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838 Advanced Sample Processor

Program version 5.838.0012

Installation Instructions

8.838.1313 09.2005 / dm

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Although all the information given in these instructions has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please inform the author at the address given above.

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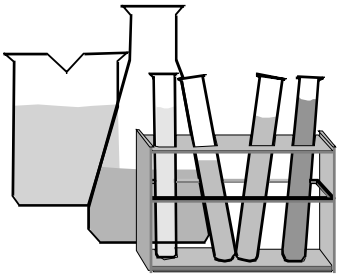


1 Introduction

This Chapter offers you an initial overview of the Metrohm 838 Advanced Sample Processor and its instrument versions. It tells you how you can use this versatile instrument and familiarises you with the most important operating controls.

1.1 Instrument description

1.1.1 Scope of application of the 838 Advanced Sample Processor

The Metrohm 838 Advanced Sample Processor is an instrument with diverse applications and is designed specifically for sample preparation in ion chromatography. Thanks to its flexibility however, it can also be used for other tasks. Online filtration, dialysis, preparation of dilutions, sample enrichment, inline calibration and partial loopfill etc. are techniques which can be used easily with the 838 Advanced Sample Processor. The entire range of tasks in sample preparation can be automated to save time.

Thanks to the very extensive communication options, the Sample Processor operates not only together with the broad range of Metrohm instruments via the parallel remote interface and serial RS232 interface. Any instruments featuring a suitable communication interface can be coordinated with this instrument.

Interchangeable standard sample racks are available for many vessel sizes. Freely selectable "special beaker" positions can be used on each rack.

Equipping with a 786 Swing Head with robotic arm allows any point on a sample rack to be approached. This means that the number of samples (max. 999 rack positions) and arrangement of the samples on the sample rack can be selected virtually at will. Special customer-specific racks for individual needs can be manufactured on request.

1.1.2 Instrument models and available versions

There are various models and available versions of the Metrohm 838 Advanced Sample Processor with various accessories.

Instrument models

- 838 Advanced Sample Processor with Swing Head, peristaltic pump and 2 pump connections
- 838 Advanced Sample Processor with Swing Head, peristaltic pump, injection valve, and 2 pump connections

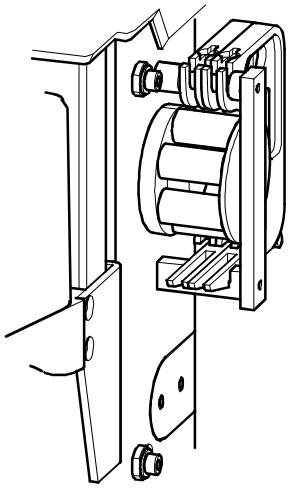


Figure 1 Models 2.838.0x10 without injection valve

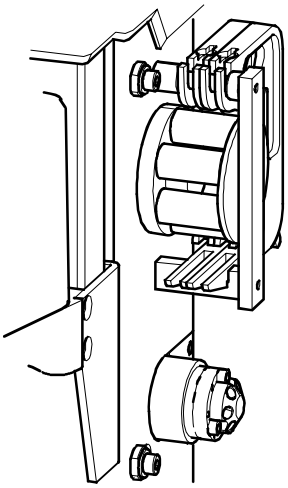


Figure 2 Models 2.838.0x20 with injection valve

Tower with 786 Swing Head + peristaltic pump + 2 external pump connections + 1 stirrer connection	Tower with 786 Swing Head + peristaltic pump + injection valve + 2 external pump connections + 1 stirrer connection
Chassis with 3 MSB sockets for dosing drive and/or stirrer + remote socket (25-pin) + RS232 connection (9-pin) + keypad connection	Chassis with 3 MSB sockets for dosing drive and/or stirrer + remote socket (25-pin) + RS232 connection (9-pin) + keypad connection

Table 1 Instrument models

Available versions

2.838.0010	**Advanced IC Sample Processor** Model without injection valve, without keypad, with standard accessories
2.838.0020	**Advanced IC Injection Sample Processor** Model with injection valve, without keypad, with standard accessories
2.838.0110	**Advanced IC Dialysis Sample Processor** Model without injection valve, without keypad, with dialysis accessories
2.838.0120	**Advanced IC Dilution Sample Processor** Model with injection valve, without keypad, with accessories for sample dilution
2.838.0210	**Advanced IC Ultrafiltration Sample Processor** Model without injection valve, without keypad, with filtration accessories
2.838.0310	**Advanced VA Sample Processor** Model without injection valve, with keypad, with VA accessories

Table 2 Available versions

The 2.838.00xx and 2.838.02xx versions (no keypad) are intended as ion chromatography systems, controlled by «IC Net».

The 2.838.0310 version (with keypad) is the stand-alone system version for voltammetric applications. Sample treatment is controlled by instrument methods of the Sample Processor.

«IC Net 2.3» (Service release 3 or later) sets a parameter in the 838 Advanced Sample Processor, which forces the Sample Processor to reset all of it's device settings and delete all stored methods on start-up (RAM init). This behavior is intended and required for controlling the Sample processor with «IC Net».

If a 838 Advanced Sample Processor is to be used as a stand-alone system with keypad control and instrument methods, which previously was controlled by «IC Net 2.3», the setting mentioned above has to be switched off beforehand. In «IC Net» uncheck the check box "Autoinit" which is accessible after right-clicking the Sample Processor icon in the working system.

1.2 Information about this Installation Instructions

1.2.1 Note

Attention!
Please study these Installation Instructions carefully before you start to use the Instrument. The instructions contain information and warnings that must be observed by the user in order to guarantee the safe use of the instrument. Please keep these instructions near the instrument so that they are always to hand when required.

1.2.2 Notation and pictograms

The following notation and pictograms are used in these Instructions:

9	**Control element, instrument element**
<OK>	**Button, Key**
	**Danger/Warning** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components by electricity.
	**Danger/Warning** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components.
	**Attention** This symbol indicates important information that you should read before continuing.
	**Information** This symbol indicates additional information and tips which may be of particular use to you.

1.3 Parts and controls

1.3.1 Overall view

Safety note

The safety guard **2** must always be fitted before operating an 838 Advanced Sample Processor.

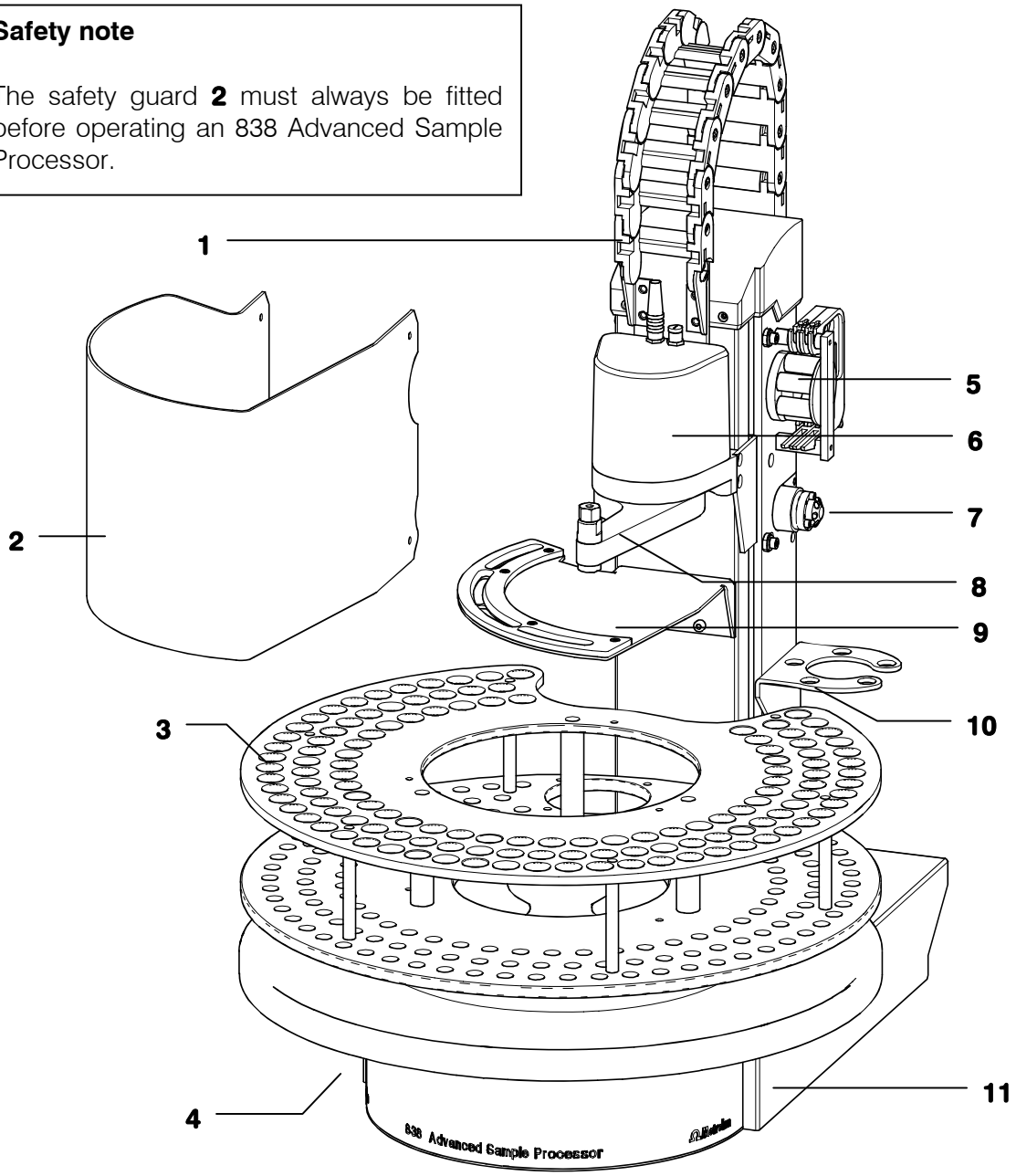


Figure 3 Overall view

1	**Guide chain**
2	**Safety guard/splash protection**
3	**Sample rack**
4	**Stirrer rail**
5	**Peristaltic pump**
6	**Swing Head**
7	**Injection valve ***
8	**Robotic arm** with needle adapter**
9	**Retention plate ***
10	**Holder for ultrafiltration cell *****
11	**Chassis**

* optional, depending on available version
** robotic arm model 6.1462.030
*** depending on available version, holder for ultrafiltration cell/dialysis cell or Dosino holder

1.3.2 Rear panel

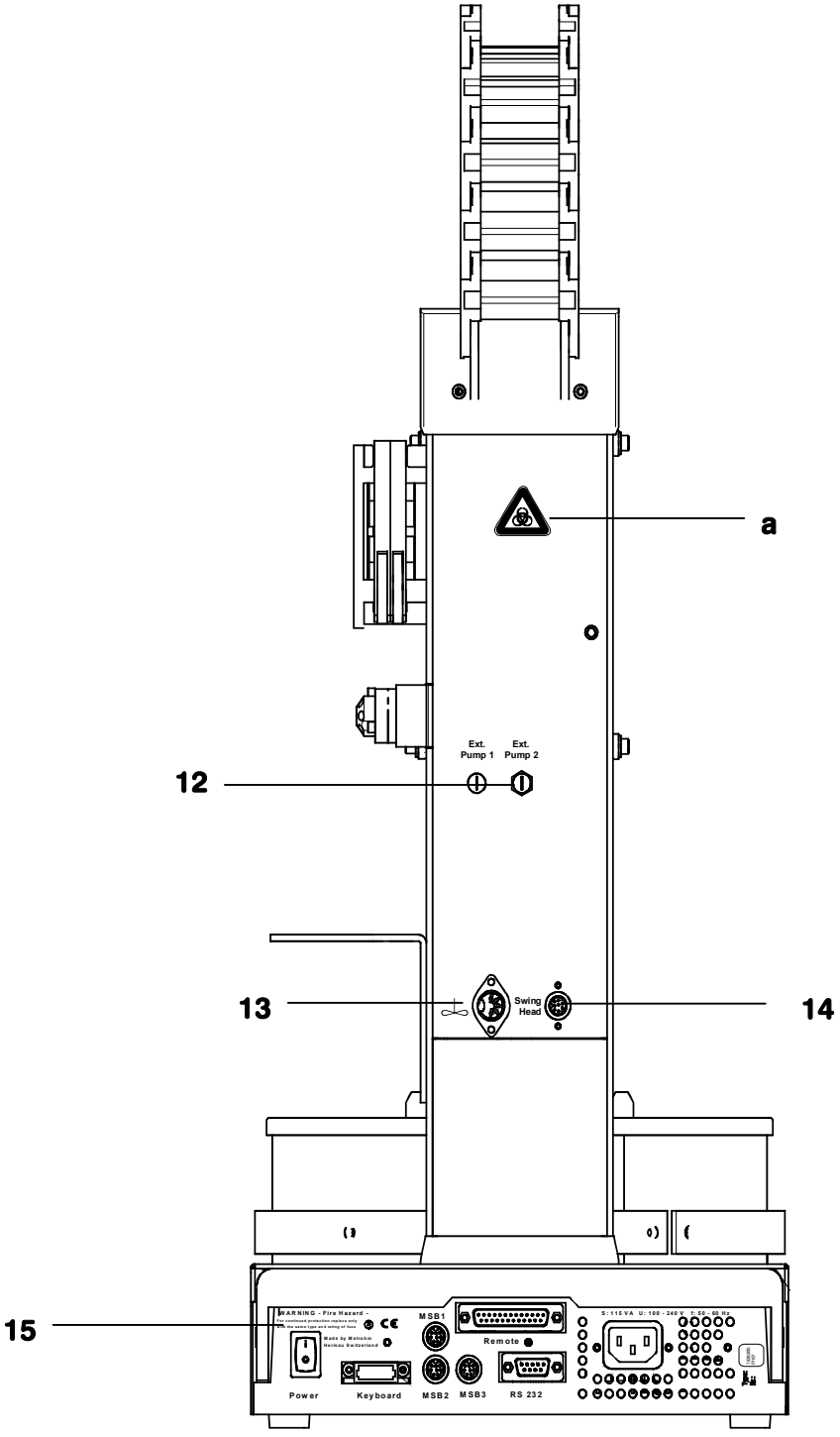


Figure 4 Rear panel

12	**Pump connections M8 (external)** for 772 or 823 pump models
13	**Stirrer connection** for 802 rod stirrer or 741 magnetic stirrer
14	**Connection socket for the 786 Swing Head**
15	**Connection panel**
a	**Warning: Biohazard** See *Chapter 2.3 Personal protection*

1.3.3 Connections

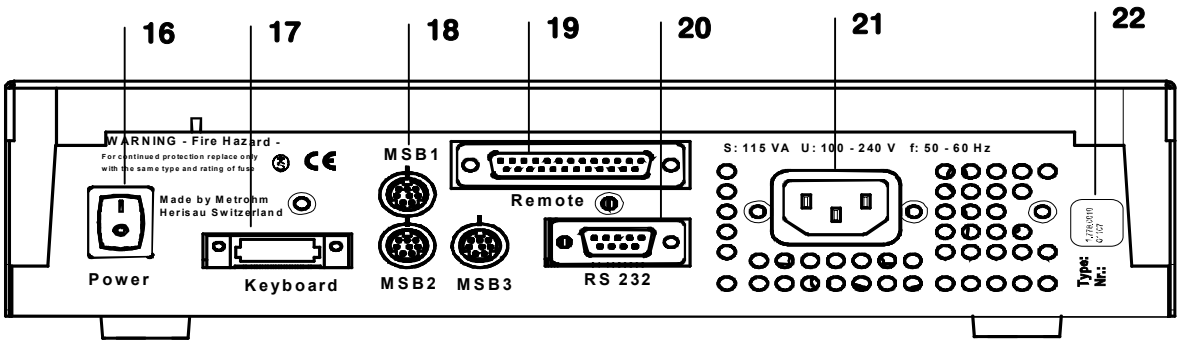


Figure 5 Connection panel

16	**Power switch**
17	**Keypad connection**
18	**MSB connections MSB1 … MSB3** Metrohm Serial Bus Connection of dosing drives and stirrers
19	**Remote connection** (25-pin)
20	**Serial RS232 connection** (9-pin)
21	**Mains connection**
22	**Instrument number**

1.3.4 Injection valve

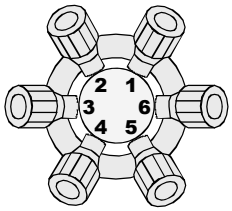
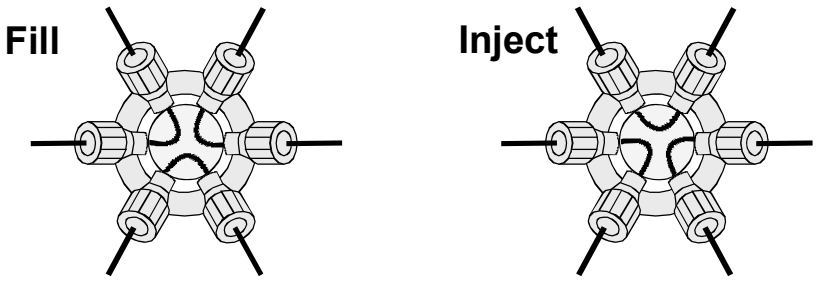


Figure 6 Injection valve

The injection valve on the right-hand side of the tower, with its connections 1 to 6 (see Figure at left), can be used for complex sample preparation steps. The schematic below shows the assignments of the connections in the switch positions **FILL** and **INJECT**.



If not in use, the injection valve should be protected against dust contamination with the red protective cap.

1.3.5 Peristaltic pump

The peristaltic pump of the 838 Advanced Sample Processor can be used as a single-channel or two-channel pump. One or two tubing cartridges 6.2755.000 may be fitted.

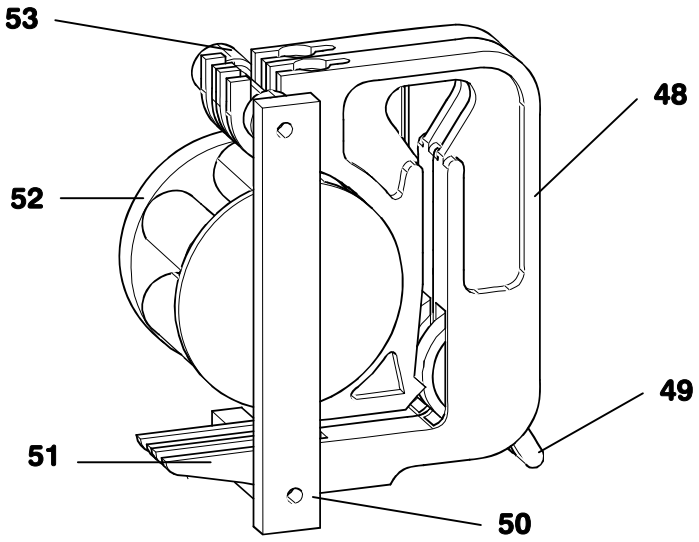
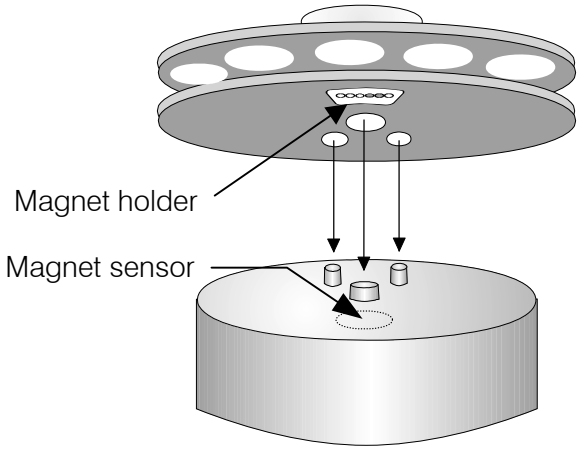


Figure 7 Peristaltic pump with 2 tubing cartridges

48	**Tubing cartridge (6.2755.000)** For pump tubing (6.1826.0X0)	**51**	**Snap-action lever** For detaching the tubing cartridge
49	**Pressure lever** For regulating the contact pressure	**52**	**Pump drive** Roller head with contact rollers
50	**Retaining bracket**	**53**	**Retaining cam** For engaging the tubing cartridges

1.3.6 Sensors of the Advanced Sample Processor



The magnet sensor for detecting the individual rack codes is mounted beneath the turntable of the Advanced Sample Processor. The magnetic code of a rack can be read only if the rack is in initial position, i.e. if the magnet holder is precisely above the sensor. For this reason, the Sample Processor should be switched off and back on again with each rack change.

Figure 8 Magnet sensor for rack code

2 Safety notes

Warning!
This instrument should only be used in accordance with the information given in these installation instructions.

2.1 General

This instrument left our works in perfect condition from the point of view of its operational safety (see Technical data, safety specifications). To keep it in this condition and to continue to operate safely the following information must be carefully observed.

2.2 Electrical safety

Please observe the following guidelines:

- Only qualified Metrohm personnel should carry out service work on electronic components.
- Do not open the instrument housing as this could damage the instrument. The housing contains no components which could be serviced or exchanged by the user.

Electrical safety when handling the instrument is guaranteed within the scope of Standard IEC 61010-1.

- **Protection against electrostatic charges**

Warning!
Electronic components are sensitive to electrostatic charges and can be destroyed by a discharge. Before you touch any electronic components of the Sample Processor you should ground you and your tools by grasping a grounded object (e.g. the instrument housing or a radiator) in order to eliminate any electrostatic charges that may be present.

- **Opening a Sample Processor**

When the Sample Processor is connected to the mains supply the instrument must not be opened, nor should any of its components be dismantled as otherwise you could come into contact with current-carrying components. Before opening the instrument separate it from all current sources and make sure that ***mains cable has been removed from the mains connection socket****!*

- **Mains connection**

*This instrument must only be operated at the specified **mains voltages** (see rear panel of instrument).*

2.3 Personal protection

The different drives of the Advanced Sample Processor and the Swing Head possess considerable force in order that they can freely move even under heavy loads. They are fitted with electronic overload limiters that are triggered if the mechanical resistance is too high.

*When the **instrument is running** do not intrude in the working range of the Sample Processor.*

*For the user there is a considerable **risk of injury from manual interference** with the automatic processes of the instrument.*

Important!

*Before you use the instrument for the first time you must install the included **6.2751.0xx Safety Guard**, see p. 37.*

The Sample Processor must not be operated without the Safety Guard in position!

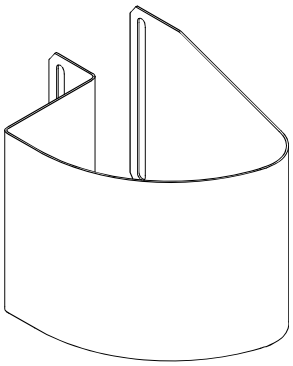


Figure 9 Safety Guard
(example shown. 6.2751.0xx for transfer robotic arm)

Biohazard

The Advanced Sample Processor does not provide sufficient protection when processing potentially infectious samples or reagents.

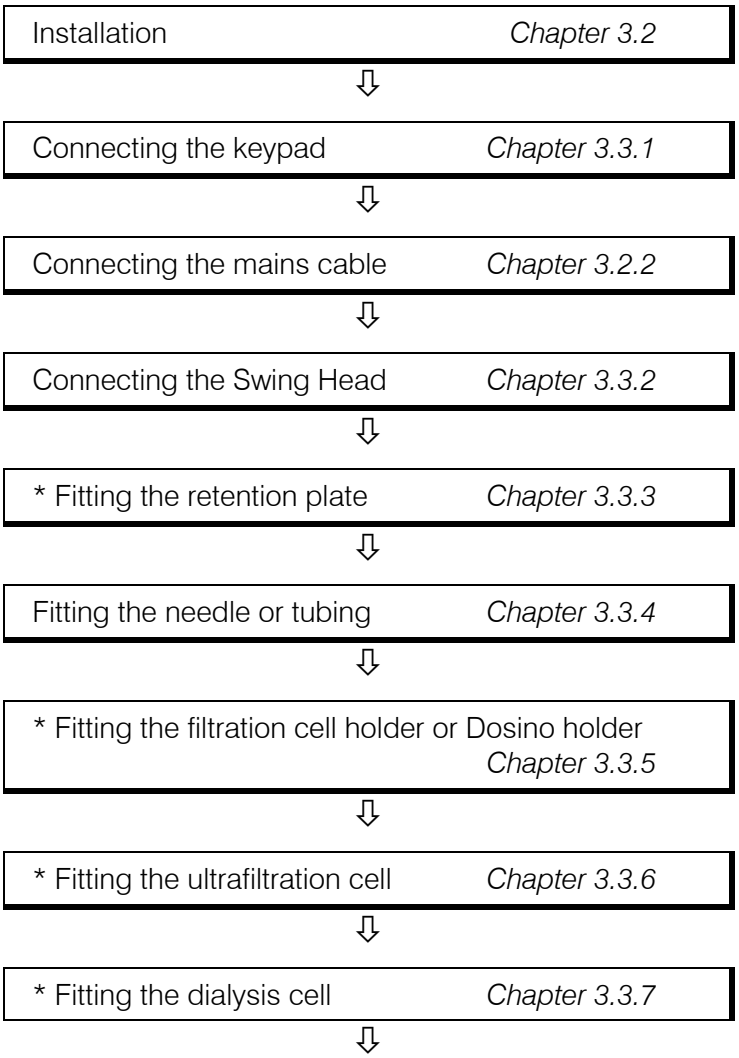
In this case install the necessary safety devices.

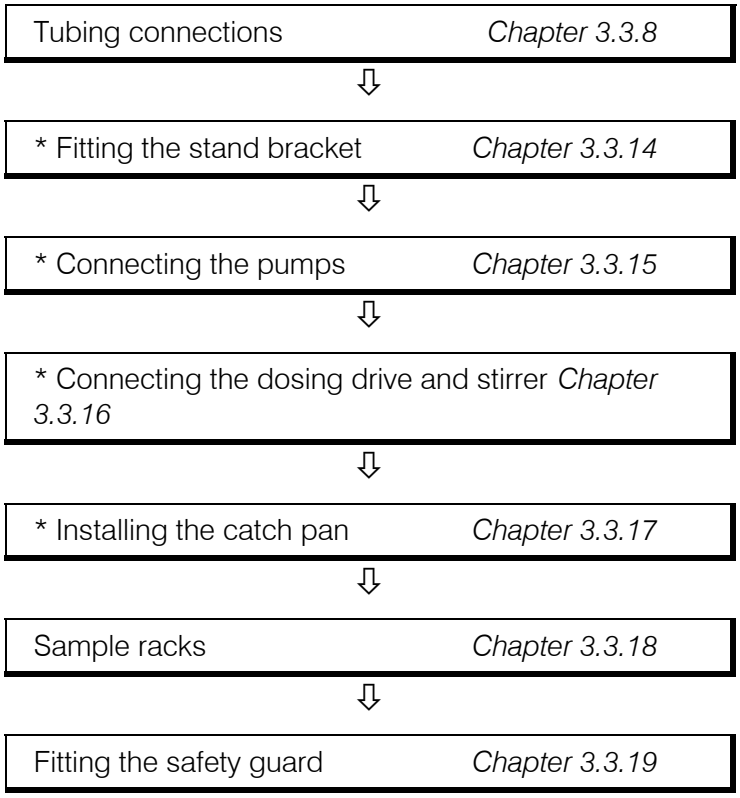
3 Installation

This Chapter describes installation of all components of a Metrohm Sample Processor and illustrates how to connect it to other instruments. Please read the following sections carefully and follow the instructions in detail. This is the only way of ensuring that a Sample Processor will function correctly.

3.1 Installation flowchart

The following installation flowchart provides an overview of the required installation work. Please refer to the specified Chapters for further information.




Tubing connections Chapter 3.3.8
* Fitting the stand bracket Chapter 3.3.14
* Connecting the pumps Chapter 3.3.15
* Connecting the dosing drive and stirrer Chapter 3.3.16
* Installing the catch pan Chapter 3.3.17
Sample racks Chapter 3.3.18
Fitting the safety guard Chapter 3.3.19

* optional

3.2 Instrument setup

3.2.1 Setup

Packaging

An 838 Metrohm Advanced Sample Processor and its specially packed accessories are supplied in very protective special packaging consisting of shock-absorbing plastic foam. Please store this packaging in a safe place; it is the only way in which the safe transport of the instrument can be guaranteed.

Checks

Please check that the delivery is complete and undamaged immediately on receipt (compare with delivery note and list of accessories given in *Section 6.3*). If transport damage is evident please refer to the information given in *Section 6.4* "*Warranty*".

Location

The 838 Advanced Sample Processor is a robust instrument and can therefore be used even in rough surroundings in laboratories and factories.

However, please ensure that it is not exposed to a corrosive atmosphere. The instrument should be serviced at regular intervals, particularly when operated under rough conditions.

3.2.2 Mains connection

This instrument must only be operated at the specified ***mains voltages*** *(see rear panel of instrument).*

Protect the connection sockets against moisture.

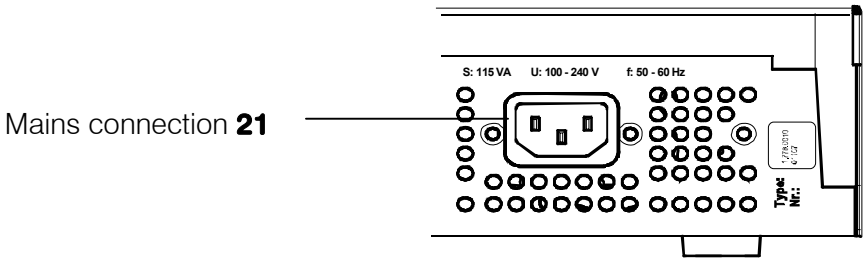


Figure 10 Mains connection socket

3.3 Fitting the accessories

3.3.1 Connecting the keypad

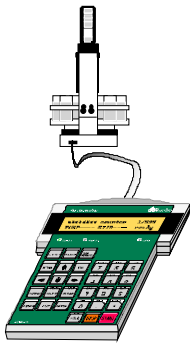


Figure 11 Connecting the keypad

(Only required if Sample Processor methods are to be used and edited).

The 6.2142.050 keypad must be connected to the instrument rear panel at the keypad socket **17** provided. The instrument must be switched off before doing this. Squeeze the connector together at both sides in order to disconnect the connector.

After connecting the keypad, you can switch on the 838 Advanced Sample Processor at the power switch **16**. The display on the keypad starts to light. The instrument is initialised and the lift is raised fully.

3.3.2 Connecting the Swing Head

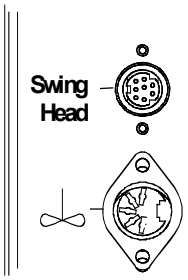


Figure 12 Connecting the Swing Head

Connect to the Swing Head connection socket 14

Route the connection cable of the Swing Head through the guide chain of the tower and connect the Mini-DIN connector of the Swing Head connection cable to the **Swing Head** socket on the rear panel of the tower.

If a robotic arm other than the Type 6.1462.030 supplied as standard is to be used, it will be necessary to make configuration settings. You will require a 6.2142.050 keypad to do this.

Configuring the Swing Head and robotic arm

Since each type of robotic arm has different geometrical dimensions, it is absolutely essential to adapt the Setup settings for the Swing Head to the relevant type of robotic arm. No settings need to be made for the robotic arm supplied as standard.

Changes are made in the Setup dialog box. The individual settings relate to:

- swing offset
- maximum swing angle
- swing radius
- swing direction

You can open the Sample Processor's Setup dialog by pressing the **<CONFIG>** key on the keypad during switch-on of the instrument.

Please refer to the 786 Swing Head Instructions for Use, which you can obtain from Metrohm by quoting order No. 8.786.1001, for details of the individual settings and robotic arm types.

3.3.3 Fitting the retention plate

When sampling from covered vials with the needle, the retention plate **9** serves to wipe the vials when the lift is rising. It is fixed in position on the front side of the tower with the three supplied Allen screws.

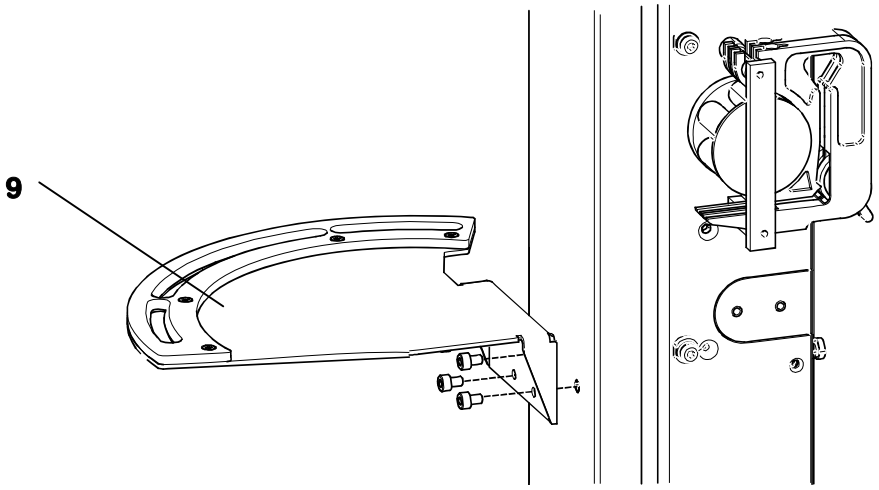
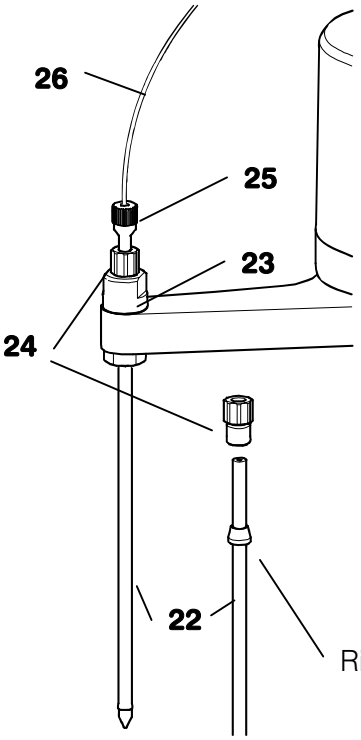


Figure 13 Fitting the retention plate

3.3.4 Fitting the needle or tubing



22	**PEEK needle (6.1835.010)** or **PEEK tubing (6.1835.020** / **6.1835.040** / **6.1835.050)**
23	**Needle holder**
24	**PEEK pressure screw (4.766.4320** or **6.2833.020 + 6.2744.080)**
25	**PEEK pressure screw (6.2744.010)**
26	**PTFE capillary (6.1803.070** or **6.1831.050** / **6.1831.060** / **6.1831.080)**

*When using a 6.1835.xxx PEEK tubing, **do not use any stoppers** on the sample vessels since these cannot be pierced by the tubing and this would damage the PEEK tubing!*
*With PEEK needles **perforated stoppers** can be used.*

Figure 14 Fitting the needle

1 Remove the PEEK pressure screw 24

Undo the PEEK pressure screw **24** screwed onto the needle holder **23 and remove it**.

2 Insert the needle

- Insert the needle **22** (6.1835.010 PEEK needle or 6.1835.020 PEEK tubing) from the top a little into the opening of the needle holder **23**.
- Slide the PEEK ring wedge from the top over the needle **22**. The narrow side of the seal must point upwards.

3 Secure the needle

- Screw the PEEK pressure screw **24** into the needle holder **23**. When doing this, press the needle **22** upwards lightly from the bottom.
- Firmly screw the PEEK pressure screw **24** tight by hand in the needle holder **23** (do not use tools!).

3.3.5 Fitting the filtration cell holder or Dosino holder

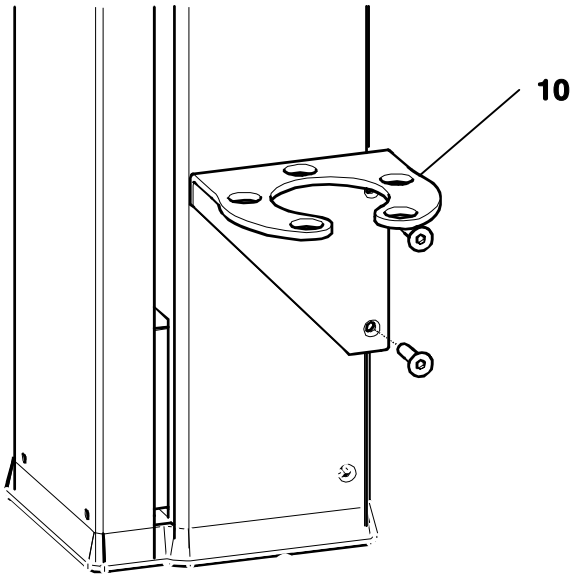


Figure 15 Filtration cell holder

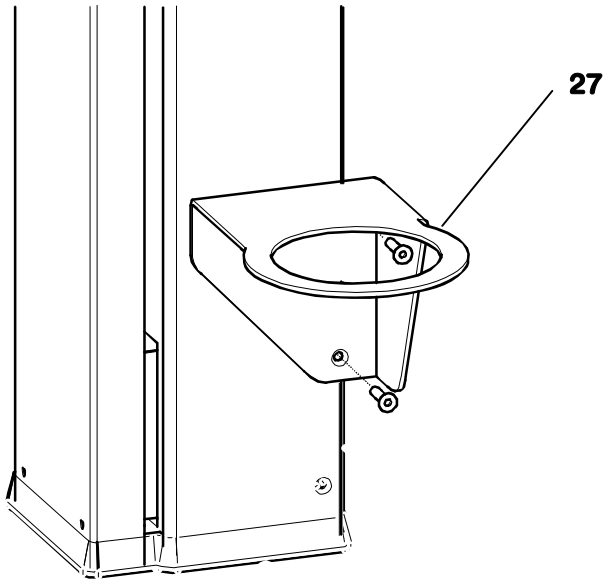


Figure 16 Dosino holder

The 6.2057.030 filtration cell holder **10** or the 6.2057.040 Dosino holder **27** can be fitted on the side panel of the tower of the 838 Advanced Sample Processor, see above.

First remove the second and third screw from the bottom from the side panel. Then fix the filtration cell holder or Dosino holder in place with the two supplied screws.

3.3.6 Fitting the ultrafiltration cell

This section describes initial fitting of the ultrafiltration cell including filtration membrane. Please note *Chapter 6.1* when assessing the need to exchange the membrane and when selecting membranes. The procedure for exchanging a filtration membrane is also described in full in *Chapter 4.2.2*.

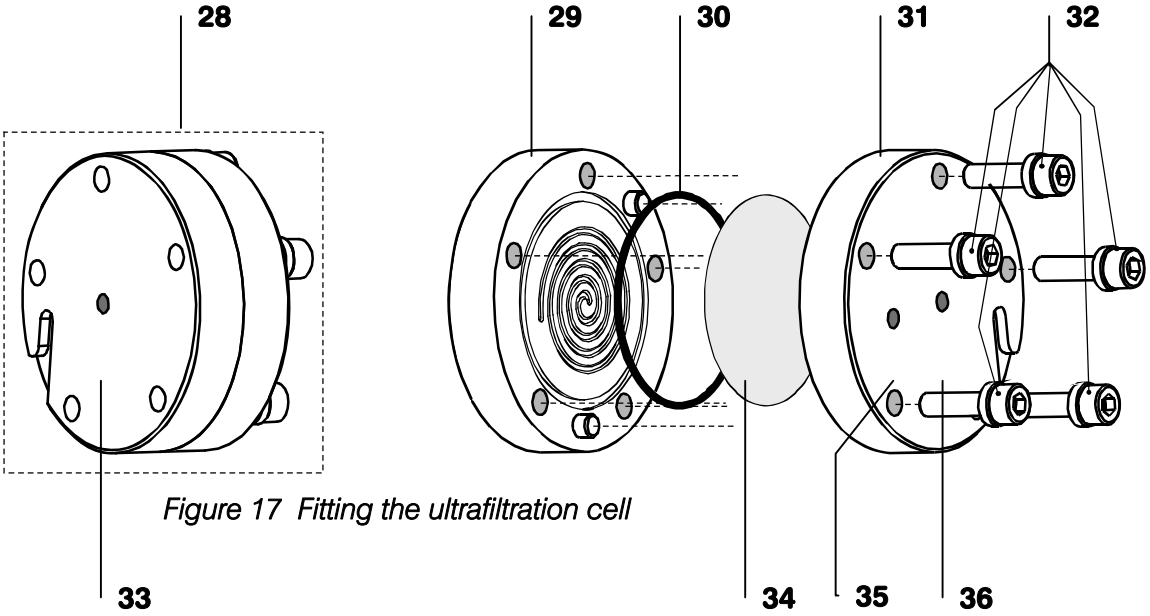


Figure 17 Fitting the ultrafiltration cell

28	**Ultra filtration cell (6.2729.110)**	**33**	**Outlet for filtrate**
29	**Upper section of the filtration cell**	**34**	**Filtration membrane (6.2714.020)**
30	**Sealing ring (E.301.0111)**	**35**	**Inlet for sample solution**
31	**Lower section of the filtration cell**	**36**	**Outlet for sample solution**
32	**Screws (V.022.6030) including washer (4.754.4090)**		

1 Preparing the ultrafiltration cell

- Remove the ultrafiltration cell **28** from its packaging and remove the three screwed-on blind stoppers.
- Using the 6.2621.070 Allen key (5 mm), fully undo the 5 screws **32**, disconnect the upper section **29** from the lower section **31** and remove the sealing ring **30**.
- Thoroughly rinse off the sealing ring, lower section and upper section of the ultrafiltration cell with ultra-pure water.

Only ultra-pure water or ethanol may be used to clean the ultrafiltration cell. Using organic solvents (e.g. acetone) will damage the Plexiglass cell!

2 Preparing the filtration membrane

- Remove a new 6.2714.020 filtration membrane **34** from the packaging using the 6.2831.010 tweezers and immerse it for approx. 2 minutes in a petri dish filled with ultra-pure water until the membrane is fully soaked with water.

It is imperative that the filtration membrane be soaked with water before inserting it into the filtration cell since this causes it to expand. If it is inserted dry, this will then lead to creasing and folding in the filtration cell which may result in blockage of the cell.

3 Inserting the filtration membrane

- **Place** the upper section **29** of the ultrafiltration cell with the inside pointing upwards on a clean paper towel.
- Insert the sealing ring **30** into the recess provided on the upper section.
- Place the wet filtration membrane, using the tweezers, centred inside the sealing ring, onto the upper section.

4 Closing the ultrafiltration cell

- Fit the upper section onto the lower section **31** so that the two parts fit perfectly.
- Using the 6.2621.070 Allen key, screw in the 5 screws **32** with washers fully and then tighten firmly.

5 Fitting the ultrafiltration cell

- After screwing the ultrafiltration cell together, fit it, as shown in *Figure 17,* in the holder **10** so that the heads of the screws **32** are located in the holes provided in the holder.

Please use only the specified ***6.2744.000 PVDF pressure screws for connection to*** *the ultrafiltration cell. If you use the 6.2744.010 PEEK pressure screws, this may result in stress cracking on the ultrafiltration cell!*

6 Rinsing the ultrafiltration cell

- First make the required tubing connections (see *section 3.3.11*) and then proceed as follows:

- After fitting a new filtration membrane, it is necessary to remove any air still in the filtration cell and in the lines. In order to do this, you should flush all lines with ultra-pure water from one of the special beakers for instance:

- Position a 300 ml PE bottle containing ultra-pure water as the rins-

ing solution at a special beaker position on the sample rack.

- Use the IC NET software to control the 838 Advanced Sample Processor directly. Choose the corresponding system and open the **Manual control** dialog box. You can run the individual functions of the Sampler Processor under **Autosampler**. Please refer to the IC NET software Online Help documentation for details of operation.

- Move the beaker with the rinsing solution beneath the needle with **MOVE**.

- You can lower the needle into the rinsing position with the **LIFT** function.

- Switch on the peristaltic pump with **PUMP**, and then all connected lines are rinsed and any air is removed.

- After allowing an adequate time (e.g. 5 minutes), switch the pump back off again with **PUMP** and move the needle back to home position.

3.3.7 Fitting the dialysis cell

Before fitting the dialysis cell, you must first insert a dialysis membrane.

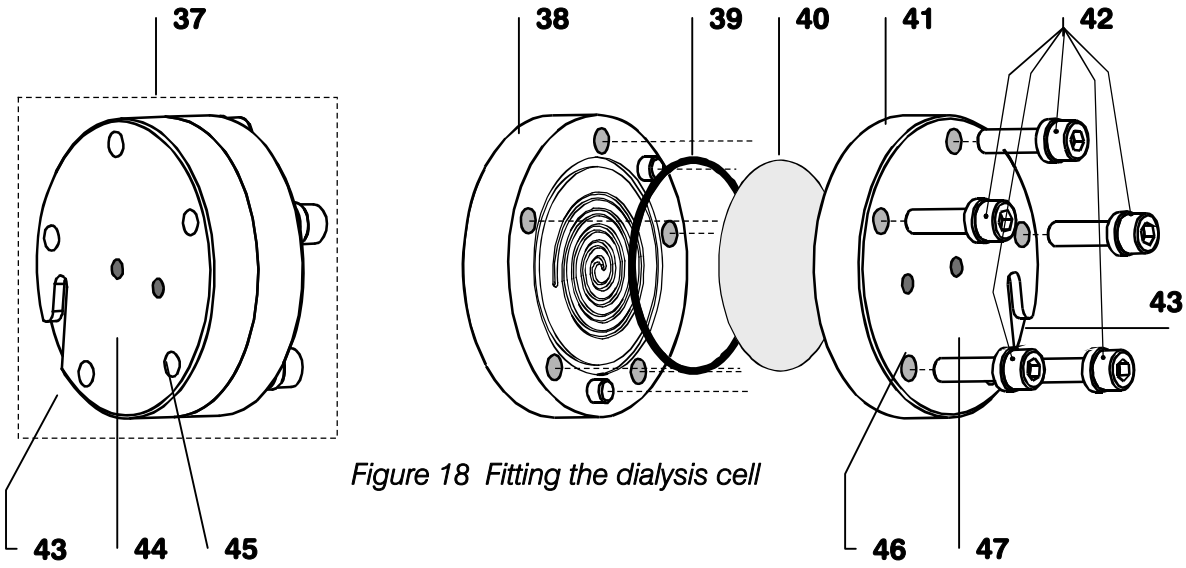


Figure 18 Fitting the dialysis cell

37	**Dialysis cell (6.2729.100)**	**43**	**Slot for engaging the dialysis cell in the cell holder**
38	**Upper section of the dialysis cell**	**44**	**Outlet for acceptor solution**
39	**Sealing ring (E.301.0111)**	**45**	**Inlet for acceptor solution**
40	**Dialysis membrane (e.g. 6.2714.010)**	**46**	**Inlet for sample solution**
41	**Lower section of the dialysis cell**	**47**	**Outlet for sample solution**
42	**Screws (V.022.6030) including washer (4.754.4090)**		

Proceed as follows:

1 Preparing the dialysis cell

- Remove the 6.2729.100 dialysis cell **37** from its packaging and remove the four screwed-on 6.2744.060 blind stoppers.
- Using the 6.2621.070 Allen key, fully undo the 5 screws **42**, disconnect the upper section **38** from the lower section **41** and remove the sealing ring **39**.

2 Cleaning the dialysis cell

- Thoroughly rinse the sealing ring **39**, upper section **38 a**nd lower section **41** of the dialysis cell with ultra-pure water and dry them with N_2 or with a lint-free cloth.

Only ultra-pure water *or* ***ethanol*** *may be used to clean the dialysis cell since other organic solvents (e.g. acetone) would damage the Plexiglass cell!*

3 Preparing the dialysis membrane

- Remove a new dialysis membrane **40** (e.g. 6.2714.010) from the packaging using the 6.2831.010 tweezers and immerse it for approx. 2 minutes in a petri dish filled with ultra-pure water until the membrane is fully soaked with water.

4 Inserting the dialysis membrane

- Place the lower section **41** with the inside pointing upwards onto a paper towel.
- Insert the sealing ring **39** into the recess provided on the lower section **41**.
- Insert the wet dialysis membrane **40** (e.g. 6.2714.010) using the 6.2831.010 tweezers inside the sealing ring **39** on the lower section **41**.

Ensure that the water-soaked dialysis membrane does not dry out before fitting it, otherwise, it can no longer be used!

5 Closing the dialysis cell

- Fit the upper section **38** onto the lower section **41** so that the two parts fit perfectly.
- Using the 6.2621.070 Allen key, fully screw in and tighten the 5 screws **42**.

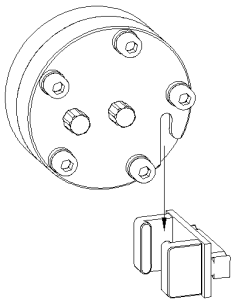


Figure 19 Fitting the dialysis cell into the 6.2057.010 holder

6 Fitting the dialysis cell

- Slide the 6.2057.010 cell holder into a free mounting rail of the 820 IC Separation Centre or the 761 Compact IC and, now that the dialysis cell has been screwed together, insert the dialysis cell **37** into the holder.

3.3.8 Fitting the Dosino

If a Dosino is required, it can be installed in the 6.2057.040 Dosino holder.

Fit the Dosino holder as specified in 3.3.5.

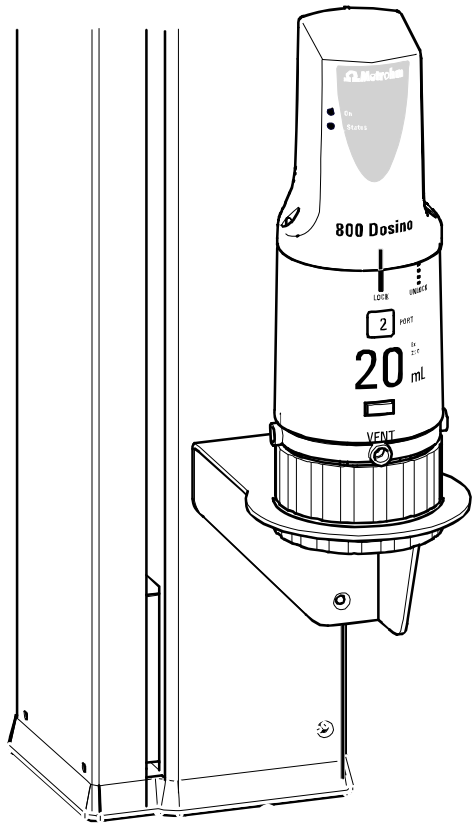


Figure 20 Fitting the Dosino

- Insert the 6.1618.020 threaded adapter (included in the scope of delivery of the 2.838.310) from below into the Dosino holder.
- Fit the dosing unit onto the Dosino holder and screw the threaded adapter tight.
- Connect the tubing.

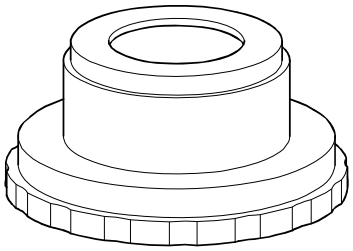


Figure 21 Threaded adapter GL 45 (6.1618.020)

3.3.9 Tubing connections

*Pump tubing is consumable material whose service life depends on the contact pressure. You should thus fully raise the tubing cartridges by releasing the snap-action lever **51** at the right-hand side if the pump is to be switched off for a long time (this will maintain the set optimum contact pressure).*

The 6.1826.0X0 pump tubing consists of PVC or PP and may thus not be used for rinsing with solutions containing acetone . In such cases, please use different pump tubing or use a different pump for rinsing.

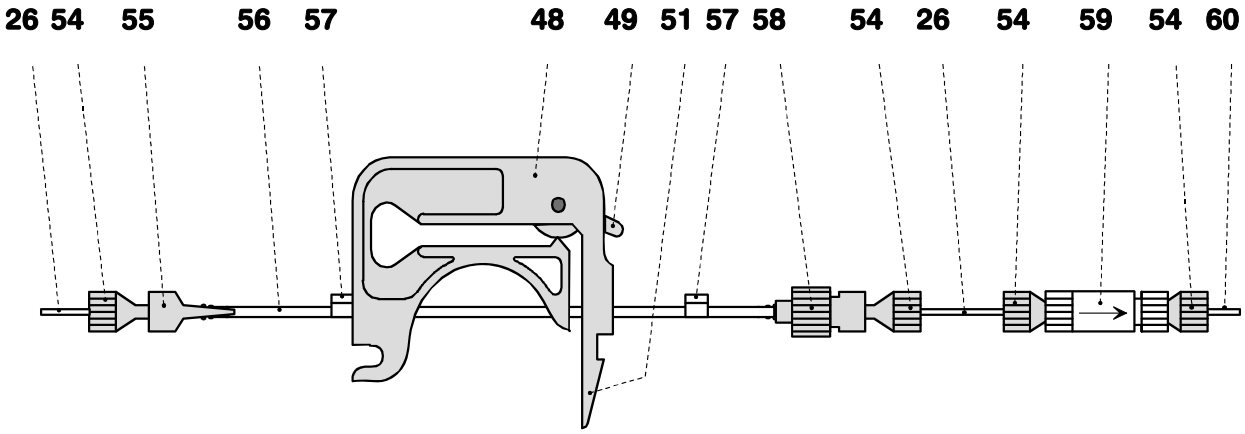


Figure 22 Fitting pump tubing

48	**Tubing cartridge**
49	**Contact pressure lever**
51	**Snap-action lever**
26	**Aspirator tubing/ capillary (6.1803.0X0)** PTFE tubing/capillary or PEEK capillary
54	**PEEK pressure screw (6.2744.010)**
55	**PEEK coupling (6.2744.034)**
56	**Pump tubing (6.1826.0X0)** Type, depending on intended application
57	**Stopper** The colour indicates the material and the dimensions of the pump tubing.
58	**PEEK coupling (6.2744.160)** with tubing guard
59	**PEEK filter unit (6.2821.120)** optional
60	**Delivery capillary** Delivery end for connection to: dialysis cell ultrafiltration cell etc.

1 Detaching the tubing cartridge(s)

- Detach the tubing cartridge(s) **48** by pressing in the snap-action lever **51** on the retaining bracket and disengage it (them) from the retaining cam **53**.

2 Fitting the pump tubing

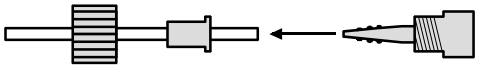
- Press the contact pressure lever **49** of the tubing cartridge(s) fully down.
- Insert one length of pump tubing into the tubing cartridge(s) as shown above.
- The stopper **57** must engage in the corresponding fixture at the top of the tubing cartridge.

3 Fitting the tubing cartridge(s)

- Engage the tubing cartridge(s) in the retaining cam **53** and press it (them) down until the snap-action lever **51** on the retaining bracket **50** engages, see *Figure 7*. Ensure that the pump tubing is not kinked.

4 Fitting the coupling on the pump tubing

- Connect the PEEK coupling **55** to the **aspiration end** of the pump tubing **56** (see illustration below).
- Fit the PEEK coupling **58** with 6.2744.160 tubing guard onto the **delivery end** of the pump tubing **56**. In order to do this, dismantle the tubing guard and slide the union nut first, followed by the thrust piece, onto the tubing.



Connect the tubing to the PEEK coupling and screw the union nut onto the coupling to lock the tubing.

5 Fitting the filter unit

- Using two 6.2744.010 PEEK pressure screws **54** and a section of aspiratory tubing/capillary **26** (6.1803.0X0), screw the optionally available 6.2821.120 PEEK filter unit **59** onto the 6.2744.160 PEEK coupling **58** at the outlet end of the pump tubing **56**.

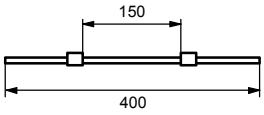
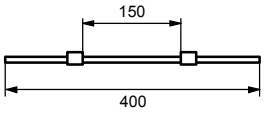
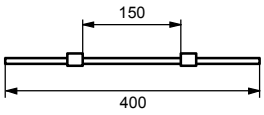
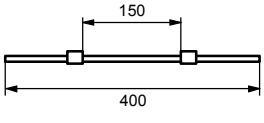
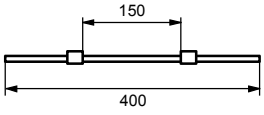
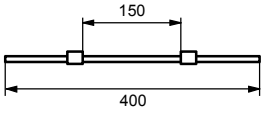
Correctly set the contact pressure:

Push the contact pressure lever **49** up until the solutions are just being aspirated. Then push the contact pressure lever one more detent position up to achieve an optimum contact pressure.

The delivery rate of the peristaltic pump primarily depends on the inside diameter of the pump tubing **56**, besides the correct contact pressure. Different pump tubings are used depending on application.

The table on the following page provides information on the characteristics and use of the available pump tubings.

3.3.10 Pump tubings

Used with	*Order No.*	*Description*
Advanced IC Ultrafiltration Sample Processor 2.838.0210: both channels	**6.1826.010**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **white-white** stoppers; Inner diameter = 1.02 mm ± 0.05 mm, Delivery 1.41 ml/min (20 rpm) 1.69 ml/min (24 rpm) 
Advanced VA Sample Processor 2.838.0310	**6.1826.020**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **blue-blue** stoppers; Inner diameter = 1.65 mm ± 0.05 mm, Delivery 3.75 ml/min (20 rpm) 4.50 ml/min (24 rpm) 
Advanced IC Dialysis Sample Processor 2.838.0110: channel for pumping the acceptor solution **Advanced IC Ultrafiltration Sample Processor 2.838.0210:** channel for pumping the filtered solution	**6.1826.030**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **orange-yellow** stoppers; Inner diameter = 0.51 mm ± 0.05 mm, Delivery 0.40 ml/min (20 rpm) 0.48 ml/min (24 rpm) 
Advanced IC Dialysis Sample Processor 2.838.0110: channel for pumping the sample solution	**6.1826.040**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **black-black** stoppers; Inner diameter = 0.76 mm ± 0.05 mm, Delivery 0.75 ml/min (20 rpm) 0.90 ml/min (24 rpm) 
Optional	**6.1826.050**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **white-yellow** stoppers; Inner diameter = 0.57 mm ± 0.05 mm, Delivery 0.43 ml/min (20 rpm) 0.52 ml/min (24 rpm) 
Optional	**6.1826.060**	**Pump tubing** made of PP (PharMed®) with 2 permanently mounted **orange-yellow** stoppers; Inner diameter = 0.51 mm ± 0.05 mm, Delivery 0.47 ml/min (20 rpm) 0.56 ml/min (24 rpm) 

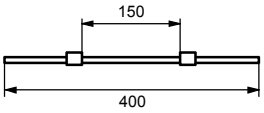
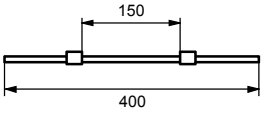
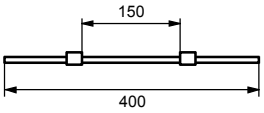
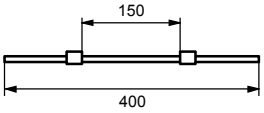
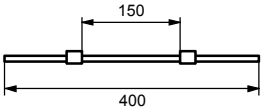
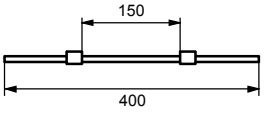
Advanced IC Ultrafiltration Sample Processor 2.838.0210: channel for pumping the sample solution	**6.1826.070**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **yellow-yellow** stoppers; Inner diameter = 1.42 mm ± 0.05 mm, Delivery 2.55 ml/min (20 rpm) 3.06 ml/min (24 rpm)	
Optional	**6.1826.110**	**Long-life pump tubing** made of PVC (Tygon® LFL) with 2 permanently mounted **orange-yellow** stoppers; Inner diameter = 0.51 mm ± 0.0102 mm, Delivery 0.40 ml/min (20 rpm) 0.48 ml/min (24 rpm)	
Optional	**6.1826.120**	**Long-life pump tubing** made of PVC (Tygon® LFL) with 2 permanently mounted **orange-white** stoppers; Inner diameter = 0.59 mm ± 0.05 mm, Delivery 0.44 ml/min (20 rpm) 0.53 ml/min (24 rpm)	
Advanced IC Sample Processor 2.838.0010: both channels **Advanced IC Injection Sample Processor 2.838.0020:** both channels	**6.1826.130**	**Long-life pump tubing** made of PVC (Tygon® LFL) with 2 permanently mounted **white-white** stoppers; Inner diameter = 1.02 mm ± 0.0127 mm, Delivery 1.41 ml/min (20 rpm) 1.69 ml/min (24 rpm)	
Advanced IC Dilution Sample Processor 2.838.0120: both channels	**6.1826.140**	**Long-life pump tubing** made of PVC (Tygon® LFL) with 2 permanently mounted **grey-grey** stoppers; Inner diameter = 1.25 mm ± 0.0127 mm, Delivery 2.18 ml/min (20 rpm) 9.7 ml/min (stage 15)	
Advanced VA Sample Processor 2.838.0310	**6.1826.150**	**Pump tubing** made of PVC (Tygon® ST) with 2 permanently mounted **violet-orange** stoppers; Inner diameter = 2.54 mm, Delivery 23.8 ml/min (stage 10)	

Table 3 Pump tubings

3.3.11 Connection of the ultrafiltration cell

60	**PEEK pressure screw (6.2744.010)**
56	**Pump tubing (6.1826.070)**
61	**Pump tubing (6.1826.030)**
62	**PEEK coupling (6.2744.030)**
63	**PTFE capillary (6.1803.050)**
64	**PVDF pressure screw (6.2744.000)**
65	**PTFE capillary (6.1803.060)**
66	**PTFE capillary (6.1803.080)**
67	**PEEK capillary (6.1831.060)**
29	**Upper section of the filtration cell**
31	**Lower section of the filtration cell**

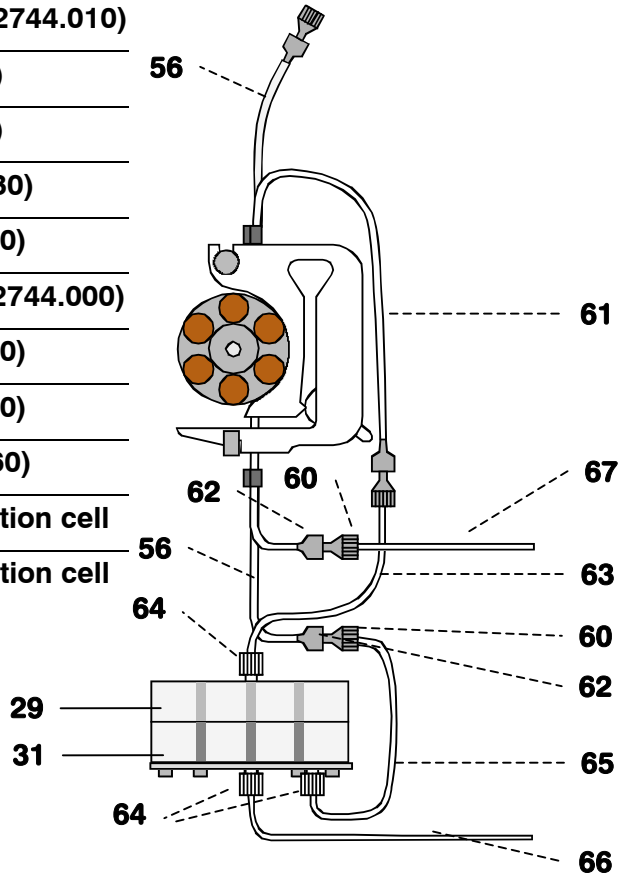


Figure 23 Connecting the ultrafiltration cell

*Use only the specified **6.2744.000 PVDF pressure screws** to connect to the ultrafiltration cell. If the 6.2744.010 PEEK pressure screws are used, this may result in stress cracking on the ultrafiltration cell!*

1 Pump tubing - filtration cell connection

- Fit a PEEK pressure screw **60** to one end of the PTFE capillary **65**.
- Screw a coupling **62** onto this pressure screw.
- Fit a PVDF pressure screw **64** onto the other end of the PTFE capillary.
- Fit this end of the PTFE capillary with the PVDF pressure screw to the inlet opening **35** on the underside of the ultrafiltration cell (see Figure 9).
- Fit the coupling **62** onto the outlet end of the pump tubing **56** (see *Figure 10*).

2 Filtration cell - waste tubing connection

- Fit a PVDF pressure screw **64** to one end of the PTFE capillary **66**.
- Fit this end of the PTFE capillary with the PVDF pressure screw to the outlet opening **36** on the underside of the ultrafiltration cell (see Fig-

ure 9).

- Insert the second end of the capillary into the waste container (e.g. optional: 6.1608.070 bottle with 6.1602.150 bottletop GL45).

3 Filtration cell – pump tubing connection

- Fit a PEEK pressure screw **60** to one end of the PTFE capillary **63**.
- Screw a coupling 62 onto this pressure screw.
- Fit a PVDF pressure screw **64** onto the other end of the PTFE capillary.
- Fit this end of the PTFE capillary with the PVDF pressure screw to the outlet opening for the filtrate **36** on the upper side of the ultrafiltration cell (see Figure 9).
- Fit a coupling **62** onto the inlet end of the pump tubing **61**.

4 Pump tubing – injection valve connection

- Fit a PEEK pressure screw **60** to one end of the PEEK capillary **67**.
- Screw a coupling 62 onto this pressure screw.
- Fit a coupling **62** onto the outlet end of the pump tubing **61**.
- Pull the PEEK capillary **67** through one of the feedthroughs on the front side of the 820 IC Separation Centre and, using a PEEK pressure screw **60**, screw it onto connection "1" of the injection valve in the 820 IC Separation Centre.
- Close the rotary nipple on the inner compartment side of the corresponding feedthrough and thus fix the PEEK capillary in position.

3.3.12 Connecting the dialysis cell

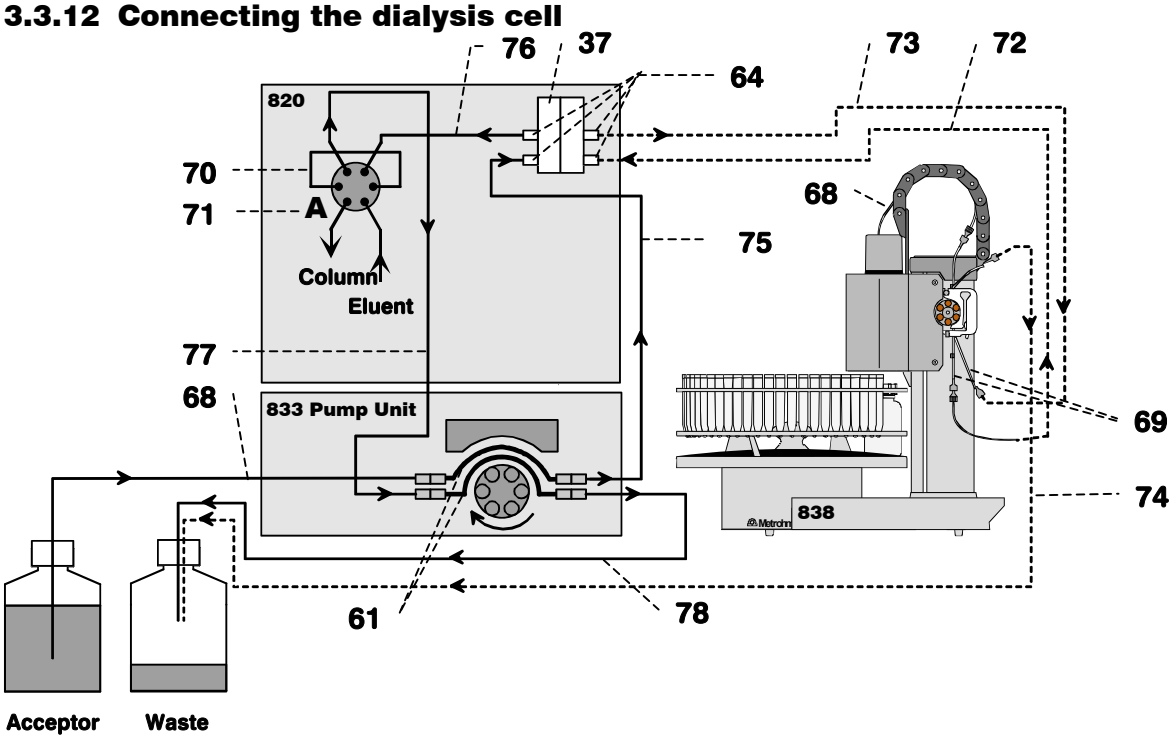


Figure 24 Capillary connections for dialysis

68 **PTFE capillary (6.1803.040, 1 m)**
supply of the sample/acceptor solution

37 **Dialysis cell (6.2729.100)**

61 **Pump tubing (6.1826.030)**
with **orange-yellow** stoppers for delivery of the **acceptor solution**

69 **Pump tubing (6.1826.040)**
with **black-black** stoppers for delivery of the **sample**

70 **PEEK sample loop (6.1825.210, 20 µl)**

71 **Injection valve A**

72 **PTFE capillary (6.1803.040, 1 m)**
peristaltic pump connection (**838 Advanced Sample Processor channel 1** for supply of fresh sample) –dialysis cell inlet (sample end)

73 **PTFE capillary (6.1803.040, 1 m)**
Dialysis cell outlet (sample end) – peristaltic pump connection (**838 Advanced Sample Processor channel 2** for disposal of the dialysed sample solution)

74 **PTFE capillary (6.1803.040, 1 m)**
Peristaltic pump (**838 Advanced Sample Processor channel 2** for disposal of the dialysed sample solution) – waste container connection

75 **PTFE capillary (6.1803.040, 1 m)**
Peristaltic pump (**833 Pump Unit channel 1** for supply of fresh acceptor solution) – dialysis cell inlet (acceptor end) connection

76 **PEEK capillary (6.1831.050, 40 cm)**
Outlet dialysis cell (acceptor end) – connection 1 valve A connection

77 **PEEK capillary (6.1831.060, 1 m)**
Connection 2 valve A – peristaltic pump (**833 Pump Unit channel 2** for disposal of the acceptor solution) connection

78 **PTFE capillary (6.1803.040, 1 m)**
peristaltic pump (**833 Pump Unit channel 2** for disposal of the acceptor solution) – waste container

64 **PVDF pressure screw (6.2744.000)**

Proceed as follows in order to connect the dialysis cell **37** to the IC system:

*Capillaries provided with new connectors must feature a flawless, flat cut edge. In order to ensure this, it is best to use the **6.2621.080 cappillary cutter**..*

Connections for sample solution

1 Fitting the pump tubing to the 838 Advanced Sample Processor

- Fit the two **6.1826.040** pump tubings (**black-black** stoppers), as described in *Chapter 3.3.8,* to the peristaltic pump of the 838 Advanced Sample Processor.

2 Connecting the aspiratory capillary for sample

- Attach one end of the 6.1803.040 aspiratory capillary **68** (L =1 m) with a 6.2744.010 PEEK pressure screw to the PEEK coupling on the aspiration end of the **black-black** pump tubing of **channel 1** of the **838 Advanced Sample Processor** (see *Chapter 3.3.12* and *Figure 22*).
- Connect the other end of the aspiratory capillary **68** to the PEEK needle **22** (see *Chapter 3.3.4* and *Figure 14*) and fix the capillary in position in the guide chain of the 838 Advanced Sample Processor.

3 Connecting the dialysis cell

- Attach the 6.1803.040 PTFE capillary **72** (L =1 m) with a 6.2744.010 PEEK pressure screw to the 6.2744.034 PEEK coupling on the delivery end of the **black-black** pump tubing of **channel 1** of the peristaltic pump of the **838 Advanced Sample Processor** (see *Chapter 3.3.12* and *Figure 22*). Guide the other end of the capillary through one of the openings at the front or on the side of the 820 Separation Centre into the column chamber and screw it on to the inlet opening **46** of the cell lower section **41** of the dialysis cell using a 6.2744.000 PVDF pressure screw **64** (see *Chapter 3.3.7* and *Figure 18*).
- Screw the 6.1803.040 PTFE capillary **73** (L =1 m) with a 6.2744.000 PVDF pressure screw **64** to the outlet opening **47** of the cell lower section **41** of the dialysis cell (see *Chapter 3.3.7* and *Figure 18*) and guide it through one of the openings at the front or at the side of the 820 Separation Centre out of the column chamber. Attach the other end of the PTFE capillary **73** with a 6.2744.010 PEEK pressure screw **64** to the PEEK coupling at the aspiration end of the **black-black** pump tubing of **channel 2** of the peristaltic pump of the **838 Advanced Sample Processor** (see *Chapter 3.3.12* and *Figure 22*).

*Use only the specified **6.2744.000 PVDF pressure screws** for connection to the dialysis cell. If the 6.2744.010 PEEK pressure screws are used, this could cause stress cracking on the dialysis cell!*

4 Connecting the waste container

- Attach the 6.1803.040 PTFE capillary **74** (L =1 m) with a 6.2744.010 PEEK pressure screw to the 6.2744.034 PEEK coupling on the delivery end of the **black-black** pump tubing of **channel 2** of the peristaltic pump of the **838 Advanced Sample Processor** (see *Chapter 3.3.12* and *Figure 22*). Insert the other end of the capillary into an adequately large waste container and secure it there.

Connections for acceptor solution

1 Fitting the pump tubing to the 833 Pump Unit

- Fit the two pump tubings **6.1826.030** (**orange-yellow** stoppers) as described in *Chapter 3.3.9*, to the **833 Pump Unit**.

2 Connecting the aspiratory capillary for acceptor solution

- Attach one end of the 6.1803.040 aspiratory capillary **68** (L =1 m) with a 6.2744.010 PEEK pressure screw to the PEEK coupling on the aspiration end of the **orange-yellow** pump tubing of **channel 1** of the **833 Pump Unit** (see *Chapter 3.3.9* and *Figure 22*).
- Insert the other end of the aspiratory capillary **68** into the vessel with **acceptor solution** and secure it there. **Ultra-pure water** which has been degassed beforehand (with N_2, He or vacuum) is normally used as the acceptor solution.

3 Connecting the dialysis cell

- Attach the 6.1803.040 connection capillary **75** (L =1 m) with a 6.2744.010 PEEK pressure screw to the 6.2744.034 PEEK coupling on the delivery end of the **orange-yellow** pump tubing of **channel 1** of the **833 Pump Unit** (see *Chapter 3.3.9* and *Figure 22*). Guide the other end of the capillary through one of the openings at the front or on the side of the 820 Separation Centre into the column chamber and screw it onto the inlet opening **45** of the cell upper section **38** of the dialysis cell using a 6.2744.000 PVDF pressure screw **64** (see *Chapter 3.3.7* and *Figure 18*).
- Screw the 6.1831.050 PEEK capillary **76** (L =40 cm) with a 6.2744.000 PVDF pressure screw **64** to the outlet opening **44** of the cell upper section **38** of the dialysis cell (see *Chapter 3.3.7* and *Figure 18*).

*Use only the specified **6.2744.000 PVDF pressure screws** to connect to the dialysis cell. If the 6.2744.010 PEEK pressure screws are used, this could cause stress cracking on the dialysis cell!*

4 Connecting the injection valve

- Screw the free end of the 6.1831.050 PEEK capillary **76** (L = 40 cm) with a 6.2744.010 PEEK pressure screw to connection "1" of the injection valve A **71**.
- Screw the 6.1831.060 PEEK capillary **77** (L =1 m) using a 6.2744.010 PEEK pressure screw to connection "2" of the injection valve A **71** and guide the other end of the capillary through one of the openings at the front or at the side of the 820 Separation Centre to the outside. Attach the other end of the PEEK capillary **77** with a 6.2744.010 PEEK pressure screw to the PEEK coupling on the aspiration end of the **orange-yellow** pump tubing of **channel 2** of the **833 Pump Unit** (see *Chapter 3.3.9* and *Figure 22*).

5 Connecting the waste container

- Attach the 6.1803.040 PTFE capillary **78** (L =1 m) with a 6.2744.010 PEEK pressure screw to the 6.2744.034 PEEK coupling on the delivery end of the **orange-yellow** pump tubing of **channel 2** of the **833 Pump Unit** (see *Chapter 3.3.9* and *Figure 22*). Insert the other end of the capillary into an adequately large waste container and secure it there.

Conditioning the dialysis system

Before the first analysis, the dialysis cell with the fitted dialysis membrane and all tubing connections must be rinsed with ultra-pure water. Please proceed as follows:

1 Settings on the 820 IC Separation Centre

- In the «IC Net» software, switch injection valve A in the 820 IC Separation Centre to position "FILL".

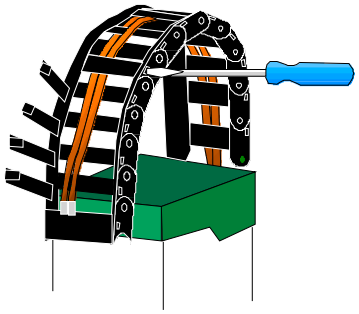
2 Commissioning the peristaltic pumps

- Immerse the two aspiratory tubings **68** and **72** (see *Figure 24*) in the acceptor solution (degassed ultra-pure water).
- Switch on the 838 Advanced Sample Processor and the 833 Pump Unit with their power switches.
- Switch on the peristaltic pumps of both instruments in «IC Net» in the corresponding 'Manual Control' dialog box. Please refer to the «IC Net» software Online Help documentation for details of operation.
- Set the contact pressure on both tubing cartridges: Push the pressure lever **49** (see *Chapter 1.3.5*) up until the solutions are just being aspirated. Then push the pressure lever 1 further detent position upwards to achieve an optimum contact pressure.
- Flush the dialysis system for approx. 10 minutes with ultra-pure water and check whether solution is emerging uniformly on the two inlet capillaries leading into the waste container.

3 Conditioning the dialysis membrane

- Flush the dialysis system for approx. 20 minutes with ultra-pure water. Check whether solution is emerging uniformly on the two inlet capillaries leading into the waste container.
- Check all tubings from the supply vessels through the tubing cartridges and the dialysis cell through to the waste vessels for the presence of emerging fluid. If fluid is escaping at any point, the corresponding connection must be tightened or exchanged.
- If air bubbles remain in the dialysis cell, unscrew the PEEK capillary **76** (acceptor solution) and PTFE capillary **73** (sample) from the outlets **44 resp**. **47** of the dialysis cell and wait until the air bubbles have disappeared. Then screw the tubings back onto the dialysis cell.

3.3.13 Inserting capillaries or tubings



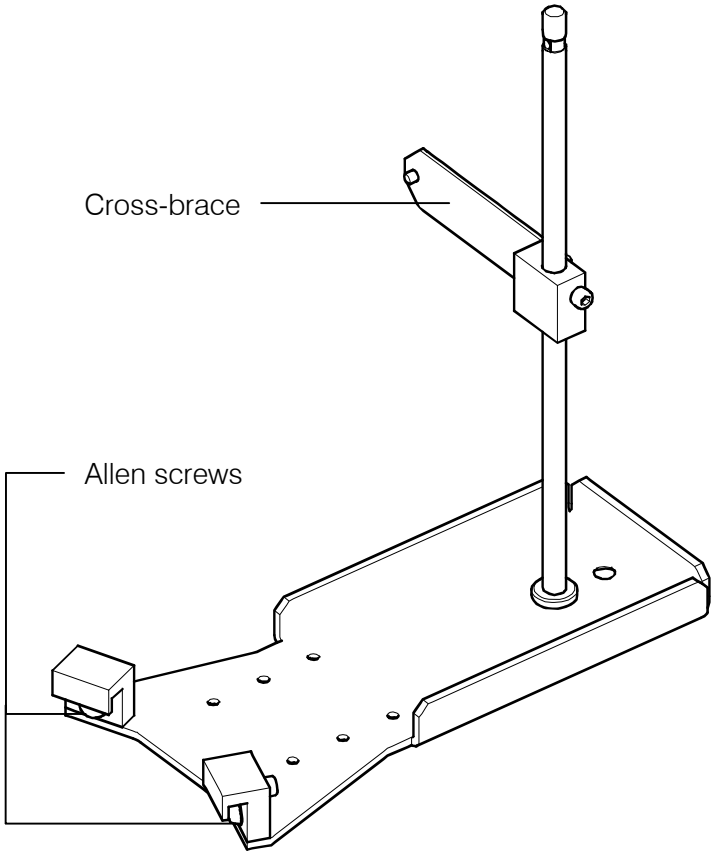
The individual chain links of the guide chain can be opened using a screwdriver or a similar implement in order to insert capillaries or tubings.

Please note the marking on the chain links.

Figure 25 Inserting capillliaries or tubings

3.3.14 Fitting the stand bracket

An external dilution or measuring cell can be fitted with the aid of a 6.2001.070 stand bracket on the Advanced Sample Processor. The stand bracket must be engaged on the stirrer rail and fixed in position with the two Allen screws.



- The height and lateral alignment of the cross-brace can be adjusted. It is fixed in position with the supplied screw on the rear panel of the tower.

Figure 26 Stand bracket

3.3.15 Connecting pumps

Two external pumps can be connected and controlled on the 838 Advanced Sample Processor.

Ext. Pump 2

The pump connections (for 3-pin M8 connectors) on the rear side of the tower of the Advanced Sample Processor supply a voltage of 16 V and may be loaded with max. 600 mA.

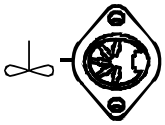
The appropriate pump models are:

- Metrohm 823 Membrane Pump Unit (membrane pump, suitable for aqueous media without precipitation)
- Metrohm 772 Pump Unit (peristaltic pump, suitable for organic solvents and aqueous solutions containing precipitation)

3.3.16 Connector dosing drives and stirrers

Metrohm Sample Processors feature various connections to which stirrers or dosing drives can be connected.

Stirrers



The **722/802 Rod stirrer** and the **741 Magnetic stirrers** feature a DIN connector and are connected on the rear panel of the tower.

As is the case on other Metrohm instruments, the three **MSB sockets** (MSB = Metrohm Serial Bus) can be used in diverse ways. Connect the **801 Stirrer** at this point.

Dosing drives

Up to three dosing drives of Type **700/800 Dosino** or **685/805 Dosimat** can be connected directly to the MSB sockets of a Sample Processor and operated. A **800 Dosino** or **805 Dosimat** can also be connected via the **MSB output socket** of another instrument connected to the MSB, such as the 801 Stirrer in a so-called '*daisy chain*'. It must be noted that only one single instrument of a specific type may occur in such a chain, e.g. one 801 Stirrer and one 800 Dosino.

The **700 Dosino** and the **685 Dosimat** must be connected directly to an **MSB socket** of the Sample Processor.

Dosing drive and stirrer connections MSB1…3

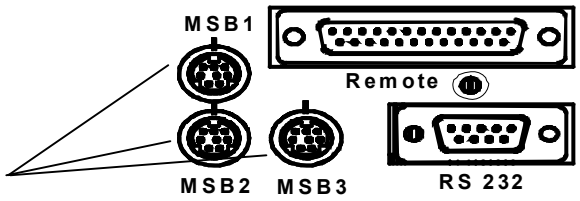


Figure 27 MSB connections

A connected dosing drive is detected automatically by the instrument only when switching on.

3.3.17 Installing the catch pan

The 6.2711.060 catch pan is available as an optional accessory. It prevents escaping fluid spreading over the laboratory bench or penetrating the interior of the instrument.

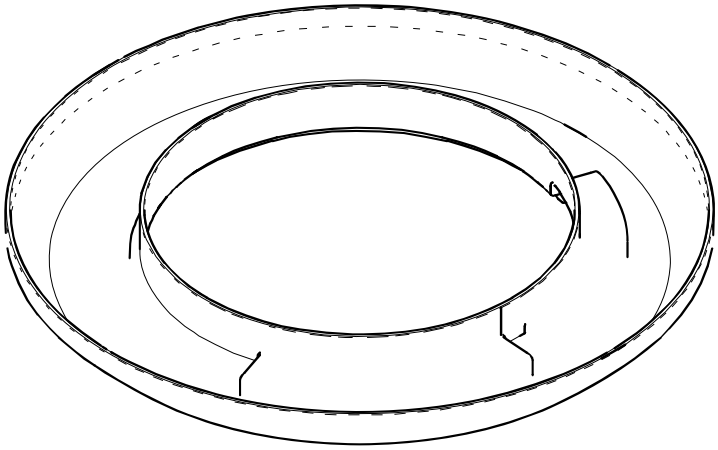
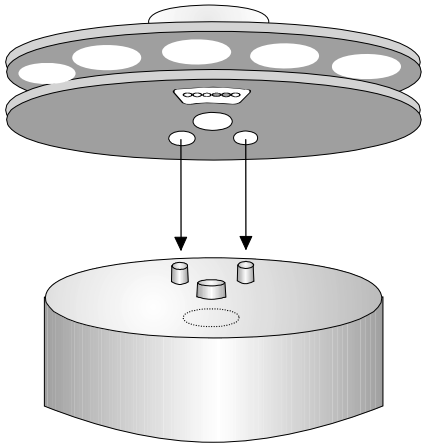


Figure 28 Catch pan

Attach the supplied tubing to the drain connector of the catch pan. Detach the sample rack and move the catch pan over the turntable so that it lies on the Sample Processor's stirrer rail. Insert the other end of the tubing into a drain or waste canister.

3.3.18 Sample racks



Sample racks must be fitted so that the two guide cams of the turntable engage in the guide openings provided in the base of the rack.

After fitting a sample rack, the Sample Processor should be switched off and then back on again so that the magnetic code of the rack can be read in. This is possible only if the rack is in initial position.

Figure 29 Fitting the sample rack

3.3.19 Fitting the safety guard/splash guard

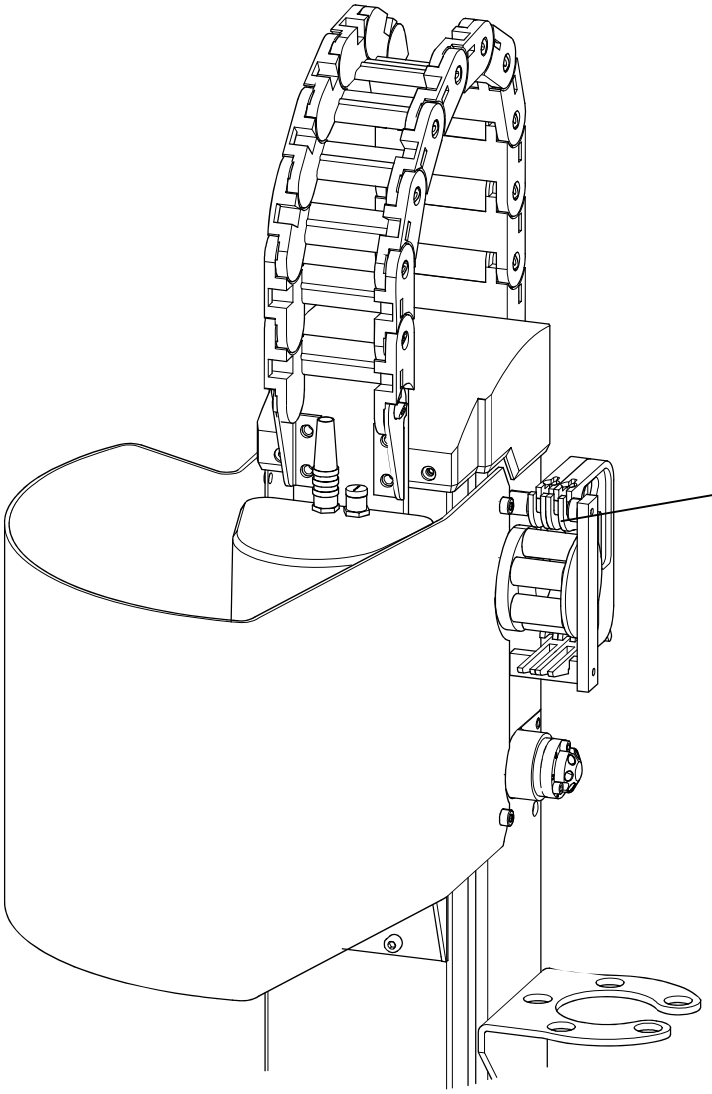


Figure 30 Fitting the safety guard

It is essential to fit the safety guard before using the 838 Advanced Sample Processor for the first time. It not only acts as an effective splash guard but also prevents the risk of injury.
The safety guard must be fitted with the securing screw on the side of the tower of the 838 Advanced Sample Processor. The height of the safety guard can be adapted to the sample vessels.

3.4 Connecting external instruments

There are numerous options for connecting the 838 Advanced Sample Processor to Metrohm systems. The 838 Advanced Sample Processor features a serial RS-232 interface via which it is possible to access the instrument functions directly using suitable control software. If working with the sequence methods of the instrument, Sample Processor and connected instruments can be coordinated with control signals via the 25-pin remote interface.

3.4.1 General information on interface connections

*The 838 Advanced Sample Processor must always be switched off with the power switch **34** before connecting an external instrument to the remote connection **30** or to the RS232 interface **40**!*

Remote interface

Any external instruments can be connected to the 25-pin remote connection **30**. The 838 Advanced Sample Processor can be controlled remotely via the 8 input leads. External instruments can be controlled via the 14 output lines.

The connector pin assignment of the remote interface, its functions, electrical conditions and statuses and the assignment of the remote input lines are described in *Chapter 5.1*.

RS232 interface

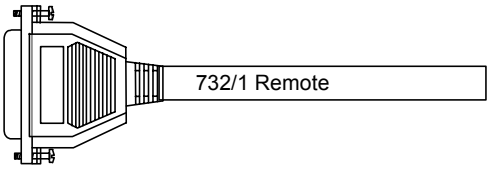
The connection options at the serial RS232 interface **40** are diverse. Besides Metrohm instruments (in this case the 830 IC Interface) featuring Metrohm remote control language, it is also possible to connect a PC (see *Chapter 2.7*). Third-party instruments featuring a serial RS232 interface can also be connected.

Connecting cables

Only Metrohm cables should be used for interconnection of the 838 Advanced Sample Processor with other devices. Only these cables guarantee interference-free data transfer.

The Metrohm remote cables have a designation at the ends of the cable, indicating for what instrument the relevant connector is scheduled and at what connector position it must be connected.

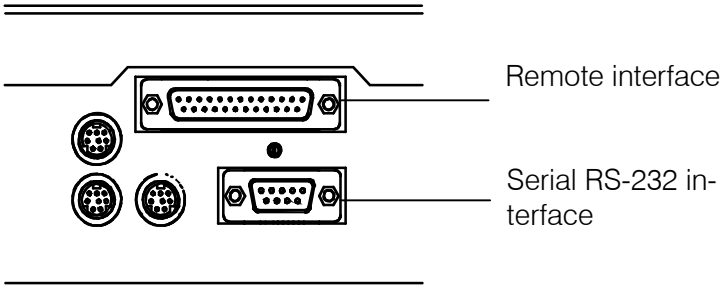
Example:



3.4.2 Serial connections (RS232)

The connection options at the serial RS232 interface are diverse. Besides all Metrohm instruments featuring the Metrohm remote control language, it is possible to connect a personal computer. Any third-party instruments featuring a serial RS232 interface may also be connected.

Correct data transfer requires correct setting of the transmission parameters. They must correspond to the settings of the interface on the connected instrument.



3.4.3 Remote interface

Connected peripheral instruments, such as the 819 Advanced IC Detector etc., can be controlled via the remote interface (25-pin socket).

14 lines (output 0–13) are available for output of signals.
8 lines (input 0–7) are available for reception of signals.

Only the designated Metrohm remote cables should be used to connect Metrohm instruments.

3.5 Connection to Metrohm IC systems

3.5.1 IC system remotely controlled by PC

Data acquisition and control of the IC components can be performed from the PC using the «IC Net 2.x» PC software and the 830 IC Interface. In this case, the 838 Advanced Sample Processor is connected to the IC system both via the serial RS232 interface and via the remote interface. The preprogrammed instrument methods of the 838 Advanced Sample Processor are not required in this case since the corresponding sequences are programmed and controlled by the PC software. This Chapter describes the various combination options of the 838 Advanced Sample Processor with Metrohm IC systems on the basis of this technology.

3.5.2 Metrohm IC systems

Metrohm IC systems can be subdivided in to modular IC systems ("**MIC**") and compact IC systems (e. g. **761 Compact IC**). The following table provides an overview of preconfigured modular Metrohm IC systems.

Designation	Function of the modular IC system
MIC-1	Anionic or cationic system with electronic suppression
MIC-2	Anionic system with chemical suppression
MIC-3	Anionic und cationic system with chemical suppression
MIC-4	Anionic or cationic system with electrical suppression and enrichment
MIC-5	Anionic system with chemical suppression and enrichment
MIC-6	Anionic system with chemical suppression, enrichment and matrix elimination
MIC-7	Anionic system with chemical suppression and dialysis
MIC-8	Modular system with 817 Bioscan for sugar analysis
MIC-9	Combined system for anionic and sugar analysis
MIC-10	Binary high pressure-gradient system for anion determination with chemical suppression

Table 4 MIC systems

The electrical interconnection of some of these systems with the 838 Advanced Sample Processor with complete control of the entire IC system by the «**IC Net 2.3**» software is described below. Since certain versions differ essentially as the result of the additional enrichment technology (see MIC-1 / MIC-4 and MIC-2 / MIC-5), we shall describe the **MIC-2** and **MIC-3** systems at this point. Systems **MIC-7** and **MIC-8** are also listed as further typical versions.

3.5.3 MIC-2 modular anionic system with chemical suppression

This system requires the **model 2.838.0010** of the 838 Advanced Sample Processor.

The 838 Advanced Sample Processor is connected to an anionic IC system with chemical suppression with 819 IC detector, 820 IC Separation Centre (2.820.0230), 818 IC pump, 833 IC Liquid Handling Unit and 830 IC Interface in accordance with *Figure 31* using the 6.2141.190 remote cable and the 6.2134.100 RS232 cable.

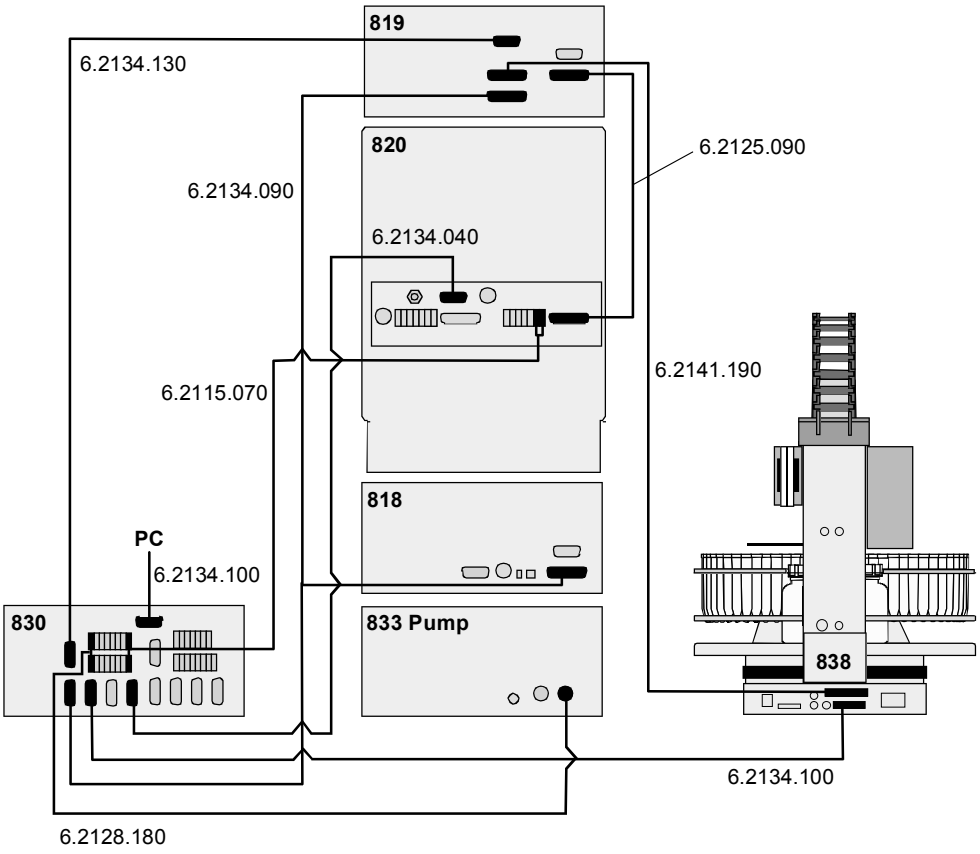


Figure 31 MIC-2 interconnection with anionic system with chemical suppression

838-specific settings in the «IC Net 2.3» program

Program for the 838 Advanced Sample Processor:

001	Ctrl INIT 819	– Initialise remote lines on 819
002	Move sample	– Move needle to sample position
003	Lift work	– Move lift with needle to working height
004	Ctrl ZERO 1	– Trigger autozero on 819/1 IC Detector
005	Ctrl FILL A 1	– Switch over injection valve on 820 "Fill"
006	Pump 240 s	– Fill sample loop for 240 s with sample
007	Ctrl INJECT A 1	– Switch over injection valve on 820 to "Inject"
008	Start DA	– Start data recording

3.5.4 MIC-2 modular anionic system with chemical suppression and sample dilution

This system requires the **model 2.838.0120** of the 838 Advanced Sample Processor.

The 838 Advanced Sample Processor is connected to an anionic IC system with chemical suppression with 819 IC detector, 820 IC Separation Centre, 818 IC pump, 833 IC Liquid Handling Unit and 830 IC Interface in accordance with *Figure 32* using the 6.2141.190 remote cable and the 6.2134.100 RS232 cable.

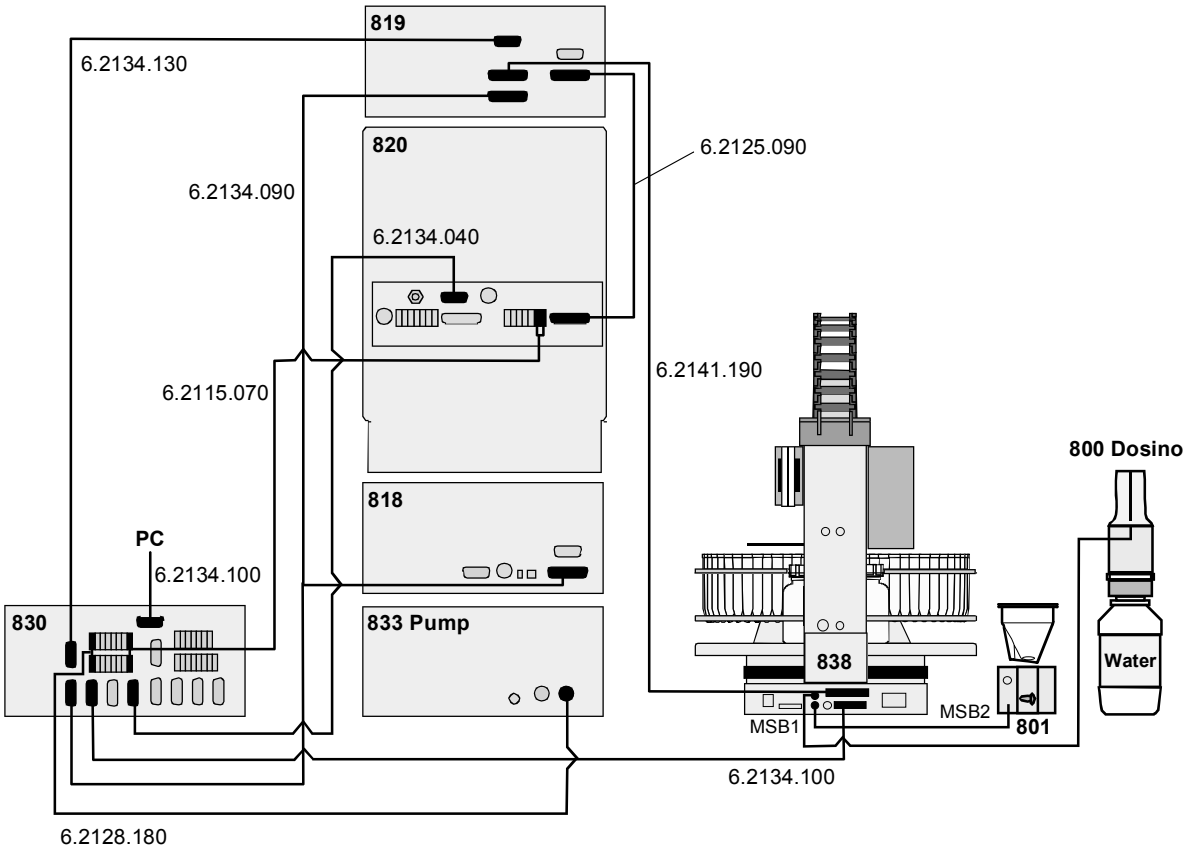


Figure 32 MIC-2 interconnection with anionic system with chemical suppression and sample dilution

838-specific settings in the «IC Net 2.3» program

Example program (sample dilution) for the 838 Advanced Sample Processor:

Conditions:

- Dosino drive with 10 ml dosing unit connected to MSB connection 1
- Stirrer connected to MSB connection 2
- Mixing volume 5 ml (this is defined in «IC Net 2.3» in the configuration of the 838)
- Rinsing vessel defined as special beaker at rack position 149 (6.2041.440 rack)
- Needle positions: "special" = 80 mm, "work" = 125 mm

001 Valve	fill	– Switch over injection valve on 838 to "Fill"
002 Move	spec1	– Move needle to rinsing beaker *
003 Lift	special	– Position lift with needle to special position *
004 Dosino MSB1 rate	5	– Set dosing rate
005 Dosino MSB1	3.5	– Eject 3.5 ml of ultra-pure water (prepare pipet.)
006 Move	sample	– Move needle to sample
007 Dosino MSB1 rate	-0.1	– Form air bubble
008 Lift	work	– Move lift with needle to working position *
009 Dosino MSB1 rate	5	– Set dosing rate
010 Dosino MSB1	-3	– Aspirate 3 ml of sample **
011 Move	spec1	– Move needle to rinsing beaker
012 Lift	special	– Move lift with needle to special position
013 Dosino MSB1	compen.	– Compensate for mech. play of Dosino coupling
014 Wait	5	– Waiting time
015 Valve	inject	– Move injection valve on 838 to "Inject" position
016 Wait	1	– Waiting time
017 Dosino MSB1 rate	2	– Set dosing rate
018 Dosino MSB1	Concentr.vol.	– Sample volume is dosed
019 Wait	5	– Waiting time
020 Valve	fill	– Switch over injection valve on 838 to "Fill"
021 Dosino MSB1 rate	5	– Set dosing rate
022 Dosino MSB1	3.5	– Eject rest of sample into rinsing beaker
023 Valve	inject	– Set injection valve on 838 to "Inject" position
024 Wait	1	– Waiting time
025 Dosino MSB1 rate	2	– Set dosing rate
026 Dosino MSB1	Dilution vol.	– Dilution volume (ultra-pure water) is dosed
027 Stirrer MSB2	15	– Set stirring speed
028 Valve	fill	– Switch over injection valve on 838 to "Fill"
029 Ctrl	Fill A1	– Switch over injection valve on 820 to "Fill"
030 Pump speed	4	– Set delivery rate
031 Pump	65	– Transfer diluted sample to sample loop
032 Ctrl	Zero 1	– Trigger autozero on 819/1 IC Detector
033 Ctrl	Inject A1	– Switch over injection valve on 820 to "Inject"
034 Pump speed	10	– Set delivery rate
035 Pump	30	– Mixing vessel is emptied
036 Stirrer MSB2	on	– Switch on stirrer
037 Valve	inject	– Set injection valve on 838 to "Inject" position
038 Dosino MSB1 rate	20	– Set dosing rate
039 Dosino MSB1	5	– Rinse mixing vessel with ultra-pure water
040 Pump	on	– Switch on pump
041 Valve	fill	– Switch over injection valve on 838 to "Fill"
042 Wait	60	– Empty mixing vessel again
043 Pump	off	– Switch off pump
044 Valve	inject	– Set injection valve on 838 to "Inject" position
045 Dosino MSB1 rate	20	– Set dosing rate
046 Dosino MSB1	5	– Rinse mixing vessel again
047 Valve	fill	– Switch over injection valve on 838 to "Fill"
048 Pump speed	10	– Set delivery rate
049 Pump	on	– Switch on pump
050 Wait	60	– Empty mixing vessel again
051 Stirrer MSB2	off	– Switch off stirrer
052 Wait	10	– Waiting time
053 Pump	off	– Switch off pump
054 Dosino MSB1	fill	– Fill Dosino for next dilution

* must be predefined in «IC Net»

** max. volume must be taken into account. The sample must not reach the Dosino cylinder.

3.5.5 Capillary connections for sample dilutions

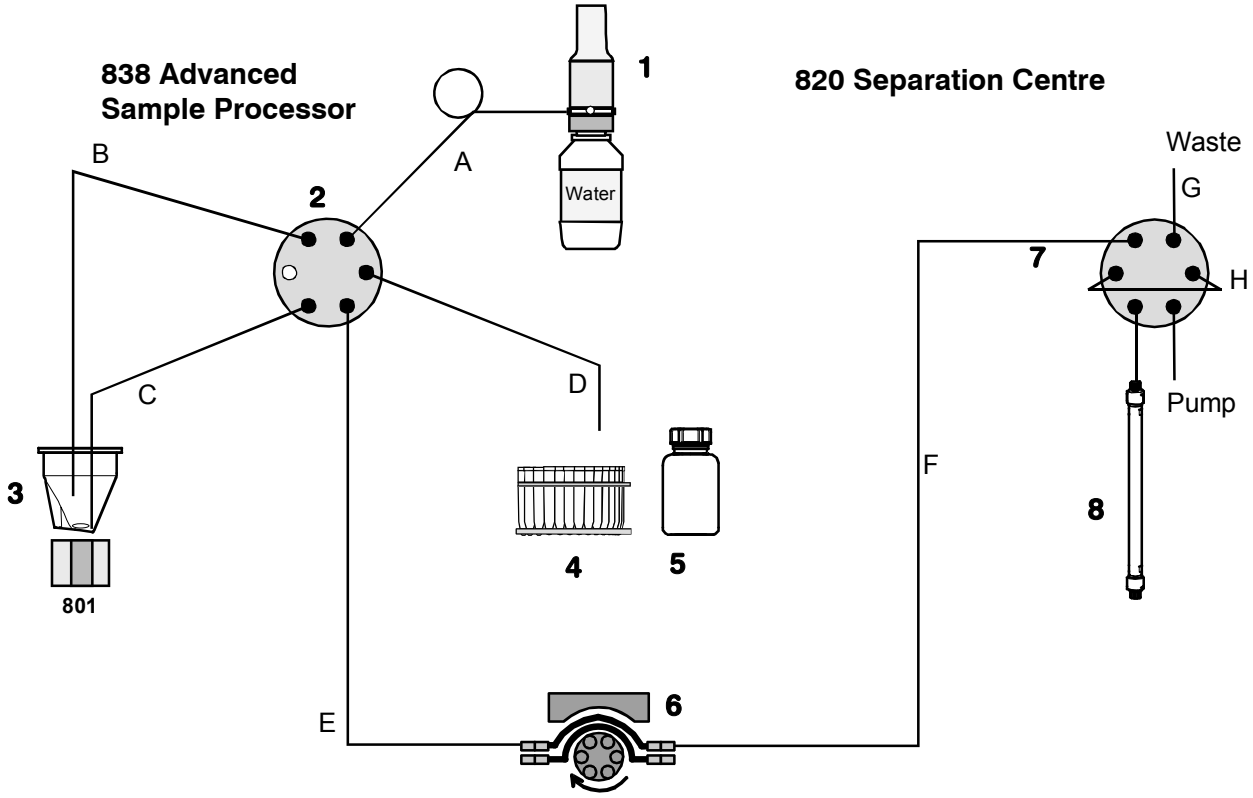


Figure 33 Capilliary connections for sample dilutions

A	**Capillary (6.1803.120)** IØ = 0.97 mm, L = 3.0 m	**E**	**Capillary (6.1803.060)** IØ = 0.97 mm, L = 0.2 m
B	**Capillary (6.1803.070)** IØ = 0.97 mm, L = 0.4 m	**F**	**Capillary (6.1803.080)** IØ = 0.97 mm, L = 1.0 m
C	**Capillary (6.1803.070) *** IØ = 0.97 mm, L = 0.4 m	**G**	**Capillary (6.1803.080)** IØ = 0.97 mm, L = 1.0 m
D	**Capillary (6.1803.080)** IØ = 0.97 mm, L = 1.0 m	**H**	**Injection loop**

* *The **capillary C** serves to aspirate. It must extend down to the bottom of the mixing container down to the lowest point of the inclined container bottom.*

1	**800 Dosino** with 10 ml dosing unit, filled with water	**5**	**PE bottle (6.1608.080)** as rinsing vessel, on sample rack (6.2041.440)
2	**Switchover valve on the 838** Note tubing connection	**6**	**Peristaltic pump on 838** with pump tubing LFL grey/grey (6.1826.140)
3	**Mixing container (6.1456.210)** with 801 magnetic stirrer and titration head 6.1414.070	**7**	**Injection valve in 820 Separation Centre** Note tubing connection
4	**Sample vessels (6.2743.050)** with PP stopper (6.2743.070), on sample rack (6.2041.440)	**8**	**IC column**

3.5.6 Equipping the work head of the mixing container

The 6.1414.070 work head of the mixing container must be provided with a capillary for supply of sample and water and a capillary for aspiration of diluted solution. The other openings must be fitted with blind stoppers.

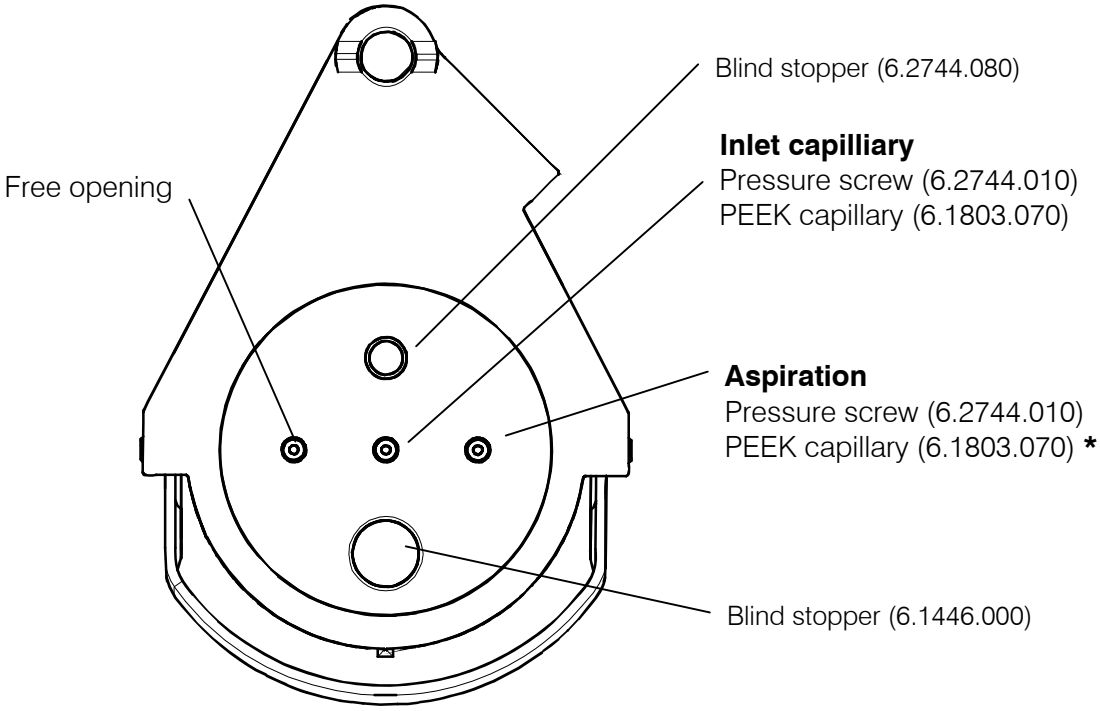


Figure 34 Equipping the mixing container

***** The PEEK capillary for aspiration must extend down to the bottom of the mixing container!

3.5.7 MIC-2 modular anionic system with chemical suppression and ultrafiltration of the samples

This system requires the **model 2.838.0210** of the 838 Advanced Sample Processor. Install the ultrafiltration cell, see *Chapter 3.3.6*.

The 838 Advanced Sample Processor is connected to an anionic IC system with chemical suppression with 819 IC detector, 820 IC Separation Centre, 818 IC pump, 833 IC Liquid Handling Unit and 830 IC Interface in accordance with *Figure 35* using the 6.2141.190.remote cable and the 6.2134.100 RS232 cable.

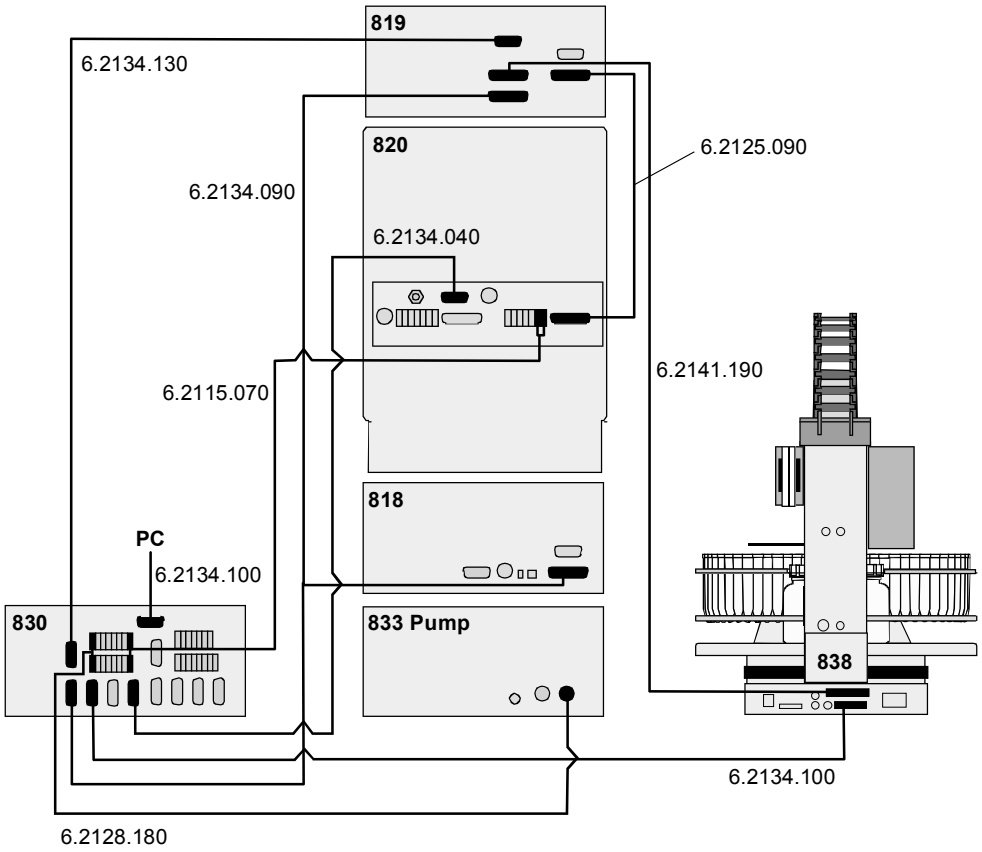


Figure 35 MIC-2 interconnection with anionic system with chemical suppression

838-specific settings in the «IC Net 2.3» program

Program for the 838 Advanced Sample Processor:

001	Ctrl INIT 819	– Initialise remote lines on 819
002	Move sample	– Move needle to sample position
003	Lift work	– Move lift with needle to working height
004	Ctrl ZERO 1	– Trigger autozero on 819/1 IC Detector
005	Ctrl FILL A 1	– Switch over injection valve on 820 to "Fill"
006	Pump 240 s	– Fill sample loop for 240 s with sample
007	Ctrl INJECT A 1	– Switch over injection valve on 820 to "Inject"
008	Start DA	– Start data recording

3.5.8 MIC-3 modular anionic and cationic system with chemical suppression

This system requires the **model 2.838.0010** of the 838 Advanced Sample Processor.

The combined anionic/cationic IC system can operate either with chemical suppression or with electronic suppression. The 838 Advanced Sample Processor is connected to the System MIC-3 with two 819 IC detectors, 820 IC Separation Centre (2 injectors), two 818 IC pumps, 833 IC Suppressor Module and 830 IC Interface in accordance with *Figure 36* using the 6.2125.120 remote adapter, the 6.2125.090 remote cable and the 6.2134.100 RS232 cable.

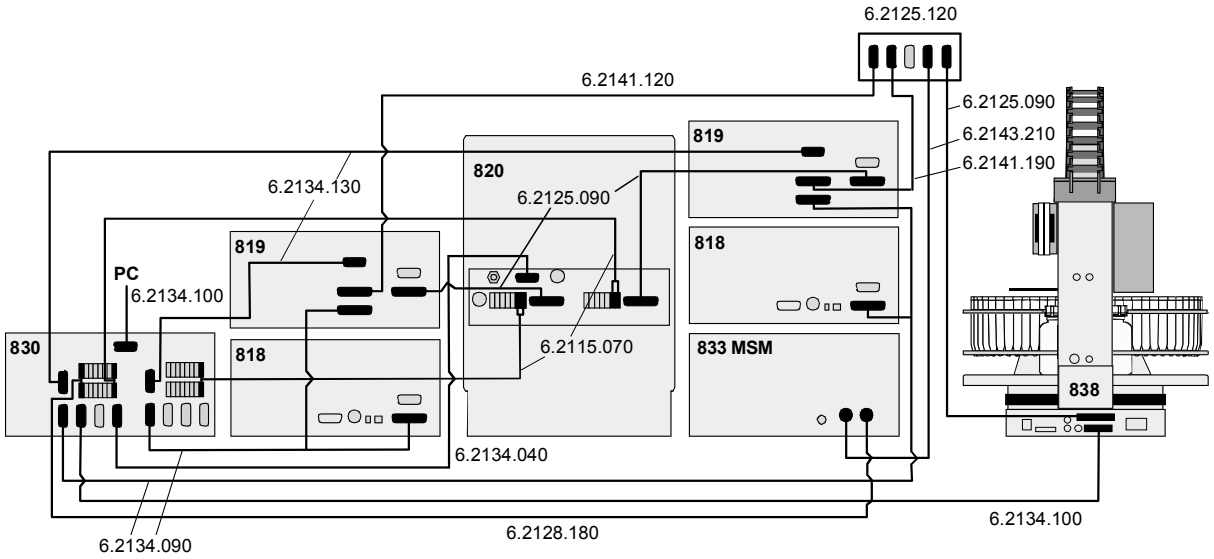


Figure 36 MIC-3 interconnection with modular anionic and cationic system with chemical suppression

838-specific settings in the «IC Net program 2.3»

Configuration of additional remote lines for the 838 Advanced Sample Processor:

```
Fill A 2    ***0*010***
Inject A 2  ***1*000***
Reset 2     ***0*000***
ZERO 2      ***0*011***
```

Program for the 838 Advanced Sample Processor:

001	Move	sample	– Move needle to sample position
002	Lift	work	– Move lift with needle to working height
003	Ctrl	ZERO 1	– Trigger autozero on 819/1 IC Detector
004	Ctrl	FILL A 1	– Switch over injection valve 1 on 820 to "Fill"
005	Ctrl	STEP MSM 833	– Trigger step in the Suppressor Unit
006	Pump	120 s	– Fill sample loop for 120 s with sample
007	Ctrl	INJECT A 1	– Switch over injection valve 1 on 820 to "Inject"
008	Move	Sample+1	– Move needle to next sample
009	Lift	work	– Move lift with needle to working height

010	Ctrl ZERO 2	– Trigger autozero on 819/2 IC Detector
012	Scan Wait1	– Wait for Remote signal
013	Ctrl FILL A 2	– Switch over injection valve 2 on 820 to "Fill"
015	Pump 120 s	– Fill sample loop for 120 s with sample
016	Ctrl INJECT A 2	– Switch over injection valve 2 on 820 to "Inject"

3.5.9 MIC-7 anionic system with chemical suppression and dialysis

This system requires the **model 2.838.0110** of the 838 Advanced Sample Processor.

The 838 Advanced Sample Processor is connected to an anionic IC system with chemical suppression with 819 IC detector, 820 IC Separation Centre, 818 IC pump, 833 IC Liquid Handling Unit and 830 IC Interface in accordance with *Figure 37* using the 6.2141.190 remote cable. and the 6.2134.090 RS232 cable.

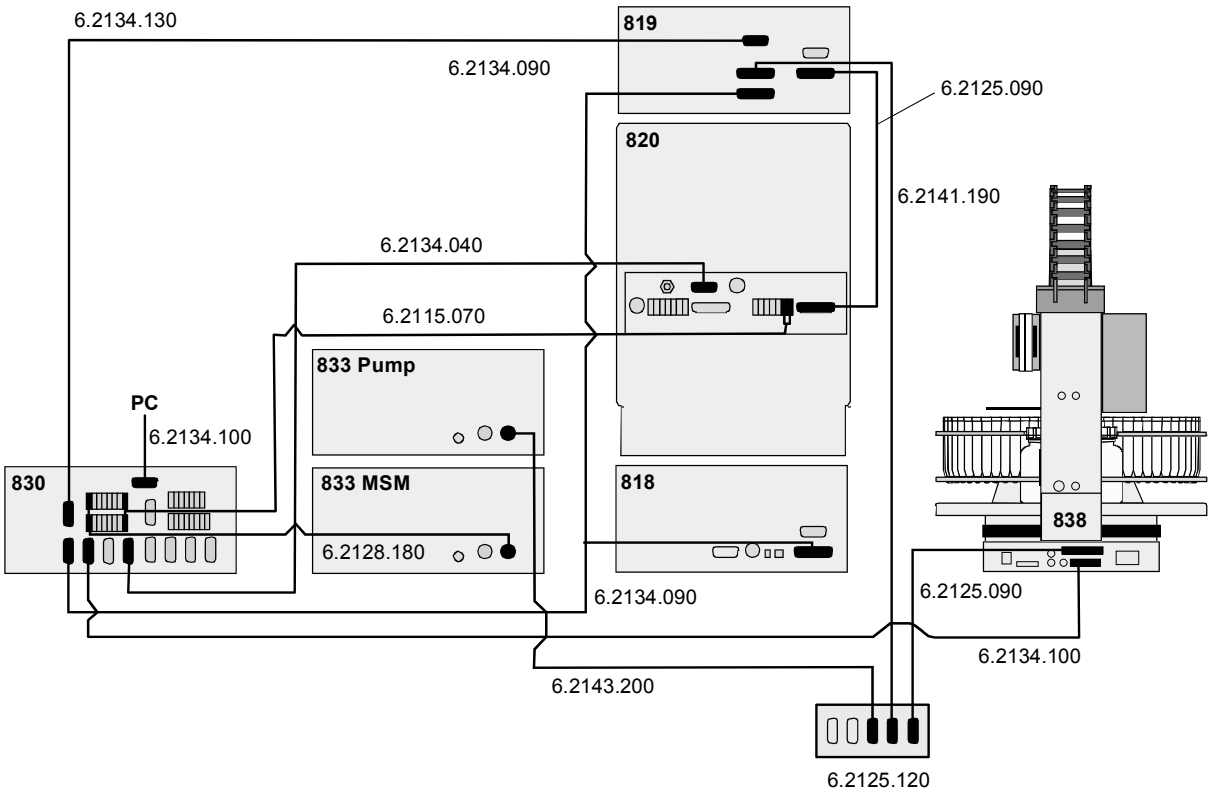


Figure 37 MIC-7 interconnection with anionic system with chemical suppression and dialysis

838-specific settings in the «IC Net 2.3» program

The sequences of an automated IC analysis with prior dialysis can be programmed in two different ways:

A) A sample is first prepared by dialysis for each analysis and this sample is then chromatographically separated.

⇒ The total analysis time per sample comprises the times for dialysis and for the chromatogram.

B) Dialysis of the next sample is performed as early as the phase in which one sample is being chromatographically separated.

⇒ The total analysis time per sample is shortened to the time required for one chromatogram.

A) Dialysis and chromatogram of a sample in one sequence

Entry of the program for the 838 Advanced Sample Processor:

- Dialysis by stop flow procedure, dialysis time 10 min.

001	Move sample	– Move needle to sample position
002	Lift work	– Move lift with needle to working height
003	Ctrl Pump 833 on	– Switch on pump 833 (acceptor solution)
004	Pump on	– Pump sample solution
005	Wait 120 s	– Wait for rinsing time
006	Ctrl Pump 833 off	– Switch off pump 833, dialysis starts
007	Wait 420 s	– Dialysis time + 180 s
008	Ctrl FILL B/STEP 1	– Trigger step of suppressor unit
009	Wait 180 s	– Wait until baseline is stable (= 10 min. dialysis time)
010	Ctrl ZERO 1	– Trigger autozero on 819/1 IC Detector
011	Ctrl FILL A 1	– Switch over injection valve in 820 to "Fill"
012	Ctrl Pump 833 on	– Pump acceptor solution
013	Wait 30 s	– Transfer time (must be determined)
014	Ctrl INJECT A 1	– Switch over injection valve in 820 to "Inject"
015	Ctrl Pump 833 off	– Stop pumping acceptor solution
016	Pump off	– Stop pumping sample solution

B) Chromatogram with simultaneous dialysis of the next sample

The following program descriptions prerequire chromatograms with a duration of e. g. 20 minutes. Dialysis of the next sample is started 10 minutes prior to the end of each chromatogram. A waiting time of 600 seconds (see below) is entered for this purpose in line 008 of the 838 program in System Dialysis.smt. This time information may need to be adapted to specific requirements.

A program which controls both injection of the dialysed sample and also dialysis of the next sample ('Dialysis.smt') is written for the 838 Advanced Sample Processor in the existing system.

In order to also process the first and last sample of a Sample Queue correctly, it is necessary to create programs in separate system files for these samples. The 838 program in system file 'Start-Dialysis.smt' only starts dialysis of the first sample. 'End-Dialysis.smt' is required for injection of the last dialysed sample.

Dialysis.smt

Entry of the program for the 838 Advanced Sample Processor

Dialysis program:

001	Pump	on	– Pump sample solution
002	Ctrl	FILL A 1	– Switch over injection valve in 820 to "Fill"
003	Ctrl	Pump 833 on	– Pump acceptor solution
004	Wait	30 s	– Transfer time (must be determined)
005	Ctrl	INJECT A 1	– Switch over injection valve in 820 to "Inject"
006	Ctrl	Pump 833 off	– Stop pumping acceptor solution
007	Pump	off	– Stop pumping sample solution
008	Wait	600	– Waiting time for synchronisation
009	Move	Sample+1	– Approach next sample
010	Lift	work	– Move lift with needle to working height
011	Pump	on	– Pump sample solution
012	Ctrl	Pump 833 on	– Pump acceptor solution
013	Wait	120	– Rinsing time
014	Ctrl	Pump 833 off	– Stop pumping acceptor solution, start of dialysis
015	Wait	480 s	– Dialysis time (120 s + 480 s = 10 min.)
016	Ctrl	FILL B/STEP 1	– Trigger step of suppressor unit
017	Wait	120	– Wait until baseline is stable
018	Ctrl	ZERO 1	– Trigger autozero on 819/1 IC Detector
019	Pump	off	– Stop pumping sample solution

Start-Dialysis.smt

- Remove the data recorder by clicking on the recorder icon with the right mouse button an selecting '*unlink*'.

Start program:

001	Move	sample	– Move needle to sample position
002	Lift	work	– Move lift with needle to working height
003	Ctrl	Pump 833 on	– Pump acceptor solution
004	Pump	on	– Pump sample solution
005	Wait	120 s	– Rinsing time
006	Ctrl	Pump 833 off	– Stop pumping acceptor solution, start of dialysis
007	Wait	480 s	– Dialysis time (780 s+ 120 s = 10 min)
008	Ctrl	FILL B/STEP 1	– Trigger step of suppressor unit
009	Wait	180 s	– Wait until baseline is stable
010	Ctrl	ZERO 1	– Trigger autozero on 819/1 IC Detector
011	Pump	off	– Switch over injection valve the 820 to "Inject"

End-Dialysis.smt

End program:

```
001   Pump  on              – Pump sample solution
002   Ctrl  FILL A 1        – Switch over injection valve in 820 to "Fill"
003   Ctrl  Pump 833 on     – Pump acceptor solution
004   Wait  30 s            – Transfer time (must be determined)
005   Ctrl  INJECT A 1      – Switch over injection valve in 820 to "Inject"
006   Ctrl  Pump 833 off    – Stop pumping acceptor solution
007   Pump  off             – Stop pumping sample solution
```

The Sample Queue to be processed then contains the following entries for instance:

	System	Ident.	Vial	Chrom. No.	Dialysis No.
1	**Start-Dialysis.smt**	**Sample 0**	**1**	-	1
2	**Dialysis.smt**	**Sample 1**	**1**	1	2
3	**Dialysis.smt**	**Sample 2**	**2**	2	3
4	**Dialysis.smt**	**Sample 3**	**3**	3	4
5	**Dialysis.smt**	**Sample 4**	**4**	4	5
6	**Dialysis.smt**	**Sample 5**	**5**	5	6
7	**End-Dialysis.smt**	**Sample 6**	**6**	6	-

This example shows processing of a sample series of 6 samples. Columns 'Chrom. No.' and 'Dialysis No.' serve only for information purposes in this case, Please note that the sample position specified here is not approached in the 838 program of system 'Dialysis.smt' for dialysis but that this position is incremented by one, thus processing the next sample. Consequently, all sample vessels must be located in a closed sequence on the sample rack.

3.5.10 MIC-8 modular system with 817 Bioscan for the sugar analysis

This system requires the **model 2.838.0020** of the 838 Advanced Sample Processor.

The 838 Advanced Sample Processor is connected to a modular Bioscan system with 819 IC detector and 817 Bioscan in accordance with *Figure 38* via PC (RS232 connections).

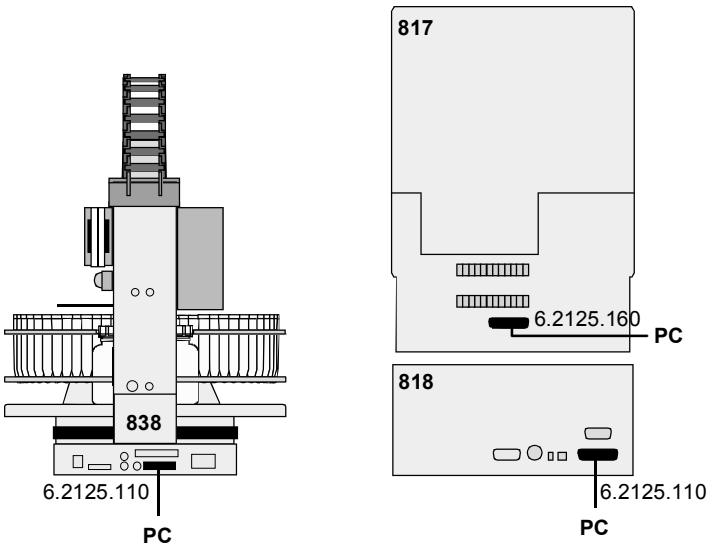
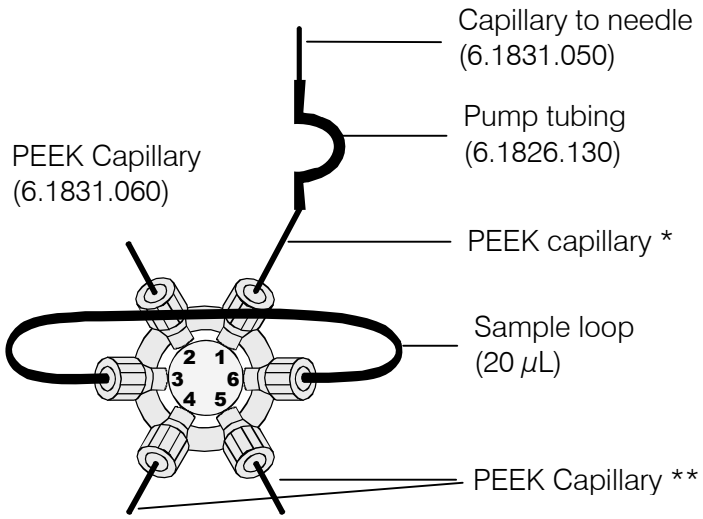


Figure 38 MIC-8 interconnection with modular system with 817 Bioscan for sugar analysis

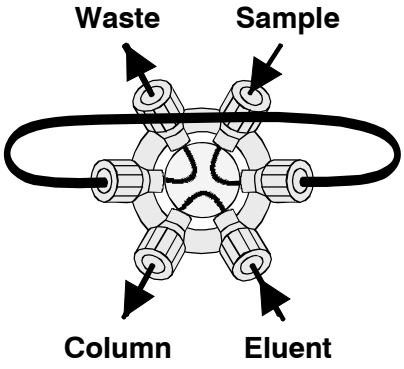
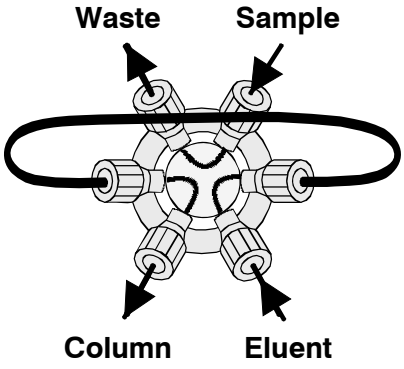
Capillary connections of the injection valve of the 838 Advanced Sample Processors:



Notice:

* cut a short fragment of the 6.1831.060 PEEK capillary (ø=0.5 mm).

** cut a fragment (approx 1 m) of the 6.1831.010 PEEK Capillary (ø=0.25 mm).

Injektion valve in **FILL** position	Injektion valve in **INJECT** position
	

838-specific settings in the «IC Net 2.3» program

Program for the 838 Advanced Sample Processor:

001	Move Sample	– Move needle to sample position
002	Lift work	– Move lift with needle to working height
003	Valve Fill	– Switch over injection valve on 838 to "Fill"
004	Pump 240 s	– Fill sample loop with sample
005	Valve Inject	– Switch over injection valve on 838 to "Inject"
006	Start DA	– Start data recording

3.5.11 Connection to 761 Compact IC or 790 Personal IC

The compact 761 Compact IC is also controlled from the PC. The 838 Advanced Sample Processor is controlled via an RS232 connection. If necessary, Compact IC and Sample Processor may also be synchronised via a remote connection.

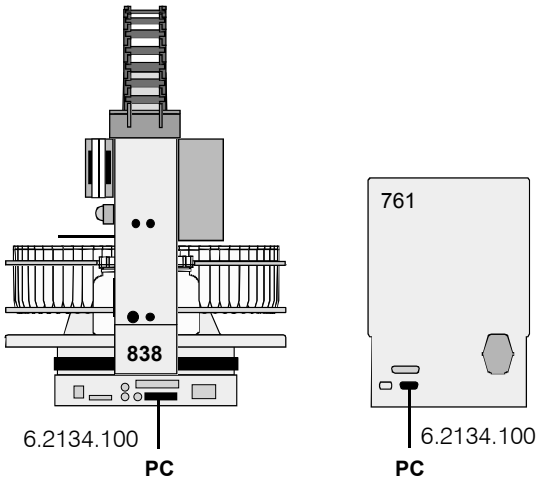


Figure 39 Interconnection with the 761 Compact IC via PC (RS232 only)

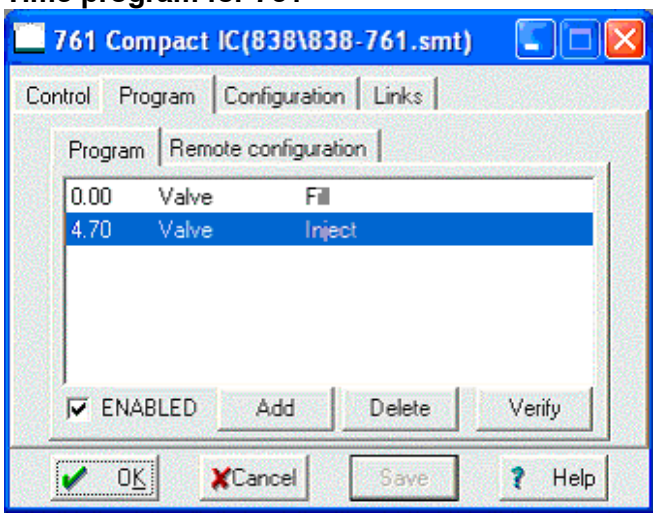
838-specific settings in the «IC Net 2.3» program

Program for the 838 Advanced Sample Processor:

```
001   Move  Sample
002   Lift  work
003   Pump  240 s
```

– Move needle to sample position
– Move lift with needle to working height
– Fill sample loop with sample

Time program for 761



Switchover of the injection valve is programmed in the time program of the 761 Compact IC.
The times may need to be adapted for the application.

The functions of the 838 Advanced Sample Processor may be triggered time-controlled via remote connection for more complex sample preparation steps. A simple example is shown below.

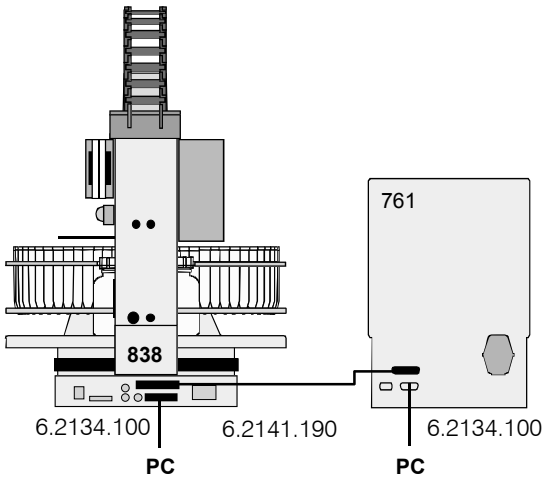


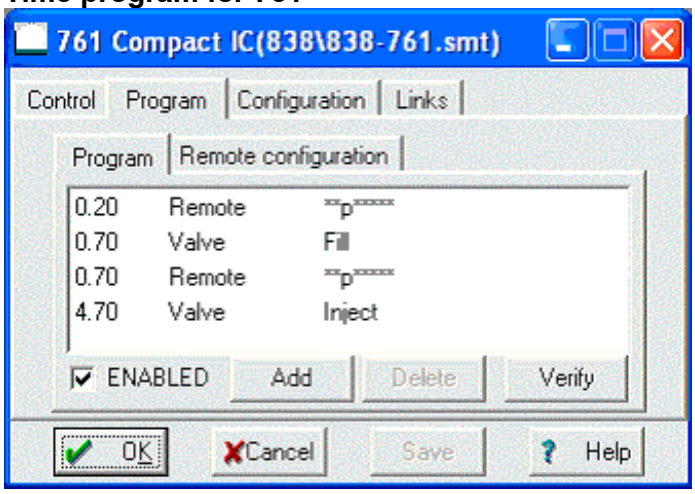
Figure 40 Interconnection with compact systems via remote connection (PC-controlled)

838-specific settings in the «IC Net 2.3» program

Program for the 838 Advanced Sample Processor:

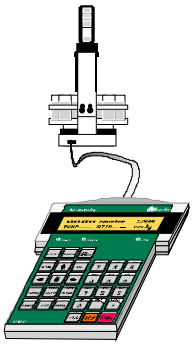
001	Scan Wait1	– Wait for pulse on remote lead
002	Move Sample	– Move needle to sample position
003	Lift work	– Move lift with needle to working height
004	Scan Wait1	– Wait for pulse on remote lead
005	Pump 240 s	– Fill sample loop with sample

Time program for 761



Remote pulses are programmed time-controlled in the time program of the 761 Compact IC.
The times may need to be adapted to the application.

3.6 Connection to Metrohm VA systems



If the 838 Advanced Sample Processor is operated with a Metrohm VA system, the predefined sequence methods of the 838 Advanced Sample Processor are used. It is absolutely essential to connect the 6.2142.050 keypad in order to adapt these methods.

The possible instrument combinations depend greatly on the individual determination methods in voltammetry. Two systems are shown by way of example below.

3.6.1 Connection to a Metrohm 797 VA Computrace

The 838 Advanced Sample Processor is connected to a Metrohm 797 VA Computrace with the 6.2141.180 multiple remote cable, see below. Connection of pumps to the 731 Relay Box requires one 6.2160.010 adapter cable.

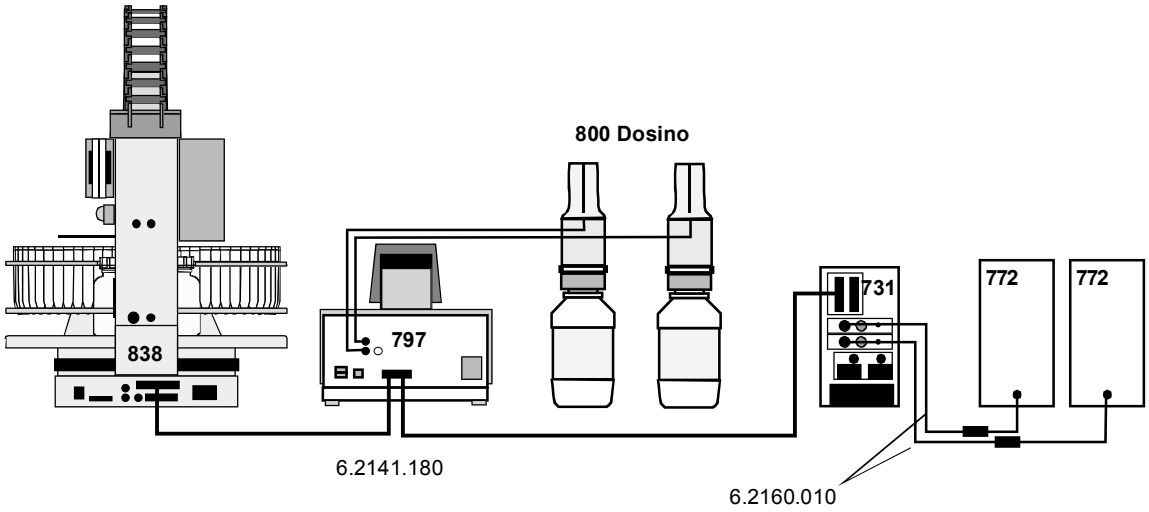


Figure 41 Interconnection with 797 VA Computrace

3.6.2 MVA-13 modular system for automatic analysis of electroplating baths

The 838 Advanced Sample Processor is connected to a Metrohm 797 VA Computrace with the multiple 6.2141.180 remote cable, see below. Connection of pumps to the 731 Relay Box requires one 6.2160.010 adapter cable in each case.

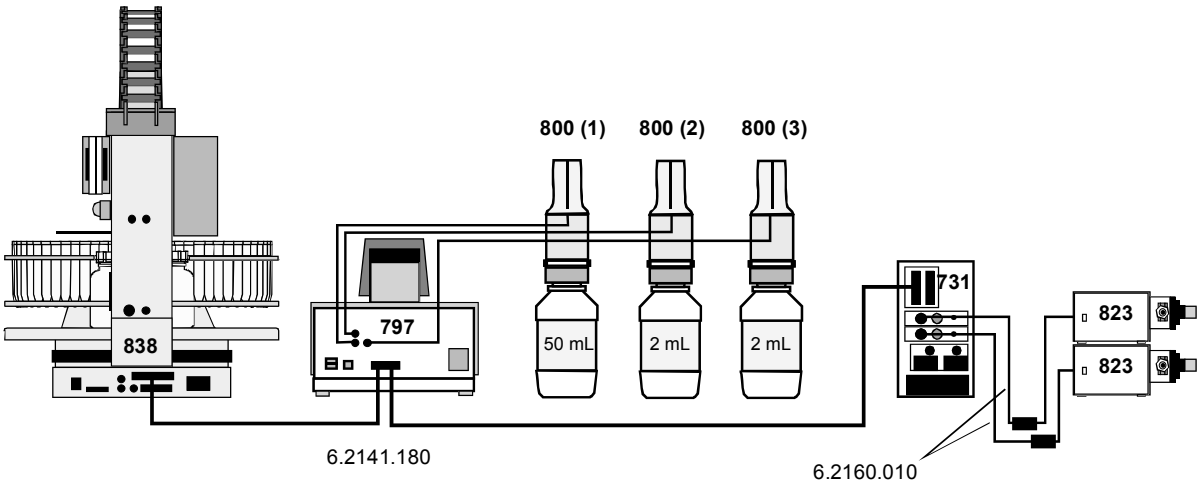


Figure 42 MVA-13 connection to an analysis system for electroplating baths

3.6.3 Accessories for sample volumes greater than 10 ml

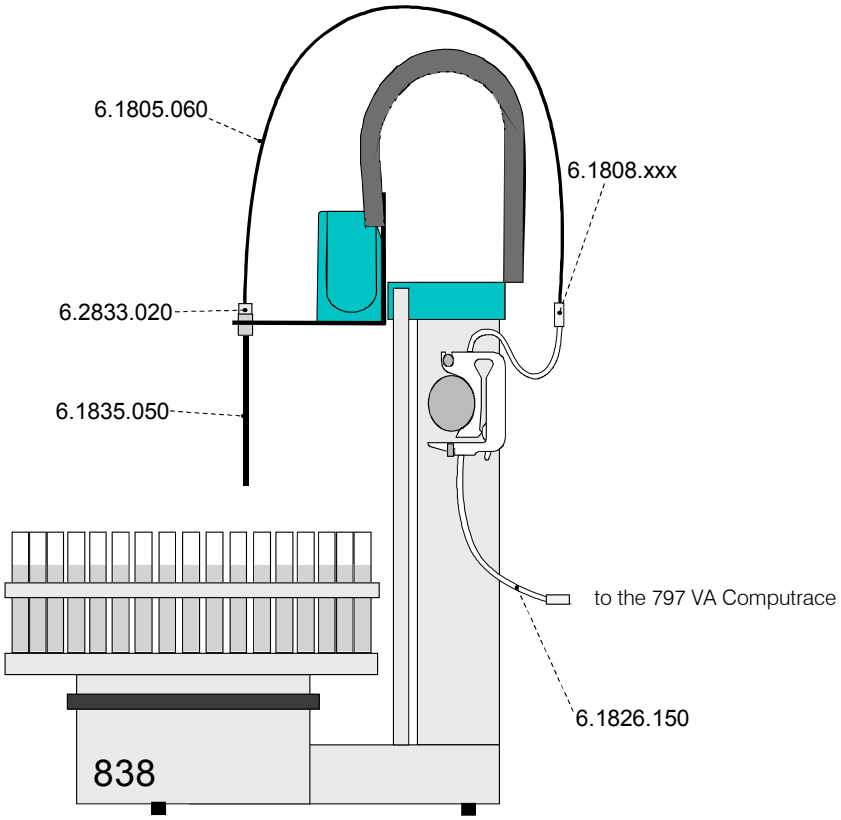


Figure 43 Accessories for larger sample volumes

The 6.1835.040 PEEK tubing, the 6.2833.000 needle holder and the 6.1831.070 PEEK capillary can be used for sample transfer of small volumes. Please refer to the 797 VA Computrace Instructions for Use or the documentation of the MVA-13 system for further information.

3.7 Sample racks

A sample rack is a turntable for accommodating sample vessels which is fitted on the Sample Processor. Various types of sample rack can be used and exchanged easily in order to support different types of sample vessel. The rack offers space for different numbers of samples depending on the diameter of the sample vessels.

3.7.1 Metrohm standard sample racks

Article No. / Rack type	Number of samples	Type of sample vessel	Vessel diameter	Magnetic code predefined
6.2041.310	12	250 ml Metrohm titration beaker	65 mm	000001
6.2041.320	16	150 ml beaker	55 mm	000010
6.2041.340	24	75 ml Metrohm titration beaker	35 mm	001000
6.2041.350	48	75 ml Metrohm titration beaker	35 mm	010000
6.2041.360	12	150 ml beaker or 200 ml disposable beaker	55 mm	100000
6.2041.370	14	200 ml disposable beaker	55 mm	000011
6.2041.380	14	8 oz disposable beaker	59 mm	000101
6.2041.400 *	126 + 2	11 ml sample tube 250 ml Metrohm rinsing beaker	16 mm 65 mm	001010
6.2041.410 *	141 + 1	11 ml sample tube 500 ml beaker	16 mm 71 mm	001010
6.2041.430 *	127 + 2	11 ml sample tube 2 x 300 ml PE bottles	16 mm 68 mm	010001
6.2041.440 *	148 + 3	11 ml sample tube 3 x 300 ml PE bottles	16 mm 68 mm	010100
6.2041.450**	56 + 56	50 ml PP sample vessel 11 ml sample tube	30 mm 16 mm	100100
6.2041.750 *	36	11 ml sample tube	16 mm	011000

* recommended for IC applications

** recommended for VA applications

Table 5 Sample racks

On request, other user-defined racks can be supplied and defined via PC software in the instrument. Any arrangements of the sample positions are possible.

3.7.2 Magnetic codes

Each individual sample rack can be uniquely identified by means of a magnetic code. Magnetic pins on the underside of the rack (see Figure 8) can be combined to form a binary, six-digit code. The Sample Processor can thus automatically detect what rack is fitted.

When changing the rack, it should first be moved to initial position by pressing the **<RACK>** key (if a keypad is connected) or the instrument should be switched off and then on again. This allows unique detection of the rack and, thus, correct beaker positioning. An internal position table defining the angle of rotation and the distance from the centre of the rack is assigned to each rack type.

When a sample series is started, the Sample Processor automatically moves the rack first to initial position in order to read out the magnetic code. This always ensures that the beaker positions correspond to the internal position table of the fitted rack.

The standard racks supplied by Metrohm already feature a predefined magnetic code for each type. If several racks of the same type are used, the magnetic pins may be arranged differently so as to allow unique identification of a sample rack.

Magnetic code format (example):

000001, i.e. only one magnet is fitted, bit 0
000101, i.e. two magnets are fitted, bits 0 and 2

63 different combinations are possible. Code 000000 means "no code defined".

4 Service, maintenance, faults

4.1 Servicing

Servicing the Advanced Sample Processor should be carried out within the framework of an annual service visit by technicians from Metrohm or one of its local agencies. If aggressive or corrosive chemicals are used then shorter service intervals are necessary.

The Metrohm service department is always pleased to provide competent advice about the servicing and maintenance of all Metrohm instruments.

4.2 Care and maintenance

Not just sensitive instruments, but even a Sample Processor requires a certain amount of care and attention. If the instrument becomes excessively dirty this could interfere with its functions and shorten the working life of its basically robust mechanism and electronics.

Excessive dirt on the working heads can influence the measuring results obtained. Regular cleaning of exposed parts can prevent this to a large extent.

Spilled chemicals and solvents should be cleaned up immediately. Above all, the connection strip (the mains plug in particular) must be protected against contamination.

Although this prevented to a large extent by constructive measures, if aggressive media should penetrate the interior of the instrument then the mains plug should be pulled out immediately in order to prevent massive damage to the electronics. If such damage should occur please contact the Metrohm service department.

The instrument must not be opened by untrained personnel.

4.2.1 Exchanging pump tubings

Pump tubings are consumable material with a restricted service life. You should thus periodically replace pump tubings (approx. every 2 weeks if used continuously).

The service life of pump tubings depends greatly on the contact pressure. You should thus set the contact pressure correctly in accordance with *Chapter 3.3.9* and fully raise the tubing cartridges by releasing the snap-action lever **51** if the pump is to be switched off for a long period (this maintains the optimum contact pressure once set).

Proceed as follows in order to exchange pump tubing:

1 Removing the old pump tubing

- Press the contact pressure lever **49** on the tubing cartridge down fully.
- Detach the tubing cartridge **48** from the retaining bracket 50 by pushing the snap-action lever **51** in and disengage the tubing cartridge from the retaining cam **53** on the 838 Advanced Sample Processor.
- Remove the old pump tubing.

2 Fitting the new pump tubing

- Insert the new pump tubing **56** (6.1826.xxx) into the tubing cartridge. The stopper **57** must engage in the corresponding fixture on the upper side of the tubing cartridge.
- Engage the tubing cartridge in the retaining cam **53** and push it at the rear to the front until the snap-action lever **51** engages on the retaining bracket **50**. Ensure that the pump tubing is not kinked when doing this.

3 Setting the contact pressure

- Push the pressure lever **49** upwards until the solution is just being aspirated. Then push the pressure lever 1 further detent position up to achieve an optimum contact pressure.

Pump tubings made of PVC or PP may not be used to rinse with solutions containing acetone. Use different pump tubings or use another pump for rinsing in this case.

4.2.2 Replacing the filtration membrane

Perfect condition of the filtration membrane used is absolutely essential in order to achieve constant quality of the analysis results. Consequently, this membrane must be exchanged at regular intervals.

Please follow the information in *Chapter 6.1* when assessing the need to exchange a membrane.

Please proceed as follows (see also *Chapter 3.3.6*) when replacing a filtration membrane:

1 Preparing the ultrafiltration cell

- Detach all capillary connections on the ultrafiltration cell **28** by unscrewing the PVDF pressure screws **22**.
- Using the 6.2621.070 Allen key (5 mm) fully undo the 5 screws **46**, separate the upper section **43** from the lower section **45** and remove the sealing ring **44** and the spent filtration membrane.
- Thoroughly rinse off the sealing ring, lower section and upper section of the ultrafiltration cell with ultra-pure water.

*Only **ultra-pure water** or **ethanol** may be used to clean the ultrafiltration cell. Organic solvents (e.g. acetone) will result in damage to the Plexiglass cell!*

2 Preparing the filtration membrane

- Remove a new 6.2714.020 filtration membrane **50** using the 6.2831.010 tweezers from the packaging and immerse it for approx. 2 minutes in a petri dish filled with ultra-pure water until the membrane is fully soaked with water.

3 Fitting the filtration membrane

- Place the upper section **43** of the ultrafiltration cell with the inside pointing upwards onto a clean paper towel.
- Fit the sealing ring **44** into the recess provided on the upper section.
- Place the wet filtration membrane using the tweezers, centred inside the sealing ring, onto the upper section.

It is imperative that the filtration membrane be soaked with water before inserting it into the filtration cell since this causes it to expand. If it is inserted dry, this will then lead to creasing and folding in the filtration cell which may result in blockage of the cell.

*Please use only the specified **6.2744.000 PVDF pressure screws for connection to** the ultrafiltration cell. If you use the 6.2744.010 PEEK pressure screws, this may result in stress cracking on the ultrafiltration cell!*

4 Closing the ultrafiltration cell

- Fit the lower section **45** onto the upper section **43** so that the two parts fit perfectly.
- Using the 6.2621.070 Allen key, fully screw in and firmly tighten the 5 screws **46**.

5 Fitting the ultrafiltration cell

- After screwing the ultrafiltration cell together, insert it into the holder **26** as shown in *Figure 17* so that the heads of the screws **46** are located in the holes provided in the holder.
- Fit the three capillary connections which were detached previously back on the inlet and outlet openings provided on the ultrafiltration cell using the PVDF pressure screws **22**.

6 Rinsing the ultrafiltration cell

- Each time the ultrafiltration membrane is replaced, any air still in the filtration cell and in the lines must be removed. In order to do this, rinse all lines with ultra-pure water from one of the special beakers for instance:
- Place a 300 ml PE bottle with ultra-pure water as the rinsing solution onto a special beaker position on the sample rack.
- Use the IC Net software to control the 838 Advanced Sample Processor directly. Choose the corresponding system and open the **Manual control** dialog box. You can run the individual functions of the Sample Processor under **Autosampler**. Please refer to the IC NET software Online Help documentation for details of operation.
- Move the beaker with the rinsing solution above the lift with **MOVE**.
- You can use the **LIFT** function to lower the needle into rinsing position.
- Switch on the peristaltic pump with **PUMP**, and all connected lines are then rinsed and any air they contain is removed.
- After an adequate time (e.g. 5 min), switch the pump back off again with **PUMP** and move the needle back to home position.

4.2.3 Replacing the dialysis membrane

It may be necessary to replace the dialysis membrane in the following cases:

- Reduced yield in dialysis
- Dried-out membrane or membrane damage as the result of deposits or bacterial growth
- Irremediable blockage of the sample channel (sample is no longer able to be pumped through the dialysis cell)

Proceed as follows in order to exchange the membrane (see also 3.3.7):

1 Detaching the dialysis cell

- Unscrew the four inlet resp. outlet capillaries from the dialysis cell **37** and remove the cell from the cell holder.
- Using the 6.2621.070 Allen key, fully undo the 5 screws **42** and separate the lower section **41** from the upper section **38**
- Remove the old dialysis membrane **40**.

2 Cleaning the dialysis cell, fitting the dialysis membrane and fitting the cell back on

- See *Chapter* 3.3.7 Fitting the dialysis cell.

3 Connecting the dialysis cell

- See *Chapter 3.3.12* Connecting the dialysis cell.

4 Conditioning the dialysis membrane

See also *Chapter 3.3.12*.

- Immerse the two aspiratory tubings **68** and **72** (see Figure 24) into the acceptor solution (degassed ultra-pure water).
- Switch on the peristaltic pump in «IC Net».
- Rinse the dialysis system for approx. 20 minutes with ultra-pure water. Check whether solution is emerging uniformly at the two inlet capillaries into the waste vessel.
- Check all tubings from the supply vessels through the tubing cartridges and the dialysis cell as far as the waste vessels for escaping fluid. If fluid is escaping, at any point, the corresponding connection must be tightened or replaced.
- If air bubbles remain in the dialysis cell, unscrew the PEEK capillary **76** (acceptor solution) and PTFE capillary **73** (sample) from the outlets **44 resp. 47 of the** dialysis cell and wait until the air bubbles have disappeared. Then screw the tubings back onto the dialysis cell.
- Switch off the peristaltic pump.

5 GLP validation – diagnosis

5.1 Validation / GLP

GLP (**G**ood **L**aboratory **P**ractice) requires, among other things, that the precision and correctness of analytical instruments is checked at regular intervals by using SOPs (**S**tandard **O**perating **P**rocedures).

As this instrument is not a measuring instrument as such, we recommend that the Sample Processor is included in an analytical system and is validated as part of the all-embracing validation of the whole analytical system.

Checking the electronic and mechanical assemblies of Metrohm instruments can and should be undertaken within the framework of regular servicing by Metrohm technicians. All Metrohm instruments are equipped with start-up check routines which check that the relevant assemblies are functioning perfectly when the instrument is switched on. If no error message appears it can be assumed that the instrument is functioning properly. Metrohm also supplies its instruments with built-in diagnosis programs which allow the service technicians to check the functioning of particular assemblies should faults or malfunctions occur and to localize them. Diagnosis programs can also be incorporated in a validation method.

6 Annex

6.1 Filtration

6.1.1 Selection of possible sample types

Each filtration process using a filtration membrane with a small pore size could be subject to a membrane blockage.

The following table lists some types of sample that have been filtered with the Metrohm 6.2729.110 Ultrafiltration Cell with the standard 6.2714.020 Filtration membrane (0.15 µm) or a second filter membrane (0.2 µm) and then analyzed on a Metrohm IC system. The concentrations of the following 7 anions were determined: F^-, Cl^-, NO_2^-, Br^-, NO_3^-, HPO_4^{2-}, SO_4^{2-}.

Sample type	*Pore size of membrane*	*No. of samples per filter*
Orange juice with fruit pulp	0.15	40
Surface water	0.15	500
Drinking water	0.15	1000
Ground water	0.15	500
Wastewater 1	0.15	1000
Wastewater 2	0.15	130
Wastewater 3	0.15	40
Wastewater 4	0.15	80
NaCl solution (1%)	0.2	5000
Schöninger digestion soln.	0.2	100
Acidic soil extracts	0.2	1000
Aqueous soil extracts	0.2	200

Table 6 Filtering various samples

The given number of samples that can be filtered on a filter membrane without any loss of quality being observed are empirical values. They have been determined at Metrohm AG and by various customers and should be used as an orientation guide for estimating the application of the ultrafiltration cell for sample preparation. These values must be determined individually for each new application.

6.1.2 Filter working life

A reduction in the recovery rate when analyzing standard solutions can be used as a possible indicator for the early recognition of an impending blockage. Ideally these solutions should be made up in the sample matrix being analyzed.

This means that if a large number of samples are to be analyzed then it is advisable to measure standard solutions at regular intervals, for example after every 5th or 10th sample for sample with a high particle load. However, it is not possible to make any general prediction about the number of possible filtration processes. The development of the recovery rate with the number of samples may also be subject to large variations. While with one sample matrix the recovery rate may remain stable rate for many samples and then drop sharply, with a different sample matrix it may diminish slowly and continuously.

The time when the filter membrane should be replaced ultimately depends on the sample matrix and the specifications of the analytical method used. In our experience very fine and suspended particles in the sample matrix will block the filter membrane more rapidly than coarse particles, which tend to be carried past the membrane in the sample flow.

Instructions for replacing the filter membrane are given in Section *4.2.2*.

6.1.3 Filter membrane selection

You can apply existing sample preparation rules to filtration with the Metrohm 6.2729.110 Ultrafiltration Cell. If you wish to use a different filter membrane from that supplied as standard then please note that, even if the particle size is known, the selection of a membrane with an appropriate pore size does not automatically produce the required results.

Some investigations have shown that the retention capability of normal filter membranes does not always correspond to their specified pore size. The following table shows the qualitative filtering effect of filter membranes with different nominal pore sizes. The tests were carried out on aqueous solutions containing silica particles with particles sizes 1.5 μm and 5 μm.

Test solutions: silica particles in water	Pore size of filter membrane 1	Effect
0.5 %, 5 µm	0.15 µm	no breakthrough
0.5 %, 5 µm	3 µm	no breakthrough
0.5 %, 5 µm	8 µm	no breakthrough
0.5 %, 5 µm	10 µm	breakthrough [2]
0.5 %, 5 µm	12 µm	no breakthrough
0.5 %, 1.5 µm	0.15 µm	no breakthrough
0.5 %, 1.5 µm	3 µm	breakthrough

(1) Nominal pore size according to information supplied by manufacturer.
(2) All the membranes came from a single manufacturer except this one.

Table 7 Selection of the filtration membrane

Please also note that, because of their lack of thickness, the retention capability of filter membranes may be lower than that of thicker filters with the same nominal pore size. This should be taken into account when choosing a suitable filter membrane.

6.2 Technical data

6.2.1 2 Channel peristaltic pump

Speed	± 6.7/min ... ± 100/min adjustable in ±15 steps	
Delivery rate (typical)	*Tubing*	*Delivery*
(with water, no back-pressure, dependent on contact pressure and tubing type, at 20/min apart from 6.1826.150 in the case of 67/min)	6.1826.010: 6.1826.020: 6.1826.030: 6.1826.040: 6.1826.070: 6.1826.130: 6.1826.150:	1.4 ml/min 3.8 ml/min 0.4 ml/min 0.8 ml/min 2.6 ml/min 1.4 ml/min 23.8 ml/min
Pressure	max. 4 bar (0.4MPa)	
Pumpable fluids	Clear fluids, no solids	
Pump tubing material	PVC (Tygon® ST) PVC (Tygon® LFL) PP	

6.2.2 Pump connections

Outlets	2 x M8 sockets:
for 823 Membrane Pump or 772 Pump Unit	U = 16 ± 1 V I ≤ 0.8 A

6.2.3 Injection valve

Positions	Fill … Inject

6.2.4 Keypad with LCD display

Number of characters	2 x 24
Character height	5 mm
LED indicators	3
Number of keys	30

6.2.5 Interfaces

RS232 connector	For connection of a computer, 9-pin
Remote socket	Universal parallel interface, programmable for communication with external instruments, 22 signal lines (8 x Input, 14 x Output), TTL level

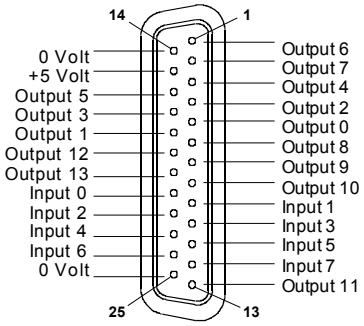
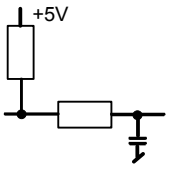
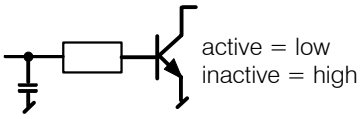


Figure 44 Remote interface

Input: t_p t_p >20 ms
approx. 50 kΩ
Pull-up



Output: t_p t_p >200 ms
V_{CEO} = 40 V
I_C = 20 mA
Open Collector



+5 V: maximum load = 20 mA

6.2.6 MSB connections

3 connection sockets	9-pin Mini-DIN sockets - for 800/700 Dosino or 805 / 685 Dosimat - for 801 Stirrer or 804 Titration Stand

6.2.7 Swing Head connection

Connection socket	9-pin Mini-DIN socket - for 786 Swing Head

6.2.8 Lift

Max. lift travel	235 mm
Max. load	approx. 30 N
Lift rate	adjustable, 5...25 mm/s

6.2.9 Turntable

Shifting rate	adjustable, 3...20 angular degrees/s

6.2.10 Stirrer connection (DIN socket)

Stirring speed	adjustable in 15 steps 741 magnetic stirrer 180/min...2600/min 802 / 722 rod stirrer 180/min...3000/min

6.2.11 Mains connection

Voltage	100… 240 V (±10%)
Frequency	50...60 Hz
Power consumption	115 W
Fuse	2.0 A slow-blow

6.2.12 Safety specification

Design and testing	in accordance with EN/IEC 61010-1, EN/IEC 61010-2-081, UL 3101-1 safety class I
Safety notes	The Instructions for Use contain information and warnings which must be followed by the user in order to ensure safe operation of the instrument.

6.2.13 Electromagnetic compatibility (EMC)

Emitted interference	Standards met: - EN/IEC 61326 - EN 55022 / CISPR 22 - EN/IEC 61000-3-2
Interference immunity	Standards met: - EN/IEC 61326 - EN/IEC 61000-4-2 - EN/IEC 61000-4-3 - EN/IEC 61000-4-4 - EN/IEC 61000-4-5 - EN/IEC 61000-4-6 - EN/IEC 61000-4-8 - EN/IEC 61000-4-11 - EN/IEC 61000-4-14 - NAMUR

6.2.14 Ambient temperature

Nominal operating range	+5…+45 °C (at max. 80 % relative humidity)
Storage	-20 ...+60 °C Relative humidity < +40 °C < 95 % Relative humidity < +50 °C < 85 % Relative humidity < +60 °C < 50 %
Transport	-20 ...+60 °C Relative humidity < +40 °C < 95 % Relative humidity < +50 °C < 85 % Relative humidity < +60 °C < 50 %

6.2.15 Dimensions and material

Height	0.73 m
Width	0.28 m
Depth	0.50 m
Weight (not including accessories)	15.50 kg (1.838.0010) 15.90 kg (1.838.0020)
Materials	
- Sample changer housing	Metal housing, surface-treated
- Keypad housing	Crastin (PBTB), aluminium-sputtered on inside
- Keypad film	Polyester, chemical-resistant

6.3 Standard equipment

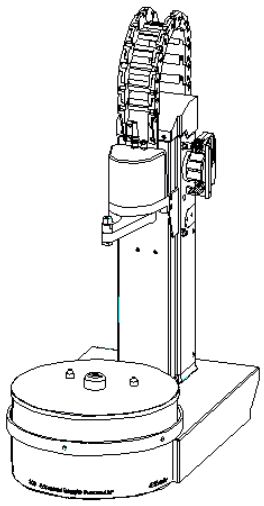
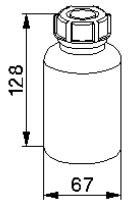
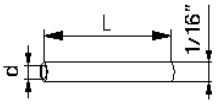
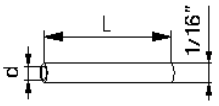
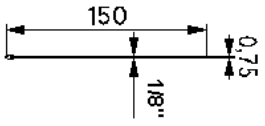
On receipt of the instrument please check that the delivery is complete.

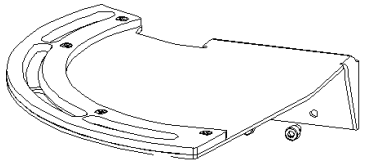
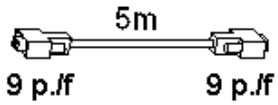
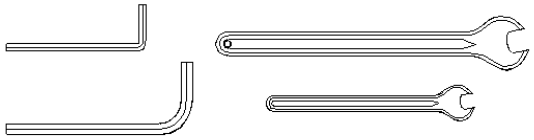
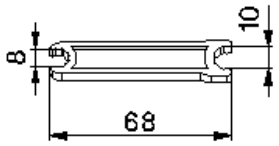
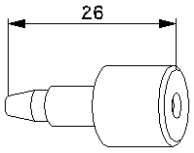
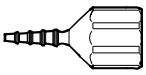
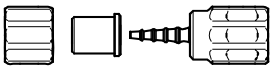
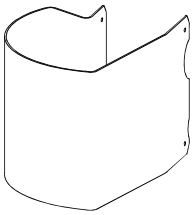
6.3.1 Metrohm 838 Advanced Sample Processor

Order no. 2.838.0010

Advanced IC Sample Processor

The following accessories are included as standard:

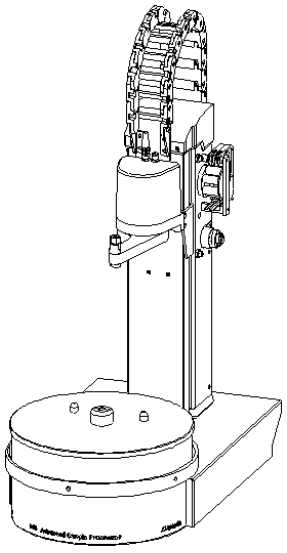
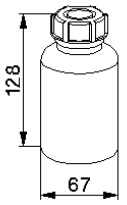
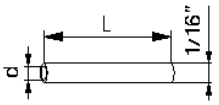
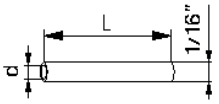
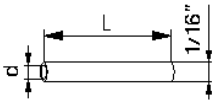
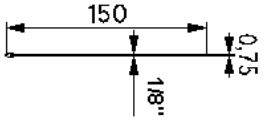
No.	*Order no.*	*Description*
1	1.838.0010 1.786.0010 6.1462.090	**838 Advanced Sample Processor** For Metrohm IC systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • no injection valve • no sample rack Sample racks see 6.3.2. 
3	6.1608.080	PE bottle 300 ml (40 mm opening) 
2	6.1826.130	Pump tubing LFL White/White
1	6.1831.050	PEEK capillary 1/16 " d = 0.5 mm, L = 0.40 m 
2	6.1831.060	PEEK capillary 1/16 " d = 0.5 mm, L = 1 m 
1	6.1835.010	PEEK needle 1/8" 

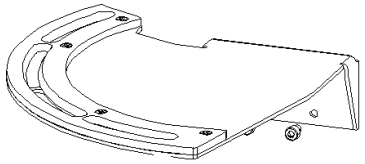
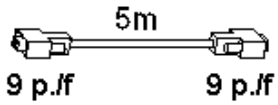
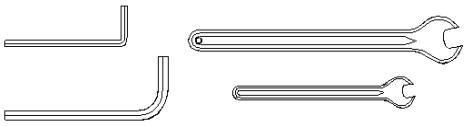
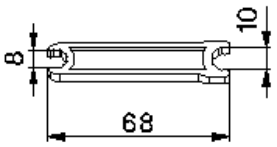
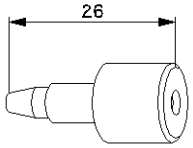
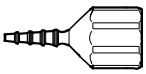
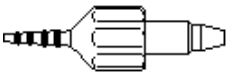
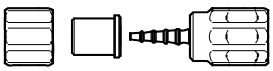
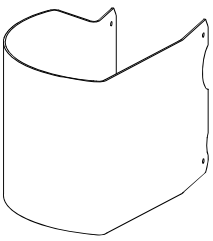
1	6.2064.000	Retention plate 
1	6.2134.100	RS-232 cable DB9/f — DB9/f (5 m) 
1	6.2141.190	Remote cable 732/819 — 766/788/838
1	6.2621.300	Tool kit for 838 
1	6.2739.000	Spanner for nipple 
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea. 
1	6.2744.034	Coupling, olive/UNF 10/32 2 ea. 
1	6.2744.160	Coupling with lock Olive/UNF 10/32 
1	6.2751.110	Safety guard/splash guard 
1	Y.1070.150	Cable strap, self-adhesive
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English

Order No. 2.838.0020

Advanced IC Injection Sample Processor

The following accessories are included in the scope of delivery:

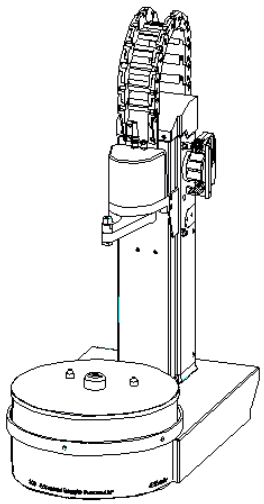
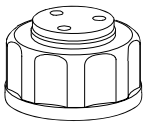
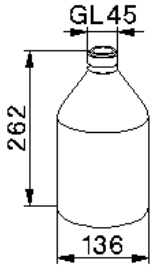
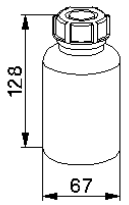
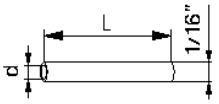
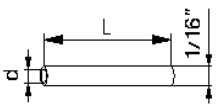
Qty.	*Order No.*	*Description*
1	1.838.0020 1.786.0010 6.1462.090	**838 Advanced Sample Processor** For Metrohm IC systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • Injection valve • Without sample rack Sample racks, see 6.3.2. 
3	6.1608.080	PE bottle 300 ml (40 mm opening) 
1	6.1825.210	Sample loop 20 µL made of PEEK 
2	6.1826.130	Pump tubing LFL White/White
1	6.1831.010	PEEK capillary 1/16 " d = 0.25 mm, L = 3.0 m 
1	6.1831.050	PEEK capillary 1/16 " d = 0.5 mm, L = 0.40 m 
2	6.1831.060	PEEK capillary 1/16 " d = 0.5 mm, L = 1 m 
1	6.1835.010	PEEK needle 1/8" 

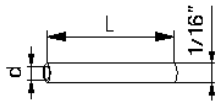
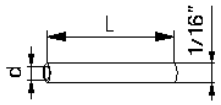
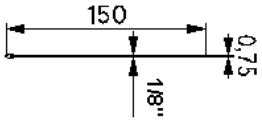
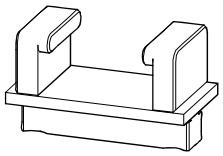
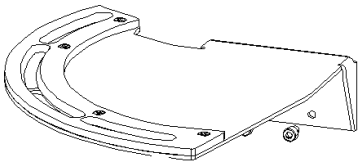
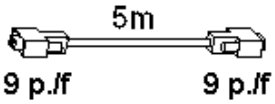
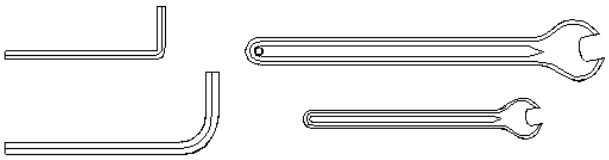
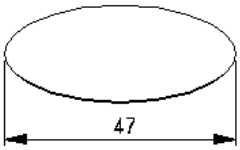
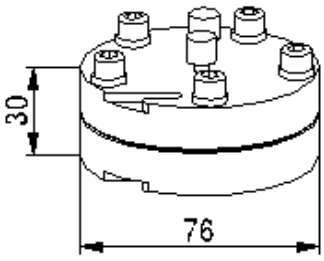
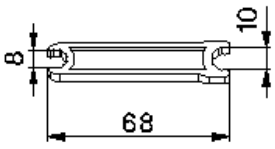
1	6.2064.000	Retention plate 
1	6.2134.100	RS-232 cable DB9/f — DB9/f (5 m) 
1	6.2141.190	Remote cable 732/819 — 766/788/838
1	6.2621.300	Tool kit for 838 
1	6.2739.000	Spanner for nipple 
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea. 
1	6.2744.034	Coupling, olive/UNF 10/32 2 ea. 
1	6.2744.110	Coupling UNF 10/32 external / olive 
1	6.2744.160	Coupling with lock Olive/UNF 10/32 
1	6.2751.110	Safety guard/splash guard 
1	Y.1070.150	Cable strap, self-adhesive
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English

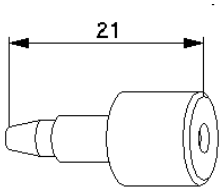
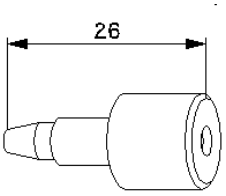
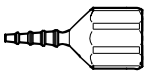
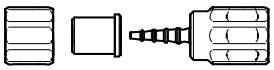
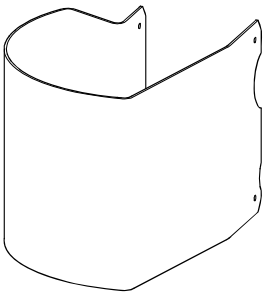
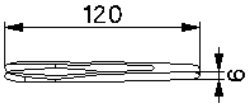
Order No. 2.838.0110

Advanced IC Dialysis Sample Processor

The following accessories are included in the scope of delivery:

Qty.	*Order No.*	*Description*
1	1.838.0010 1.786.0010 6.1462.090	**838 Advanced Sample Processor** **For** Metrohm IC systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • Without injection valve • Without sample rack Sample rack, see 6.3.2. 
1	6.1602.150	Bottletop GL 45-3x10/32 
3	6.1608.070	Transparent glass bottle 2 L GL45 
3	6.1608.080	PE bottle 300 ml (40 mm opening) 
6	6.1803.040	PTFE capillary 1/16 " d = 0.5 mm, L = 1.0 m 
1	6.1803.100	PTFE capillary 1/16 " d = 0.5 mm, L = 0.40 m 
2	6.1826.030	Pump tubing AME-05 Orange/Yellow
2	6.1826.040	Pump tubing AME-08, Black/Black

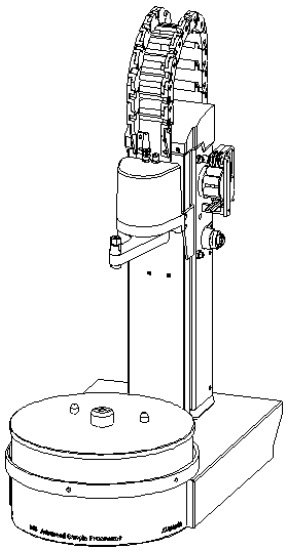
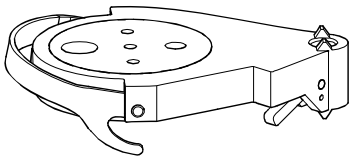
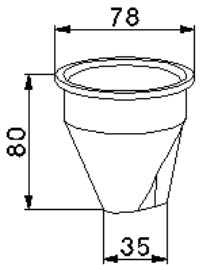
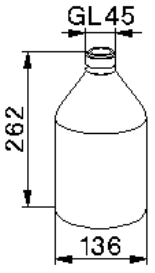
1	6.1831.050	PEEK capillary 1/16 " d = 0.5 mm, L = 0.40 m	
1	6.1831.060	PEEK capillary 1/16 " d = 0.5 mm, L = 1 m	
1	6.1835.010	PEEK needle 1/8"	
1	6.2057.010	Holder for dialysis cell 6.2729.100	
1	6.2064.000	Retention plate	
1	6.2134.100	RS-232 cable DB9/f — DB9/f (5 m)	
1	6.2141.190	Remote cable 732/819 — 766/788/838	
1	6.2621.300	Tool kit for 838	
1	6.2714.010	Dialysis membrane made of cellulose acetate 0.2 μm, 50 ea.	
1	6.2729.100	Dialysis cell made of PMMA for the 754 Pump Unit with 4 x stopper 6.2744.060	
1	6.2739.000	Spanner for nipple	

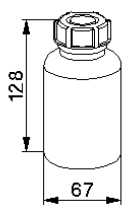
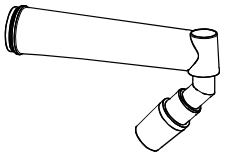
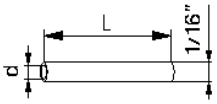
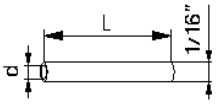
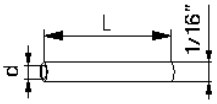
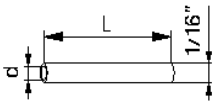
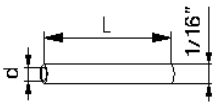
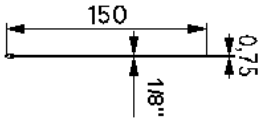
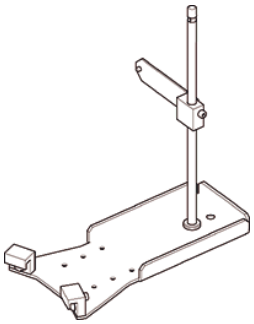
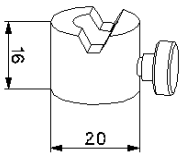
1	6.2744.000	Pressure screw made of PVDF, UNF 10/32 5 ea.	
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea.	
1	6.2744.034	Coupling, olive/UNF 10/32 2 ea.	
1	6.2744.160	Coupling with lock Olive/UNF 10/32	
1	6.2751.110	Safety guard/splash guard	
1	6.2831.010	PBTP tweezers	
1	Y.1070.150	Cable strap, self-adhesive	
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070	
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English	

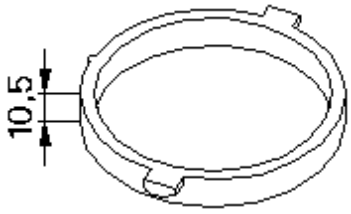
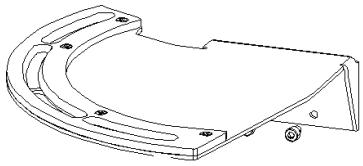
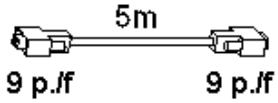
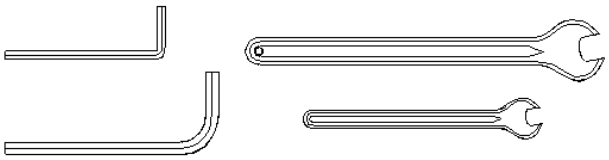
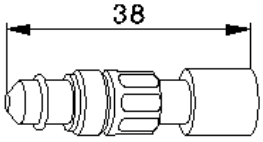
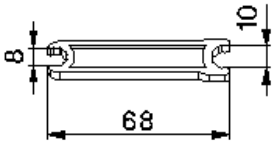
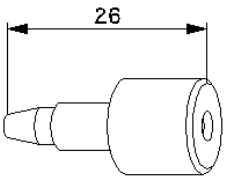
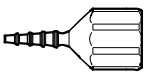
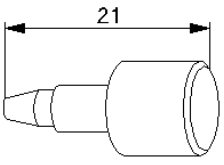
Order No. 2.838.0120

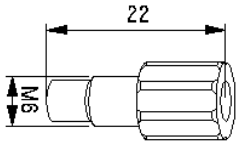
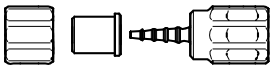
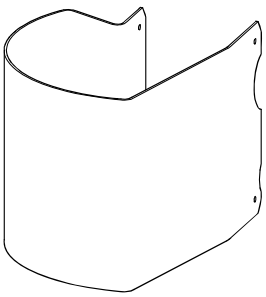
Advanced IC Dilution Sample Processor

The following accessories are included in the scope of delivery:

Qty.	*Order No.*	*Description*
1	1.838.0020 1.786.0010 6.1462.090	**838 Advanced Sample Processor** For Metrohm IC systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • With injection valve • Without sample rack Sample racks, see 6.3.2. 
1	6.1414.070	Titration vessel upper section 
1	6.1456.210	Mixing vessel 10 … 90 ml 
3	6.1608.070	Transparent glass bottle 2 l GL45 

3	6.1608.080	PE bottle 300 ml (40 mm opening)	
1	6.1619.010	Absorber	
1	6.1803.060	PTFE capillary 1/16 " d = 0.97 mm, L = 0.20 m	
1	6.1803.070	PTFE capillary 1/16 " d = 0.97 mm, L = 0.40 m	
1	6.1803.080	PTFE capillary 1/16 " d = 0.97 mm, L = 1.0 m	
1	6.1803.110	PTFE capillary 1/16 " d = 0.97 mm, L = 0.50 m	
1	6.1803.120	PTFE capillary 1/16 " d = 0.97 mm, L = 3.0 m	
2	6.1826.140	Pump tubing LFL Grey/Grey	
1	6.1835.010	PEEK needle 1/8"	
1	6.2001.070	Stand bracket for the sample changers 778/789/814/815/838	
1	6.2013.010	Adjusting ring for stand rods 10 mm	

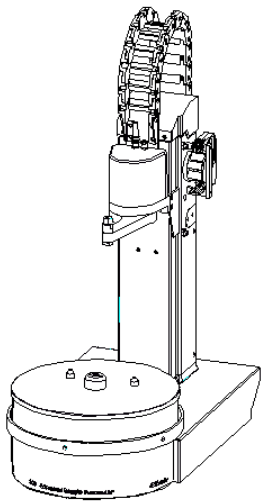
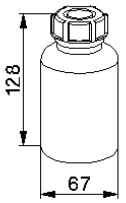
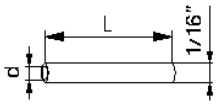
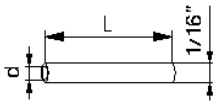
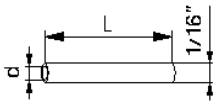
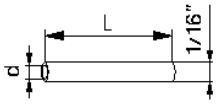
1	6.2036.000	Retaining ring for titration vessel 
1	6.2064.000	Retention plate 
1	6.2134.100	RS-232 cable DB9/f — DB9/f (5 m) 
1	6.2141.190	Remote cable 732/819 — 766/788/838
1	6.2621.300	Tool kit for 838 
1	6.2730.030	Stopper with nipple M10 
1	6.2739.000	Spanner for nipple 
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea. 
1	6.2744.034	Coupling, olive/UNF 10/32 2 ea. 
1	6.2744.060	Threaded stopper POM UNF 10/32 

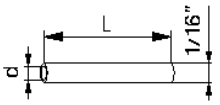
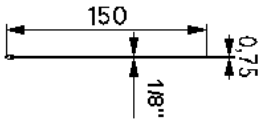
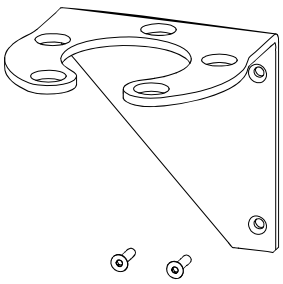
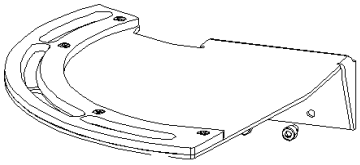
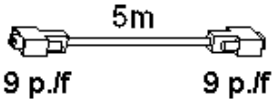
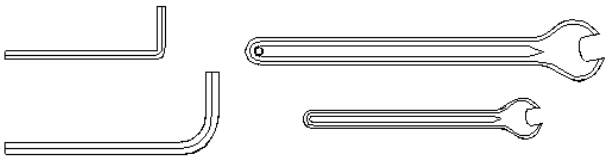
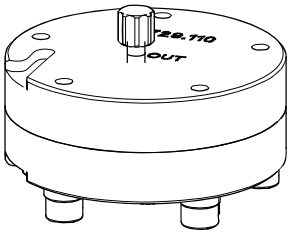
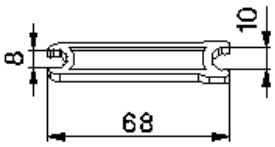
1	6.2744.080	PEEK coupling, M6 external/UNF 
1	6.2744.160	Coupling with lock Olive/UNF 10/32 
1	6.2751.110	Safety guard/splash guard 
1	Y.1070.150	Cable strap, self-adhesive
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English

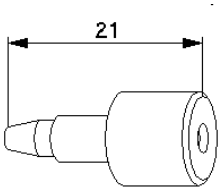
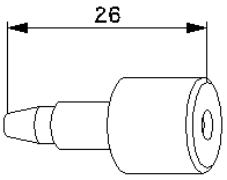
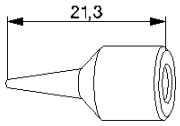
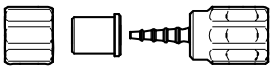
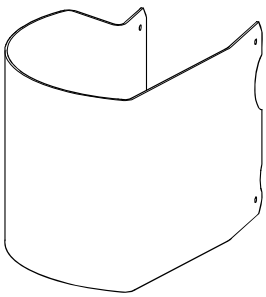
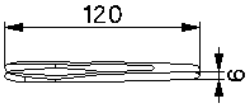
Order No. 2.838.0210

Advanced IC Ultrafiltration Sample Processor

The following accessories are included in the scope of delivery:

Qty.	*Order No.*	*Description*
1	1.838.0010 1.786.0010 6.1462.090	**838 Advanced Sample Processor** For Metrohm IC systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • Without injection valve • Without sample rack Sample racks, see 6.3.2. 
3	6.1608.080	PE bottle 300 ml (40 mm opening) 
1	6.1803.050	PTFE capillary 1/16 " d = 0.5 mm, L = 0.20 m 
1	6.1803.060	PTFE capillary 1/16 " d = 0.97 mm, L = 0.20 m 
1	6.1803.070	PTFE capillary 1/16 " d = 0.97 mm, L = 0.40 m 
2	6.1803.080	PTFE capillary 1/16 " d = 0.97 mm, L = 1.0 m 
2	6.1826.010	Pump tubing ENE-11 White/White
2	6.1826.030	Pump tubing AME-05 Orange/Yellow
2	6.1826.070	Pump tubing ENE-16 Yellow/Yellow

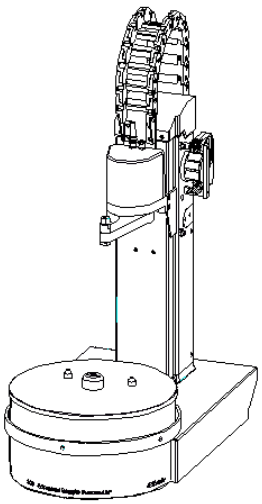
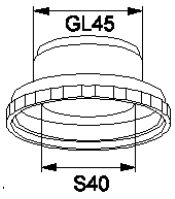
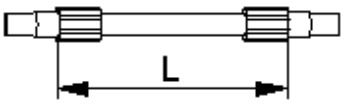
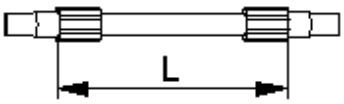
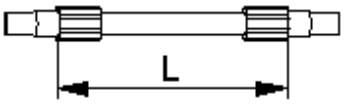
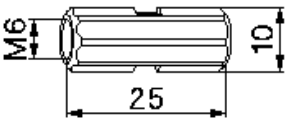
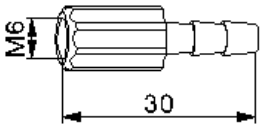
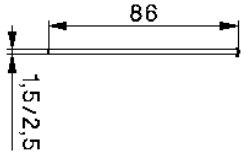
2	6.1831.060	PEEK capillary 1/16 " d = 0.5 mm, L = 1 m 
1	6.1835.010	PEEK needle 1/8" 
1	6.2057.030	Filtration cell holder 
1	6.2064.000	Retention plate 
1	6.2134.100	RS-232 cable DB9/f — DB9/f (5 m) 
1	6.2141.190	Remote cable 732/819 — 766/788/838
1	6.2621.300	Tool kit for 838 
1	6.2714.020	Filtration membranes 0.2 µm, 50 ea.
1	6.2729.110	Ultrafiltration cell 
1	6.2739.000	Spanner for nipple 

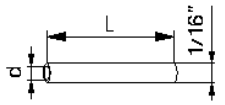
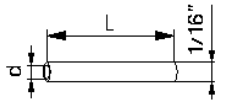
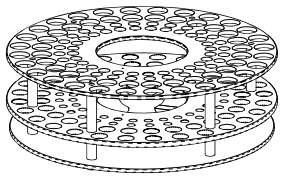
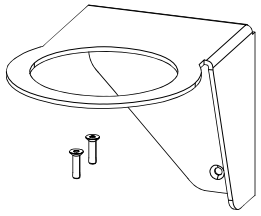
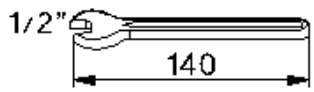
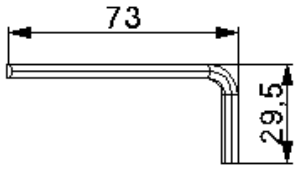
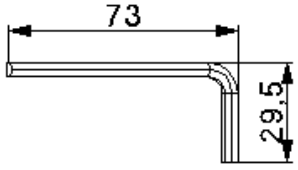
1	6.2744.000	Pressure screw made of PVDF, UNF 10/32 5 ea. 
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea. 
1	6.2744.030	Coupling, olive/UNF 10/32 4 ea. 
1	6.2744.160	Coupling with lock Olive/UNF 10/32 
1	6.2751.110	Safety guard/splash guard 
1	6.2831.010	PBTP tweezers 
1	Y.1070.150	Cable strap, self-adhesive
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English

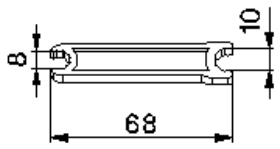
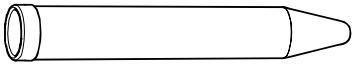
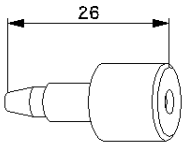
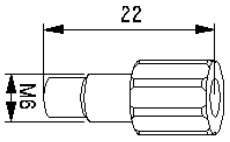
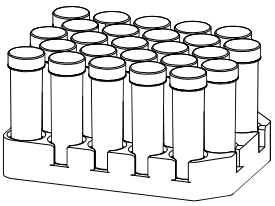
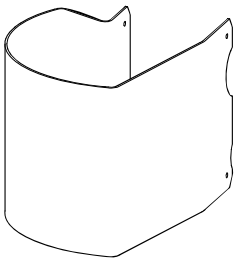
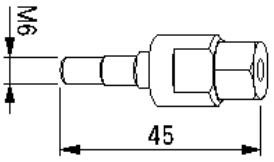
Order No. 2.838.0310

Advanced VA Sample Processor

The following accessories are included in the scope of delivery:

Qty.	*Order No.*	*Description*
1	1.838.0010 1.786.0010 6.1462.090	**838 Advanced Sample Processor** For Metrohm VA systems • 1 tower • Swing Head • Robotic arm with needle adapter • Peristaltic pump • Without injection valve 
1	6.1618.020	Threaded adapter S40 to GL45 
1	6.1805.020	FEP tubing connection M6 d = 2 mm, L = 0.52 m 
1	6.1805.060	FEP tubing connection M6 d = 2 mm, L = 0.60 m 
1	6.1805.120	FEP tubing connection M6 d = 2 mm, L = 1.0m 
1	6.1808.000	Coupling sleeve 2 x M6 
2	6.1808.020	Tubing olive, external/M6 internal 
1	6.1819.010	PTFE tubing 

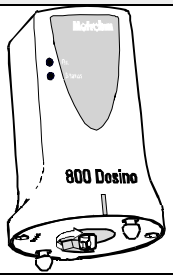
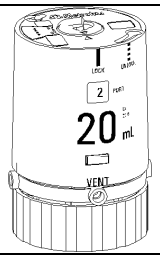
1	6.1822.420	PEEK capillary 1x M6, $^1/_{16}$" d = 0.75 mm
2	6.1826.020	Pump tubing ENE-18 Blue/Blue
2	6.1826.150	Pump tubing ENE-23 Violet/Orange
1	6.1831.070	PEEK capillary $^1/_{16}$" d = 0.75 mm, L = 0.70 m 
1	6.1831.080	PEEK capillary $^1/_{16}$" d = 0.75 mm, L = 1.10 m 
1	6.1835.040	PEEK needle 1/8"
1	6.1835.050	PEEK needle 1/8" d = 1.58 mm
1	6.2041.450	Sample rack 56 x 15 ml + 56 x 50 ml 
1	6.2057.040	Dosino holder 
1	6.2142.050	Keypad for 838 
1	6.2621.090	Fork spanner ½" 
1	6.2621.100	Allen key 3 mm 
1	6.2621.130	Allen key 2 mm 

1	6.2739.000	Spanner for nipple	
1	6.2743.057	PP sample vessels 11 ml 200 ea.	
1	6.2744.010	Pressure screw made of PEEK with UNF 10/32 connection, 5 ea.	
2	6.2744.080	Coupling M6 external/UNF 10/32 internal	
1	6.2744.160	Coupling with lock Olive/UNF 10/32	
4	6.2747.010	PP sample vessels 50 ml 25 ea.	
1	6.2751.110	Safety guard/splash guard	
1	6.2833.020	Needle holder 1/8" to M6	
2	Y.1070.150	Cable strap, self-adhesive	
1	6.2122.xxx	Mains cable with coupling, Type IEC 320/C13 Cable connector to customer specifications: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070	
1	8.838.1013	Instructions for Use Metrohm 838 Advanced Sample Processor	
1	8.838.1313	Installation Instructions, 838 Advanced Sample Processor, English	

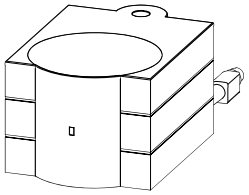
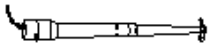
6.3.2 Keyboard (optional)

Order No.	*Description*
6.4142.050	**Keyboard** for the 838 Advanced Sample Processor 

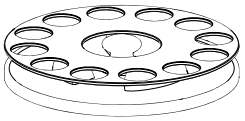
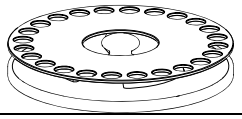
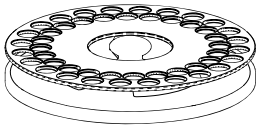
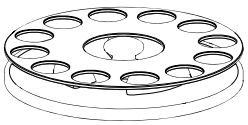
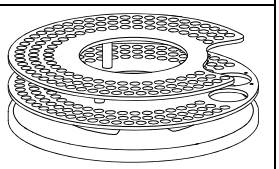
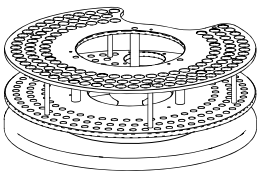
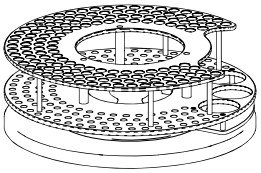
6.3.3 Dosing drive and units

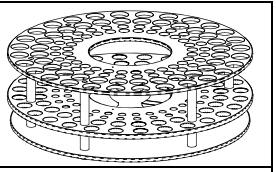
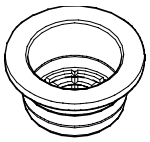
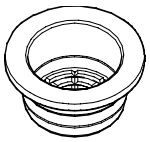
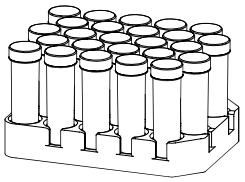
Order No.	*Description*
2.800.0010	**800 Dosino** 
6.3032.120	807 Dosing unit, 2 mL glass cylinder
6.3032.150	807 Dosing unit, 5 mL glass cylinder
6.3032.210	807 Dosing unit, 10 mL glass cylinder
6.3032.220	807 Dosing unit, 20 mL glass cylinder 
6.3032.250	807 Dosing unit, 50 mL glass cylinder

6.3.4 Stirrer

Order No.	*Description*
2.801.0040	**801 Magnetic stirrer** with support rod 
2.802.0020 6.1909.020 6.1909.040	**802 Rod stirrer**  Incl. stirring propeller PP or PTFE optional

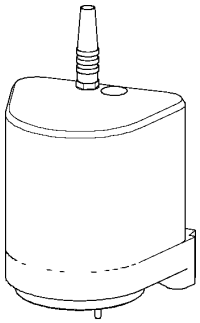
6.3.5 Sample racks and vessels

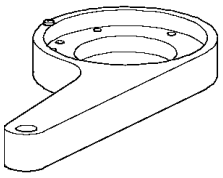
Order No.	*Description*	
6.2041.310	**Sample rack 12 x 250 ml** (d = 416 mm) for	
6.1432.320	Metrohm sample beakers, glass, 250 ml	
6.1453.220	Metrohm sample beaker PP 200 ml	
6.1453.250	Metrohm sample beaker PP 250 ml	
6.2041.320	**Sample rack 16 x 150 ml** for	
	Standard beakers (high type)	
6.2041.340	**Sample rack 24 x 75 ml** (d = 416 mm) for	
6.1432.210	Metrohm sample beakers, glass 75 ml,	
6.2041.350	**Sample rack** *) **48 x 75 ml** (d = 416 mm) for direct titration to	
6.1432.210	Metrohm sample beakers, glass, 75 ml	
6.2041.360	**Sample rack 12 x 150 ml** (d=416 mm) for	
	150 ml standard beakers (high type)	
6.1459.310	200 ml disposable beakers (EU) PP (1000 ea.)	
6.2041.370	**Sample rack 14 x 200 ml** (d = 416 mm) for	
6.1459.310	200 ml disposable beakers (EU) PP	
6.2041.380	**Sample rack 14 x 8 oz** (d = 416 mm) for	
	disposable beakers (US) PP 8 oz	
6.2041.400	**Sample rack 126 x 11 ml and 2 x 250 ml** (d = 416 mm) for	
6.2743.057	sample tubes 11 ml and	
6.1432.320	Metrohm sample beakers, glass, 250 ml or	
6.1453.220	Metrohm sample beakers, PP 200 ml or	
6.1453.250	Metrohm sample beakers, PP 250 ml	
6.2041.430	**Sample rack 127 x 11 ml and 2 x 300 ml** (d = 416 mm) for	
6.2743.057	sample tubes 11 ml and	
6.1608.080	300 ml PE bottles	
6.2041.440	**Sample rack 148 x 11 ml and 3 x 300 ml** (d = 416 mm) for	
6.2743.057	sample tubes 11 ml and	
6.1608.080	300 ml PE bottles	

6.2041.450 6.2743.057 6.2747.010	**Sample rack 56x 11 ml + 56x 50 ml** (d = 476 mm,) for sample tubes 11 ml and PP sample vessel 50 ml	
6.2041.760 6.2743.057 6.1432.320 6.1453.220 6.1453.250	**Sample rack 54x 11 ml + 1x 250 ml** (d = 476 mm,) for sample tubes 11 ml and Metrohm sample beakers, glass, 250 ml or Metrohm sample beakers, PP 200 ml or Metrohm sample beakers, PP 250 ml	
6.2743.040	**PP sample vessels 2.5 mL** 2000 ea., not for use with ultra filtration cell	
6.2743.047	**PP sample vessels 2.5 mL** 200 ea., not for use with ultra filtration cell	
6.2743.050	**PP sample vessels 11 mL** 2000 ea.	
6.2743.057	**PP sample vessels 11 mL** 200 ea.	
6.2743.070	**PP stopper with perforation** 2000 ea. for 6.2743.xxx sample vessels	
6.2743.075	**PP stopper with perforation** 200 ea. for 6.2743.xxx sample vessels	
6.2747.010	**PP sample vessels 50 ml** 25 each	

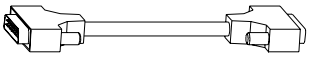
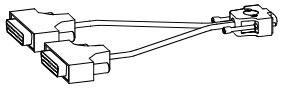
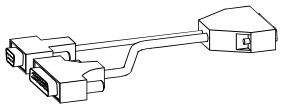
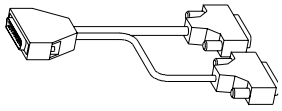
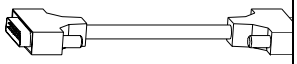
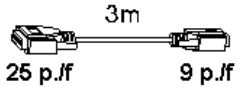
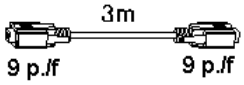
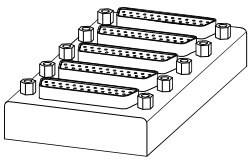
6.3.6 786 Swing Head

Order No. 2.786.0010 (model version "Transfer" with pipetting accessories)

No.	*Order no.*	*Description*	
1	**1.786.0010**	**786 Swing Head** Precision drive for robotic arms	

1	6.1462.030	Robotic arm for sample transfer, for left-swinging installation 
1	6.1562.100	Pipetting tubing 10 ml
1	6.1823.010	Guide shank for pipetting tubing
1	6.2621.120	Allen key 1.5 mm
1	6.2751.100	Splash guard
2	V.024.4012	Countersunk screws M.I hexagon

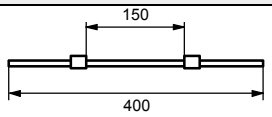
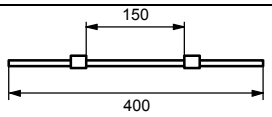
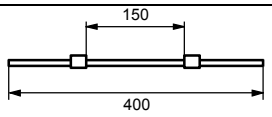
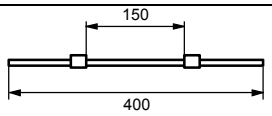
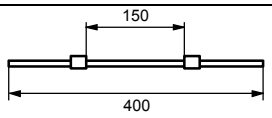
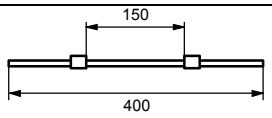
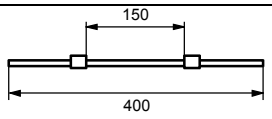
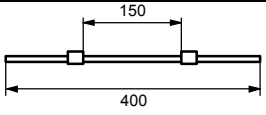
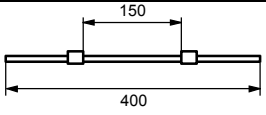
6.3.7 Connecting cables

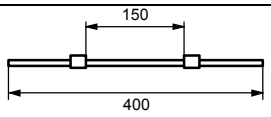
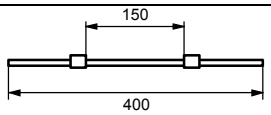
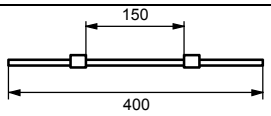
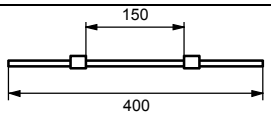
Order No.	*Description*
6.2141.020	**Standard remote cable** 25-pin/25-pin 
6.2134.090	**Remote cable** 762/830 IC Interface — Device 1...4 or 5... 
6.2141.110	**Remote cable** 766/788/813 — 709 or 762 and 732 
6.2141.140	**Remote cable** 766/788/813 — 817 
6.2141.180	**Remote cable** 797— 766/813/838 — 731, 25-pin/25-pin/25-pin 
6.2125.090	**Connecting cable RS232** Wired 1:1, 1m, 25-pin/m to 25-pin/m 
6.2125.110	**Connecting cable RS232** for connecting Metrohm instrument to PC 25-pin/f to 9-pin/f 
6.2134.040	**Connecting cable RS232** for connecting Metrohm instrument to PC 9-pin/f to 9-pin/f 
6.2125.120	**Remote adapter** Distributor from remote lines to 5 x 25-pin sockets. 

6.3.8 Filtration and dialysis accessories

Order No.	*Description*
6.2714.010	**Dialysis membrane** for inline dialysis made of cellulose acetate, nominal pore size 0.2 µm, d = 47 mm, 50 ea.
6.2714.020	**Filtration membrane** made of cellulose acetate, nominal pore size 0.15 µm, d = 47 mm, 50 ea.
6.2714.030	**Dialysis membrane** for inline dialysis, made of polyamide, nominal pore size 0.2 µm, d = 47 mm, 50 ea.

6.3.9 Pump tubing

Order No.	*Description*
6.1826.010	**Pump tubing** made of PVC (Tygon® ST), White/White Inner diam. = 1.02 mm ± 0.05 mm 
6.1826.020	**Pump tubing** made of PVC (Tygon® ST), Blue/Blue Inner diam.= 1.65 mm ± 0.05 mm 
6.1826.020	**Pump tubing** made of PVC (Tygon® ST), Blue/Blue Inner diam.= 1.65 mm ± 0.05 mm 
6.1826.030	**Pump tubing** made of PVC (Tygon® ST), Orange/Yellow Inner diam.= 0.51 mm ± 0.05 mm 
6.1826.040	**Pump tubing** made of PVC (Tygon® ST), Black/Black Inner diam.= 0.76 mm ± 0.05 mm 
6.1826.050	**Pump tubing** made of PVC (Tygon® ST), White/Yellow Inner diam.= 0.57 mm ± 0.05 mm 
6.1826.060	**Pump tubing** made of PP (PharMed®) Orange/Yellow Inner diam.= 0.51 mm ± 0.05 mm 
6.1826.070	**Pump tubing** made of PVC (Tygon® ST), Yellow/Yellow Inner diam.= 1.42 mm ± 0.05 mm 
6.1826.110	**Long-life pump tubing** made of PVC (Tygon® LFL), Orange/Yellow Inner diam.= 0.51 mm ± 0.0102 mm 

6.1826.120	**Long-life pump tubing** made of PVC (Tygon® LFL), Orange/White Inner diam.= 0.59 mm ± 0.05 mm	
6.1826.130	**Long-life pump tubing** made of PVC (Tygon® LFL), White/White Inner diam.= 1.02 mm ± 0.0127 mm	
6.1826.140	**Long-life pump tubing** made of PVC (Tygon® LFL), Grey/Grey Inner diam.= 0.51 mm ± 0.0102 mm	
6.1826.150	**Pump tubing** made of PVC (Tygon® ST), Violet/Orange Inner diam.= 2.54 mm	

6.3.10 Needles and tubings

Order No.	*Description*	
6.1835.010	PEEK needle 1/8" For aspirating solutions from closed sample vessels with perforated stopper	
6.1835.020	PEEK tube 1/8" For aspirating solutions from open sample vessels, for filtration and dialysis applications	
6.1835.040	PEEK sample aspiration tube 1/8" For aspirating solutions from open sample vessels, inner diameter 0.75 mm	
6.1835.050	PEEK sample aspiration tube 1/8" For aspirating solutions from open sample vessels, inner diameter 1.58 mm, sphenoidal tip	
6.2624.000	Steel needle, inner diameter 0.66 mm For aspirating solutions from open sample vessels	

6.4 Warranty

The warranty on our products is limited to defects that are traceable to material, construction or manufacturing error which occur within 12 months from the day of delivery. In this case the defects will be rectified in our workshops free of charge. Transport costs are to be paid by the customer.

For day and night operation the warranty is limited to 6 months.

Glass breakage in the case of electrodes or other parts is not covered by the warranty. Checks which are not a result of material or manufacturing faults are also charged during the warranty period. For parts from outside manufacturers, insofar as these constitute an appreciable part of our instrument, the warranty stipulations of the manufacturer in question apply.

With the regard to the guarantee of accuracy the technical specifications in the instruction manual are authoritative.

Concerning defects in materials, construction or design as well as the absence of guaranteed features the purchaser has no rights or claims except those mentioned above.

If damage of the packaging is evident on receipt of a consignment or if the goods show signs of transport damage after unpacking, the carrier must be informed immediately and a written damage report demanded. Lack of an official damage report releases Metrohm Ltd. from any liability to pay compensation.

If any instruments and parts have to be returned then the original packaging should be used if at all possible. This applies above all to instruments, electrodes, burette cylinders and PTFE pistons. Before embedment in wood shavings or similar material the parts must be packed in a dustproof package (for instruments the use of a plastic bag is essential). If open assemblies are included that are sensitive to electromagnetic voltages (e.g. data interfaces, etc.) then these must be returned in the associated original protective packaging (e.g. conductive protective bag). (Exception: assemblies with a built-in voltage source belong in non-conductive protective packaging).

For damage which arises as a result of non-compliance with these instructions no warranty responsibility whatsoever will be accepted by Metrohm.

6.5 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

838 Advanced Sample Processor

Metrohm
Ion analysis
CH-9101 Herisau/Switzerland
E-Mail info@metrohm.com
www.metrohm.com

Description Sample changer with advanced Liquid Handling abilities for the automation of batch processing of sample preparation in analytical laboratories.

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

Electromagnetic compatibility: Emission
EN/IEC 61326, EN 55022 / CISPR 22, EN/IEC 61000-3-2

Electromagnetic compatibility: Immunity
EN/IEC 61326, EN/IEC 61000-4-2, EN/IEC 61000-4-3, EN/IEC 61000-4-4, EN/IEC 61000-4-5, EN/IEC 61000-4-6, EN/IEC 61000-4-8, EN/IEC 61000-4-11, EN/IEC 61000-4-14, NAMUR

Safety specifications
EN/IEC 61010-1, EN/IEC 61010-2-081, UL 3101-1 protection class I

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

CE *The instrument meets the requirements of the CE mark as contained in the EU directives 89/336/EEC and 73/23/EEC and fulfils the following specifications:*

EN 61326 Electrical equipment for measurement, control and laboratory use – EMC requirements
EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use
EN 61010-2-081 Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.

Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.

The system software, stored in Read Only Memories (ROMs) has been validated in connection with standard operating procedures in respect to functionality and performance.
The technical specifications are documented in the instruction manual.

Herisau, February 16, 2004

D. Strohm
Vice President
Head of R&D

Ch. Buchmann
Vice President
Head of Production
Responsible for Quality Assurance

6.5.1 Quality Management Principles

Metrohm AG, CH-9101 Herisau, Switzerland

Metrohm
ion analysis
CH-9101 Herisau/Switzerland
E-Mail info@metrohm.com
Internet www.metrohm.com

Metrohm Ltd. holds the ISO 9001 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 quality system is described in Metrohm's QM Manual, which comprises detailed instructions on the following fields of activity:

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

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 organisation 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.

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