1**).

4 Mains connection socket

For connecting the mains cable.

6 MSB connectors

2 MSB connectors (labeled with *MSB 1* and *MSB 2*) for connecting MSB devices

Caution: The 850 **must** be switched off when connecting a device.

MSB = Metrohm Serial Bus.

8 Leak sensor connection socket

For connecting the leak sensor connector plug (8-2).

10 Serial number

12 Leak sensor connection cable

For connecting the leak sensor.

14 Knurled screws

For fastening the rollers.

16 Extension module connection

For connecting an extension module (labeled with *Extension Module*).

18 PC connection socket

For connecting the instrument to the computer with the USB cable 6.2151.020.

20 Transport locking screws

For securing the vacuum pump when transporting the instrument.

22 Rear panel

Removable. Access to the detector chamber.

2.2 Rear



Caution

When connecting an instrument to the MSB connector (2- $\pmb{6}$) you $\pmb{\text{must}}$ switch off the 850 Professional IC .

3 Installation

3.1 About this chapter

The *Installation* chapter contains

- this overview
- a brief set of instructions for the initial installation of the 850 Professional IC Anion MSM-HC MCS Prep 3 (see Chapter 3.2, page 13). At each step you will find cross-references to more detailed installation instructions for individual components, should you require such aids.
- an installation diagram (see Chapter 3.3, page 16), showing a completely installed 850 Professional IC Anion MSM-HC MCS Prep 3.
- several chapters (see chapter 3.4, page 19 and following) with detailed installation instructions for all components, including those that are already installed at the time the instrument is delivered.

3.2 Initial installation



Note

A number of the capillaries is already connected at the time the instrument is delivered.

The following work steps must still be carried out:

Installing 850 Professional IC – Anion – MSM-HC – MCS – Prep 3

1 Setting up the instrument

(see Chapter 3.4, page 19).

2 Installations on the rear of the instrument

- Remove handle and rollers (see Chapter 3.6.1, page 21).
- Remove transport locking screws (see Chapter 3.6.3, page 26).
- Place the detector in the instrument and connect it (see Chapter 3.6.2, page 24).
- Connect the leak sensor (see Chapter 3.6.4, page 26).

3.2 Initial installation

• Connect drainage tubings (see Chapter 3.6.5, page 27).

3 Connecting the eluent path

- Equip the 6.1834.080 eluent aspiration tubing and connect with the eluent bottle (see Chapter 3.8.1, page 32).
- Connect the 6.1831.150 column inlet capillary and the capillary of the MSM-HC labeled with *Eluent* with a 6.2744.040 coupling and two 6.2744.070 short pressure screws.
- Use a 6.2744.090 long pressure screw to connect the capillary of the MSM-HC labeled with *Detector* to the input of the MCS (see Chapter 3.19.2, page 65).
- Connect the detector inlet capillary with a 6.2744.090 long pressure screw to the output of the MCS (see Chapter 3.19.2, page 65).

4 Installing the upper peristaltic pump

(see Chapter 3.15.2, page 53)

- Connect the 6.1803.020 aspirating capillary for regeneration solutions with a 6.2744.034 tubing olive and a 6.2744.070 short pressure screw to the aspiration end of the 6.1826.320 pump tubing for the regeneration solution.
- Place the pump tubing in a tubing cartridge.
- Connect the 6.1803.020 aspirating capillary for rinsing solutions with a 6.2744.034 tubing olive and a 6.2744.070 short pressure screw to the aspiration end of the second 6.1826.320 pump tubing for the rinsing solution.
- Place the second pump tubing in the second tubing cartridge.
- Place both tubing cartridges into the peristaltic pump.

5 Connecting the MSM-HC

(see Chapter 3.18.2, page 62)

- Connect the capillary labeled with H2SO4 with a 6.2744.180 pump tubing connection and a 6.2744.070 short pressure screw to the peristaltic pump on the outlet end of the pump tubing for the regeneration solution.
- Connect the capillary labeled with H20 with a 6.2744.180 pump tubing connection and a 6.2744.070 short pressure screw to the peristaltic pump on the outlet end of the pump tubing for the rinsing solution.
- Guide the two capillaries labeled with *Waste* into a waste container and fasten it there.

6 Connecting the instrument

• Connect the instrument to the PC with a 6.2151.020 USB cable (see Chapter 3.21.1, page 71).

• Connect instrument to mains supply (see Chapter 3.21.2, page 71).

7 Initial start-up

(see Chapter 4.1, page 76)

- Switch on the PC and start MagIC Net.
- Switch on the instrument.
- Deaerate the high pressure pump.
- Set contact pressure of the peristaltic pump.
- Rinse instrument without column.

8 Installing guard and separation column

- Remove the 6.2744.040 coupling between the column inlet capillary and the eluent inlet capillary of the MSM-HC.
- Connect guard column (optional) (see Chapter 3.22, page 72)
 - Fasten the guard column to the end of the column inlet capillary according to the specifications contained in the leaflet accompanying the guard column.
 - Rinse guard column.
- Connecting the separation column (see Chapter 3.23, page 74)
 - Fasten the inlet of the separation column either to the end of the column inlet capillary or to the guard column (if used) according to the specifications contained in the leaflet accompanying the column.
 - Fasten the MSM-HC capillary labeled with *Eluent* with a 6.2744.070 PEEK pressure screw at the output of the separation column.
- Hang separation column with chip in the column holder of the instrument.

9 Conditioning the instrument

(see "Conditioning the system", page 77)

10 Installing the sample path

Connect the sample aspirating capillary and the sample outlet capillary as well as the necessary capillaries for auxiliary solutions according to the installation diagram.

3.3 Installation diagram

3.3 Installation diagram

The following installation diagram shows the schematics of the front of the instrument after installation is complete with sequential suppression and cation exchange. Many capillaries are already installed at the time the instrument is delivered; these capillaries are not numbered in the diagram. Numbered capillaries must be connected at the time of installation.

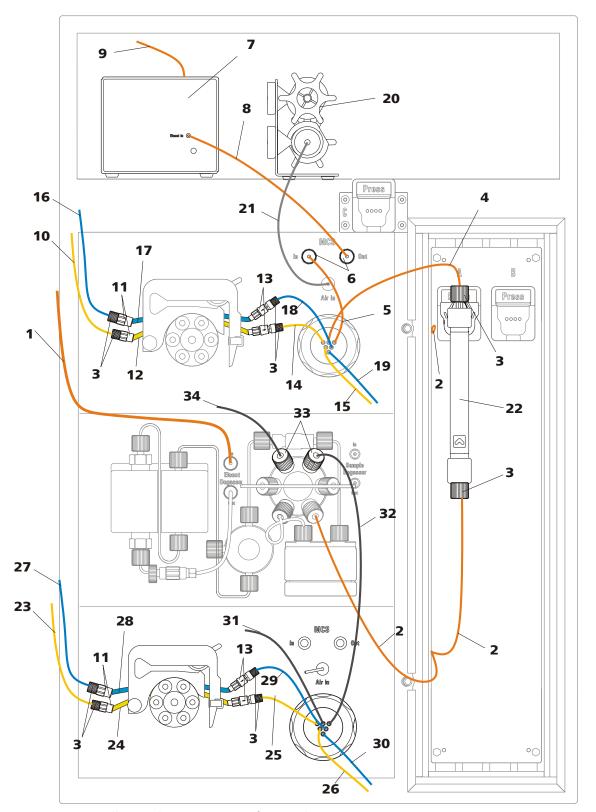


Figure 3 Installation diagram 850 Professional IC – Anion – MSM-HC – MCS – Prep 3

- **1 Eluent aspiration tubing 6.1834.080** Connection to the eluent bottle (see Chapter 3.8.1, page 32).
- **2** Column inlet capillary 6.1831.150

 Connected to the injection valve and threaded into the capillary recesses of the column thermostat.

3.3 Installation diagram

3	PEEK pressure screw, short 6.2744.070	4	MSM-HC eluent inlet capillary Labeled with <i>Eluent</i> . Connected to the column output.
5	MSM-HC eluent outlet capillary Labeled with <i>Detector</i> . Connected to the input of the MCS.	6	PEEK pressure screw, long 6.2744.090
7	Conductivity detector	8	Detector inlet capillary Connected to the output of the MCS.
9	Detector outlet capillary	10	MSM-HC regeneration solution aspirating capillary 6.1803.020
11	Tubing olive 6.2744.034 For connecting capillaries to the aspiration side of the peristaltic pump.	12	Pump tubing 6.1826.320 With orange/yellow stoppers. For the regeneration solution.
13	Pump tubing connection 6.2744.180 With safety device and filter. For connecting capillaries to the outlet side of the peristaltic pump.	14	MSM-HC regeneration solution inlet capillary Labeled with <i>H2SO4</i> .
15	MSM-HC regeneration solution outlet capillary Labeled with <i>Waste</i> .	16	MSM-HC rinsing solution aspirating capillary 6.1803.020
17	Pump tubing 6.1826.320 With orange/yellow stoppers. For the rinsing solution.	18	MSM-HC rinsing solution inlet capillary Labeled with <i>H2O</i> .
19	MSM-HC rinsing solution outlet capillary Labeled with <i>Waste</i> .	20	MCS adsorption cartridges
21	Air aspirating capillary For aspirating CO2-low air from the cartridges of the MCS.	22	Separation column
23	SPM regeneration solution aspirating capillary 6.1803.020	24	Pump tubing 6.1826.340 With black/black stoppers. For the regeneration solution.
25	SPM regeneration solution inlet capillary Labeled with <i>H2SO4</i> .	26	SPM regeneration solution outlet capillary Labeled with <i>Waste</i> .
27	SPM rinsing solution aspirating capillary 6.1803.020	28	Pump tubing 6.1826.340 With black/black stoppers. For the rinsing solution.
29	SPM rinsing solution inlet capillary Labeled with <i>H2O</i> .	30	SPM rinsing solution outlet capillary Labeled with <i>Waste</i> .

31 SPM sample aspirating capillary

Connect it to the sample aspirating capillary (6.1803.040).

33 PEEK pressure screw 6.2744.014

32 SPM sample outlet capillary

Connect it to the injection valve.

34 PTFE capillary 6.1803.040

Sample outlet capillary.

3.4 Setting up the instrument

3.4.1 Packaging

The instrument is supplied in highly protective special packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.4.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.4.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation, free of vibrations, protected from corrosive atmosphere, and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight.

3.5 Capillary connections in the IC system

This chapter contains general information concerning the capillary connections in the IC instruments.

Generally speaking, capillary connections between two components of an IC instrument are made up of one connection capillary and two pressure screws with which the capillary is connected to the respective components.

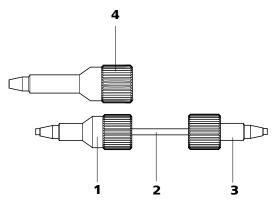


Figure 4 Connection of capillaries with pressure screws

- **1 PEEK pressure screw 6.2744.014** Use on the injection valve.
- **PEEK pressure screw, short 6.2744.070**For use on the high pressure pump, the purge valve, the inline filter, the pulsation damper, the guard column and the separation column.
- **2** Connection capillary
- **4 PEEK pressure screw, long 6.2744.090** Usage on other components. Is not used on all instruments.



Note

In order to keep the dead volume as low as possible, capillary connections should generally be as short as possible.



Note

For an improved overview, capillary and tubing connections can be bundled with the 6.1815.010 spiral band.

Connection capillary

PEEK capillaries and PTFE capillaries are used in the IC system.

PEEK capillaries (polyetheretherketone) PEEK capillaries are temperature-resistant up to 100°C, stable under pressure up to 400 bar, flexible, chemically inert and exhibit an extremely smooth surface. They can be readily cut down to the desired length with the capillary cutter.

Usage:

- 6.1831.010 PEEK capillary (internal diameter of 0.25 mm) for the entire high pressure range.
- 6.1831.030 PEEK capillary (internal diameter of 0.75 mm) for sample handling in the ultra trace range.



Caution

For the capillary connections between the injection valve (see Chapter 3.16, page 57) and detector (see Chapter 3.20, page 68), PEEK capillaries with an internal diameter of 0.25 mm must be used. These are already connected to a newly delivered instrument.

PTFE capillaries (polytetrafluoroethylene)

PTFE capillaries are transparent and enable visual tracing of the liquids to be pumped. They are chemically inert, flexible and temperature-resistant up to 80° C.

Usage:

PTFE capillaries (6.1803.0x0) are used for the low pressure range.

- PTFE capillaries with internal diameter of 0.5 mm for sample handling.
- PTFE capillaries with internal diameter of 0.97 mm for the sample handling as for rinsing and regeneration solutions (they do not have to be in the scope of delivery of the instrument).



Note

Capillaries must have a flawless level cut edge. For cutting PEEK capillaries only use the 6.2621.080 capillary cutter.

3.6 Rear of the instrument

3.6.1 Rollers and handle

In order to make transport easier, the instrument is equipped with rollers and a handle.

3.6 Rear of the instrument

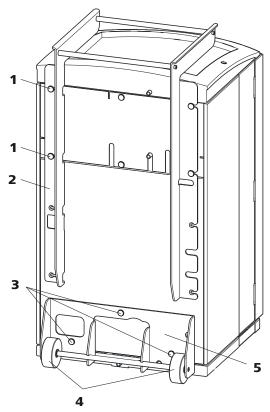


Figure 5 Rollers and handle

- **1 Knurled screws**For fastening the handle (5-2) and the rear panel of the detector chamber.
- **3 Knurled screws** For fastening the roller holder (5-**5**).
- 5 Roller holder

- 2 Handle
- 4 Rollers

Removing handle

1 Loosen knurled screws (5-1) and remove handle (5-2).

Removing rollers

Proceed as follows to remove the rollers:

- **1** Remove knurled screws (5-**3**).
- **2** Remove roller holder (5-**5**).

Mounting handle as MPak holder



Note

When extended, the handle (6-2) can also be used for hanging up MPaks (eluent bags).

1 Move handle (6-2) upwards and screw in the knurled screws (6-1) again.

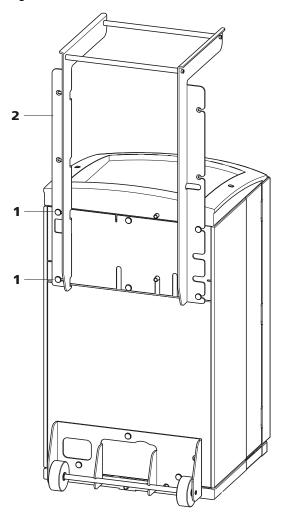


Figure 6 Handle as MPak holder

1 Knurled screws

For fastening the handle (6-2) and the rear panel of the detector chamber.

2 Handle

Extended. As holder for MPaks (eluent bag).

3.6 Rear of the instrument

3.6.2 Positioning and connecting the detector

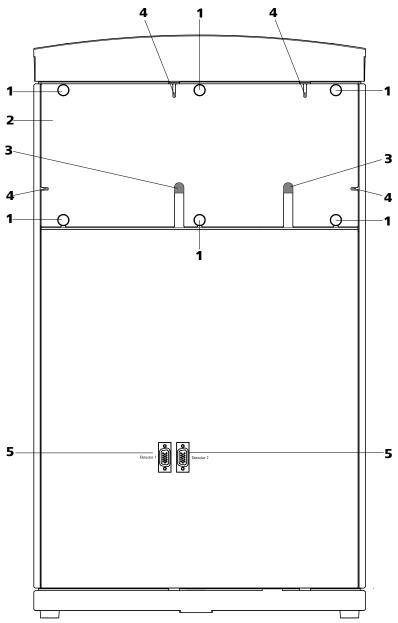


Figure 7 Removable rear panel

1 Knurled screws

For fastening the removable rear panel.

3 Cable feed-throughs

For feeding through detector cables.

5 Detector connection sockets

Labeled with *Detector 1* and *Detector 2* for connecting Metrohm detectors.

- 2 Rear panel Removable
- 4 Capillary feed-throughs



Note

Up to two detectors can be positioned and connected.



Caution

The instrument **must** be turned off when connecting a detector.

1 Removing rear panel

- Unscrew knurled screws (7-1) on the rear panel.
- Remove handle if still fastened to the instrument.
- Remove rear panel (7-2).

2 Positioning the detector

 Put the detector through this opening and position it on the support surface intended for this purpose. Slide it right up to the front.

3 Replacing rear panel

- Insert the detector cable in a cable feed-through (7-3) on the rear panel (7-2).
- Place the detector output capillary in a suitable capillary feed-through.
- Replace (7-2) rear panel.
 (Optionally, the handle can be remounted higher up and used as a holder for MPaks.)
- Tighten (7-1) knurled screws.

4 Connecting the detector



Note

The instrument has two detector connection sockets (7-**5**), Detector 1 and Detector 2. You must ensure that the selected connector corresponds to the connector entered in the MagIC Net method.

Recommendation: Use *Detector 1* as standard. In the AnCat system with 2 detectors: *Detector 1* for anions, *Detector 2* for cations.

3.6 Rear of the instrument

• Connect the detector cable to the detector connection socket Detector 1 (7-**5**).

5 Conntecting detector output



Note

The detector output capillary must be free of blockages (the measuring cell is tested to 5 MPa = 50 bar backpressure).

Guide the detector output capillary into a sufficiently large waste container and fasten it there.

3.6.3 Transport locking screws

To avoid damage to the high pressure pump and vacuum pump during transport, the pumps are secured with transport locking screws (2-17)(2-15)(2-20).

Remove these transport locking screws before the initial start-up.

Removing transport locking screws

1 Remove and keep transport locking screws.



Warning

In order to avoid damage to the pumps, the transport locking screws must be remounted each time the instrument undergoes major transport.

3.6.4 Leak sensor

The leak sensor detects escaping liquid which collects in the base tray of the instrument.

To activate the leak sensor, the leak sensor connector plug (8-2) must be connected, the instrument switched on and the leak sensor switched to active in the software.

Connecting the leak sensor

Plug the leak sensor connector plug (8-2) into the leak sensor connector socket (8-1) on the rear of the instrument (see Figure 8, page 27).

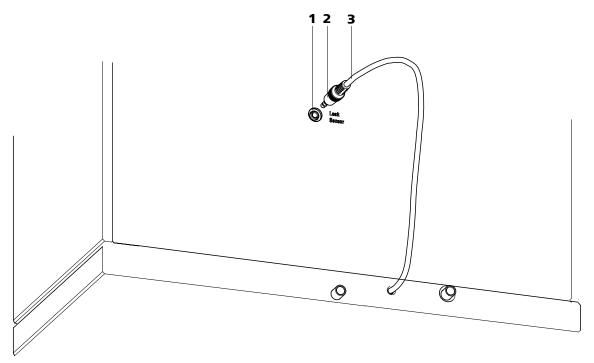


Figure 8 Connection for the leak sensor on the rear of the instrument

- 1 Leak sensor connector socket Is labeled with "Leak Sensor".
- 3 Leak sensor connection cable
 Is firmly mounted on the rear of the instrument.

2 Leak sensor connector plug

3.6.5 Drainage tubing

Fluid that escapes in the covering plate or in the detector chamber flows through the drainage tubing into the base tray and past the leak sensor into the waste container. This ensures that any leaks in the system will be detected by the leak sensor.

3.6 Rear of the instrument

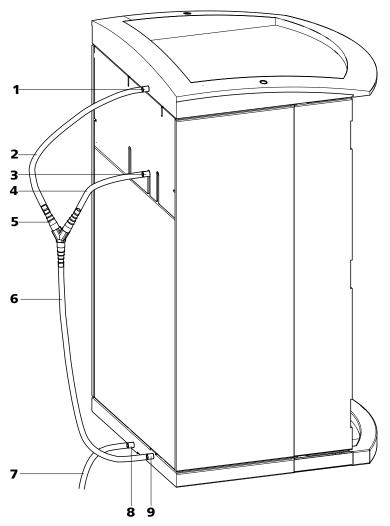


Figure 9 Drainage tubing

1 Drainage tubing connection

For draining escaped fluid from the covering plate.

3 Drainage tubing connection

For draining escaped fluid from the detector chamber.

5 Y connector 6.1807.010

For connecting the two drainage tubings (9-**2**) and (9-**4**).

2 Drainage tubing

Section of the 6.1816.020 silicon tubing. For draining escaped fluid from the covering plate.

4 Drainage tubing

Section of the 6.1816.020 silicon tubing. For draining escaped fluid from the detector chamber.

6 Drainage tubing

Section of the 6.1816.020 silicon tubing. Guides escaped fluid to the leak sensor.

Drainage tubing

Section of the 6.1816.020 silicon tubing. Guides escaped fluid into a waste container.

9 Drainage tubing connection

For supplying escaped fluid through the connected drainage tubing to the leak sensor.

8 Drainage tubing connection

For draining escaped fluid from the base tray through the connected drainage tubing.

Proceed as follows to install the drainage tubing:

Installing drainage tubing

- Plug drainage tubing (9-2) into the drainage tubing connection (9-1) of the covering plate and shorten to required length.
- Plug drainage tubing (9-4) into the drainage tubing connection (9-3) of the detector chamber and shorten to required length.
- Connect drainage tubing (9-2) from the covering plate and drainage tubing (9-4) from the detector chamber to the Y connector (9-5).
- 4 Connect drainage tubing (9-6) to the Y connector (9-5), shorten to required length and plug the other end of the drainage tubing into the drainage tubing connection (9-9).
- Plug drainage tubing (9-**7**) into the drainage tubing connection (9-**8**) of the base tray and guide the other end into a waste container.

3.7 Capillary and cable feed-throughs

Several openings have been integrated for feeding through capillaries and cables. They are located on the doors (see Figure 10, page 30), on the rear panel (see Figure 7, Page 24) or below the covering plate or above the base tray (see Figure 11, Page 31).

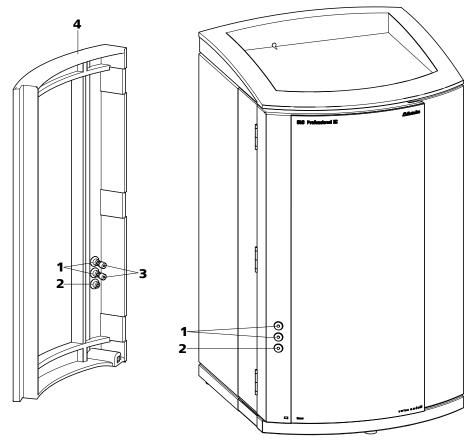


Figure 10 Capillary feed-throughs on the doors

- **1 Luer connectors**For connecting a 6.2816.020 syringe. For manual sample feeding.
- **3** PEEK pressure screws, short 6.2744.070
- 2 Capillary feed-through
- 4 Door

Do not feed capillaries through the Luer connectors (10-1). The capillaries are fastened with PEEK pressure screws (10-3) from inside to the Luer connector. From outside, liquid can be aspirated or injected with a syringe.

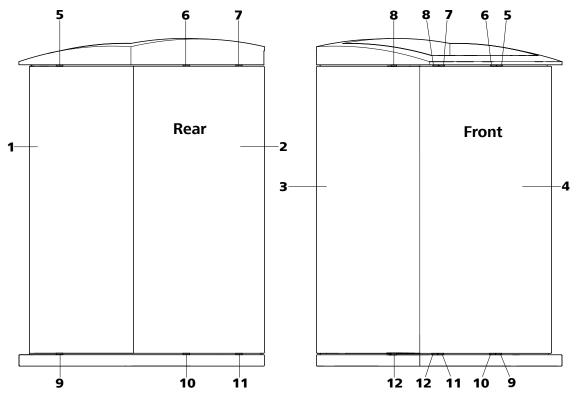


Figure 11 Capillary feed-throughs base tray/covering plate

1	Side panel (right) Right panel.	2	Rear of the instrument
3	Side panel (left) Left panel.	4	Front of the instrument
5	Capillary feed-through Upper. From front to right.	6	Capillary feed-through Upper. From front to back.
7	Capillary feed-through Upper. From front to back.	8	Capillary feed-through Upper. From front to left.
9	Capillary feed-through Lower. From front to right.	10	Capillary feed-through Lower. From front to back.
11	Capillary feed-through Lower. From front to back.	12	Capillary feed-through Lower. From front to left.

3.8 Eluent

3.8 Eluent

3.8.1 Connecting eluent bottle

The eluent is aspirated out of the eluent bottle via the eluent aspiration tubing (12-1).

The eluent aspiration tubing is connected to the eluent degasser (see Chapter 3.9, page 36). The tubing must be threaded through a suitable capillary feed-through (see Chapter 3.7, page 29) of the instrument before the other end can be equipped.

You will require the parts from the following accessories for equipping the eluent aspiration tubing:

- 6.1602.160 eluent bottle attachment GL 45
- 6.2744.210 tubing adapter for aspiration filter
- 6.2821.090 aspiration filter

To equip the eluent aspiration tubing proceed as follows:

Assembling eluent aspiration tubing

1 Guide the free end of the eluent aspiration tubing (12-**1**) out of the instrument through a suitable capillary feed-through.

2 Installing the 6.1602.160 eluent bottle attachment

- Slide tubing nipple (12-2) and O-ring (12-3) onto the eluent aspiration tubing (12-1).
- Push eluent aspiration tubing (12-1) through the bottle attachment (12-4) and screw tight.

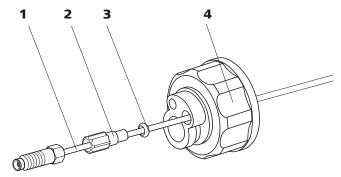


Figure 12 Installing eluent bottle attachment

- 1 Eluent aspiration tubing 6.1834.080
- **Tubing nipple** From accessory set 6.1602.160.
- **3 O-ring** From accessory set 6.1602.160.
- **4 Bottle attachment** From accessory set 6.1602.160.

3 Mounting aspiration filter

• Insert filter holder (13-1) into the aspiration filter (13-2) and screw tight.

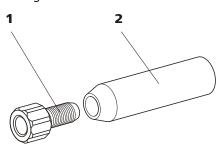


Figure 13 Mounting aspiration filter

- **1** Filter holder From accessory set 6.2744.210.
- 2 Aspiration filter 6.2821.090

3.8 Eluent

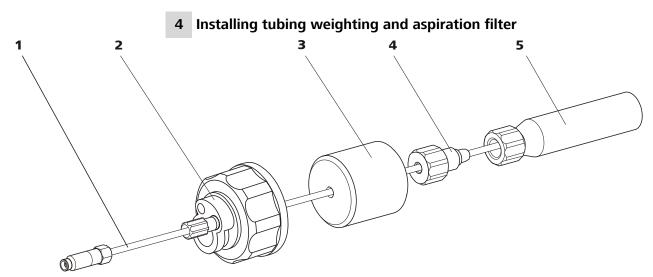


Figure 14 Installing tubing weighting and aspiration filter

6.2744.210.

1	Eluent aspiration tubing 6.1834.080	:	2	Eluent bottle attachment 6.1602.160
3	Tubing weighting From accessory set 6.2744.210.	•	4	Clamping screw From accessory set 6.2744.210.
5	Aspiration filter 6.2821.090 With filter holder from accessory set			

- Slide the tubing weighting (14-3) onto the eluent aspiration tubing (14-1).
- Slide the clamping screw (14-4) onto the eluent aspiration tubing (14-1).
- Insert eluent aspiration tubing (14-1) into the aspiration filter (14-5). The end of the tubing must touch the base of the filter.
- Screw together clamping screw (14-4) and filter holder (13-1). The end of the tubing must still touch the base of the filter.

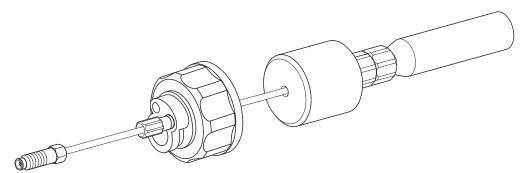


Figure 15 Eluent aspiration tubing fully equipped.

5 Mounting eluent aspiration tubing to the eluent bottle

• Insert the eluent aspiration tubing into the eluent bottle (16-10).

■ Fasten the bottle attachment (14-2) on the eluent bottle (16-10). The aspiration filter (16-6) must rest on the base of the eluent bottle.

6 Mounting the adsorber tube



Note

In the case of alkaline eluents and eluents with lower buffer capacity, the eluent bottle must be equipped with a CO_2 adsorber (16-**4**).

- First, place a piece of wadding (16-3), then the CO₂ adsorber (16-4) in the large opening of the adsorber tube (16-2) and close with the plastic cover.
- Fasten the adsorber tube (16-2) using the SGJ clip (16-12) onto the bottle attachment (16-11).

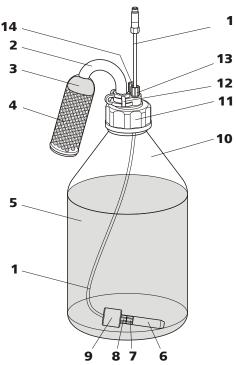


Figure 16 Eluent bottle – connected

1 Eluent aspiration tubing 6.1834.080 For aspirating the eluent. Pre-installed.

3 Wadding

2 Adsorber tube 6.1609.000

4 CO₂ adsorber

Adsorbs CO₂ from the air (e.g. Merck soda lime with indicator, no. 6839.10).

3.9 Eluent degasser

5	Eluent	6	Aspiration filter 6.2821.090
7	Filter holder From accessory set 6.2744.210.	8	Clamping screw From accessory set 6.2744.210.
9	Tubing weighting From accessory set 6.2744.210.	10	Eluent bottle 6.1608.070
11	Bottle attachment 6.1602.160	12	SGJ clip 6.2023.020
13	Tubing nipple	14	Thread stopper

3.9 Eluent degasser

Gas bubbles in the eluent lead to an unstable baseline, as high pressure pumps can transport liquids, but not gases. The eluent therefore has to be degassed, before it reaches the high pressure pump.

The eluent degasser removes gas bubbles and dissolved gases from the eluent. For degassing, the eluent flows into a vacuum chamber through a special fluoropolymer capillary.



Note

The eluent degasser is already installed in the newly delivered instrument. The following installation instructions need **not** be carried out at the time of initial installation.

Connecting the eluent degasser

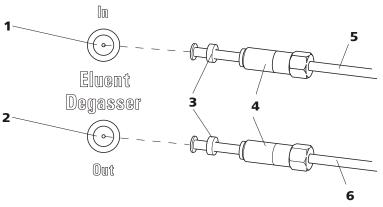


Figure 17 Eluent degasser

1 Eluent degasser input

2 Eluent degasser output

Tubing flareWith tubing nipple.

5 Eluent aspiration tubing 6.1834.080For aspirating the eluent. The clamping screw (17-4) is firmly mounted.

4 Clamping screw

6 Connection capillary 6.1834.090 Connection from the eluent degasser to the high pressure pump (see Chapter 3.10, page 37). The clamping screw (17-4) is firmly mounted.

1



Caution

The clamping screws (17-4) must be tightened carefully. Use the 6.2621.050 wrench for this.

- Insert the eluent aspiration tubing (17-**5**) in the eluent degasser input (17-**1**).
- Carefully tighten clamping screw (17-4).
- Insert connection capillary (17-6) (the end with the longer clamping screw (17-4)) into the eluent degasser output (17-2).
 - Carefully tighten clamping screw (17-**4**).
 - Connect the other end of the connection capillary (17-**6**) (with the shorter clamping screw) to the high pressure pump (see "Connecting inlet to the high pressure pump", page 39).

3.10 High pressure pump

The intelligent and low pulsation high pressure pump pumps the eluent through the system. It is equipped with a chip on which its technical specifications and "life history" (operating hours, service data, ...) are saved.

The purge valve is used for deaerating (see Chapter 3.10.2, page 40) the high pressure pump.

3.10.1 Capillary connections high pressure pump/purge valve



Note

All of the capillary connections of the high pressure pump and the purge valve are already installed in the newly delivered instrument.

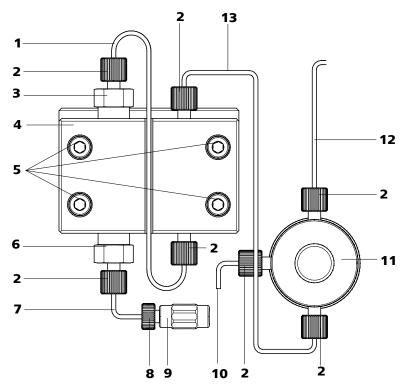


Figure 18 Capillary connections high pressure pump/purge valve

1 Connection capillary

PEEK capillary, connects main piston and auxiliary piston.

3 Outlet valve holder

5 Fastening screws

For fastening the pump head.

7 Pump head input capillary

PEEK capillary at the input of the pump head.

9 Coupling

For the connection of the eluent path at the input of the high pressure pump. Can be ordered together with the pressure screw (18-8) under the number 6.2744.230.

11 Purge valve

For deaerating the high pressure pump. With rotary knob in the center and pressure sensor.

13 Connection capillary

Connects the output of the pump head with the purge valve.

2 PEEK pressure screw, short 6.2744.070

4 Pump head 6.2824.110

6 Inlet valve holder

8 Pressure screw

For connecting a PEEK capillary to the coupling (18-**9**).

10 Deaerating capillary

For aspirating the eluent when deaerating the high pressure pump (see Chapter 3.10.2, page 40).

12 Connection capillary

For connecting the inline filter (see Chapter 3.11, page 42)



Note

The eluent aspiration tubing is already installed in the newly delivered instrument. The following installation instructions need **not** be carried out at the time of initial installation.

Connecting inlet to the high pressure pump

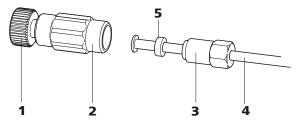


Figure 19 High pressure pump – Connect inlet

1 Pressure screw

For connecting the coupling (19-**2**) to the pump head input capillary (18-**7**). Can be ordered together with the coupling under the number 6.2744.230.

3 Clamping screw

2 Coupling 6.2744.230

For connecting the eluent aspiration tubing (19-**4**) to the input of the high pressure pump.

4 Eluent aspiration tubing

Eluent aspiration tubing 6.1834.080 or 6.1834.090.

5 Backup ring

1 Connecting coupling

Fasten the coupling (19-2) with a pressure screw (19-1) on the pump head input capillary (18-7).

2 Connecting eluent aspiration tubing



Caution

The clamping screws must be tightened carefully. To tighten, grip the coupling (19-2) with the 6.2739.000 key and grip the clamping screw (19-3) with the 6.2621.050 wrench.

- Plug the eluent aspiration tubing (19-4) into the coupling (19-2).
- Tighten clamping screw (19-**3**).

3.10 High pressure pump

3.10.2 Deaerating the high pressure pump

The high pressure pump will only operate perfectly if the pump head contains no more air bubbles. Therefore it must be deaerated during initial start-up and after every change of eluent.



Caution

The high pressure pump must **not** be deaerated before the initial start-up (see Chapter 4.1, page 76).

Deaerate the high pressure pump as follows (see Figure 20, page 41):

Deaerating the high pressure pump

The instrument must be connected to the PC and switched on to deaerate the high pressure pump.

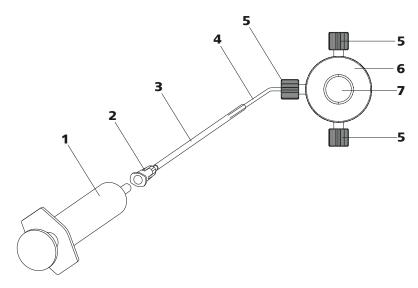


Figure 20 Deaerating the high pressure pump

1	Syringe 10 mL 6.2816.020 For aspirating the eluent.	2	Luer connector On purging needle.
3	Purging needle 6.2816.040	4	Deaerating capillary
5	PEEK pressure screws, short 6.2744.070	6	Purge valve
7	Purge valve rotary knob		

1 Connecting the purging needle

• Push the end of the purging needle (20-3) over the end of the deaerating capillary (20-4) on the purge valve.

2 Connecting the syringe

■ Insert syringe (20-**1**) in the Luer connector (20-**2**) of the purging needle (see Figure 20, page 41).

3 Opening purge valve

■ Open the rotary knob (20-**7**) by approx. ½ rotation counterclockwise.

3.11 Inline filter

4 Setting the flow rate

- Start MagIC Net (if not yet started).
- Ensure that the eluent aspiration tubing is immersed sufficiently in the eluent.
- Let the high pressure pump run.

5 Aspirating eluent

 Aspirate with the syringe (20-1) until bubble-free eluent flows into the syringe.

6 Completing deaerating

- Turn off high pressure pump.
- Close rotary knob (20-7).
- Remove syringe (20-1) from the Luer connector (20-2).
- Pull the purging needle (20-3) out of the deaerating capillary (20-4).

3.11 Inline filter

Between the purge valve and the pulsation damper the 6.2821.120 inline filter is installed as protection against particles.

Inline filters protect the separation column securely against possible contamination from the eluent. Inline filters can however also just as well be used for the purpose of protecting the suppressor against contaminations in the regeneration or rinsing solutions. The fine 2 μm material of the readily and easily replaceable filter platelets removes particles such as bacteria and algae from the solutions.



Note

The inline filter is already installed in the newly delivered instrument. The following installation instructions need **not** be carried out at the time of initial installation.

Installing the inline filter



Caution

Observe the flow direction marked on the filter housing for the connection of the inline filter.

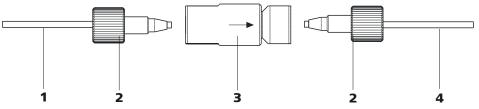


Figure 21 Connecting inline filter

- **1** Connection capillary
 - Connects the purge valve with the inline filter
- 3 Inline filter 6.2821.120 Protects against particles.

- 2 PEEK pressure screws, short 6.2744.070
- 4 Connection capillary

Connects the inline filter with the pulsation damper.

- Screw on the connection capillary running from the purge valve with a 6.2744.070 pressure screw to the input side of the inline filters.
- 2 Screw on the connection capillary running to the pulsation damper with a 6.2744.070 pressure screw to the output side of the inline filter.

3.12 Pulsation damper



Note

The pulsation damper is already installed in the newly delivered instrument.



Caution

The pulsation damper is maintenance-free and may not be opened.

3.12 Pulsation damper

The pulsation damper protects the separation column from damage caused by pressure fluctuations when switching the injection valve, and reduces interfering pulsations during highly sensitive measurements. In order to ensure these functionalities, it must be connected between the high pressure pump (see Chapter 3.10, page 37) and injection valve (see Chapter 3.16, page 57).

The pulsation damper can be operated in both directions.

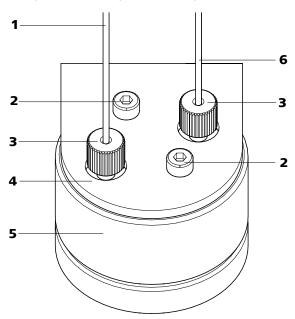


Figure 22 Pulsation damper – Connection

1	Connection capillary Connection to the inline filter.	2	Fastening screws
3	PEEK pressure screws, short 6.2744.070	4	Holder for pulsation damper
5	Pulsation damper 6.2620.150	6	Connection capillary Connection to the injection valve.

3.13 Sample degasser

The sample degasser removes gas bubbles and disolved gases from the sample. For degassing, the sample flows into a vacuum chamber through a special fluoropolymer capillary.

Gas bubbles in the sample lead to poor reproducibility, as the quantity of sample in the sample loop would not always be the same. Samples (containing gas) should therefore be degassed before injection. For this the sample is sucked through a degasser chamber before injection, whereby any gas bubbles are automatically removed.



Note

When using the sample degasser, the rinsing time extends by at least 2 minutes.

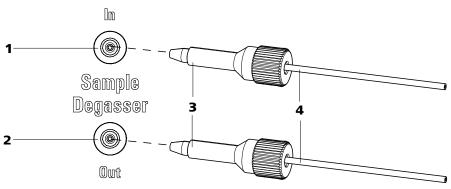


Figure 23 Sample degasser

- 1 Sample degasser input
- .
- **3** PEEK pressure screw, long 6.2744.090
- 2 Sample degasser output
- 4 Connection capillaries 6.1803.040

Connecting the sample degasser

- Remove and keep 6.2744.220 thread stoppers from the input and output of the sample degasser.
- 2 Connect the end of the 6.1803.040 sample aspirating capillary connected to the injection valve with a long PEEK pressure screw (23-3) to the output of the sample degasser (23-2).
- Connect 6.1803.040 connection capillary with a long PEEK pressure screw (23-3) to the input of the sample degasser (23-1).

4 Guide the other end of the connection capillary out of the instrument through a capillary feed-through.



Caution

If the sample degasser is not used, the input and output **must** be sealed with the 6.2744.220 thread stoppers.

3.14 Sample preparation module (SPM)

3.14.1 Fields of application

The SPM consists of 3 neutralization units in total, which are used, regenerated and rinsed in rotation for sample preparation.

It can be used for the following applications (amongst others):

- for cation exchange before feeding the sample (see "Cation exchange", page 48).
- for the neutralization of a sample (see "Neutralization", page 49).

3.14.2 Connectors



Caution

To protect the SPM against foreign particles or bacterial growth, a pump tubing connection with filter (6.2744.180) must be mounted between the peristaltic pump and the inlet capillaries of the SPM.

The three inlets and outlets of the neutralization units numbered 1..3 on the SPM each have 2 fixed mounted PTFE capillaries (see Figure 24, page 47).

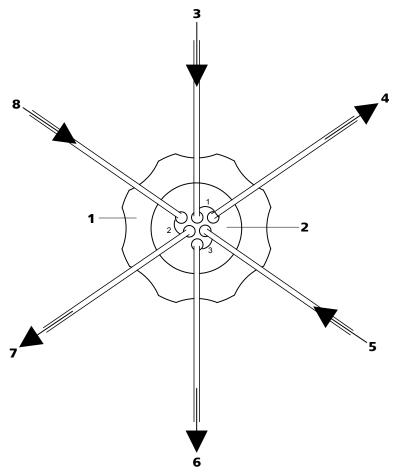


Figure 24 SPM – Connectors

- 1 Union nut
- **3** Inlet capillary
 Made from PTFE. Labeled with Sample in.
- **5** Rinsing solution inlet capillary Made from PTFE. Labeled with *H2O*.
- **7** Regeneration solution outlet capillary Made from PTFE. Labeled with *Waste*.
- **2** SPM connecting piece (6.2835.010)
- **4 Outlet capillary**Made from PTFE. Labeled with *Sample out*.
- **6** Rinsing solution outlet capillary Made from PTFE. Labeled with *Waste*.
- **8** Regeneration solution inlet capillary Made from PTFE. Labeled with *Regenerant*.



Caution

As the PTFE capillaries are very soft, the pressure screws should not be overtightened.

Flattened capillaries must be shortened with the help of a capillary cutter.

3.14.3 Inline sample preparation with the SPM

This chapter briefly describes the processes of the two sample preparation techniques:

- Cation exchange before feeding the sample (see "Cation exchange", page 48).
- Neutralization of an alkaline sample before feeding (see "Neutralization", page 49).

For a better overview, the flow paths of the regeneration and the rinsing solution in the SPM are not shown in the following figures.

Cation exchange

The SPM can be used for the separation of cations (e.g. of heavy metals) before feeding the sample onto the separation column.

Procedure of the cation exchange with the SPM

The SPM, the injection valve and the MSM-HC are used for the cation exchange with sequential suppression.



Note

If you are not sure whether the capacity of the SPM is sufficient for your application, you should use a system with sample measuring and preconcentration for more heavily loaded samples requiring a matrix elimination and preconcentration, as it is described in chapter *Neutralization*.

1 Cation exchange

- Injection valve position: Fill
- The sample flows through the SPM (25-A).
 The cations of the sample will continuously be exchanged for H⁺ ions.
- The sample flows on through the sample loop of the injection valve (25-**B**).

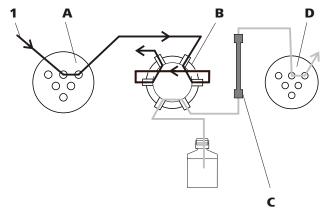


Figure 25 Cation exchange with the SPM

1	Sample	A	SPM
В	Injection valve	C	Separation column
D	MSM-HC		

2 Injection and sequential suppression

- The injection valve is switched to the position **Inject**.
- With the eluent flow (26-**2**) the sample prepared is rinsed onto the separation column (26-**C**).
- The sequential suppression with the MSM-HC (26-**D**) and the MCS follows after the separation.

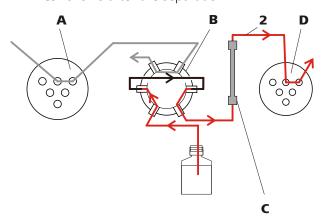


Figure 26 Injection and sequential suppression

2	Sample in the eluent flow	A	SPM
В	Injection valve	C	Separation column
D	MSM-HC		

Neutralization

A typical use of the SPM is the neutralization of an alkaline sample for anion determination with chemical suppression.

Weak alkaline solutions can directly be forwarded to the SPM as with cation exchange. However, strong alkaline solutions (e.g. 30 % NaOH) could exceed the capacity of the SPM. In order to ensure a sufficient capacity for exchanging the Na⁺ ions for H⁺ ions in all cases, only a small part of the sample (e.g. 20 μ L) is therefore given onto the SPM. For measuring the sample the sample loop of an **additional injection valve** (27-**A**) (e.g. on the Sample Processor) is needed.

Procedure of the neutralization with the SPM

1 Measuring the sample

- Valve positions:
 - Injection valve 1 (27-**A**) in position **Fill**.
 - Injection valve 2 (in the instrument) in position **Inject**.
- On the injection valve 1 (27-**A**) the sample is carried through the sample loop and is measured.

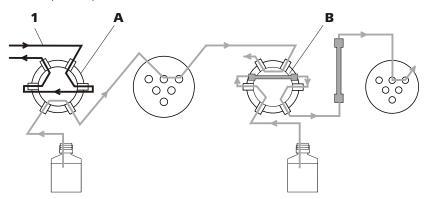


Figure 27 Measuring the sample

1 Sample

A Injection valve 1

With sample loop. For measuring the sample.

B Injection valve 2

With preconcentration column. For preconcentrating and injecting the analyte ions.

2 Neutralization and preconcentration

- Switch both injection valves:
 - Injection valve 1 (28-**A**) to position **Inject**.
 - Injection valve 2 (28-€) to position Fill.
- The sample is carried with the transfer solution (28-2) onto the SPM (28-B).

Na⁺ ions are exchanged for H⁺ ions.

• The analyte ions and the transfer solution flow to the injection valve 2.

-----3 Installation

> The analyte ions are retained on the preconcentration column (28-**D**) while the transfer solution flows to the waste container.

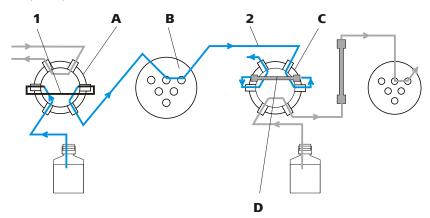
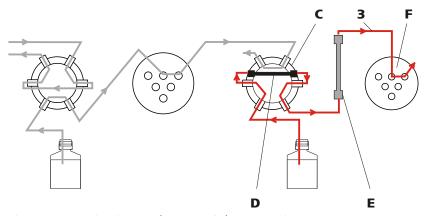


Figure 28 Neutralization and preconcentration

1	Sample	2	Transfer solution
A	Injection valve 1	В	SPM
C	Injection valve 2	D	Preconcentration column

3 Injection and sequential suppression

- Injection valve 2 is switched:
 - Injection valve 1 still is in position **Inject**.
 Injection valve 2 (29-**C**) in position **Inject**.
- With the eluent flow (29-3) the analyte ions retained on the preconcentration column (29-D) are rinsed onto the separation column (29-**E**).
- The sequential suppression with the MSM-HC (29-**F**) and the MCS follows after the separation.



Injection and sequential suppression Figure 29

3 **Eluent Injection valve 2** 3.15 Peristaltic pump

D Preconcentration column

E Separation column

F MSM-HC



Note

In order to prevent impurities by the transfer water, a **Metrosep I Trap** (6.1014.200) can be installed between the injection valve 1 and the peristaltic pump.

3.15 Peristaltic pump

3.15.1 Principle of the peristaltic pump

The Peristaltic pump is used for pumping sample and auxiliary solutions. It can rotate in both directions.

The peristaltic pump pumps liquids according to the principle of displacement. The pump tubing is clamped between the rollers (30-3) and the tubing cartridge (30-5). During operation, the peristaltic pump drive rotates the roller hub (30-2), so that the rollers (30-3) push the liquid forward in the pump tubing.

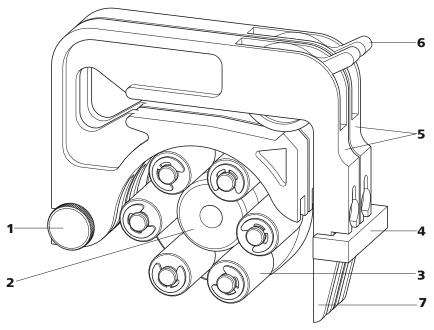


Figure 30 Peristaltic pump

1	Knurled screw in the mounting pin	2	Roller hub
3	Rollers	4	Cartridge holder

- 5 Tubing cartridges 6.2755.000
- **6** Contact pressure lever

7 Snap-action lever

3.15.2 Installing the peristaltic pump

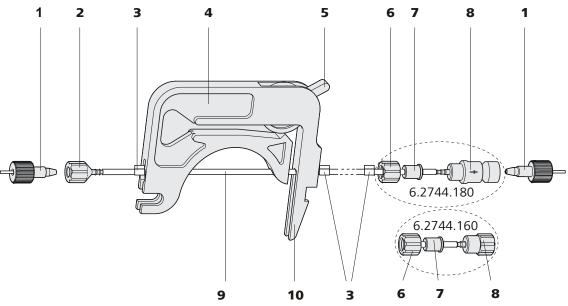


Figure 31 Installing the pump tubing

1	PEEK pressure screws, short
	(6.2744.070)

3 Stopper

The colors of the stopper indicate the inner diameter of the pump tubing.

5 Contact pressure lever

7 Adapter

9 Pump tubing (6.1826.xx0)

- **2** Tubing olive (6.2744.034)
- **4** Tubing cartridge (6.2755.000)
- 6 Union nut

8 Tubing olive

Either with filter holder (6.2744.180) or without filter holder (6.2744.160).

10 Snap-action lever

Mount the pump tubing as follows:

1 Removing the tubing cartridge

Release the tubing cartridge from the cartridge holder by pressing the snap-action lever and unhooking from the mounting pins (30-1).

2 Connecting the aspiration side

Place a 6.2744.034 tubing olive (31-2) on the aspiration side of the pump tubing.

3.15 Peristaltic pump

3 Connecting the pressure side



Note

Depending on the use of the peristaltic pump, on the pressure side you can either connect:

- Case A: a 6.2744.180 pump tubing connection with filter (see Figure 32, page 54) or
- Case B: a 6.2744.160 pump tubing connection without filter (see Figure 33, page 55).

For pumping the auxiliary solutions to the MSM or to the SPM, a 6.2744.180 pump tubing connection **with** filter **must** be used.

Case A: 6.2744.180 pump tubing connection with filter:

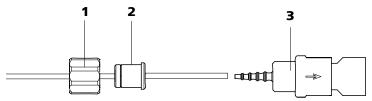


Figure 32 Install pump tubing connection with filter

1 Union nut

2 Adapter

3 Tubing olive with filter holder

- Slide union nut (32-1) onto the pump tubing.
- Select a suitable adapter (32-2) and slide it onto the pump tubing. The type of adapter depends on the pump tubing (see Table 1, page 55).
- Place the tubing olive with filter holder (32-3) onto the pump tubing.
- Screw the union nut (32-1) onto the tubing olive (32-3).

or

Case B: 6.2744.160 pump tubing connection without filter:

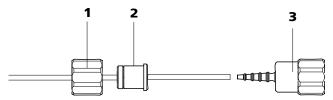


Figure 33 Install pump tubing connection without filter

1	Union nut	2	Adapter
3	Tubing olive		

- Slide union nut (33-1) onto the pump tubing.
- Select a suitable adapter (33-2) and slide it onto the pump tubing.
 The type of adapter depends on the pump tubing (see Table 1, page 55).
- Place the tubing olive (33-3) onto the pump tubing.
- Screw the union nut (33-1) onto the tubing olive (33-3).

4 Inserting the pump tubing

- Press the contact pressure lever all the way down.
- Place the pump tubing in the tubing cartridge. The stoppers (31-3) must snap into the corresponding holders of the tubing cartridge.

5 Inserting the tubing cartridge

• Hang the tubing cartridge in the mounting pin and press in the cartridge holder until the snap-action lever snaps in.

6 Connecting the capillaries

• Screw the respective capillaries tightly to the two tubing olives with PEEK pressure screws (31-1).

Table 1 Pump tubings and suitable adapters

Pump tubing	Adapter
6.1826.020 (blue/blue)	
6.1826.310 (orange/green)	
6.1826.320 (orange/yellow)	
6.1826.330 (orange/white)	

3.15 Peristaltic pump

Pump tubing	Adapter
6.1826.340 (black/black)	
6.1826.360 (white/white)	
6.1826.380 (gray/gray)	
6.1826.390 (yellow/yellow)	

Set flow rate

The contact pressure of the tubing cartridge must be adjusted in order to regulate the flow rate. Proceed as follows:

Set the contact pressure

- **1** Fully loosen the contact pressure lever (31-**5**), i.e. press it all the way down.
 - Switch on the peristaltic pump.
 - Raise the contact pressure lever one step at a time until liquid flows.
 - When liquid starts flowing, raise the contact pressure lever by an additional 2 ratchet increments.

The contact pressure is now set optimally.

The delivery rate depends not only on the correct contact pressure but also on the interior diameter of the pump tubing and the rotational speed of the drive.



Note

Pump tubings are consumable material. The service life of the pump tubings depends on the contact pressure amongst other factors.

3.16 Injection valve

The injection valve connects the eluent and sample path. Through rapid and precise valve switchover a precise amount of sample solution defined by the size of the sample loop is injected and rinsed with eluent onto the separation column.

3.16.1 Connecting the injection valve

The injection valve has six connectors: two for the sample path (connectors 1 and 2), two for the eluent path (connectors 4 and 5) and two for the sample loop (connectors 3 and 6).



Note

The capillaries of the eluent path and the sample path and the sample loop are already installed in the newly delivered instrument.

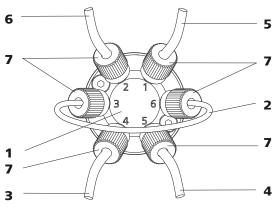


Figure 34 Injection valve - connected

1 Injection valve

3 Connection capillary

Connected to connector 4. Carries eluent to the injection valve.

5 Connection capillary

Connected to connector 1. Carries sample to the injection valve.

7 PEEK pressure screw 6.2744.010

2 Sample loop

Connected to connectors 3 and 6.

4 Connection capillary (column inlet capillary)

Connected to connector 5. Carries eluent to the separation column.

6 Connection capillary

Connected to connector 2. Carries sample to the waste container.

3.16 Injection valve

Replacing the sample loop

The sample loop can be replaced, depending on requirements. For additional information concerning selection of the appropriate sample loop, see Chapter 3.16.3, page 59.



Note

Use only 6.2744.010 PEEK pressure screws for connecting capillaries and sample loop to the injection valve.

1 Removing existing sample loop

- Loosen 6.2744.010 pressure screws at connector 3 and connector 6.
- Remove sample loop.

2 Mounting new sample loop

- Fasten one end of the sample loop (34-2) with a 6.2744.010 PEEK pressure screw (34-7) to connector 3.
- Fasten the other end of the sample loop (34-2) with a second 6.2744.010 PEEK pressure screw (34-7) to connector 6.

3.16.2 Mode of operation of the injection valve

The injection valve (see Figure 35, page 58) can adopt two valve positions - **FILL** and **INJECT**. Switching back and forth between the two valve positions determines whether the sample path or the eluent path is guided through the sample loop. The following figure provides a schematic display of the flow paths of the two valve positions.

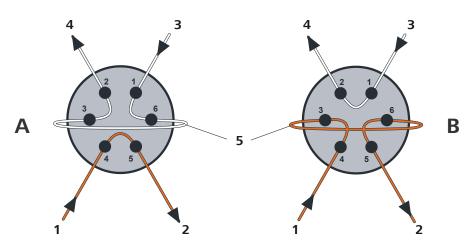


Figure 35 Injection valve – Positions

A Position FILL

B Position INJECT

1 Eluent input

Capillary coming from the high pressure pump.

3 Sample input

Sample aspirating capillary.

5 Sample loop

2 Eluent output

Capillary to the column.

4 Sample output

Capillary to waste container.

Position A

In the position **FILL**, the sample solution flows through the sample loop to the waste container. The eluent flows directly to the separation column at the same time.

Position B

In the position **INJECT**, the eluent flows through the sample loop to the separation column. If sample solution is to be found in the sample loop at the time of the valve switchover, then this will be conveyed along with the eluent, thus making its way to the separation column. The flow in the sample path is either stopped or the sample flows directly to the waste container.

3.16.3 Selecting the sample loop

The amount of sample solution injected depends on the volume of the sample loop. The choice is made on the basis of the application. The following sample loops are normally used:

Cation determination 10 μ L Anion determination with suppression 20 μ L Anion determination without suppression 100 μ L

3.17 Column thermostat

The column thermostat controls the temperature of the column and eluent channel and thus ensures stable measuring conditions. It provides space for 2 separation columns.

3.17 Column thermostat

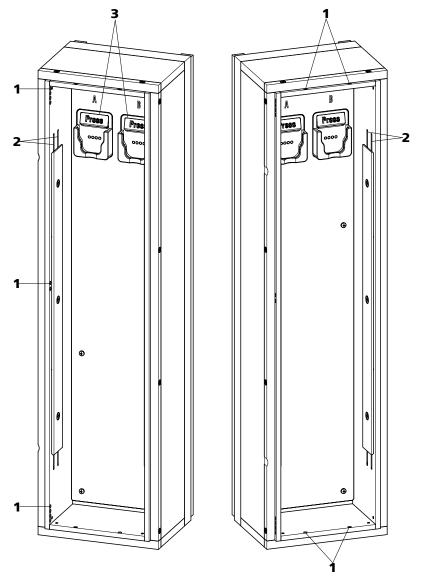


Figure 36 Column thermostat

1 Capillary feed-throughs

For guiding the capillaries in and out.

2 Capillary recesses

For controlling the temperature of the elu-

Preheating capillary already pre-installed.

3 Column holder

For fastening the columns.

With column recognition.

The column thermostat contains two column holders (36-**3**) equipped with chip recognition. The separation columns can be clicked into the column holder with the chip.



Note

The column input capillary is already threaded into the capillary recesses of the column thermostat at the time the instrument is first delivered. The following installation instructions need **not** be carried out at the time of initial installation.

Threading capillaries

- 1 Introduce column input capillary into the column thermostat via a suitable capillary feed-through (36-1).
- 2 Slide the column input capillary from below into the outer of the two capillary recesses (36-2). Slide it through under the holder plate until it emerges again at the top.
- Carefully bend the column input capillary downward and slide from from above to below through the inner capillary recess until it emerges at the lower edge of the holder plate.

4



Note

The columns (guard column and separation column) may only be installed after the initial start-up (see Chapter 4.1, page 76).

Before initial start-up:

Fasten the 6.2744.040 coupling with a 6.2744.010 pressure screw to the end of the column input capillary.

• After initial start-up:

Fasten the guard column (if used) or the separation column with a 6.2744.010 pressure screw to the end of the column input capillary.

3.18 High Capacity Metrohm Suppressor Module (MSM-HC)

3.18.1 General information on the MSM-HC

The MSM-HC is used for chemical suppression during anion analysis if eluents with a high ionic concentration are used or if the concentration is being significantly increased in the course of a gradient application. It consists of 3 suppressor units in total, which are used for suppression, regenerated with sulfuric acid or rinsed with ultra pure water in rotation.

Suppression reaction in the MSM-HC

When using a carbonate eluent, the following reaction (amongst others) occurs in the MSM-HC:

 $R-SO_3^-H^+ + NaHCO_3/Na_2CO_3 \rightarrow R-SO_3^-Na^+ + H_2O + CO_2$

3.18.2 Connecting the MSM-HC



Caution

To protect the MSM-HC against foreign particles or bacterial growth, a 6.2744.180 pump tubing connection with filter must be mounted between the peristaltic pump and the inlet capillaries of the MSM-HC.

The three inputs and outputs of the suppressor units numbered with 1, 2 and 3 on the MSM-HC each have 2 fixed mounted PTFE capillaries (see Figure 37, page 63).

3 Installation

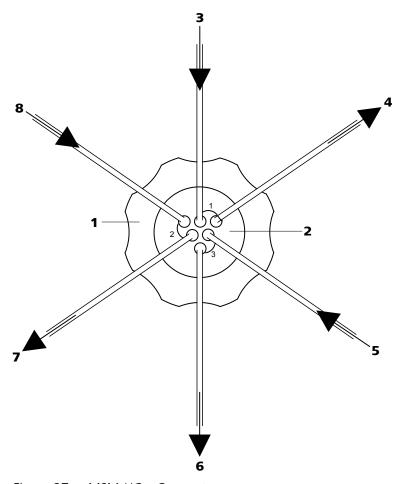


Figure 37 MSM-HC – Connectors

Union nut 1 2 MSM-HC connecting piece 6.2835.010 **Eluent inlet capillary Eluent outlet capillary** 3 Labeled with *Eluent*. Labeled with *Detector*. Rinsing solution inlet capillary Rinsing solution outlet capillary 5 Labeled with H2O. Labeled with Waste. 7 Regeneration solution outlet capillary 8 Regeneration solution inlet capillary Labeled with Waste. Labeled with H2SO4.

The PTFE capillaries firmly mounted on the MSM-HC are connected to the other components of the IC system as follows:



Caution

As the PTFE capillaries are very soft, the pressure screws should not be overtightened.

Flattened capillaries can be shortened with the help of a capillary cutter.

Connecting the capillaries of the MSM-HC

1 Connecting the eluent inlet capillary

 Fasten the end of the inlet capillary labeled with *Eluent* with a 6.2744.070 short PEEK pressure screw to the output of the column.

2 Connecting the eluent outlet capillary

 Fasten the end of the outlet capillary labeled with *Detector* with a long PEEK pressure screw (6.2744.090) to the input of the MCS.
 OR

Connect the end of the outlet capillary labeled with *Detector* and the detector inlet capillary with a 6.2744.040 coupling and two 6.2744.070 short pressure screws.

3 Connecting the rinsing solution inlet capillary

■ Fasten the end of the inlet capillary labeled with *H20* with a 6.2744.070 short PEEK pressure screw to the pump tubing connection of the pump tubing which carries the rinsing solution.

4 Connecting the rinsing the solution outlet capillary

• Guide the other end of the outlet capillary labeled with *Waste* into a sufficiently large waste container and fasten it there.

5 Connecting the regeneration solution inlet capillary

 Fasten the end of the inlet capillary labeled with H2S04 with a 6.2744.070 short PEEK pressure screw to the pump tubing connection of the pump tubing which carries the regeneration solution.

6 Connecting the regeneration solution outlet capillary

• Guide the other end of the outlet capillary labeled with *Waste* into a sufficiently large waste container and fasten it there.

The rinsing and regeneration solutions are pumped with a peristaltic pump (see Chapter 3.15, page 52).

3 Installation

3.19 Metrohm CO₂ suppressor (MCS)

3.19.1 General information on the MCS

The MCS removes the CO_2 from the eluent flow. This reduces the background conductivity, improves the detection sensitivity and minimizes the injection and carbonate peaks.

The MCS is used for removing CO_2 from the eluent flow before detection. CO_2 can reach the eluent flow through the sample itself or arise through the suppression reaction in the MSM.

The CO_2 peak is effectively minimized through connection of the MCS between the MSM and detector. The principle is based on the gas permeability of the fluoropolymer membrane inside the degassing cell of the MCS. The eluent is guided through a capillary with a fluoropolymer membrane inside the degassing cell. A vacuum is generated in the degassing cell via a pump. At the same time, the pump sucks CO_2 -free air (CO_2 is removed by a CO_2 adsorption cartridge (39-4)) through the degassing cell. The pressure and concentration difference in the degassing cell in comparison to the inside of the capillary now causes the CO_2 to diffuse out of the eluent flow.

3.19.2 Connecting MCS

The MCS is connected between the MSM (see Chapter 3.18, page 62) and detector.

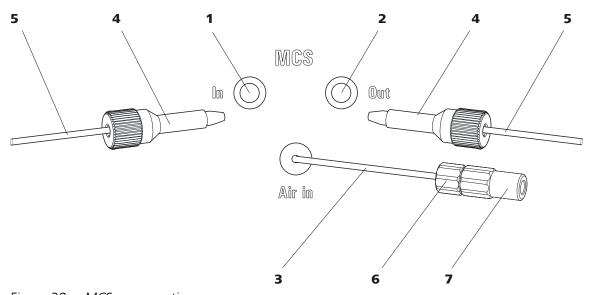


Figure 38 MCS – connection

1 MCS input Connection to the MSM. 2 MCS output Connection to the detector.

3 Aspirating capillary

For aspirating air low in CO_2 (as a result of CO_2 adsorption cartridge (39-**4**)).

5 Capillary connection

7 Luer coupling 6.2744.120

Mounted on the air aspirating capillary with pressure screw 6.2744.070.

4 PEEK pressure screw, long 6.2744.090

6 Pressure screw, short 6.2744.070 Mounted on the air aspirating capillary.

Connecting the MCS

1 Connecting the MSM

Connect the eluent output capillary (labeled with *Detector*) using a 6.2744.090 long PEEK pressure screw (38-**4**) to the MCS inlet (38-**1**).

2 Connecting the detector

Connect the detector input capillary (40-3) using a long PEEK pressure screw 6.2744.090 (38-4) to the MCS output (38-2).



Caution

If the MCS is not used, the input and output should be sealed with 6.2744.220 stoppers.

3.19.3 Installing the adsorption cartridges

For effective CO_2 removal, the air sucked through the degassing cell should be as low in CO_2 as possible. To achieve this, the air is aspirated through a 6.2837.000 CO_2 adsorption cartridge (39-**4**).

Moisture can block the CO_2 adsorption cartridge. In order to prevent this, a 6.2837.010 H_2O adsorption cartridge (39-**7**) is connected upstream.

3 Installation

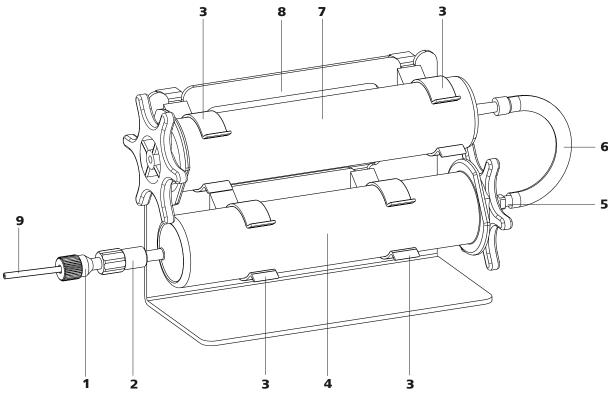


Figure 39 Adsorption cartridge holder

- 1 PEEK pressure screw, short 6.2744.070
- 3 Clips

For fastening the adsorption cartridges.

5 Adapter 6.1808.190

For connecting the H_2O adsorption cartridge and CO_2 adsorption cartridge.

- **7** H_2O adsorption cartridge 6.2837.010 For removing the H_2O from the aspirated air. Filled with bead desiccant.
- **9** MCS aspirating capillary Connection to the MCS. Corresponds to (38-3).

- **2** Luer coupling 6.2744.120
- **4 CO₂ adsorption cartridge 6.2837.000** For removing the CO₂ from the aspirated air. 3-layer filled, blue-brown-gray.
- 6 PVC tubing

For connecting the H_2O adsorption cartridge and CO_2 adsorption cartridge.

8 Adsorption cartridge holder 6.2057.080

Installing the adsorption cartridges

1 Preparing the adsorption cartridge holder

Push the 4 clips (39-**3**) into the slot of the adsorption cartridge holder (39-**8**).

3.20 Conductivity detector

2 Removing the caps

- Remove the two locking caps at the tip of the two cartridges.
- In the case of the H₂O adsorption cartridge, replace the round sealing cap on the larger end with the star-shaped sealing cap.

3 Connecting the CO₂ adsorption cartridge

- Insert the CO₂ adsorption cartridge into the coupling (39-**2**) on the end of the MCS aspirating capillary .
- Click the CO_2 adsorption cartridge into the two lower clips (39-3) of the adsorption cartridge holder (39-8).

4 Connecting the PVC tubing

- Insert the adapter (39-**5**) into the CO₂ adsorption cartridge.
- Fasten the PVC tubing (39-6) on the adapter (39-5).

5 Connecting the H₂O adsorption cartridge

- Place the H₂O adsorption cartridge into the PVC tubing (39-6).
- Click the H_2O adsorption cartridge into the two upper clips (39-3) of the adsorption cartridge holder (39-8).

6 Placing the adsorption cartridge holder in the instrument

 Place the adsorption cartridge holder with cartridges into the detector chamber of the instrument.

3.20 Conductivity detector

The conductivity detector continuously measures the conductivity of the liquid passing through and indicates these signals in digital form (DSP – Digital Signal Processing). The conductivity detector exhibits outstanding thermal stability and thus guarantees reproducible measuring conditions.

3 Installation

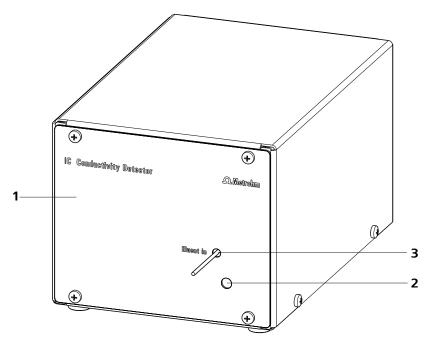


Figure 40 Conductivity detector front

1 IC detector 1.850.9010

2 Opening for temperature sensor

3 Detector input capillary Permanently installed.

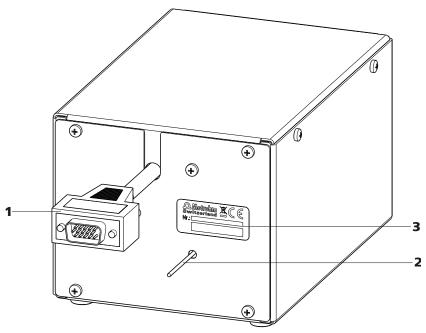


Figure 41 Conductivity detector rear

- **1 Detector cable**With mounted plug.
- **Type plate**With serial number.

2 Detector output capillary Permanently installed.



Note

In order to prevent unnecessary peak widening after separation, the connection between the outlet of the separation column and the inlet in the detector should be kept as short as possible.

Connecting the detector input capillary to the MCS

Fasten the detector input capillary (42-1) using a 2.2744.090 long PEEK pressure screw (42-2) on the output of the MCS (42-3).

3 Installation

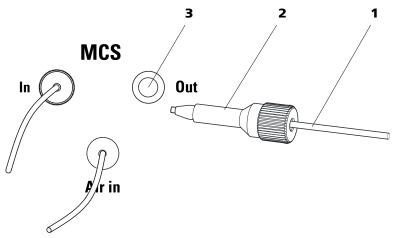


Figure 42 Connection detector – MCS

1 Detector input capillary

2 Pressure screw, long 6.2744.090

3 MCS output

3.21 Connecting the instrument

3.21.1 Connecting the instrument to the PC



Note

The instrument must be turned off when connecting the PC.

1 Connecting the USB cable

Connect the PC connection socket (2-18) of the instrument to a USB connector of the computer via the 6.2151.020 USB cable.

3.21.2 Connecting the instrument to mains supply



Warning

The power supply unit must not get wet. Protect it against the direct effect of liquids.

Mains cable

Which mains cable is supplied depends on the location:

- 6.2122.020 with plug SEV 12 (Switzerland, ...)
- 6.2122.040 with plug CEE(7), VII (Germany, ...)
- 6.2122.070 with plug NEMA 5-15 (USA, ...)

3.22 Guard column

The mains cable is three-core and provided with a plug with grounding. If another plug has to be mounted, the yellow/green conductor (IEC standard) must be connected to the protective ground (protection class I).

1 Connecting the mains cable

- Plug the mains cable into the mains connection socket (2-4).
- Connect the mains cable to the mains supply.

2 Switching the instrument on and off

Switch the instrument on and off with the mains switch (2-3).

After switching on, the LED on the front of the instrument flashes while a system test is carried out and the connection to the software is established. Once the system test is complete and the connection to the software has been established, the LED lights up continuously.

3.22 Guard column

The use of guard columns serves for protecting the separation column and increasing their service life considerably. The guard columns available from Metrohm represent either actual guard columns or are so-called guard column cartridges which are used together with a cartridge holder. The installation of a guard column cartridge in the associated holder is described in the information sheet of the guard columns.



Note

Information regarding which guard column is suitable for your separation column can be found in the **Metrohm IC Column Program** (which is available from your Metrohm agent), the information sheet provided along with your separation column, the product information on the separation column at http://www.metrohm.com (product area lon Chromatography), or obtained directly from your agent.



Caution

New guard columns are filled with solution and are sealed on both sides with stoppers or caps, respectively. Before using the guard column, you need to ensure that this solution is miscible with the eluents used (observe manufacturer's data).

3 Installation



Note

The guard column may only be installed after the **initial start-up** (see Chapter 4.1, page 76) of the instrument. Until then, use the 6.2744.040 coupling instead of the guard and separation column.

Connecting and rinsing the guard column

1 Connecting the guard column



Caution

When inserting the guard column, always ensure that it is inserted correctly corresponding to the flow direction (if indicated).

- Remove locking caps and/or stoppers from the guard column.
- Fasten the lower end of the guard column with a 6.2744.070 short PEEK pressure screw to the column input capillary .
- Fasten the connection capillary (3.4224.240) enclosed with the guard column to the upper end of the guard column with a 6.2744.070 short PEEK pressure screw.
 Guard columns are also available which can be screwed with the upper end directly onto the separation column.

2 Rinsing the guard column

- Place beaker under the outlet capillary of the guard column.
- Start the high pressure pump and rinse the guard column approx.
 5 minutes with eluent. Set the flow according to the corresponding column information sheet.
- Switch off the high pressure pump again.

3.23 Separation column

3.23 Separation column

The intelligent separation column (iColumn) is the heart of the ion chromatographic analysis. It separates the different components corresponding to their interactions with the column. Metrohm analytical columns are equipped with a chip on which their technical specifications and their history (first use / setting up, operating hours, injections, ...) are saved.



Note

Information regarding which separation column is suitable for your application can be found in the **Metrohm IC Column Program**, the product information for your separation column at http://www.metrohm.com in the product area ion chromatography, or obtained directly from your agent.



Caution

New separation columns are filled with solution and are sealed on both sides with stoppers. Before using the column, you need to ensure that this solution is miscible with the eluents used (observe manufacturer's data).

You can find the separation columns and guard columns currently available from Metrohm in the Metrohm IC Column Program, or in the Internet at http://www.metrohm.com in the product area Ion Chromatography. A test chromatogram and an information sheet are provided along with each column. You can request detailed information on special IC applications in the corresponding "Application Bulletins" or "Application Notes", available in the Internet at http://www.metrohm.com in the Applications area or via the Metrohm agent responsible free of charge.



Note

The separation column may only be installed after the **initial start-up** (see Chapter 4.1, page 76) of the instrument. Until then, use the 6.2744.040 coupling instead of the guard and separation column.

3 Installation

Connecting and rinsing the separation column

1 Connecting the separation column



Caution

When using the columns, always ensure that these are correctly inserted corresponding to the flow direction indicated.

- Remove stoppers from the separation column.
- Connect the lower end of the separation column with a 6.2744.070 short PEEK pressure screw to the outlet capillary of the guard column (if used), or to the column input capillary.

2 Rinsing the separation column

- Place beaker under the outlet end of the separation column.
- Set the flow rate of the high pressure pump to the value suitable for the separation column selected.
- Start the high pressure pump and rinse the separation column approx. 10 minutes with eluent.
- Switch off the high pressure pump again.

3 Mounting the separation column

Hang separation column with chip into the column holder.



Note

The iColumns are equipped with a chip on which their operating data is saved. The chip has to be hooked into the chip holder provided for this so that the column recognition can function.

4.1 Initial start-up

4 Start-up

The chapter *Start-up* is divided into 2 sections:

Initial start-up The **initial start-up** is carried out during the **ini-**

tial installation.

Conditioning Conditioning is carried out as a final installation

step and each time after the system is started.

4.1 Initial start-up

The initial start-up is carried out during the initial installation. The entire system is flushed before guard column and separation column are installed.



Caution

The separation column and guard column may not be installed for the initial start-up.

Make sure that the 6.2744.040 coupling is being used instead of the columns.

Perform the following steps during the initial start-up:

1 Preparing the software

- Start the PC program MagIC Net.
- Open the **Equilibration** tab in **MagIC Net**.
- Select (or create) a suitable method.

2 Preparing the instrument

- Ensure that the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.
- Switch on the instrument.

3 Deaerating the high pressure pump

• Deaerate the high pressure pump(s) via the purge valve (see Chapter 3.10.2, page 40).

4 Start-up

4 Setting the contact pressure of the peristaltic pump



Note

This work step needs to be performed only if a peristaltic pump is being used.

• If peristaltic pumps are used, set the contact pressure (see "Set flow rate", page 56).

5 Rinsing the instrument without columns

• Rinse the instrument (without columns) with eluent for 5 minutes.

The instrument is now prepared for the installation of the columns (see Chapter 3.22, page 72).

4.2 Conditioning

After the installation and after switching on the instrument, the system must be conditioned with eluent until a stable baseline is reached.



Note

After a change of eluent (see Chapter 5.4.2.3, page 82), the conditioning time can lengthen considerably.

Conditioning the system

1 Preparing the software



Caution

Ensure that the flow set is not higher than the flow permissible for the corresponding column (see column information sheet and chip data set).

- Start the PC program MagIC Net.
- Open the **Equilibration** tab in **MagIC Net**.
- Select (or create) a suitable method.

4.2 Conditioning

2 Preparing the instrument

 Ensure that the column is correctly mounted in accordance with the flow direction indicated on the label (arrow must point in the direction of flow).

• Ensure that the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.

3 Checking leak-tightness

- In **MagIC Net**, start the equilibration.
- Check all capillaries and their connections from the high pressure pump to the detector block for signs of liquid escaping. If eluent escapes anywhere, tighten the corresponding pressure screw or loosen the connection, check the end of the capillary, shorten it with a capillary cutter if necessary, and restore the connection.

4 Conditioning the system

Rinse the system with eluent until the required stability of the baseline is attained (normally 30 minutes).

The instrument is now ready for measuring samples.

5 Operation and maintenance

5.1 General information

5.1.1 Care



Warning

The instrument housing must not be opened by untrained personnel.

The instrument requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the service life of the sturdy mechanics and electronics.



Caution

Although this is extensively prevented by design measures, the mains plug should be unplugged immediately if aggressive media has penetrated the inside of the instrument, so as to avoid serious damage to the instrument electronics. In such cases, the Metrohm Service must be informed.

On the rear of the instrument, the drainage tubings must be mounted and the leak sensor must be plugged in and activated as protection against escaping liquids.

Spillages of chemicals and solvents should be cleaned up immediately. In particular, the plug connections on the rear panel of the instrument (especially the mains plug) should be protected from contamination.

5.1.2 Maintenance by Metrohm Service

Maintenance of the instrument is best carried out as part of an annual service, which is performed by specialist personnel of the Metrohm company. If working frequently with caustic and corrosive chemicals, a shorter maintenance interval is recommended. The Metrohm service department offers every form of technical advice for maintenance and service of all Metrohm instruments.

5.2 Capillary connections

5.1.3 Operation



Caution

In order to avoid disturbing temperature influences, the entire system including the eluent bottle must be protected against direct sunlight.

5.1.4 Shutting down

If the instrument is shut down for a longer period, the entire IC system (without separation column) must be rinsed salt-free with methanol/ultra pure water (1:4), in order to prevent eluent salts from forming crystals which may cause subsequent damage.

Guard column and separation column are excluded from the eluent path for rinsing. The connection capillaries are directly connected to one another with a 6.2744.040 coupling. Rinsing is carried out with methanol/ultra pure water (1:4) until the conductivity drops below $10 \,\mu$ S/cm.

Rinse with eluent for at least 15 minutes at starting up again and before connecting the guard column and separation column.

5.2 Capillary connections

5.2.1 Operation

All connections between injection valve (see Chapter 3.16, page 57), separation column (see Chapter 3.23, page 74) and detector (see Chapter 3.20, page 68) must be as short as possible, have a low dead volume and be completely leak-tight. The PEEK capillary after the detector must be free of blockages (the measuring cell is tested to 5 MPa = 50 bar back-pressure). Only use PEEK capillaries with an internal diameter of 0.25 mm in the high pressure range between the high pressure pump (see Chapter 3.10, page 37) and the detector.

5 Operation and maintenance

5.3 Door



Caution

The door is made of PMMA (polymethylmetacrylate). It must never be cleaned with abrasive media or solvents.



Caution

Never use the door as a handle.

5.4 Eluent

5.4.1 Production

The chemicals used for the production of eluents should have a degree of purity of at least "p.a.". Only ultra pure water (resistance > 18.2 $M\Omega^*$ cm) may be used for dilution (this generally applies for reagents which are used in ion chromatography).

Newly produced eluents should always be microfiltered (filter 0.45 µm).



Caution

Only microfiltered (filter 0.45 μ m) eluents may be used.

The composition of the eluent has a crucial effect on the chromatographic analysis:

Concentration An increase in the concentration generally leads

to shorter retention times and faster separation, but also to higher background conductivity.

pH pH changes result in shifts in the dissociation

equilibria and hence changes in the retention

times.

Organic solvents The addition of an organic solvent (e.g. metha-

nol, acetone, acetonitrile) to aqueous eluents

generally accelerates lipophilic ions.

5.5 High pressure pump

5.4.2 Operation

5.4.2.1 Supply bottle

The supply bottle with the eluent must be connected as indicated in *Chapter 3.8.1*, *Page 32*. This is above all important for eluents with volatile solvents (e.g. acetone).

Moreover, condensation must also be prevented in the eluent bottle. Drop formation can change the concentration ratio in the eluent.

5.4.2.2 Aspiration filter

To protect the IC system against foreign particles, we recommend aspirating the eluents via a 6.2821.090 aspiration filter (13-**2**). This aspiration filter must be replaced should it show signs of yellow discoloration (but no later than every 3 months).

In the case of very sensitive measurements, the eluent should be stirred constantly with a magnetic stirrer.

5.4.2.3 Changing the eluent

When changing the eluent, it must be ensured that no precipitates can occur. Solutions following one another in direct succession must therefore be miscible. If the system has to be rinsed organically, several solvents with rising or falling lipophilia must be used.

5.5 High pressure pump

5.5.1 Protection



Caution

The pump head is filled ex works with methanol/ultra pure water. It must be ensured that the eluent used is freely miscible with the solvent remaining in the pump head.

To protect the high pressure pump against **foreign particles**, we recommend that the eluent undergoes a **microfiltration** (filter 0.45 μ m) before being aspirated via a 6.2821.090 aspiration filter (see "Assembling eluent aspiration tubing", page 32).

Salt crystals between the piston and seal cause abrasion particles which can find their way into the eluent. These lead to contaminated valves, a rise in pressure and in extreme cases scratched pistons. It is therefore essential to ensure that **no precipitates** can occur (see Chapter 5.4.2.3, page 82).



Caution

In order to spare the pump seals, the pump should not be operated dry. Therefore ensure that the eluent supply is correctly connected and that there is enough eluent in the eluent bottle each time before turning on the pump.

5.5.2 Maintenance



Caution

Maintenance work on the high pressure pump may not be carried out unless the **instrument is switched off**.

Pump head maintenance

An unstable baseline (pulsation, flow fluctuations) is in many cases the result of contaminated valves (49-2), (49-3) or defective, leaking piston seals on the high pressure pump. Proceed as follows for cleaning contaminated valves and/or replacing worn parts such as pistons, piston seal and valves:

This maintenance work should be carried out at least once a year.

Removing the pump head

- 1 Turn off high pressure pump and wait until pressure is released.
- Loosen the pressure screw on the inlet valve holder (18-2) and unscrew the coupling (18-9), the pump head input capillary (18-7) and the eluent aspiration tubing from the pump head.
- Unscrew the pump head output capillary (18-13) from the pump head.
- 4 Remove pump head from the pump housing by loosening the 4 fastening screws (18-**5**) using the 6.2621.030 hexagon key. The main piston is on the left (viewed from the front), and the auxiliary piston is on the right.

5.5 High pressure pump

Cleaning/replacing the zirconium oxide piston

Clean one piston after the other as follows:

1 Removing the piston cartridge from the pump head

Loosen the piston cartridge with a wrench and unscrew from the pump head by hand.

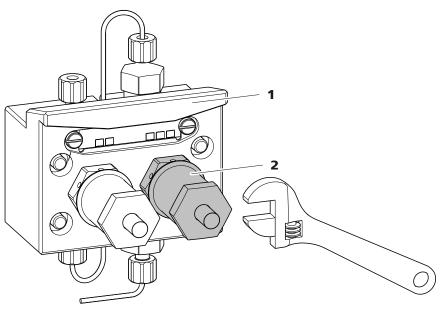


Figure 43 Removing piston

1 Pump head

2 Piston

2 Dismantle the piston



Caution

On the inside of the piston cartridge there is a taut spring than can jump out of the piston cartridge if suddenly loosing tension.

When opening the piston cartridge, hold pressure towards the spring and unscrew carefully.

- Loosen the screw of the piston cartridge with a wrench and unscrew carefully by hand and by holding pressure towards the taut spring.
- Remove the zirconium oxide piston and lay on a tissue.
- Remove the spring retainer, spring and the inner plastic sleeve from the piston cartridge and lay by.

• Remove the backup ring from the pump head and lay to the other parts.

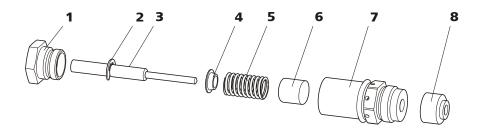


Figure 44 Components of the piston cartridge

1	Piston cartridge screw	2	Retaining washer
3	Zirconium oxide piston with piston shaft Order number: 6.2824.070.	4	Spring retainer
5	Spring Order number: 6.2824.060.	6	Inner plastic sleeve Protects from metallic abrasion.
7	Piston cartridge	8	Backup ring

3 Cleaning the components of the piston

- Clean zirconium oxide pistons contaminated by abrasion or deposits with pure abrasive cleaning powder, rinse particle free with ultra pure water and dry.
 Replace highly contaminated or scratched zirconium oxide pistons (spare part: 6.2824.070 zirconium oxide piston).
- Rinse the other parts of the piston and dry with a lint-free cloth.

4 Assembling the piston

- Insert the inner plastic sleeve, spring and spring retainer into the piston cartridge.
- Slide the zirconium oxide piston carefully into the piston cartridge until its tip emerges from the small opening of the piston cartridge.
- Attach screw and tighten by hand.

Replacing the piston seal

The 6.2617.010 special tool (see Figure 45, page 86) is necessary in order to remove the piston seal from the pump head. It consists of two

5.5 High pressure pump

parts: a tip for removing the old piston seal and a sleeve for inserting the new piston seal.

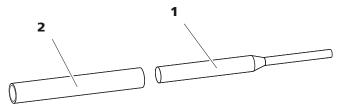


Figure 45 Tool for piston seal 6.2617.010

1 Pin

Pin for removing the old piston seal.

2 Sleeve

Sleeve for inserting the new piston seal.



Caution

Screwing the 6.2617.010 special tool for the piston seal into the piston seal destroys this completely!

1 Removing the piston seal



Caution

Avoid touching the sealing surface in the pump head (18-4) with the tool.

Screw the special tool for the piston seal (45-1) with the narrow side just as far into the piston seal as the same can be removed.

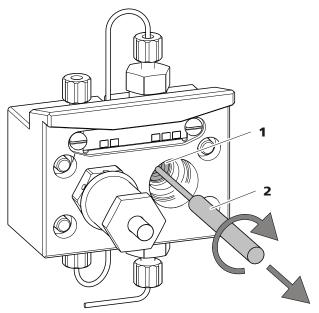


Figure 46 Removing the piston seal

1 Piston seal

2 Tool for piston seal Pin of the tool.

2 Inserting the new piston seal into the tool

Insert the new piston seal tightly by hand into the recess of the sleeve of the tool for the piston seal (45-2). The sealing springs must be visible from the outside.

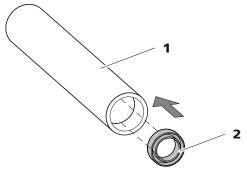


Figure 47 Insert the piston seal into the tool

Tool for piston seal 6.2617.010Sleeve for inserting the new piston seal.

2 Piston seal Order number: 6.2741.020

3 Inserting the new piston seal into the pump head

Guide the sleeve of the tool for the piston seal (45-2) with inserted piston seal into the pump head and press the seal with the wide end of the tool for the piston seal (45-1) into the pump head recess.

5.5 High pressure pump

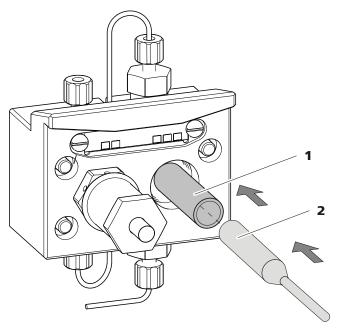


Figure 48 Inserting the piston seal into the pump head

4 Replacing the piston cartridge

Screw the assembled piston cartridge back into the pump head and tighten, first by hand, then additionally by approx. 15° with a wrench.

Cleaning the inlet valve and outlet valve

1 Removing valves

- Unscrew the connection capillary for the auxiliary piston (18-1) from the outlet valve holder.
- Unscrew the holders for the inlet and outlet valves and remove valves.

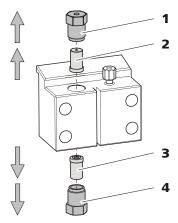


Figure 49 Removing valves

1 Outlet valve holder

3 Inlet valve

Order number: 6.2824.170

2 Outlet valve

Order number: 6.2824.160

4 Inlet valve holder

2 Cleaning undissected valve

Clean contaminated or blocked valves initially **without** dismantling them completely.

- Rinse the valve in eluent flow and counterflow direction using a spray bottle filled with ultra pure water, RBS solution or acetone.
- The rinsing effect is further increased through a short treatment (lasting for a maximum of 20 s) in an ultrasonic bath.



Note

Longer lasting ultrasonic baths can damage the ruby ball of the valve.

Only if this cleaning is useless, dismantle the valves separately and clean the components.

3 Dismantling valve

Dismantle every valve separately.



Note

For dismantling the valve the 6.2617.020 tool for valve cartridges is required.

5.5 High pressure pump

• Place the valve with the seal faced downwards above the recess in the holder.

• Push the valve components out of the valve housing using the needle of the tool.

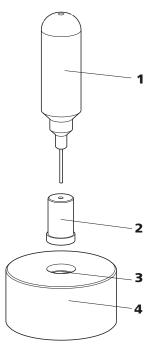


Figure 50 Dismantling valve

Needle
For pushing the valve components out of the valve housing.

3 Holder

2 Valve

4 Recess
For collecting the valve components.

The components of the valve are collected in the recess of the holder.



Note

The components of the valve are very small. In order not to lose them, put the components into a dish.

• The inlet valve and the outlet valve consist of the same, just differently arranged components (see Figure 51, page 91).

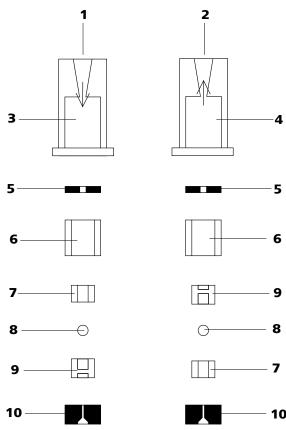


Figure 51 Components of the inlet valve and outlet valve

1	Inlet valve 6.2824.170	2	Outlet valve 6.2824.160
3	Inlet valve housing	4	Outlet valve housing
5	Sealing ring (black)	6	Sleeve
7	Sapphire sleeve The shiny side must point to ruby ball.	8	Ruby ball
9	Ceramic holder for ruby ball	10	Seal The larger opening must point outwards.

4 Clean the components of the valve

Rinse the valve components with ultra pure water and/or acetone and dry with a lint-free cloth.

5 Reassemble the valve

Reassemble valve components according to figure 51, page 91.

- Insert the seal with the larger opening faced downwards into the recess of the tool.
- Lay the other valve components above another in the correct sequence (see Figure 51, page 91).

5.5 High pressure pump

 Place the valve housing over the stacked components and hold it tightly.

- By tilting the tool, the valve components slide into the valve housing.
- Press the seal by hand well on the valve housing.

6 Checking the flow direction

Rinse the valve in the direction of the arrow on the valve housing and check wether liquid is escaping on the other end.

If this is not the case, the valve has to be dismantled again and be assembled correctly (see Figure 51, page 91).

7 Inserting the valves back into the pump head



Caution

If by mistake, the inlet valve is mounted instead of the outlet valve, an extreme pressure builds up within the working cylinder, which can destroy the piston seal!

When inserting the valves, please take into account that the liquid is being pumped through the pump head from bottom to top.

- Insert the inlet valve into the inlet valve holder the way the seal is visible.
- Screw the inlet valve holder into the bottom of the pump head and tighten with a wrench (49-4).
- Insert the outlet valve into the outlet valve holder the way the seal is visible.
- Screw the outlet valve holder into the top of the pump head and tighten with a wrench (49-1).

5 Operation and maintenance

Mounting the pump head



Note

To prevent the pump head from being positioned the wrong way, it is provided with different bore hole depths for the fastening bolts, i. e. a fastening bolt is longer than all others. The bore hole with the greatest depth must therefore be assigned to the longest bolt. If this is not the case, the pump will not function perfectly.

- 1 Mount the pump head on the pump again using the four fastening screws (18-5). Firmly tighten the screws with the 6.2621.030 hexagon key.
- 2 Screw connection capillaries (18-1), (18-7) and (18-13) onto the pump head again.

5.6 Inline filter

5.6.1 Maintenance

The 6.2821.120 inline filters comprise the filter housing (52-2), the filter screw (52-4) and the flter (52-3). New filters (52-3) are available under the order number 6.2821.130 (10 items).

The 6.2821.130 filters (21-3) should be changed every 3 months (more frequently at higher backpressure).

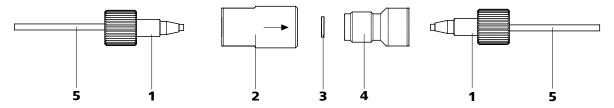


Figure 52 Changing the filter

- 1 PEEK pressure screws, short 6.2744.070
- **3 6.2821.130 filter** Packaging contains 10 items.
- **5** Connection capillaries

2 Filter housing

Housing of the inline filter. Part of the 6.2821.120 accessories.

4 Filter screw

Screw of the inline filter. Part of the 6.2821.120 accessories.

5.6 Inline filter

Changing the filter

The flow must be stopped before changing the filter.

1 Removing the inline filter

• Unscrew the pressure screws (52-1) from the inline filter.

2 Unscrewing the filter screw

• Screw the filter screw (52-4) out of the filter housing (52-2) with the aid of two 6.2621.000 adjustable wrenches.

3 Inserting the filter

- Remove the old filter (52-3) with tweezers.
- Place the new filter (52-3) flat in the filter housing with tweezers (52-2).

4 Mounting filter screw

• Screw the filter screw (52-4) back into the filter housing (52-2) and tighten by hand. Then additionally tighten slightly with two 6.2621.000 adjustable wrenches.

5 Remounting the inline filter

• Screw the pressure screws (52-1) back onto the inline filter.

6 Rinsing the inline filter

- Dismantle the guard column (if present) and the separation column and replace with a 6.2744.040 coupling.
- Rinse the instrument with eluent.

5.7 Inline sample preparation

To protect the separation column (see Chapter 3.23, Page 74) against foreign particles which can affect the separating efficiency, we recommend that all samples undergo a microfiltration (filter 0.45 μ m). The ultrafiltration cell can be used for **filtration** (see documentation on the *IC Equipment for Ultrafiltration*).

Samples containing significant amounts of **gas** should be degassed. The sample degasser (see Chapter 3.13, Page 45) (if available) is used for degassing.

Matrix-loaded samples (e.g. blood, oil) should be prepared for the measurement by means of dialysis (see documentation on the *IC Equipment for Dialysis*).

If the concentration of the sample is too high, it should be **diluted** before feeding (see documentation on the *IC Equipment for Sample Dilution*).

For the sample preparation methods **Neutralization** (replacement of e.g. Na⁺ with H⁺) and **cation exchange** (replacement of e.g. heavy metals with H⁺), a sample preparation module (SPM) is used.

5.8 Rinsing the sample path

Before a new sample can be measured, the sample path must be rinsed with it so that the measuring result is not falsified by the previous sample (**Sample carry-over**).

In the case of automated sample feeding, the rinsing time should be at least 3 times the **transfer time**. The transfer time is the time required by the sample to flow from the sample vessel to the end of the sample loop.

Ascertaining the transfer time

The transfer time depends on the pump capacity of the peristaltic pump, the total capillary volume and the volume of the gas removed by the sample degasser (if used) - in other words the amount of gas in the sample.

1 Emptying the sample path

Pump air through the sample path (pump tubing, tubing connections, capillary in the degasser, sample loop) for several minutes until all liquid is displaced by the air.

2 Aspirating the sample and measuring time

Aspirate a sample typical for the later application and use a stop watch to measure the time required by the sample to travel from the sample vessel to the end of the sample loop.

The time measured corresponds to the "transfer time". The rinsing time should be at least 3 times the transfer time.

Checking the rinsing time

It is possible to determine whether the rinsing time is adequate via a direct measurement of the sample carry-over. Proceed as follows:

1 Preparing two samples

- **Sample A**: A typical sample for the application.
- **Sample B**: Ultra pure water.

2 Determining "Sample A"

Let "Sample A" pass through the sample path for the duration of the rinsing time, then inject and measure.

3 Determining "Sample B"

Let "Sample B" pass through the sample path for the duration of the rinsing time, then inject and measure.

4 Calculating sample carry-over

The degree of the sample carry-over corresponds to the ratio of the peak areas of the measurement for sample B to the measurement for sample A. The lower the ratio, the lower the sample carry-over. This ratio can be altered by varying the rinsing time – thus allowing the rinsing time required for the application to be ascertained.

5.9 Sample degasser

5.9.1 Operation

If you are working with sample degassing, the longer "transfer time" (see Ascertaining the transfer time, page 95) means that it is also necessary to rinse for longer (with the subsequent sample). The rinsing time should be at least 3 times the "transfer time" so as to minimize the carry-over effects. The "transfer time" itself depends on the pump capacity, total capillary volume and volume of gas removed (i.e. the amount of gas in the sample).



Note

When using the sample degasser, the rinsing time extends by at least 2 minutes.

5.10 Sample preparation module (SPM)

5.10.1 Protection

To protect the SPM against foreign particles or bacterial growth, a filter must be mounted between the peristaltic pump and the inlet capillaries of the SPM .

5.10.2 Operation



Caution

The neutralization units must never be regenerated in the same flow direction the eluent is pumped. Therefore always mount the inlet and outlet capillaries according to the diagram outlined in *Figure 24*.

The SPM consists of 3 neutralization units, which are used, regenerated with perchloric acid or rinsed with ultra pure water in rotation. In order to record every new chromatogram under comparable conditions, you should normally work with a freshly regenerated SPM.



Caution

The SPM must never be switched over in a dry state, as there is a risk of jamming. If the SPM is in a dry state, the SPM must be rinsed for at least 5 minutes before it may be switched over.



Caution

In the case of reduced capacity or high backpressure, the SPM must be regenerated (see Chapter 5.10.3.1, page 98), cleaned (see Chapter 5.10.3.2, page 99) or replaced (see Chapter 5.10.3.3, page 101).

5.10.3 Maintenance

5.10.3.1 Regenerating the SPM

If the neutralization units are loaded with certain heavy metals (e.g. iron) or organic impurities, these can no longer be completely removed with the regeneration solution (100 mmol/L HClO₄) normally used. The capacity of the neutralization units is affected by this, which can lead to a reduced detection sensitivity. If such capacity problems occur at one or more positions, the neutralization units must be regenerated:

Regenerate the SPM

Regenerate the SPM as follows:

1 Disconnecting the SPM from the system

- Switch off the instrument.
- Disconnect capillary connections of the SPM from the system.

2 Regenerate the SPM



Caution

The pump tubings made of PVC must not be used for rinsing with solutions containing organic solvents. In this case, other pump tubings must be used for rinsing.

- Rinse the 3 neutralization units with the following solutions for about 15 minutes each:
 - Contamination with heavy metals: $1 \text{ mol/L H}_2SO_4 + 0.1 \text{ mol/L oxalic acid}$
 - Contamination with organic cationic complexing agents:
 - 0.1 mol/L H₂SO₄ / 0.1 mol/L oxalic acid / acetone 5%
 - Severe contamination with organic substances:
 0.2 mol/L H₂SO₄ / acetone ≥ 20%

3 Connecting the SPM to the IC system

• Reconnect the SPM to the IC system. If the capacity problems remain, the SPM rotor A must be replaced (see Chapter 5.10.3.3, page 101).

5.10.3.2 Cleaning the SPM

It may be necessary to clean the SPM in the following cases:

- Increased backpressure on the connection tubings of the SPM.
- Blockage of the SPM which cannot be eliminated (solutions can no longer be pumped through the SPM).
- Jamming of the SPM which cannot be eliminated (SPM can no longer be switched over).

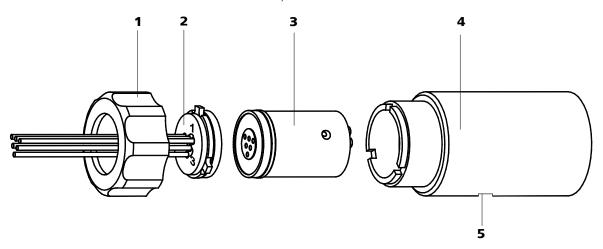


Figure 53 SPM – Components

1	Union nut	2	SPM connecting piece (6.2835.010)
3	SPM rotor A (6.2835.000) Cation exchanger.	4	SPM housing
5	Slot in the SPM housing		

SPM cleaning

Clean the SPM as follows:

1 Disconnecting the SPM from the system

- Switch off the instrument.
- Disconnect capillary connections of the SPM from the system.

2 Dismounting SPM

• Unscrew the union nut (53-1) from the SPM housing (53-4).

• Pull the SPM connecting piece (53-2) and the SPM rotor A (53-3) out of the SPM housing (53-4). The SPM connecting piece and the SPM rotor A normally stick to one another - if this is not the case: Take a sharp object, insert into the slot (53-5) in the SPM housing, and pull out the SPM rotor A (53-3) in this way.

Detach the SPM connecting piece (53-2) from the SPM rotor A (53-3).

3 Cleaning the supply and discharge lines

- Connect in turn each of the 6 capillary tubings fastened on the SPM connecting piece (53-2) on the high pressure pump(see Chapter 3.10, page 37) and pump through ultra pure water.
- Check whether solution emerges at the SPM connecting piece (53-2). If one of the supply or discharge lines remained blocked, the SPM connecting piece (53-2) must be replaced (order number 6.2835.010).

4 Cleaning the SPM rotor A

• Clean sealing surface of the SPM rotor A (53-3) with ethanol using a lint-free cloth.

5 Inserting the SPM rotor A



Caution

An incorrectly inserted SPM rotor A (53-3) can be **destroyed** during first use.

- Insert the SPM rotor A (53-3) into the SPM housing (53-4) in such a way that the tubing connections on the rear of the SPM rotor A fit into the corresponding recesses inside the SPM housing and one of the three holes of the SPM rotor A is visible from below in the slot (53-5) of the SPM housing.
- If the SPM rotor A (53-3) is correctly inserted, its sealing surface will be approx. 4 mm within the SPM housing (53-4). If this is not the case, SPM rotor A must be moved into the right position from below using a sharp object (e.g. screwdriver).

6 Cleaning the SPM connecting piece

• Clean sealing surface of the SPM connecting piece (53-2) with ethanol using a lint-free cloth.

7 Inserting the SPM connecting piece

■ Insert the SPM connecting piece (53-2) into the SPM housing (53-4) in such a way that the connector 1 is on top and the three pins of the SPM connecting piece fit into the corresponding recesses on the SPM housing (53-4).

8 Connecting and conditioning the SPM

- Reconnect the SPM to the IC system.
- Before switching the SPM over for the first time, rinse the three neutralization units with solution for 5 minutes.

5.10.3.3 Replacing parts of the SPM

It may be necessary to replace parts of the SPM in the following cases:

- Loss of neutralization capacity which cannot be eliminated (reduced detection sensitivity).
- Blockage of the SPM which cannot be eliminated (solutions can no longer be pumped through the SPM).

Both the SPM rotor A (53-3) and the SPM connecting piece (53-2) with its supply and discharge lines can be replaced.

Replacing parts of the SPM

Replace parts of the SPM as follows (see Figure 53, page 99):

1 Disconnecting the SPM from the IC system

- Switch off the instrument.
- Disconnect capillary connections of the SPM from the system.

2 Dismounting SPM

- Unscrew union nut (53-1) from the SPM housing (53-4).
- Pull the SPM connecting piece (53-2) and the SPM rotor A (53-3) out of the SPM housing (53-4). The SPM connecting piece and the SPM rotor A normally stick to one another if this is not the case: Take a sharp object, insert into the slot (53-5) in the SPM housing, and pull out the SPM rotor A (53-3) in this way.
- Detach the SPM connecting piece (53-2) from the SPM rotor A (53-3).

3 Cleaning the new SPM rotor A

• Clean sealing surface of the new SPM rotor A (53-3) with ethanol using a lint-free cloth.

4 Inserting the new SPM rotor A



Caution

An incorrectly inserted SPM rotor A (53-3) can be **destroyed** during first use.

- Insert the new SPM rotor A (53-3) in the SPM housing (53-4) in such a way that the tubing connections on the rear of the SPM rotor A fit into the corresponding recesses inside the SPM housing and one of the three holes of the SPM rotor A is visible from below in the slot (53-5) of the SPM housing.
- If the SPM rotor A (53-3) is correctly inserted, its sealing surface will be approx. 4 mm within the SPM housing (53-4). If this is not the case, the SPM rotor A must be moved into the right position from below using a sharp object (e.g. screwdriver).

5 Cleaning the SPM connecting piece

• Clean sealing surface of the SPM connecting piece (53-2) with ethanol using a lint-free cloth.

6 Inserting the new SPM connecting piece

■ Insert the SPM connecting piece (53-2) into the SPM housing (53-4) in such a way that the connector 1 is on top and the three pins of the SPM connecting piece fit into the corresponding recesses on the SPM housing (53-4).

7 Connecting and conditioning the SPM

- Reconnect the SPM to the IC system.
- Before switching the SPM over for the first time, rinse the three neutralization units with solution for 5 minutes.

5.11 Peristaltic pump

5.11.1 Operation

The pumping capacity of the peristaltic pump depends on the drive speed (set via software), the contact pressure and, above all, the internal diameter of the pump tubing. Depending on the application, different pump tubings are used.



Caution

The service life of the pump tubings also depends on the contact pressure. Therefore fully lift the tubing cartridges by loosening the snapaction lever (31-10) on the right-hand side if the peristaltic pump is to be turned off for a longer period. Once set, the contact pressure remains unaffected.



Caution

The 6.1826.xxx pump tubings consist of PVC or PP and therefore must not be used for rinsing with solutions containing acetone. In this case, use other pump tubings or use another pump for rinsing.

5.11.2 Maintenance

5.11.2.1 Pump tubing

The pump tubing used in the peristaltic pump is a consumable whose service life is restricted.

The LFL pump tubing with 3 stoppers is stretched in the tubing cartridge in such a way that it comes to rest between two stoppers. This results in two possible positions for the tubing cartridge. If the pump tubing should exhibit clear signs of wear, then this can be stretched a second time, in the respective alternate position.

Therefore replace the pump tubing periodically, or when used permanently approx. every 4 weeks .

Selecting the pump tubing

The pump tubing differs in material, diameter and hence also pumping capacity. Depending on the application, different pump tubings are used.

The following table provides information on the properties and use of the pump tubing:

5.11 Peristaltic pump

Table 2 Pump tubing

Order number	Name	Material	Inner diameter	Use
6.1826.020	Pump tubing (blue/ blue), 2-stopper	PVC (Tygon ST)	1.65 mm	Pump tubing for online IC instruments and automation in voltammetry
6.1826.310	Pump tubing LFL (orange/green), 3- stopper	PVC (Tygon)	0.38 mm	Pump tubing for bromate determination using the triiodide method.
6.1826.320	Pump tubing LFL (orange/yellow), 3- stopper	PVC (Tygon)	0.48 mm	For suppressor solutions, acceptor solutions for inline dialysis and for inline ultrafiltration.
6.1826.330	Pump tubing LFL (orange/white), 3- stopper	PVC (Tygon)	0.64 mm	No special applications.
6.1826.340	Pump tubing LFL (black/black), 3-stop- per	PVC (Tygon)	0.76 mm	For the sample solution in inline dialysis.
6.1826.360	Pump tubing LFL (white/white), 3-stop- per	PVC (Tygon)	1.02 mm	For sample transfer.
6.1826.380	Pump tubing LFL (gray/gray), 3-stopper	PVC (Tygon)	1.25 mm	For inline sample dilution.
6.1826.390	Pump tubing LFL (yellow/yellow), 3-stopper	PVC (Tygon)	1.37 mm	For the sample solution in inline ultrafiltration.

5.11.2.2 Pump tubing connection with filter

The 6.2821.130 filters (54-2) should be changed every 3 months, more frequently at higher backpressure.

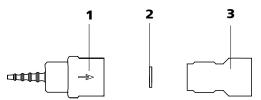


Figure 54 Pump tubing connection – Changing the filter

Tubing olive
 Filter 6.2821.130
 Packaging contains 10 items.

Replacing the filter

1 Unscrewing filter screw

• Screw the filter screw (54-3) out of the tubing olive (54-1) with the aid of two 6.2621.000 adjustable wrenches.

2 Replacing the filter

- Remove the old filter (54-2) with tweezers.
- Place the new filter (54-2) flat in the tubing olive (54-1) with tweezers.

3 Mounting filter screw

• Screw the filter screw (54-3) back into the tubing olive (54-1) and tighten by hand. Then additionally tighten with two 6.2621.000 adjustable wrenches.

5.12 Injection valve

5.12.1 Protection

To prevent contamination of the injection valve, a 6.2821.120 inline filter (see Chapter 3.11, page 42) should be mounted between the high pressure pump and the pulsation damper.

5.13 High Capacity Metrohm Suppressor Module (MSM-HC)

5.13.1 Protection

To protect the MSM-HC against foreign particles or bacterial growth, a 6.2744.180 pump tubing connection with filter (see Figure 32, page 54) must be mounted between the peristaltic pump and the inlet capillaries of the MSM-HC.

5.13.2 Operation



Note

The suppressor units must never be regenerated in the same flow direction in which the eluent is pumped. Therefore always mount the inlet and outlet capillaries according to diagram outlined in *figure 37*.

The MSM-HC consists of 3 suppressor units, which are used for suppression, regenerated with sulfuric acid or rinsed with ultra pure water in rotation. In order to record every new chromatogram under comparable conditions, you should normally work with a freshly regenerated suppressor.



Caution

The MSM-HC must never be switched over in a dry state, as there is a risk of jamming. If the MSM-HC is in a dry state, the MSM-HC must be rinsed for at least 5 minutes before it may be switched over.



Caution

In the case of reduced capacity or high backpressure, the MSM-HC must be regenerated (see Chapter 5.13.3.1, page 107), cleaned (see Chapter 5.13.3.2, page 108) or replaced (see Chapter 5.13.3.3, page 110).

5.13.3 Maintenance

5.13.3.1 Regenerating the MSM-HC

If the suppressor units are loaded for a longer period with certain heavy metals (e.g. iron) or organic impurities, these can no longer be completely removed with the regeneration solution (100 mmol/L $\rm H_2SO_4$) normally used. The capacity of the suppressor units is consequently affected, which can result in reduced phosphate sensitivity in less serious cases and a significant rise in the baseline in more serious cases. If such capacity problems occur at one or more positions, the suppressor units must be regenerated:

Regenerating the MSM-HC

1 Disconnecting the MSM-HC from the IC system

 Disconnect the MSM-HC from the separation column and MCS or the detector.

2 Regenerating the MSM-HC



Caution

The pump tubings made of PVC must not be used for rinsing with solutions containing organic solvents. In this case, other pump tubings must be used for rinsing.



Note

The high pressure pump can be used for regeneration. For this, remove the guard column and separation column and connect the capillary directly to the MSM-HC (regenerate in opposite direction).

- Rinse the 3 suppressor units with the following solutions for about 15 minutes each:
 - Contamination with heavy metals: $1 \text{ mol/L H}_2SO_4 + 0.1 \text{ mol/L oxalic acid}$
 - Contamination with organic cationic complexing agents:
 - 0.1 mol/L H₂SO₄ / 0.1 mol/L oxalic acid / acetone 5%
 - Severe contamination with organic substances:
 0.2 mol/L H₂SO₄ / acetone ≥ 20%

3 Connecting the MSM-HC to the IC system

 Reconnect the MSM-HC to the IC system. If the capacity problems remain, the MSM-HC rotor A must be replaced (see Chapter 5.13.3.3, page 110).

5.13.3.2 Cleaning the MSM-HC

It may be necessary to clean the MSM-HC in the following cases:

- Increased backpressure onto the connection tubings of the MSM-HC.
- Blockage of the MSM-HC which cannot be eliminated (solutions can no longer be pumped through the MSM-HC).
- Jamming of the MSM-HC which cannot be eliminated (MSM-HC can no longer be switched over).

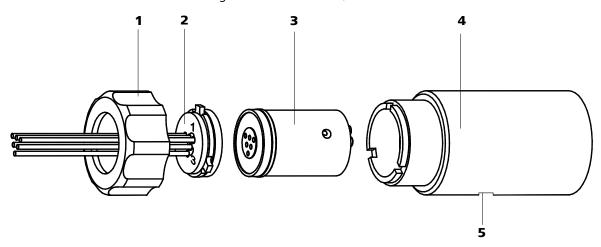


Figure 55 MSM-HC – Components

1	Union nut	2	MSM-HC connecting piece 6.2835.010
3	MSM-HC rotor A 6.2842.000	4	MSM-HC housing
5	Slot in the MSM-HC housing		

Cleaning the MSM-HC

Clean the MSM-HC as follows:

1 Disconnecting the MSM-HC from the IC system

- Switch off the instrument.
- Disconnect the MSM-HC from the separation column, peristaltic pump and detector.

2 Dismantling the MSM-HC

• Unscrew union nut (55-1) from the MSM-HC housing (55-4).

- Pull the MSM-HC connecting piece (55-2) and the MSM-HC rotor A (55-3) out of the MSM-HC housing (55-4). The connecting piece and the MSM-HC rotor A normally stick to one another if this is not the case: Take a sharp object, insert into the slot (55-5) in the MSM-HC housing, and pull out the MSM-HC rotor A (55-3) in this way.
- Detach the MSM-HC connecting piece (55-2) from MSM-HC rotor A (55-3).

3 Cleaning the supply and discharge lines

- Connect in turn each of the 6 capillary tubings fastened on the MSM-HC connecting piece (55-2) on the high pressure pump (see Chapter 3.10, page 37) and pump through ultra pure water.
- Check whether solution emerges at the MSM-HC connecting piece (55-2). If one of the supply or discharge lines remained blocked, the MSM-HC connecting piece (55-2) must be replaced (order number 6.2835.010).

4 Cleaning the MSM-HC rotor A

• Clean the sealing surface of the MSM-HC rotor A (55-3) with ethanol using a lint-free cloth.

5 Inserting the MSM-HC rotor A



Caution

An incorrectly inserted MSM rotor A (55-3) can be **destroyed** during start-up.

- Insert the MSM-HC rotor A (55-3) into the MSM-HC housing (55-4) in such a way that the tubing connections on the rear of MSM-HC rotor A fit into the corresponding recesses inside the MSM-HC housing and one of the three holes of the MSM-HC rotor A is visible from below in the slot (55-5) of the MSM-HC housing.
- If the MSM-HC rotor A (55-3) is correctly inserted, its sealing surface will be approx. 4 mm within the MSM-HC housing (55-4). If this is not the case, the MSM-HC rotor A must be moved into the right position from below using a sharp object (e.g. screwdriver).

6 Cleaning the MSM-HC connecting piece

• Clean the sealing surface of the MSM-HC connecting piece (55-2) with ethanol using a lint-free cloth.

7 Inserting the MSM-HC connecting piece

■ Insert the MSM-HC conencting piece (55-2) into the MSM-HC housing (55-4) in such a way that the connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the MSM-HC housing (55-4).

• Reattach the union nut (55-1) onto the coupling and tighten.

8 Connecting and conditioning the MSM-HC

- Reconnect the MSM-HC to the IC system.
- Before switching the MSM-HC over for the first time, rinse the three suppressor units with solution for 5 minutes.

5.13.3.3 Replacing parts of the MSM-HC

It may be necessary to replace parts of the MSM-HC in the following cases:

- Loss of suppression capacity which cannot be eliminated (reduced phosphate sensitivity and/or significant rise in the baseline).
- Blockage of the MSM-HC which cannot be eliminated (solutions can no longer be pumped through the suppressor).

Both the MSM-HC rotor A (55-3) and the MSM-HC connecting piece (55-2) with its supply and discharge lines can be replaced.

Replacing parts of the MSM-HC

Replace parts of the MSM-HC as follows (see Figure 55, page 108):

1 Disconnecting the MSM-HC from the IC system

- Switch off the instrument.
- Disconnect the MSM-HC from the separation column, peristaltic pump and detector.

2 Dismantling the MSM-HC

- Unscrew union nut (55-**1**) from the MSM-HC housing (55-**4**).
- Pull the MSM-HC connecting piece (55-2) and the MSM-HC rotor A (55-3) out of the MSM-HC housing (55-4). The connecting piece and the MSM-HC rotor A normally stick to one another if this is not the case: Take a sharp object, insert into the slot (55-5) in the MSM-HC housing, and pull out the MSM-HC rotor A (55-3) in this way.
- Detach the MSM-HC connecting piece (55-2) from MSM-HC rotor A (55-3).

5 Operation and maintenance

3 Cleaning the new MSM-HC rotor A

• Clean the sealing surface of the new MSM-rotor A (55-3) with ethanol using a lint-free cloth.

4 Inserting the new MSM-HC rotor A



Caution

An incorrectly inserted MSM rotor A (55-3) can be **destroyed** during start-up.

- Insert the new MSM-HC rotor A (55-3) in the MSM-HC housing (55-4) in such a way that the tubing connections on the rear of MSM-HC rotor A fit into the corresponding recesses inside the MSM-HC housing and one of the three holes of MSM-HC rotor A is visible from below in the slot (55-5) of the MSM-HC housing.
- If the MSM-HC rotor A (55-3) is correctly inserted, its sealing surface will be approx. 4 mm within the MSM-HC housing (55-4). If this is not the case, the MSM-HC rotor A must be moved into the right position from below using a sharp object (e.g. screwdriver).

5 Cleaning the MSM-HC connecting piece

• Clean the sealing surface of the MSM-HC connecting piece (55-2) with ethanol using a lint-free cloth.

6 Inserting the new MSM-HC connecting piece

- Insert the MSM-HC conencting piece (55-2) into the MSM-HC housing (55-4) in such a way that the connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the MSM-HC housing (55-4).
- Reattach the union nut (55-**1**) onto the coupling and tighten.

7 Connecting and conditioning the MSM-HC

- Reconnect the MSM-HC to the IC system.
- Before switching the MSM-HC over for the first time, rinse the three suppressor units with solution for 5 minutes.

5.14 Metrohm CO₂ suppressor (MCS)

5.14.1 Replacing the CO₂ adsorption cartridge

The CO_2 adsorption cartridge 6.2837.000 (39-**4**) must be replaced regularly. This is because of blockages and losses in capacity.

Blockage

Moisture can block the CO_2 adsorption cartridge. This is revealed by a change in color of the cartridge material (the orange part becomes colorless). As the air flow is reduced, the vacuum becomes lower. To protect the CO_2 adsorption cartridge, an H_2O adsorption cartridge (39-**7**) is installed upstream. Regular regeneration (see Chapter 5.14.2, page 112) of the H_2O adsorption cartridge extends the service life of the CO_2 adsorption cartridge.

Capacity loss

The adsorption capacity of the CO_2 adsorption cartridge is limited. Depending on the period of operation and laboratory environment, the adsorption capacity will diminish over time. This is manifested in a rising baseline (as more CO_2 reaches the detector).

5.14.2 Regenerating the H₂O adsorption cartridge

The function of the H_2O adsorption cartridge is to protect the CO_2 adsorption cartridge against moisture. The service life of the H_2O adsorption cartridge depends on the moisture content of the ambient air. Moisture reduces the capacity of the H_2O adsorption cartridge (which can be observed by a change in color). Before the color changes in the entire filling material (from orange to colorless, with Fluka Order No. 94098), the H_2O adsorption cartridge should be regenerated (see information sheet). The filling material is replaced during regeneration:

- Allow material to dry loose (not in cartridge) at 140 °C overnight and refill. Or dispose of the old material, and fill with new material.
- **2** Cover the packed material with wadding.

5.15 Conductivity detector

5.15.1 Maintenance



Caution

The conductivity detector must not be opened!



Warning

When rinsing the detector, the pressure must not exceed **5 MPa**. In order to ensure this, the maximum pressure of the high pressure pump must be set to **5 MPa** in MagIC Net.

If the conductivity detector is blocked, you should first of all check whether the blockage results from the capillary ends being pressed together too firmly. In this case, shorten the detector input capillary (40-3) or the detector output capillary (41-2) by several millimeters.

If this does not help, the conductivity detector can be rinsed against the normal flow direction. For this, connect the high pressure pump to the detector output capillary (41-2) and rinse - the pressure may not exceed 5 MPa.

5.16 Separation column

5.16.1 Separating efficiency

Which analysis quality can be attained, depends to a great extent on the separating efficiency of the separation column used. The separating efficiency of the selected separation column must be sufficient for the analysis problems present. If difficulties occur, you should always first check the quality of the separation column by recording a standard chromatogram.

You can find detailed information on the separation columns available from Metrohm in the information sheet provided along with your separation column, in the **Metrohm IC-Column Program** (available via your Metrohm agent) or in the Internet at http://www.metrohm.com in the product area Ion chromatography. You can request free information on special IC applications in the corresponding "**Application Bulletins**" or "**Application Notes**", which are available in the Internet at http://www.metrohm.com in the Applications area or via the Metrohm agent responsible.

5.16 Separation column

5.16.2 Protection

To protect the separation column against foreign particles, which can affect the separating efficiency, we recommend that both the eluent and the samples undergo a microfiltration (filter 0.45 μ m) before being aspirated via the 6.2821.090 aspiration filter.

The use of guard columns (see Chapter 3.22, page 72) serves for protecting the actual separation columns and increases their service life considerably. Information regarding which guard column is suitable for your separation column can be seen in the **Metrohm IC Column Program** (which is available from your Metrohm agent), the information sheet provided along with your separation column, the product information on the separation column at http://www.metrohm.com (product area Ion Chromatography) or can be obtained directly from your agent.

The pulsation damper (see Chapter 3.12, page 43) must be installed in order to protect the column material from pressure concussion caused by injection.

5.16.3 Storage

Always store the separation columns sealed and filled according to the data of the column manufacturer when not using them.

5.16.4 Regeneration



Note

The regeneration is considered as the last measure, and not to be carried out regularly.

If the separating properties of the column have deteriorated, the column can be regenerated according to the specifications of the column manufacturer. In the case of separation columns available from Metrohm, the specification for regeneration can be found on the information sheet provided along with each column.

5 Operation and maintenance

5.17 Quality Management and validation with Metrohm

Quality Management

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software. Further information on this can be found in the brochure **«Quality Management with Metrohm»** available from your local Metrohm agent.

Validation

Please contact your local Metrohm agent for support in validating instruments and software. Here you can also obtain validation documentation to provide help for carrying out the **Installation Qualification** (IQ) and the **Operational Qualification** (OQ). IQ and OQ are also offered as a service by the Metrohm agents. In addition, various application bulletins are also available on the subject, which also contain **Standard Operating Procedures** (SOP) for testing analytical measuring instruments for reproducibility and correctness.

Maintenance

Electronic and mechanical functional groups in Metrohm instruments can and should be checked as part of regular maintenance by specialist personnel from Metrohm. Please ask your local Metrohm agent regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement.



Note

You can find information on the subjects of quality management, validation and maintenance as well as an overview of the documents currently available at www.metrohm.com/com/ under **Support**.

6 Troubleshooting

6.1 Problems and their solutions

Problem	Cause	Remedy
Marked drop in pressure	Leak in the system.	Check and seal connections (see Chapter 3.5, page 19).
Marked rise in pressure	6.2821.120 inline filter blocked.	Replace 6.2821.130 filter (see Chapter 5.6, page 93).
	MSM-HC – blocked.	Regenerate the MSM-HC (see Chapter 5.13.3.1, page 107).
		Note: 6.2821.180 pump tubing connection with filter must be used .
	Conductivity detector blocked.	 Shorten capillary ends by several mm (see Chapter 5.15.1, Page 113).
		• Rinse detector against the normal flow direction (see Chapter 5.15.1, Page 113).
	Guard column – blocked.	Replace guard column <i>(see Chapter 3.22, page 72)</i> .
	Separation column – blocked.	 Regenerate separation column (see Chapter 5.16.4, page 114). Replace separation column (see "Connect-
		ing and rinsing the separation column", page 75).
		Note: Samples should always be microfiltered (see Chapter 5.7, page 95).
	Injection valve – valve blocked.	Have the valve cleaned (by Metrohm service technicians).
Drift of the baseline	Thermal equilibrium not yet attained.	Condition <i>(see Chapter 3.17, page 59)</i> instrument with the column thermostat switched on .
	Leak in the system.	Check and seal connections (see Chapter 3.5, page 19).

6 Troubleshooting

Problem	Cause	Remedy
	Eluent – Evaporation of the organic solvent in the eluent.	Check the eluent bottle attachment (see Figure 14, page 34).
Peak areas lower than expected	Sample – Leak in the sample path.	Check the sample path.
	Sample – Blockage in the sample path.	Check the sample path.
	Sample – Sample loop not (completely) filled.	Prolong the sample transfer time.
	Sample – Gas bubbles in the sample.	Use the sample degasser (see Chapter 3.13, page 45) (if available).
	MCS – not connected.	Connect the MCS.
Peristaltic pump – insufficient or no delivery rate	Peristaltic pump – contact pressure too weak.	Correctly set contact pressure (see "Set flow rate", page 56).
actively rate	Peristaltic pump – filter blocked.	Replace the filter (see Chapter 5.11.2.2, page 104).
	Peristaltic pump – pump tubing defective.	Replace pump tubing (see Chapter 5.11.2.1, page 103).
Very noisy baseline	High pressure pump – con- taminated pump valves.	Clean pump valves (see Chapter 5.5.2, page 83).
	Eluent – Leak in the eluent path.	Check the eluent path.
	Eluent – Blockage in the eluent path.	Check the eluent path.
	High pressure pump – defective piston seals.	Replace piston seals (see Chapter 5.5.2, page 83).
	MCS – CO ₂ adsorption cartridge exhausted.	Replace CO_2 adsorption cartridge (see Chapter 5.14.1, page 112).
	Pulsation damper not con- nected.	Connect the pulsation damper (see Chapter 3.12, page 43).
	Pulsation damper not con- nected.	Connect pulsation damper (see Chapter 3.12, page 43).

Problem	Cause	Remedy
	MCS – vacuum pump defective.	Contact the Metrohm Service.
Background conduc- tivity too high	MSM-HC – not connected.	Connecting the MSM-HC (see Chapter 3.18, page 62).
	MCS – not connected.	Connect the MCS.
	Incorrect eluent.	Change eluent (see Chapter 5.4.2.3, page 82).
	MSM-HC – regeneration or rinsing solution flow problems.	Check the flow of the regeneration and rinsing solution (see Chapter 3.18.2, page 62).
Data of the separa- tion column cannot be read.	Column chip contamina- ted.	Clean contact surfaces of the column chip (with alcohol).
se reau.	Column chip defective.	 Save column configuration in MagIC Net. Notify Metrohm Service.
Individual peaks greater than expec- ted	Sample – Carry-over of the samples from previous measurement.	Rinse system longer between two samples.
MSM-HC – No (or insufficient) pump-	Leak in the system.	Check connections.
ing of regeneration or rinsing solution	Peristaltic pump – contact pressure too weak.	Correctly set contact pressure .
	Peristaltic pump – filter blocked .	Replace the filter .
	MSM-HC – backpressure too high.	Clean the MSM-HC (see Chapter 5.13.3.2, page 108) or replace parts (see Chapter 5.13.3.3, page 110).
	Peristaltic pump – pump tubing defective.	Replace pump tubing .
Poor reproducibility of the retention	Eluent – Leak in the eluent path.	Check the eluent path.
times	Eluent – Blockage in the eluent path.	Check the eluent path.
Chromatograms have poor resolution	Separation column – diminished separating effi- ciency.	 Regenerate separation column (see Chapter 5.16.4, page 114).

6 Troubleshooting

Problem	Cause	Remedy
		 Replace separation column (see "Connect- ing and rinsing the separation column", page 75).
Conductivity detector is not recognized in the software	No connection.	 Check the cable connection (41-1). Turn the instrument off and on again (after 15 seconds).
Extreme spread of the peaks in the chromatogram. Splitting (dual	Connections – dead volume in the system.	Check the connections (see Chapter 3.5, page 19) (use PEEK capillaries with an internal diameter of 0.25 mm between the injection valve and detector).
peaks)	Guard column – diminished performance.	 Replace guard column (see Chapter 3.22, page 72).
	Separation column – dead volume at column head.	 Install separation column in reverse flow direction (if permitted by the information sheet). Replace separation column (see "Connecting and rinsing the separation column", page 75).
Greater rise in the baseline	SPM – reduced capacity.	Regenerate the SPM (see Chapter 5.10.3.1, page 98).
	MSM-HC — reduced capacity.	Regenerate the MSM-HC (see Chapter 5.13.3.1, page 107).
Precision problems - significant scatter-	Sample – Gas bubbles in the sample.	Use sample degasser (see Chapter 3.13, page 45).
ing of the measured values	Injection valve – sample loop.	Check installation of the sample loop (see Chapter 3.16.1, page 57).
	Sample – Rinsing volume too low.	Prolong the rinsing time (see Chapter 5.8, page 95).
	Injection valve – defective.	Request Metrohm Service.
	MCS – vacuum too low.	Check connectors. If they are ok:Contact the Metrohm Service.

Problem	Cause	Remedy
Unexpected change to the retention times in the chroma- tograms	Separation column – diminished separating effi- ciency.	 Regenerate separation column (see Chapter 5.16.4, page 114). Replace separation column (see "Connecting and rinsing the separation column", page 75).
	Eluent – Gas bubbles in the eluent.	Check connections of the eluent degasser (see Chapter 3.9, page 36).
	High pressure pump – defective.	Request Metrohm Service.
Vacuum is not being built	Eluent Degasser – Connector Vacuum on the rear of the instrument not (tightly) sealed.	 Seal the connector Vacuum tightly with a 6.144.6040 threaded stopper. or when using an 872 Extension Module: Connect an FEP tubing between the IC instrument and the Extension Module and tighten both clamping screws until they seal.
SPM – No (or insufficient) pumping of	Leak in the system.	Check connections.
regeneration or rins- ing solution	Peristaltic pump – contact pressure too weak.	Correctly set contact pressure .
	Peristaltic pump – filter blocked (see Chapter 3.15, page 52).	Replace the filter .
	SPM – backpressure too high.	Clean the SPM (see Chapter 5.10.3.2, page 99) or replace parts (see Chapter 5.10.3.3, page 101).
	Peristaltic pump – pump tubing defective.	Replace pump tubing .

7 Technical specifications

7 Technical specifications

7.1 Reference conditions

The technical data listed in this Chapter refers to the following reference

conditions:

Ambient tempera-

+25 °C (± 3 °C)

ture

Instrument status > 40 minutes in operation (equilibrated)

7.2 Instrument

IC system ■ Metal-free IC system

Compact system with modular design

• Up to two complete chromatographic systems in one housing

Material Painted polyurethane hard foam without CFCs, fire class V0

Operating pressure range

0...50 MPa (500 bar) high pressure pump0...35 MPa (350 bar) standard-PEEK system

Intelligent com-

iPump, iDetector, iColumn, MagIC Net

ponents

7.3 Leak sensor

Type Electronic, no calibration necessary

7.4 Ambient conditions

Operation

Ambient tem- +5...+45 °C

perature

Humidity 20...80 % relative humidity

Storage

Ambient tem- −20...+70 °C

perature

Transport

Ambient tem- -40...+70 °C

perature

7.5 Housing -----

Housing 7.5

Dimensions

Width 365 mm Height 642 mm Depth 380 mm

Material of base

Polyurethane hard foam (PUR) with flame retardation for fire class V0,

tray, housing and bottle holder

CFC-free, painted

Operating ele-

ments

Indicators LED for power display

On/Off switch On the rear panel of the instrument

Eluent degasser 7.6

Material fluoropolymer

Resistance to sol-

No restriction (apart from PFC)

vents

Build-up time for

< 60 s

the vacuum

High pressure pump 7.7

Type Serial dual-piston pump

Intelligent pump head recognition

Chemically inert

Metal-free pump heads

■ Materials in contact with eluent: PEEK, ZrO₂, PTFE/PE

Self-optimizing flow and pressure

Flow rate

Adjustable flow

0.001...20.0 mL/min

range

Flow increment 1 μL/min

Reproducibility

< 0.1 % deviation

of the eluent

flow

122 -----

7 Technical specifications

Pressure range

Pump 0...50.0 MPa (0...500 bar)

< 1 %

Pump head 0...35.0 MPa (0...350 bar) (applies for the standard PEEK pump head)

Residual pulsa-

tion

Safety shutdown

Function Automatic shutdown upon reaching the pressure limit values

Maximum pressure limit Adjustable from 0.1...50 MPa (1...500 bar)

■ The pump is automatically shut down at the first piston stroke above the maximum limit value

Minimum pressure limit Adjustable from 0...49 MPa (0...490 bar)

• The shutdown mechanism is inactive at 0 MPa

The shutdown mechanism only becomes active 2 minutes after system start

• The pump is automatically shut down after 3 piston strokes below the minimum pressure limit

Gradient capacity Isocratic or gradient (extendable to quaternary)

Profile Step, linear, convex and concave Resolution < 1 nL/min flow increments

7.8 Sample degasser

Material fluoropolymer

Resistance to sol-

vents

No restriction (apart from PFC)

Build-up time for

the vacuum

< 60 s

7.9 Sample preparation module (SPM)

Resistance to sol- No I

vents

No restriction

Switching dura-

typ.100 ms

tion

Operating pres-

sure

2.5 MPa (25 bar), valve function prevents damage at overpressure

7.10 Peristaltic pump

7.10 Peristaltic pump

Type 2-channel peristaltic pump

Rotating direction Counterclockwise/Clockwise rotation

Rotational speed 0...42 rpm in 7 stages at 6 rpm.

Pumping proper-

ties

0.3 mL/min at 18 rpm; with 6.1826.320 standard pump tubing.

Material of pump

tubings

recommended: Tygon Long Flex Life

7.11 Injection valve

Actuator time typ.100 ms

Max. operating

35 MPa (350 bar)

pressure

Material PEEK

7.12 Column thermostat

Type Peltier technique thermostat for two intelligent separation columns

Adjustable tem-

perature range

0...+80 °C, in increments of 0.1 °C

Heating Ambient temperature +50 °C

Cooling Ambient temperature -20 °C

Temperature \pm 0.2 °C

reproducibility

Stability < 0.05 °C

Heating up time < 30 minutes from 20 to 50 °C

Cooling time < 40 minutes from 50 to 20 °C

7 Technical specifications

7.13 High Capacity Metrohm Suppressor Module (MSM-HC)

Resistance to sol-

No restriction

vents

Switching dura-

typ.100 ms

tion

Operating pres-

2.5 MPa (25 bar), valve function prevents damage at overpressure

sure

7.14 Metrohm CO₂ suppressor (MCS)

Material fluoropolymer

Resistance to sol-

No restriction (apart from PFC)

vents

Vacuum

Working range Microprocessor-controlled / stabilized

Build-up time

< 30 s

after start

Capillary volume 400 µL

Recommended

0.1...1.0 mL

flow range

7.15 Conductivity measuring system

Type • Microprocessor-controlled Digital Signal Processing (DSP technol-

ogy)

Intelligent detector with 6 reference chromatograms

Measuring range 0...15000 μS/cm single range

Noise $< 0.1 \text{ nS at } 1 \mu\text{S/cm}$

νοίδε < 0.1 113 αξ 1 μ3/ς11

Deviations from the linearity

< 1 % for conductivity values greater than 1...16 μ S/cm (typical for

analyses with sequential suppression)

Drift < 0.2 nS/cm per hour

Measuring rate 10 measurements per second for optimum results without filtering

Resolution 0.0047 nS/cm

Baseline Noise < 0.2 nS/cm typical for sequential suppression

7.16 Mains connection

Conductivity detector

Cell volume 0.8 µL

Cell constantIndividual calibration data saved in the detector

■ adjustable range: 13.0...21.0 /cm

Electrodes Ring-shaped electrodes made from stainless steel

Materials in Chemically inert PCTFE

contact with

eluent

Maximum operating pressure 5.0 MPa (50 bar)

Cell tempera-

20...50 °C in increments of 5 °C

ture

Temperature < 0.001 °C

stability

Temperature 0...5 %/K adjustable, default 2.3 %/K

compensation

Heating up time < 30 minutes (40 °C)

7.16 Mains connection

Required voltage 100...240 V \pm 10 % (auto-sensing)

Required fre- $50...60 \text{ Hz} \pm 3 \text{ (auto-sensing)}$

quency

Power consump- ■ 65 W for typical analysis application

tion ■ 25 W standby (detector to 40 °C)

Power supply unit ■ Up to 300 W maximum, electronically monitored

• internal fuse 3.15 A

7 Technical specifications

7.17 Interfaces

USB

Input 1 USB upstream, type B (for connection to the PC)

Output 2 USB downstream, type A

MSB 2 MSB Mini Din 8-pin (female) (for Dosino, stirrer, remote lines, ...)



Caution

When connecting an instrument to the MSB connector you **must** switch off the 850 Professional IC .

Detector 2 DSUB-15-pin high density (female)

Column recogni-

tion

3 (including 2 in the column thermostat (see Chapter 3.17, page 59))

Leak sensor 1 jack plug

Further connec-

tions

■ 1 DSUB 15-pin (female)

7.18 Safety specification

Design / Test ■ EN/IEC/UL 61010-1

CSA-C22.2 No. 61010-1Degree of protection IP20

Protection class I

7.19 Electromagnetic compatibility (EMC)

Emission ■ EN/IEC 61326-1

EEN 55022 / CISPR 22EN/IEC 61000-6-3EN/IEC 61000-3-2

■ EN/IEC 61000-3-3

Immunity ■ EN/IEC 61326-1

■ EN/IEC 61000-4-2

EN/IEC 61000-4-3EN/IEC 61000-4-4

■ EN/IEC 61000-4-5

■ EN/IEC 61000-4-6

■ EN/IEC 61000-4-8

7.20 Weight

EN/IEC 61000-4-11EN/IEC 61000-4-14NAMUR: 2006

2.3 kg (with accessories)

7.20 Weight

1.850.2180 30.8 kg (without accessories)

1.850.9010 (con-

ductivity detector)

Transport carriage (rollers and han-

dle)

1.8 kg

8 Conformity and warranty

8 Conformity and warranty

8.1 Declaration of Conformity

This is to certify the conformity to the standard specifications for electrical appliances and accessories, as well as to the standard specifications for security and to system validation issued by the manufacturing company.

Name of commodity

850 Professional IC

The 850 Professional IC is an intelligent instrument for ion chromatography analysis.

This instrument has been built and has undergone final type testing according to the standards:

Electromagnetic compatibility

Emission: EN/IEC 61326-1: 2006,

EN 55011 / CISPR 11: 2003, EN/IEC 61000-6-3: 2006, EN/IEC 61000-3-2: 2006, EN/IEC 61000-3-3: 2005

Immunity: EN/IEC 61326-1: 2006, EN/IEC 61000-6-1: 2007,

EN/IEC 61000-4-2: 2001, EN/IEC 61000-4-3: 2006, EN/IEC 61000-4-4: 2004, EN/IEC 61000-4-5: 2001, EN/IEC 61000-4-6: 2001, EN/IEC 61000-4-11: 2004,

EN/IEC 61000-4-14: 2004, NAMUR: 2004

Safety specifications

EN/IEC 61010-1: 2001, UL 61010-1: 2004, CSA-C22.2 No. 61010-1: 2004, protection class I

It has also been certified by ElectroSuisse, a member of the International Certification Body (CB/IEC).



This instrument meets the requirements of the CE mark as contained in the EU directives 2006/95/EC (LVD), 2004/108/EC (EMC). It fulfils the following specifications:

EN 61326-1 Electrical equipment for measurement, control

and laboratory use – EMC requirements

EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use



Manufacturer

This instrument meets the requirements of the ETL Listed Mark for the North American market. It conforms to the electrical safety standards UL 61010-1 and CSA-C22.2 No. 61010-1. This product is listed in Intertek's Directory of Listed Products.

Metrohm Ltd., CH-9101 Herisau/Switzerland

Metrohm Ltd. is holder of the SQS-certificate ISO 9001:2000 Quality management system for development, production and sales of instruments and accessories for ion analysis.

Herisau, 27 October, 2008

D. Strohm

Vice President, Head of R&D

Ch. Buchmann

Vice President, Head of Production

Responsible for Quality Assurance

8.2 Quality Management Principles

Metrohm Ltd. holds the ISO 9001:2000 Certificate, registration number 10872-02, issued by SQS (Swiss Association for Quality and Management Systems). Internal and external audits are carried out periodically to assure that the standards defined by Metrohm's QM Manual are maintained.

The steps involved in the design, manufacture and servicing of instruments are fully documented and the resulting reports are archived for ten years. The development of software for PCs and instruments is also duly documented and the documents and source codes are archived. Both remain the possession of Metrohm. A non-disclosure agreement may be asked to be provided by those requiring access to them.

The implementation of the ISO 9001:2000 quality management system is described in Metrohm's QM Manual, which comprises detailed instructions on the following fields of activity:

Instrument development

The organization of the instrument design, its planning and the intermediate controls are fully documented and traceable. Laboratory testing accompanies all phases of instrument development.

8 Conformity and warranty

Software development

Software development occurs in terms of the software life cycle. Tests are performed to detect programming errors and to assess the program's functionality in a laboratory environment.

Components

All components used in the Metrohm instruments have to satisfy the quality standards that are defined and implemented for our products. Suppliers of components are audited by Metrohm as the need arises.

Manufacture

The measures put into practice in the production of our instruments guarantee a constant quality standard. Production planning and manufacturing procedures, maintenance of production means and testing of components, intermediate and finished products are prescribed.

Customer support and service

Customer support involves all phases of instrument acquisition and use by the customer, i.e. consulting to define the adequate equipment for the analytical problem at hand, delivery of the equipment, user manuals, training, after-sales service and processing of customer complaints. The Metrohm service organization is equipped to support customers in implementing standards such as GLP, GMP, ISO 900X, in performing Operational Qualification and Performance Verification of the system components or in carrying out the System Validation for the quantitative determination of a substance in a given matrix.

8.3 Warranty (guarantee)

Metrohm guarantees that the deliveries and services it provides are free from material, design or manufacturing errors. The warranty period is 36 months from the day of delivery; for day and night operation it is 18 months. The warranty remains valid on condition that the service is provided by an authorized Metrohm service organization.

Glass breakage is excluded from the warranty for electrodes and other glassware. The warranty for the accuracy corresponds to the technical specifications given in this manual. For components from third parties that make up a considerable part of our instrument, the manufacturer's warranty provisions apply. Warranty claims cannot be pursued if the Customer has not complied with the obligations to make payment on time.

During the warranty period Metrohm undertakes, at its own choice, to either repair at its own premises, free of charge, any instruments that can be shown to be faulty or to replace them. Transport costs are to the Customer's account.

8.3 Warranty (guarantee)

Faults arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc. are expressly excluded from the warranty.

9 Accessories

9 Accessories



Caution

Subject to change without notice!

9.1 Scope of delivery

2.850.2180 850 Professional IC - Anion - MSM-HC - MCS - Prep 3

Qty.	Order no.	Description
1	1.850.2180	850 Professional IC Anion – MSM-HC – MCS – Prep 3
1	6.2122.0x0	Mains cable with C13 line socket IEC-60320-C13
	Cable plug accord	ding to customer requirements.
	Switzerland:	Type SEV 12 6.2122.020
	Germany,:	Type CEE(7), VII 6.2122.040
	USA,:	Type NEMA/ASA 6.2122.070
1	1.850.9010	IC Detector MF
4	6.1602.150	Bottle neck attachment / GL 45 - 3 x UNF 10/32

For connecting capillary tubing 1/16 in. (=1.6 mm). Used for MSM auxiliary solutions and in inline dialysis.

Material: Plastic



1 6.1602.160 Eluent bottle attachment GL 45

For eluent bottles; with connections for drying tube and aspiration tubing.

Opening ground joint: A-14/15



9.1 Scope of delivery

Qty. Order no. Description

4 6.1608.020 Glass bottle / 1000 mL / GL 45

Bottle for auxiliary solutions

 Width (mm):
 96

 Height (mm):
 223

 Volume (mL):
 1000



1 6.1608.070 Eluent bottle / 2 L / GL 45

Material: Clear glass Height (mm): 262 Volume (mL): 2000



1 6.1609.000 Adsorbing tube, large and bent

For filling with adsorber material.

Material: Glass
Height (mm): 129
Inner diameter (mm): 32
SGJ size: B-14/15



2 6.1803.020 PTFE capillary 0.97 mm i.d. / 5 m

For all IC instruments

Material: PTFE
Outer diameter (mm): 1.57
Inner diameter (mm): 0.97
Length (m): 5



Qty.Order no.Description16.1803.040PTFE capillary 0.5 mm i.d. / 1 m

Capillary for sample handling in IC.

Material: PTFE
Outer diameter (inches): 1/16
Inner diameter (mm): 0.5
Length (m): 1



1 6.1807.010 Y-connector for tubing 6-9 mm i.d.

Connector for waste tubing



1 6.1815.010 Spiral band 0.5 m

For holding together different cables or tubing. Length (m): 0.5



Qty. Order no. Description 2 6.1816.020 Silicone tubing 6 mm i.d., 1 m For waste tubing. Material: Silicone rubber Outer diameter (mm): 9 Inner diameter (mm): 6 Length (m): 1

2 6.1826.320 Pump tubing LFL (orange/yellow), 3 stoppers

For suppressor solutions, acceptor solution in Inline Dialysis and for Inline Ultrafiltration



2 6.1826.360 Pump tubing LFL (white/white), 3 stoppers

For Sample Processors



1 6.2023.020 Clip for SGJ 14/15

Clip for SGJ 14/16

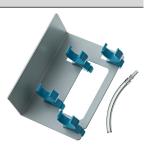
Material: POM



Qty. Order no. Description

1 6.2057.080 Adsorption cartridge holder (ProfIC)

Holder to install adsorption cartridges in Professional IC Instruments



1 6.2151.020 Cable USB A - USB B 1.8 m

USB connecting cable

Length (m): 1.8



1 6.2322.010 PRIMUS multi anion standard solution: Promo

1 6.2617.010 Tool for piston seal

For removing and assembling the piston seal for all standard pump heads



2 6.2621.000 Adjustable wrench

Max. opening: 20 mm. For IC instruments Length (mm): 150



Qty. Order no. Description 1 6.2621.030 Hexagon key 4 mm

Length (mm): 73



1 6.2621.050 1/4 in. wrench

For 1/4 in. screws. For IC instruments Length (mm): 73



1 6.2621.080 Capillary cutter

For plastic capillaries. Used with IC instruments Length (mm): 118



1 6.2621.100 Hexagon key 3 mm

Hexagon key 3 mm for IC Sample Processors Length (mm): 73



Qty. Order no. Description

1 6.2626.000 Drain nozzle (ProfIC)

Drain nozzle for Professional IC instruments, for mounting on front panel



2 6.2739.000 Wrench

For tightening connectors Length (mm):

68



1 6.2743.080 Stopper for overflow (ProfIC), 5 pieces

For Professional IC instruments



1 6.2744.014 Pressure screw 2x

With UNF 10/32 connection. For the connection of PEEK capillaries

Material: PEEK Length (mm): 26



Qty. Order no. Description

1 6.2744.020 Luer/UNF coupling

For IC instruments

Material: PEEK Length (mm): 19



1 6.2744.030 Nozzle/UNF 10/32 coupling

Connection pressure screw and pump tubing. 4 pieces. For IC instruments with peristaltic pumps

Material: PEEK Length (mm): 21.3



3 6.2744.040 2 x UNF 10/32 coupling

For connecting 1/16 in. capillaries. For IC instruments

Material: PEEK Length (mm): 24



Qty. Order no. Description

3 6.2744.070 Pressure screw short

Short version. With UNF 10/32 connection. 5 pieces. For the connection of PEEK capillaries

Material: PEEK Length (mm): 21



2 6.2744.090 Pressure screw long

Long version. With UNF 10/32 connection. 2 pieces. For the connection of PEEK capillaries (MCS and Sample degasser)

Material: PEEK



4 6.2744.180 Pump tubing connector with security lock and filter

For the connection of a pump tubing and a capillary with built-in filter

Material: PEEK



1 6.2744.210 Tubing adaptor for aspiration filter (ProfIC)

For Professional IC instruments



Qty. Order no. Description

1 6.2816.020 Syringe 10 mL with Luer connection

For various applications in IC and VA

Material: PP
Length (mm): 102
Volume (mL): 10



1 6.2816.040 Purging needle

With PTFE tubing and Luer connection. For syringes. For aspirating eluents.



1 6.2821.090 Aspiration filter

Pore size 20 $\mu m,$ set of 5 pieces. For 6.1834.000 Aspiration tubing and 6.1821.040 and 6.1821.050 Filter tubes.

Material: PE
Outer diameter (mm): 9.5
Length (mm): 35.5



1 6.2821.130 Spare filter for inline filter

Spare filters for inline filter.



Qty.	Order no.	Description	
1	6.2837.000	CO ₂ adsorber cartridge	

Adsorber cartridge for purifying the air.



2 6.2837.010 H₂O adsorption cartridge

To ${\rm CO_2}$ Suppressor. Water adsorption cartridge for the aspirated air.



1 8.850.8025EN Manual for 850 Professional IC, 2.850.2180 – Anion – MSM-HC – MCS – Prep 3, english



9.2 Optional accessories

9.2 Optional accessories

2.850.2180 850 Professional IC - Anion - MSM-HC - MCS - Prep 3

Order no. Description

6.2617.040 Tool for piston seal, macro

For removing and assembling the piston seal for all macro pump heads

6.2741.040 PE/PTFE piston seal, macro

For all macro pump heads

6.2824.130 Macro pump head PEEK

Macro pump head for intelligente IC instruments, flow range 0.1...20 mL/min, maximum pressure 12.5 MPa.

Material: PEEK (metal-free)



6.6059.112 MagIC Net[™] 1.1 Professional CD: 1 license

Professional PC program for controlling intelligent Professional IC systems, Compact IC instruments and their peripherals such as Professional Sample Processors, 800 Dosino, 771 Compact Interface, etc. The software permits control, data acquisition, evaluation and monitoring as well as report generation for ion chromatographic analyses. MagIC Net™ comprises the following features: graphic user interface for routine operations, extensive database programs, method development, configuration and manual system control, highly flexible user administration, efficient database operations, extensive data export functions, individually configurable report generator, control and monitoring of all system components and the chromatographic results. MagIC Net™ complies with FDA regulation 21 CFR part 11 as well as GLP. Dialog languages: German, English, French, Chinese, Korean, Japanese and more. 1 license.



6.6059.113 MagIC Net[™] 1.1 Multi CD: 3 licenses

Professional PC program for controlling intelligent Professional IC systems, Compact IC instruments and their peripherals such as Professional Sample Processors, 800 Dosino, 771 Compact Interface, etc. The software permits control, data acquisition, evaluation and monitoring as well as report generation for ion chromatographic analyses. MagIC Net™ comprises the following features: graphic user interface for routine operations, extensive database programs, method development, configuration and manual system control; highly flexible user administration, efficient database operations, extensive data export functions, individually configurable report generator, control and monitoring of all system components and the chromatographic results. MagIC Net™ complies with FDA regulation 21 CFR part 11 as well as GLP. Dialog languages: German, English,



Order no. Description

French, Chinese, Korean, Japanese and more. Client-Server version with 3 licenses.

6.9988.503 Validation Documentation for 850 (English / German)

- CD



8.838.4603

Index

Index

Numbers/Symbols	
6.2821.090 aspiration filter	32
6.2821.130 filter	93
<u>A</u>	
Accessories 13	 33
Optional 14	44
Adsorption cartridges	
Connection	66
Ambient conditions 12	
Aspiration filter 6.2821.090	
Aspiration tubing for eluent	
7 Spiration tability for clacific	,,
В	
Baseline	_
Conditioning	78
Unstable	
Blockage	,,
Conductivity detector 1	13
Blood	
DIOOG	,,
C	
Cable feed-throughs	 29
Capillaries	
Installation	10
Capillary feed-throughs	
Carry-over	
Cartridges	ככ
Connection	56
Changing	20
	กา
Eluent	52
Cleaning	^^
MSM-HC	
SPM	99
Valves of the high pressure	~~
pump	
CO ₂ adsorption cartridge	
Replacement 1	12
Column	
see also "Separation column"	
Column recognition 12	27
Column thermostat	
Column thermostat 12	
Installation!	
Conditioning	78
Conductivity detector	
Cable connector	24
Capillary connector	58
Cell constant 12	26

Cell volume 126				
Maintenance 113				
Positioning 24				
Conductivity measuring system				
Technical data 125				
Connections				
Installation 19				
Connector				
Mains 126				
Contamination				
High pressure pump 82				
Valves in the high pressure				
pump 83				
Contamination MSM-HC				
Heavy metals 107				
Crystallization				
High pressure pump 82				
D				
Deaerating				
High pressure pump 40				
Purge valve 37				
Degasser				
Eluent degasser 36				
Sample degasser 45				
· -				
Degassing				
Eluent				
Degree of protection 127				
Design				
Safety specification 127				
Detector				
Cable connector 24				
Conductivity detector 68				
Interface 127				
Positioning 24				
Dilution 95				
Dimensions 122				
Door				
Drainage tubing				
Installation				
1115tallati011 27				
E				
Electronic and the control of the co				
Electromagnetic compatibility . 127				
Electrostatic charge 6				
Eluent				
Aspiration 32				
Production 81				
Eluent bottle				
Figure 35				

	Installation	32
	Operation	82
Elue	ent degasser	
	Installation	36
	Technical specifications 1	
	C 1	
	ssion 1	
	ilibration	
Equ	IIIDIation	/ C
F		
Fee	d-throughs	
	Capillaries	29
Fill		
	Injection valve	59
Filte	-	
	see also "inline filter"	42
Filte	er 6.2821.090	
	Aspiration filter	27
	v fluctuations	
	v increment 1	
	v range 1	
	v rate 1	
riec	quency 1	20
G		
Gas	36,	45
GLP	⁾ 1	15
Gua	arantee 1	31
	ard column	
	Installation	72
	Rinsing	
H H₃C	adsorption cartridge	67
2 -	Regeneration 1	
Har	ndle	
	ıting	- '
	see also "Column thermostat	. 11
Hea	ivy metals	
	Contamination of the MSM-I	НС
	Impurity of the SPM	
Hial	h Capacity Metrohm Suppres	
_	dule	اں
IVIO	ouie see also "MSM-HC"	67
110-1		02
HIG	h pressure pump	~-
	Installation	
	Maintenance	
	Protection 26	27

Index

Technical specifications 122	. USB 127	N
Tubing connection 37	Interfaces 127	Neutralization
Valves 91		SPM 49
Housing 122		Noise 125
Humidity 121		
	<u>L</u>	0
<u>I</u>	Leak 83	Oil95
IC column	Leaking piston seals 83	Operation
see also "Separation column"	Leak sensor	MSM-HC 106
		Peristaltic pump 103
Immunity 127	Installation 26	Sample degasser 97
Impurity MSM-HC	Interface 127	SPM 97
Organic 107		Optional accessories 144
Impurity SPM	Leak-tightness 77, 78	Organic impurities
Heavy metals 98		MSM-HC 107
Organic 98		SPM 98
Initial installation 13	3	Overview of the instrument 8
Inject	<u>M</u>	Rear 10
Injection valve 59		_
Injection valve		P
Fill 59		PC connector
Inject 59	Mains voltage 5	Peristaltic pump
Installation 57, 124		Installation 53
Maintenance 105	•	Maintenance
Protection 105	3	Operation 103
Inline filter 42	Injection valve 105	Principle 52
Inline sample preparation 95		Technical specifications 124
Installation	Peristaltic pump 103	Piston seal 83
Column thermostat 59	•	Pistons of the high pressure pump
Conductivity detector 68		
Drainage tubing 27	Material 122	Power consumption 126
Eluent bottle 32		Power supply unit 126
Eluent degasser 36		Precipitates 82
Guard column 72	3	Pressure limit
High pressure pump 37		Pressure range 123
Initial installation 13		Pressure screws
Injection valve 57, 124		Connection 20
Leak sensor 26	Measuring range 125	Protection
MCS 65		Injection valve
MSM-HC 62		Inline filter
Peristaltic pump 53		SPM 97
Pulsation damper 43		Protection
Pump tubings 53		MSM-HC 106
Sample degasser 45		Protection class 127
Sample preparation module	Installation 62	Pulsation 83
(SPM) 46		Pulsation damper
Separation column 74		Installation 43
Verbindungen 19		Pump head
Installation diagram 16		Maintenance 83
Instrument	Replacing parts 110	Pump tubing
Connecting 71		Overview 104
Front 8	Technical specifications 125	Pump tubings
Interface		Installing 53
MSB 127	,	Service life
		Purge valve 37

Index

Quality Management 115 Installation 74 Technical specifications R Protection 2, 44, 114 Eleunt degasser 122 Regeneration 79 Separating efficiency 113 Semple generation module (SPM) 124 Sample preparation module (SPM) 125 Sample preparation module (SPM) 123 Sample preparation module (SPM) 123 Sample preparation module (SPM) 123 Technical specifications 124 Sample preparation module (SPM) 123 Technical specifications 124 Sample preparation module (SPM) 123 Sample preparation module (SPM) 123 Sample preparation module (SPM) 123 Technical specifications 123 Technical specifications 123 Sample preparation module (SPM) 123 Technical specifications 123 Sample preparation module (SPM) 125 Safety specifications 127 Tensper true 95 Sample material specifications 123 Sample specifications 123 Sample specifications 123 Samp	Q	Separation column	Sample degasser 123
Reference conditions 121 Regeneration 114 High pressure pump 122 Reference conditions 121 Rinsing .75 Peristaltic pump .124 Regeneration .79 Separating efficiency .113 Sample preparation module .98 SPM .98 Service .5,79 Technical Specifications Rinsing .75 Service Agreement .115 MSM-HC .125 Conductivity detector .113 Shutting down .80 Technical Specifications Rinsing .73 SPM Temperature .121 Guard column .73 SPM Temperature .121 Sample path .95 Cleaning .98 Safety specification .127 Reparation column .75 Installation .46 Safety specification .27 Thermostat see also "Column thermostat" .20 Transport thermostat <td>Quality Management 115</td> <td>Installation 74</td> <td>Technical specifications</td>	Quality Management 115	Installation 74	Technical specifications
Reference conditions 121 Rinsing 75 Peristaltic pump 124 Regeneration 79 Separating efficiency 113 Sample preparation module MSM-HC 107 Storage 114 (SPM) 123 SPM 98 Service 5, 79 Technical specifications Rinsing Service Agreement 115 MSM-HC 125 Gonductivity detector 113 Shutting down 80 Temperature 121 Guard column 73 SPM Temperature 121 125 Flagger 103 Cation exchange 48 Safety specification 127 Sample path .95 Cleaning .99 Thermostat see also "Column thermostat" Rising time .96 Maintenance .97 Thermostat see also "Column thermostat" Sinsing time .96 Maintenance .97 Transfer time .95 Ricial pressure .82 Neutralization .97 Transfer time .95		Protection 2, 44, 114	Eluent degasser 122
Reference conditions 121 Rinsing .75 Peristaltic pump 124 Regeneration .79 Separating efficiency 113 Sample preparation module MSM-HC 107 SPM .98 Service .5,79 Technical Specifications Rinsing Service Agreement .115 MSM-HC .125 Conductivity detector .113 Shutting down .80 Technical Specifications Guard column .73 SPM Temperature .121 Formation column .75 Cleaning .99 Thermostat Saparation column .75 Installation .46 see also "Column thermostat" Rise in pressure .82 Neutralization .49 Transfer time .95 Rollers .21 Operation .97 Transfer time .95 Safety instructions .5 Replacing parts .101 Toling pump See also "Peristaltic pump" .52 Sarple path specification .127 Technical specifications .23 Transport		Regeneration 114	High pressure pump 122
Regeneration 79 MSM-HC Separating efficiency 113 Storage Sample preparation module (SPM) 123 Sample preparation module (SPM) 124 Service 5, 79 Technical Specifications 125 MSM-HC 126 MSM-HC 125 MSM-HC 125 MSM-HC 125 MSM-HC 125 MSM-HC 125 MSM-HC 126 MSM-HC 127 MSM-HC	Reference conditions 121	_	
MSM-HC 107 Storage 114 (SPM) 123 SPM 98 Service 5, 79 Technical Specifications Rinsing Service Agreement 115 MSM-HC 125 Conductivity detector 113 Shutting down 80 Temperature 121 Guard column 73 SPM Test 121 Pump tubings 103 Cation exchange 48 Safety specification 127 Sample path 95 Cleaning 99 Thermostat see also "Column thermostat" 127 Test pressure 82 Neutralization 46 see also "Column thermostat" 127 Tensing time 95 Maintenance 97 Transport mostat 120 121 Operation 97 Reglens at a current memostat 121 121 Yes also "Column thermostat" 121 121 121 Yes also "Column thermostat" 121 122 123 124 124 124 124 124 124 124 125 125 1	Regeneration 79	=	
SPM 98 Service 5, 79 Technical Specifications Rinsing Service Agreement 115 MSM-HC 125 Conductivity detector 113 Shutting down 80 Temperature 121 Guard column 73 SPM Test 121 Pump tubings 103 Cation exchange 48 Safety specification 127 Sample path 95 Cleaning 99 Thermostat 127 Rise in pressure 82 Neutralization 46 see also "Column thermostat" Rise in pressure 82 Neutralization 49 Transfer time 95 Rise in pressure 82 Neutralization 49 Transport 121 Seles in pressure 82 Neutralization 97 Transport 121 Seles in pressure 82 Neutralization 97 Transport 121 Safety specification 123 Substancian 97 Transport 121 Safety specification	MSM-HC 107		
Service Agreement	SPM 98	_	Technical Specifications
Conductivity detector 113	Rinsing	Service Agreement	
Segmant Segm	Conductivity detector 113	_	Temperature 121
Sample path 95 Cleaning 99 Thermostat Separation column 75 Installation 46 see also "Column thermostat" Rinsing time 96 Maintenance 97 59 Rise in pressure 82 Neutralization 49 Transfer time 95 Rollers 21 Operation 97 Transport 121 Semily Protection 97 Rollers 21 Safety instructions 5 Replacing parts 101 Tubing pump 26 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Sample Standards 127 Technical specifications 123 Tubings Installation 19 Carry-over 95 Start-up 76 Sample loop 59 Storage 121 U USB 127 Sample degasser Installation 45 Operation 106 Operation 72 V Sample loop	Guard column 73	_	•
Sample path 95 Cleaning 99 Thermostat Separation column 75 Installation 46 see also "Column thermostat" Rinsing time 96 Maintenance 97 59 Rise in pressure 82 Neutralization 49 Transfer time 95 Rollers 21 Operation 97 Transport 121 Second Safety instructions 5 Reglacing parts 101 Rollers 21 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubing pump 52 Safety specification 127 Technical specifications 123 Tubings Installation 19 Carry-over 95 Stard-up 76 Stard-up 76 Stard-up 76 Stard-up 76 Stard-up 76 Storage 121 U USB 127 Sample loop 59 Suppressor <td>Pump tubings 103</td> <td>Cation exchange 48</td> <td>Safety specification 127</td>	Pump tubings 103	Cation exchange 48	Safety specification 127
Separation column 75 Installation 46 see also "Column thermostat" Rinsing time 96 Maintenance 97 59 Rise in pressure 82 Neutralization 49 Transfer time 95 Rollers 21 Operation 97 Transport 121 Secould be specified to safety shutdown 123 Switching 98 Transport locking screws 26 Safety specification 127 Technical specifications 123 Tubing pump See also "Peristaltic pump" 52 Sample Standards 127 Tubings 18 Installation 19 Carry-over 95 Standards 127 Tubings 19 Sample loop 59 Storage 121 U Sample degasser Maintenance 106 Operation 10 Connectors 11 Installation 45 Operation 72 V V Sample loop 59 T Technical data 123	Sample path 95	<u> </u>	· ·
Rinsing time 96 Maintenance 97 59 Rise in pressure 82 Neutralization 49 Transfer time 95 Rollers 21 Operation 97 Rollers 21 Safety successor Regeneration 97 Rollers 21 Safety instructions 5 Regeneration 98 Transport 121 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubing pump See also "Peristaltic pump" 52 Sample Standards 127 Tubings Installation 19 Carry-over 95 Start-up 76 Sample loop 59 Storage 121 U USB 127 Sample degasser Maintenance 106 Operation 106 Operation 106 Operation 106 Operation 106 Operation 106 Operation 126 Value<	Separation column 75		see also "Column thermostat"
Rise in pressure 82 Neutralization 49 Transfer time 95 Rollers 21 Operation 97 Transport 121 Safety instructions 5 Regeneration 98 Transport locking screws 26 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubing pump 5ee also "Peristaltic pump" 52 Sample specification 127 Technical specifications 123 Tubing pump 5ee also "Peristaltic pump" 52 Sample specification 127 Technical specifications 123 Tubings Installation 19 Carry-over 95 Standards 127 Installation 19 Carry-over 95 Start-up 76 Sample loop 59 Storage 121 U Sample degasser Maintenance 106 Connectors 11 Operation 72 V Sample loop	Rinsing time96		
Rollers 21 Operation 97 Transport 121 S Protection 97 Rollers 21 Safety instructions 5 Regeneration 98 Transport locking screws 26 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubings See also "Peristaltic pump" 52 Sample Carry-over 95 Standards 127 Tubings Installation 19 Carry-over 95 Start-up 76 Suppressor Installation 19 Mediation 19 Mediation 19 Mediation 19 Mediation 19 Mediation 10 Connectors 11 Mediation 12 V V V V V V V V <td>Rise in pressure 82</td> <td></td> <td></td>	Rise in pressure 82		
S Protection 97 Rollers 21 Safety instructions 5 Regeneration 98 Transport locking screws 26 Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubings Sample Standards 127 Tubings Sample loop 59 Stard-up 76 Sample loop 59 Storage 121 USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Operation 00 Connectors 11 Sample loop 59 T Technical data 126 Valuacum pump 26 Sample path Technical data 124 Validation 115 Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of	Rollers 21		
S Regeneration 98 Transport locking screws 26 Safety instructions .5 Replacing parts 101 Tubing pump .5 Safety shutdown 123 Switching .97 See also "Peristaltic pump" .52 Safety specification 127 Technical specifications .123 Tubings Sample Standards .127 Tubings Installation .19 Carry-over .95 Start-up .76 .76 .76 .76 .76 .77 .76 .77 </td <td></td> <td>•</td> <td>'</td>		•	'
Safety instructions 5 Replacing parts 101 Tubing pump See also "Peristaltic pump" 52 Tubings 123 Tubings Installation 19 See also "Peristaltic pump" 52 Tubings Installation 19 Vubings Installation 19 See also "Peristaltic pump" 52 Tubings Installation 19 Vubings Installation 19 Vubings Installation 19 Vubings Installation 12 Vubings Installation 15 Yubings<	S		
Safety shutdown 123 Switching 97 See also "Peristaltic pump" 52 Safety specification 127 Technical specifications 123 Tubings Sample Standards 127 Installation 19 Carry-over 95 Start-up 76 Storage 121 U Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Connectors 11 Operation 97 Switching on 72 V Technical data 123 Technical data Value Sample loop 59 T Protection 26 Sample path Technical data 124 Value Value Sample preparation 95 Column thermostat 124 Valve see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump 126 <td>Safety instructions 5</td> <td>-</td> <td></td>	Safety instructions 5	-	
Safety specification 127 Technical specifications 123 Tubings Sample Standards 127 Installation 19 Carry-over 95 Start-up 76 76 Sample loop 59 Storage 121 U Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Connectors 11 Operation 97 Switching on 72 V Technical data 123 Vacuum pump 26 Sample loop 59 Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage	Safety shutdown 123		
Sample Standards 127 Installation 19 Carry-over 95 Start-up 76 Sample loop 59 Storage 121 U Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Connectors 11 Operation 97 Switching on 72 V Technical data 123 Technical data Validation 115 Sample path Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Safety specification 127		
Carry-over 95 Start-up 76 Sample loop 59 Storage 121 U Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Connectors 11 Operation 97 Switching on 72 V Technical data 123 Vacuum pump Protection 26 Sample loop 59 T Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Interfaces 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Sample	•	_
Sample loop 59 Storage 121 U Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Vacuum pump Vacuum pump Technical data 123 Technical data Validation 11 Sample loop 59 T Protection 26 Sample path Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Carry-over 95		
Transfer time 95 Suppressor USB 127 Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Operation 97 Switching on 72 V Technical data 123 Vacuum pump Vacuum pump Sample loop 59 Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Voltage 126 Screws MCS 125 W	Sample loop 59	•	U
Sample degasser Maintenance 106 Connectors 11 Installation 45 Operation 106 Operation 97 Switching on 72 V Technical data 123 Technical data Valcuum pump Sample pop 59 Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Transfer time 95		USB 127
Installation	Sample degasser	• •	
Operation 97 Switching on 72 V Technical data 123 Yacuum pump Sample loop 59 T Protection 26 Sample path Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Voltage 126 Screws MCS 125 W	Installation 45		
Technical data 123 Vacuum pump Sample loop 59 T Protection 26 Sample path Technical data Validation 115 Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Voltage 126 Screws MCS 125 W	Operation 97		V
Sample loop	Technical data 123	3 Vite i i i g 3 i i i i i i i i i i i i i i i	Vacuum pump
Sample path Rinsing 95 Column thermostat 124 Valve Sample preparation 95 Conductivity measuring system see also "Injection valve" 57 Sample preparation module (SPM) Installation 46 Detector 127 Technical specifications 123 Interfaces 127 Voltage 99 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 Valve	Sample loop 59	т	
Sample preparation	Sample path	Technical data	
Sample preparation	Rinsing 95	Column thermostat 124	Valve
Sample preparation module (SPM) 125 Valves of the high pressure pump Installation 46 Detector 127 91 Technical specifications 123 Interfaces 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Sample preparation 95		see also "Injection valve" 57
Installation 46 Detector 127 91 Technical specifications 123 Interfaces 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W			•
Technical specifications 123 Interfaces 127 Voltage 126 Scope of delivery 133 Leak sensor 121 Screws MCS 125 W	Installation 46		•
Scope of delivery 133 Leak sensor	Technical specifications 123		
Screws MCS	•		g 120
1710			W
	Connection 20	Reference conditions 121	Warranty 131