861 Advanced Compact IC

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Instructions for Use
8.861.1033

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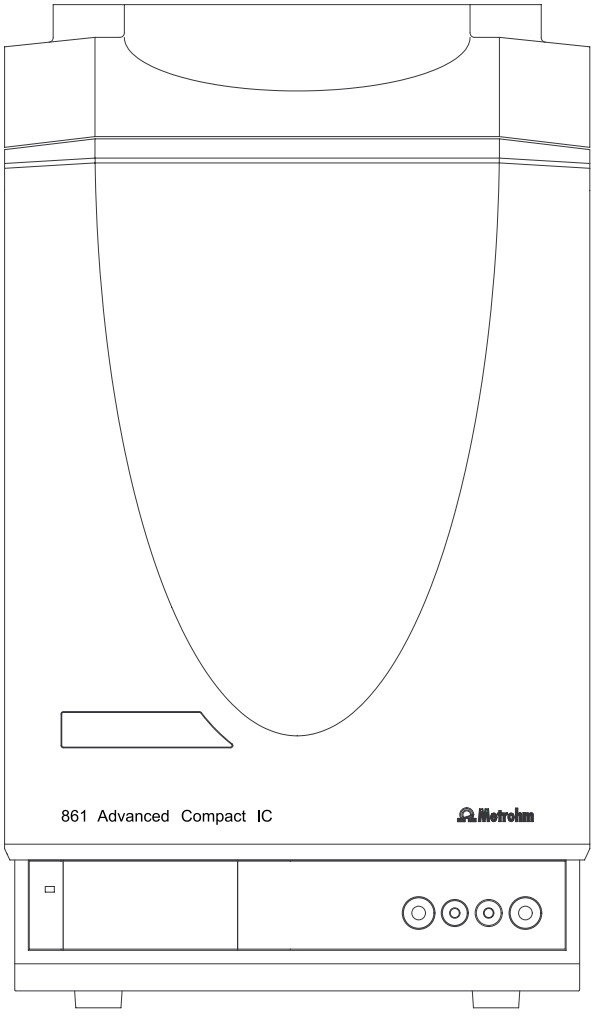

8.861.1033 Instructions for Use

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1. Edition 2005

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

1.1 Instrument description

The **861 Advanced Compact IC** is a PC-controlled system for ion chromatographic analyses. The three following versions are available:

- **2.861.0010 without suppressor**
- **2.861.0020 with suppressor module «MSM II»**
- **2.861.0040 with suppressor module «MSM II» and 853 CO_2 Suppressor (MCS)**

The extremely compact housing of the 861 Advanced Compact IC contains everything needed to carry out ion chromatography at the highest quality level:

- **Injection valve** – for individual injections or for use with a sample changer such as the Metrohm 838 Advanced Sample Processor
- **High-pressure pump** – extremely low-pulsation double piston pump with a flow range from 0.2 … 2.5 mL/min and a maximum pressure of 35 MPa (350 bar)
- **Pulsation dampener** – even with low-level pressure variations the pulsation dampener reliably protects the column against damage
- **Column chamber** – the perfect insulation of the housing provides not only thermally stable conditions for the separation column but also shields the system against electromagnetic interference
- **Columns** – whether anion columns with or without suppression, separation columns for cations or organic acids – the 861 Advanced Compact IC can accommodate them all
- **Suppressor module** – the Metrohm suppressor module (MSM) is already integrated in the versions 2.861.0020 and 2.861.0040 – pressure-resistant, with fully automatic regeneration, highest performance and optimal reproducibility
- **Peristaltic pump** – integrated two-channel peristaltic pump with a flow rate of 0.4 … 0.5 mL/min for regeneration and rinsing of the suppressor module «MSM II» built into the versions 2.861.0020 and 2.861.0040.
- **Detector** – conductivity detector with outstanding temperature stability. The detector temperature varies by less than 0.01°C and can be optimally adapted to the ambient conditions.
- **853 CO_2 Suppressor** – in Version 2.861.0040 the 853 CO_2 Suppressor (MCS) is built in downline from the suppressor module «MSM II». The 853 CO_2 Suppressor (MCS) removes the CO_2 from the eluent. This reduces the background conductivity, improves detection sensitivity and minimizes the injection and carbonate peak.

All components which come into contact with eluent and sample are metal-free.

The **operation** of the 861 Advanced Compact IC takes place via a PC connected to the RS232 interface with the help of the «**IC Net**» control and evaluation program. This PC program can be used to create systems for recording and evaluating chromatograms. Time programs can also be created in which a large number of instrument functions can be triggered for each program step. It is also possible to use programmable signals to control external instruments via the remote interface.

The «**IC Net**» operating software meets all the requirements you could place today on a modern integration software: single or multi-point calibration, internal or external standard, selectable algorithms for non-linear calibration, various integration modes with integration parameters and integration events, different methods for peak recognition, peak editor, free scaling, superimposing several chromatograms, use of sample tables and batch reprocessing; a powerful and GLP-conform report generator with output interfaces for monitor, printer and external databases.

The independent «Autodatabase» PC program supplied can be used to save and handle results and chromatograms produced by the «**IC Net**» program in a database. With «Autodatabase» data can be sorted, filtered and searched with the help of different criteria. In addition, data and curves can be printed out according to user-defined report templates.

The **«IC Net»** software can be configured and used in order to comply with the Electronic Records and Signatures Rule, known as **21 CFR Part 11**, established by the U.S. Food and Drug Administration (**FDA**). For this purpose the program contains password protection, user administration, electronic signatures, audit trail and administration of methods and results in databases. To use the 21 CFR Part 11 features of **«IC Net»** the operating system **Windows 2000** or **Windows XP** with **NTFS** file system is required.

1.2 Parts and controls

*In this Section you will find the numbers and designations of the parts and controls of the 861 Advanced Compact IC. The numbering applies throughout the Instructions for Use, i.e. bold numbers in the text (e.g. **3**) refer to the parts and controls illustrated here.*

1.2.1 Front

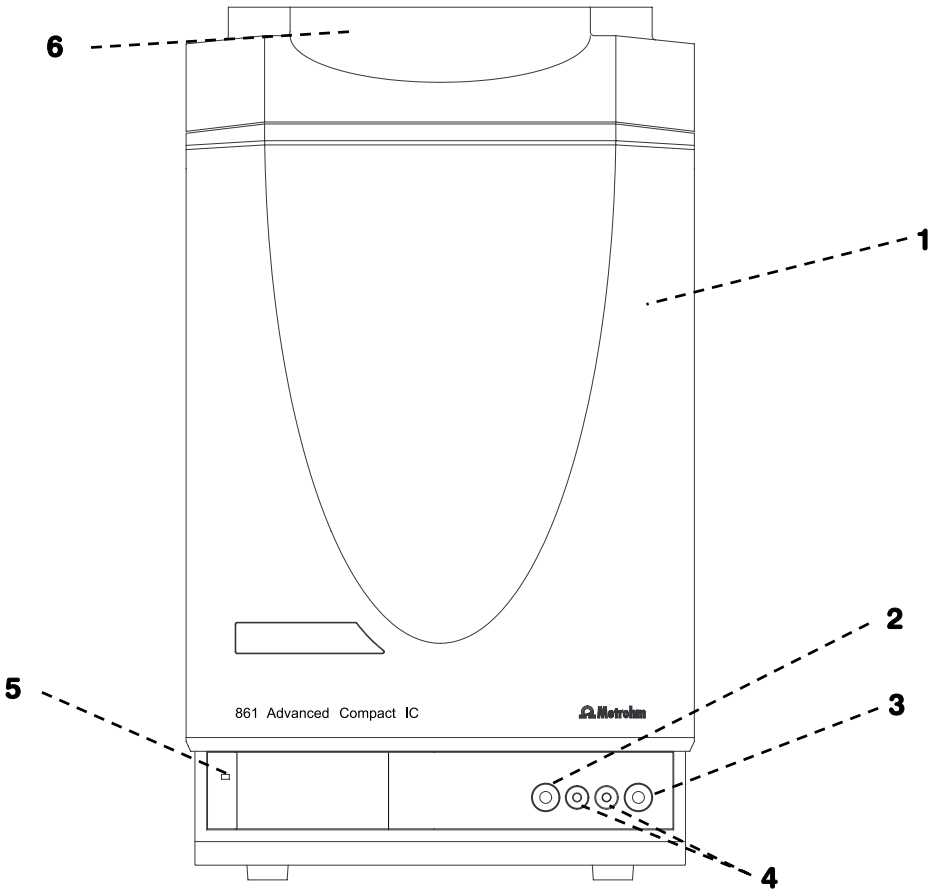


Figure 1: Front 861 Advanced Compact IC

1 Door to inner compartment

2 Connection purge valve

3 Connection for 6.2816.020 syringe
for aspiration of the sample

4 Feedthrough
for capillaries

5 Pilot lamp
is on when the instrument is switched on

6 Bottle rack
for holding supply bottles with eluent, regeneration solution, and rinsing solution

1.2.2 Rear panel

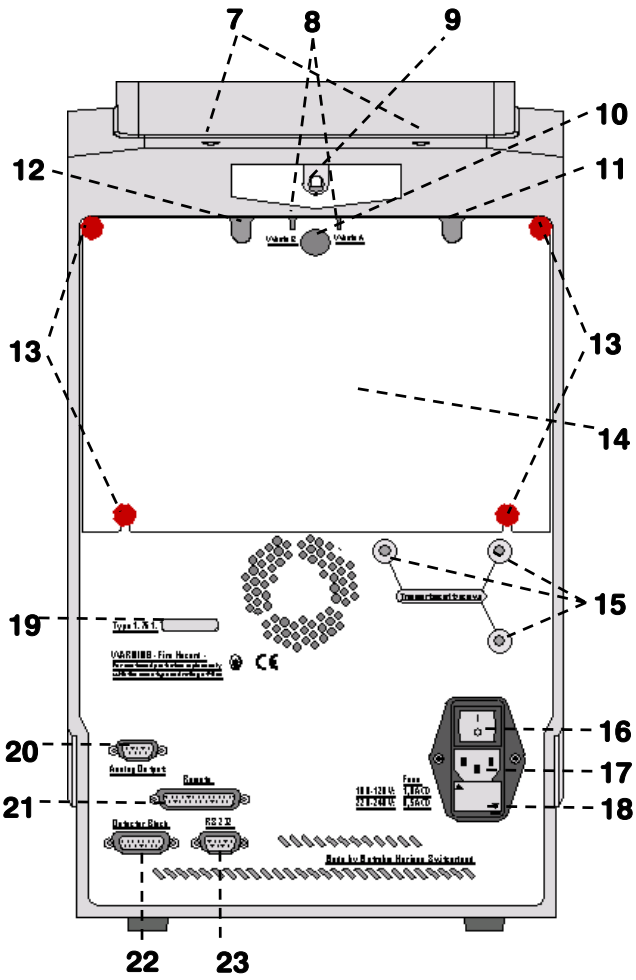


Figure 2: Rear panel 861 Advanced Compact IC

7 Opening
for in- and outlets

8 Opening
for in- and outlets

9 Connection for drain tube
for discharge of spilled liquid from the bottle rack

10 Opening
for in- and outlets

11 Opening
for in- and outlets

12 Opening for detector cable

13 Knurled screw
for fastening the rear panel

14 Detachable rear panel
Access to the inner compartment

15 Transport security screws
to secure the pump head when the instrument is transported

16 Mains switch
to switch instrument on and off:
I = ON 0 = OFF

17 Mains connection plug
Mains connection, see *Section 2.4*

18 Fuse holder
Changing the fuses, see *Section 2.4.2*

19 Serial number

20 Analog output
output for analogue signal

21 Remote interface
Remote-I/O lines for connection of external devices

22 Connection for detector block

23 RS232 interface
PC connection

1.2.3 Interior 2.861.0010

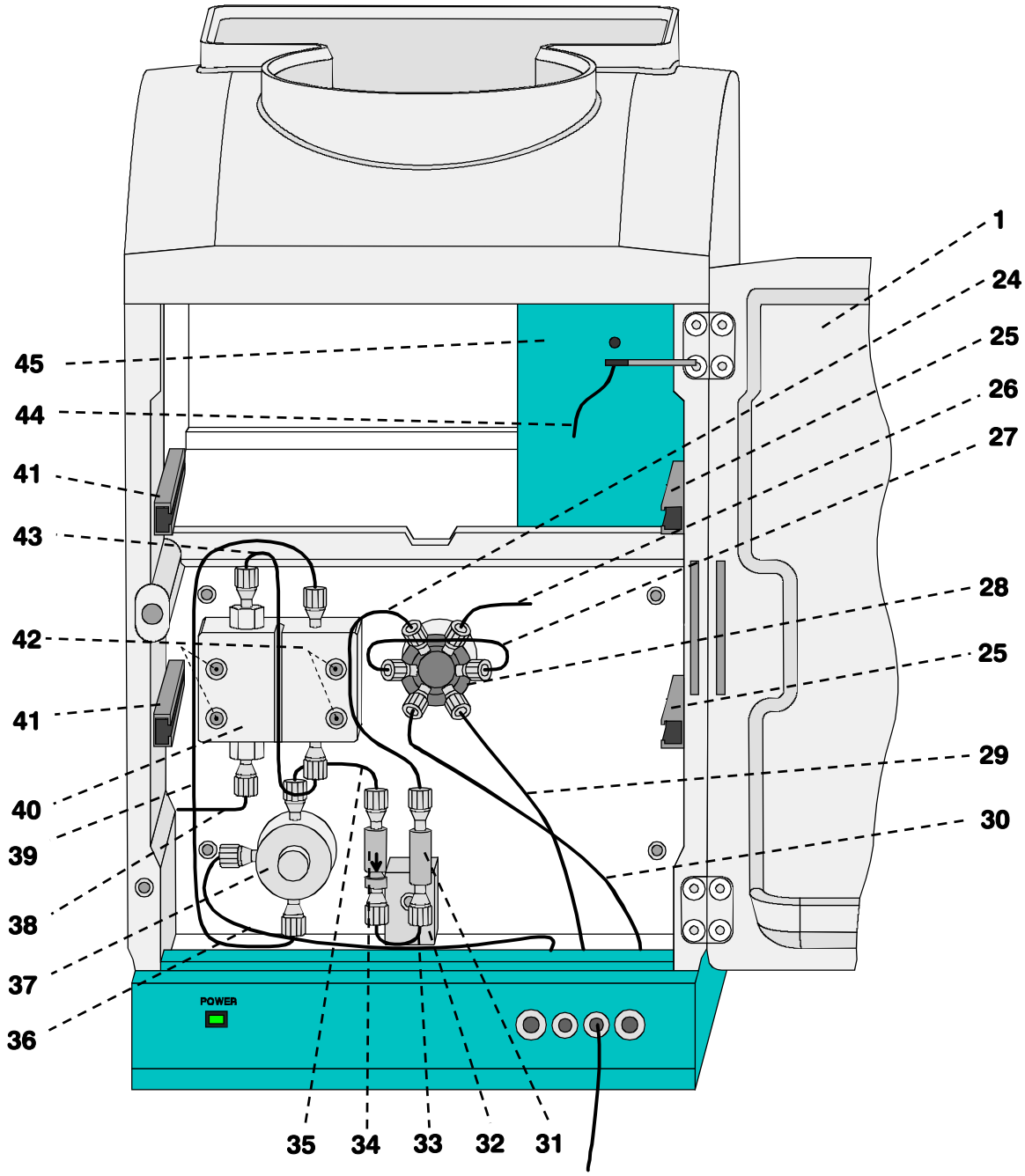


Figure 3: Interior of the IC 2.861.0010 (with permanently attached accessories and 1.733.0110 Detector block)

1 Door to inner compartment

24 Inlet capillary for injection valve
PEEK capillary 6.1831.010, length L = 24 cm

25 Mounting rail
for 6.2027.0X0 column holder

26 Column connection capillary
6.1831.010 PEEK capillary, length L = 30 cm

27 Sample loop
20 µL PEEK sample loop 6.1825.210

28 Injection valve

29 Aspirating tubing
for sample;
PTFE-tubing 6.1803.020, length L = 52 cm

30 Connection capillary to syringe
6.1803.020 PTFE tubing, length L = 30 cm

31 PEEK coupling (6.2744.040)

32 Leak detector

33 Connection capillary
6.1831.010 PEEK capillary, length L = 13 cm

34 Filter unit PEEK (6.2821.120)

35 Connection capillary
6.1831.010 PEEK capillary, length L = 13 cm

36 Connection capillary
6.1831.010 PEEK capillary, length L = 15 cm

37 Purge valve

38 Aspirating capillary
Connection for 6.1834.010 aspirating tubing

39 Connection capillary
Connection pump head – purge valve, fixed mounting

40 Pump head (6.2824.100)

41 Mounting rail
for cartridge holder

42 Fastening screws
for pump head **40**

43 Connection capillary
in pump head, fixed mounting

44 Inlet capillary for detector block
PEEK capillary, fixed mounting

45 Detector block (1.732.0110)

1.2.4 Interior 2.861.0020

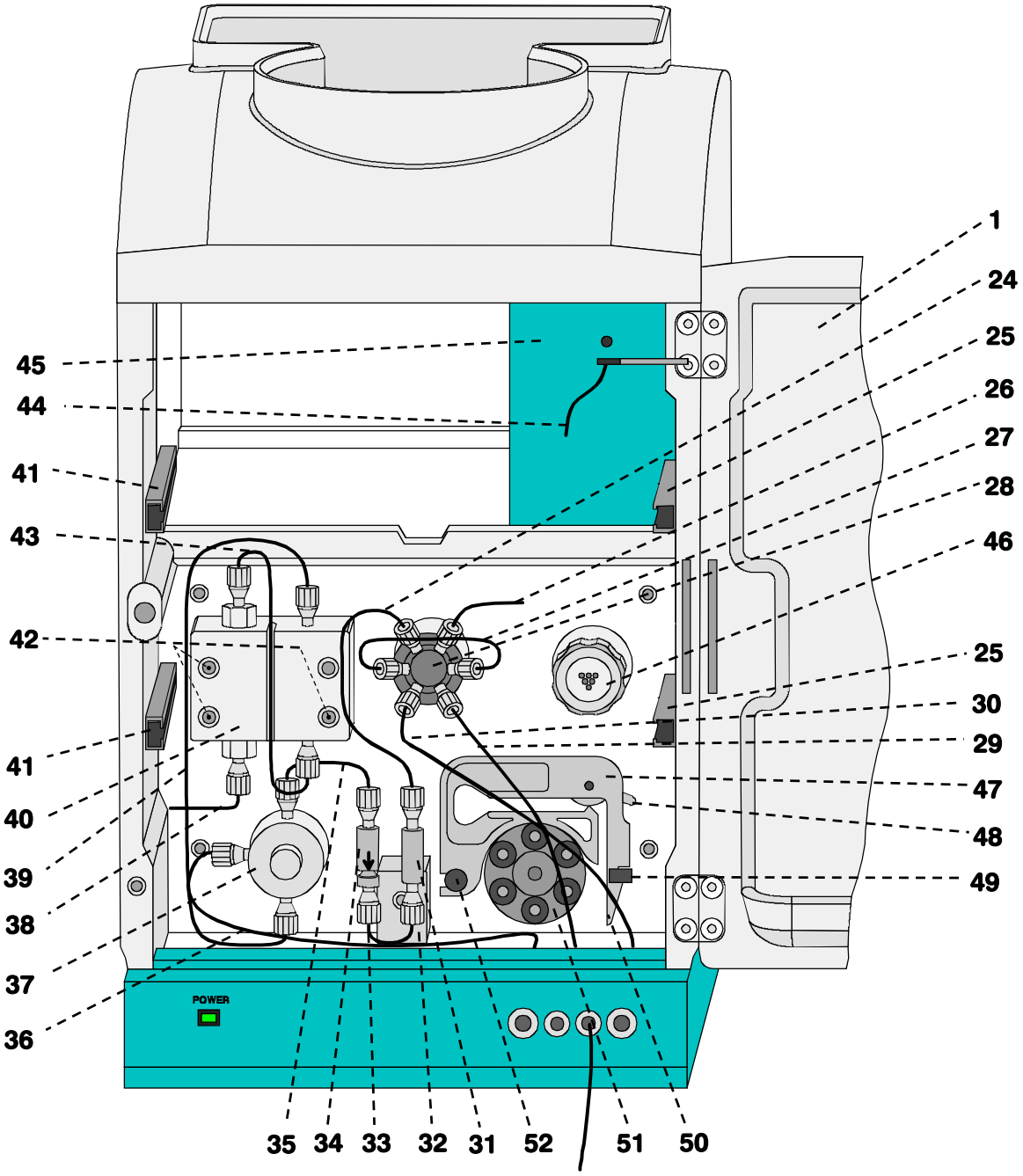


Figure 4: Interior of the IC 2.861.0020 (with permanently attached accessories, suppressor module «MSM II» and 1.733.0110 Detector block)

1 Door to inner compartment

24 Inlet capillary for injection valve
PEEK capillary 6.1831.010, length L = 24 cm

25 Mounting rail
for 6.2027.0X0 column holder

26 Column connection capillary
6.1831.010 PEEK capillary, length L = 30 cm

27 Sample loop
20 µL PEEK sample loop 6.1825.210

28 Injection valve

29 Aspirating tubing
for sample;
PTFE-tubing 6.1803.020,
length *L* = 52 cm

30 Connection capillary to syringe
6.1803.020 PTFE tubing,
length *L* = 30 cm

31 PEEK coupling (6.2744.040)

32 Leak detector

33 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 13 cm

34 Filter unit PEEK (6.2821.120)

35 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 13 cm

36 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 15 cm

37 Purge valve

38 Aspirating capillary
Connection for 6.1834.010 aspirating tubing

39 Connection capillary
Connection pump head – purge valve, fixed mounting

40 Pump head (6.2824.100)

41 Mounting rail
for cartridge holder

42 Fastening screws
for pump head **40**

43 Connection capillary
in pump head, fixed mounting

44 Inlet capillary for detector block
PEEK capillary, fixed mounting

45 Detector block (1.732.0110)

46 Suppressor module «MSM II»
(inlet and outlet capillaries are not shown)

47 Tubing cartridge (6.2755.000)
for 6.1826.110 pump tubing

48 Contact pressure lever
for adjusting the contact pressure

49 Holding clamp
for locking the tubing cartridge into place

50 Snap-action lever
for releasing the tubing cartridge

51 Pump drive
roller head with contact rollers

52 Mounting pin
for attaching the tubing cartridges

1.2.5 Interior 2.861.0040

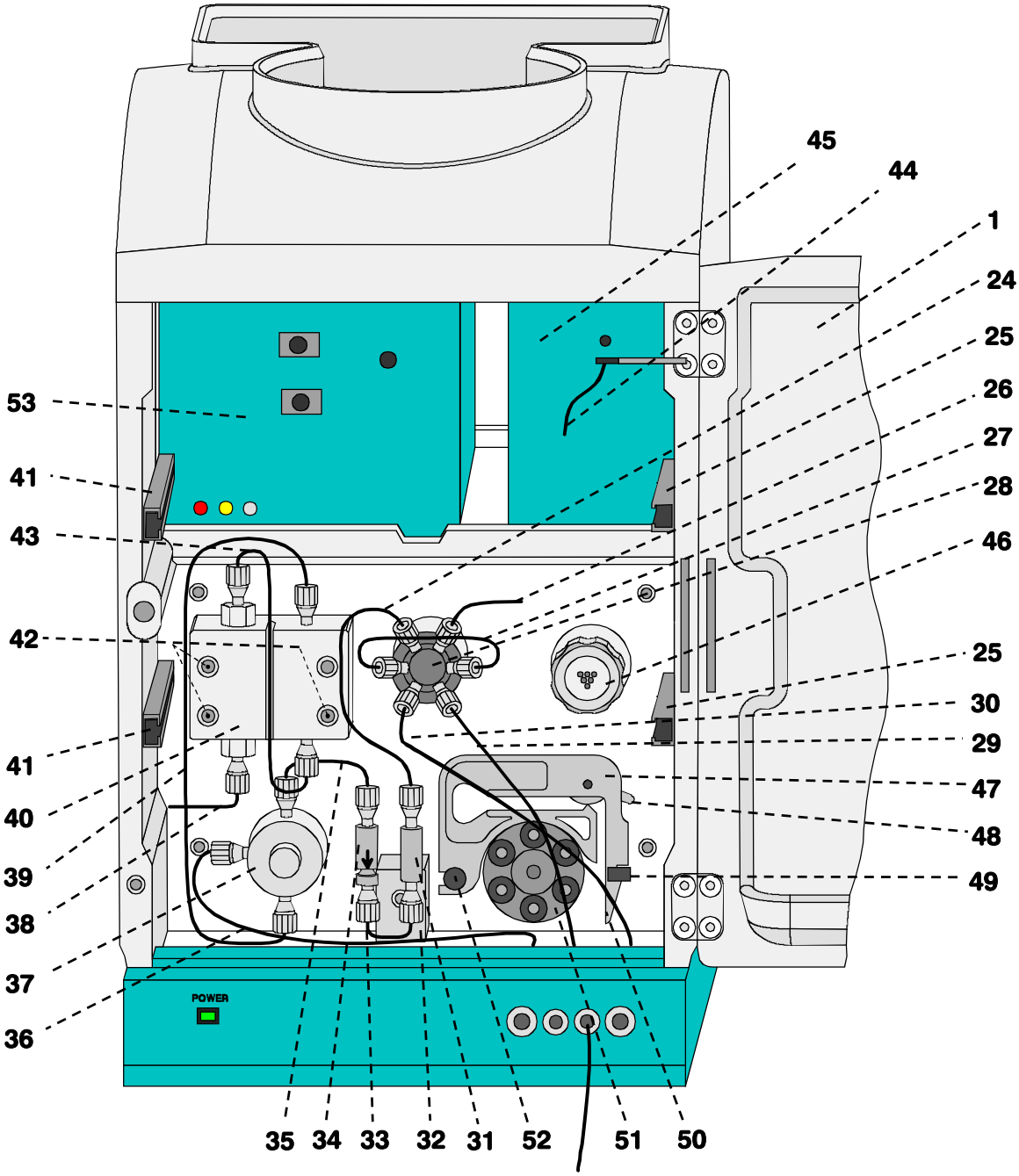


Figure 5: Interior of the IC 2.861.0040 (with permanently attached accessories, 1.733.0110 Detector block, suppressor module «MSM II» and 853 CO_2 Suppressor)

1 Door to inner compartment

24 Inlet capillary for injection valve
PEEK capillary 6.1831.010,
length *L* = 24 cm

25 Mounting rail
for 6.2027.0X0 column holder

26 Column connection capillary
6.1831.010 PEEK capillary,
length *L* = 30 cm

27 Sample loop
20 µL PEEK sample loop 6.1825.210

28 Injection valve

29 Aspirating tubing
for sample;
PTFE-tubing 6.1803.020,
length *L* = 52 cm

30 Connection capillary to syringe
6.1803.020 PTFE tubing,
length *L* = 30 cm

31 PEEK coupling (6.2744.040)

32 Leak detector

33 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 13 cm

34 Filter unit PEEK (6.2821.120)

35 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 13 cm

36 Connection capillary
6.1831.010 PEEK capillary,
length *L* = 15 cm

37 Purge valve

38 Aspirating capillary
Connection for 6.1834.010 aspirating tubing

39 Connection capillary
Connection pump head – purge valve, fixed mounting

40 Pump head (6.2824.100)

41 Mounting rail
for cartridge holder

42 Fastening screws
for pump head **40**

43 Connection capillary
in pump head, fixed mounting

44 Inlet capillary for detector block
PEEK capillary, fixed mounting

45 Detector block (1.732.0110)

46 Suppressor module «MSM II»
(inlet and outlet capillaries are not shown)

47 Tubing cartridge (6.2755.000)
for 6.1826.110 pump tubing

48 Contact pressure lever
for adjusting the contact pressure

49 Holding clamp
for locking the tubing cartridge into place

50 Snap-action lever
for releasing the tubing cartridge

51 Pump drive
roller head with contact rollers

52 Mounting pin
for attaching the tubing cartridges

53 853 CO_2 Suppressor
(inlet and outlet capillaries are not shown)

1.3 Information on the Instructions for Use

Please read through these Instructions for Use carefully before you put the 861 Advanced Compact IC into operation. The Instructions for Use contain information and warnings to which the user must pay attention in order to assure safe operation of the instrument.

1.3.1 Organization

These **Instructions for Use 8.861.1033** for the 861 Advanced Compact IC provide a comprehensive overview of installation, startup procedure, operation, fault rectification and technical specifications of this instrument. The Instructions for Use are organized as follows:

Sect. 1 Introduction
General description of instrument, parts and controls and safety notes

Sect. 2 Installation
Installation of instrument, accessories, and external devices

Sect. 3 Operation
Introduction to the operation using an example

Sect. 4 Notes - Maintenance - Faults
Notes on ion chromatography, maintenance, fault rectification, diagnostic tests, validation

Sect. 5 Appendix
Technical data, standard equipment, options, warranty, declarations of conformity, index

To find the required information on the instruments, use either the **Table of contents** or the **Index** at the back.

As a supplement to the Instructions for Use, the **Metrohm Monograph 8.792.5003 "Practical Ion Chromatography"** is also supplied. This provides an introduction to the theoretical fundamentals and general information about determinations.

1.3.2 Notation and pictograms

The following notations and pictograms (symbols) are used in these Instructions for Use:

Fill	**Menu item, parameter or entry value** in the software
SYSTEM STATE	**Program window** in the software
<OK>	**Button** in the software
22	**Part or control of 861**
	**Hazard** This symbol draws attention to a possible danger to life or of injury if the associated directions are not followed correctly.
	**Warning** This symbol draws attention to possible damage to instruments or instrument parts if the associated directions are not followed correctly.
	**Caution** This symbol marks important information. First read the associated directions before you continue.
	**Comment** This symbol marks additional information and tips.

1.4 Safety notes

1.4.1 Electrical safety

While electrical safety in the handling of the 861 Advanced Compact IC is assured in the context of the specifications EN / IEC 61010-1 (protection class I, degree of protection IP20), the following points should be noted:

- **Mains connection**

*Setting of the **mains voltage**, checking the **mains fuse** and the **mains connection** must be effected in accordance with the instructions in Section 2.4.*

- **Opening the 861 Advanced Compact IC**

*If the 861 Advanced Compact IC is connected to the power supply, the instrument must not be opened nor must parts be removed from it, otherwise there is a danger of coming into contact with components which are live. Therefore always disconnect the instrument from all voltage sources before you open it and ensure that the **mains cable is disconnected from mains connection 17**!*

- **Protection against static charges**

Electronic components are sensitive to static charging and can be destroyed by discharges. Before you touch any of the components inside the 861 Advanced Compact IC, you should ground yourself and any tools you are using by touching a grounded object (e.g. housing of the instrument or a radiator) to eliminate any static charges which exist.

1.4.2 General precautionary rules

- **Handling of solvents**

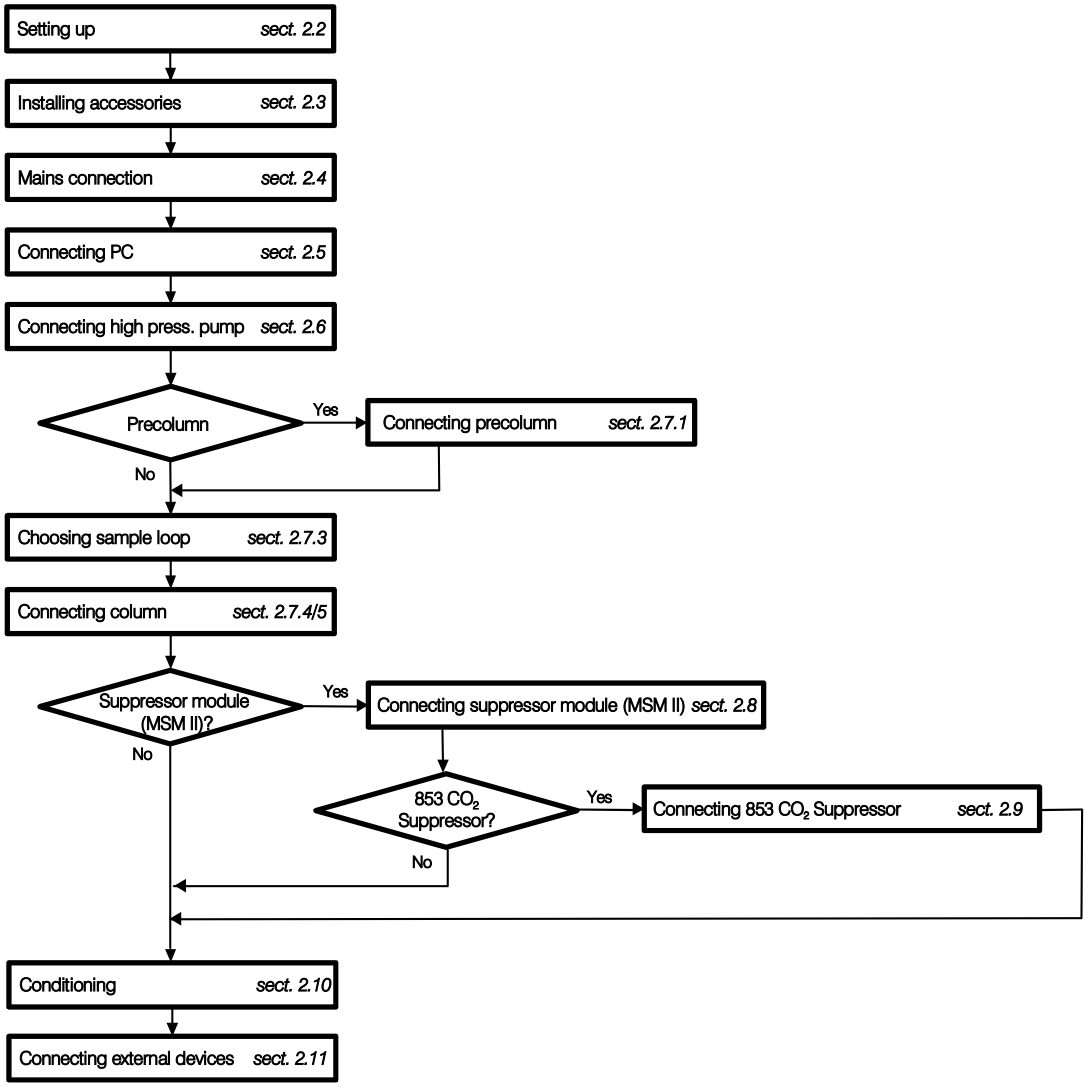
Check all lines of the IC system periodically for possible leaks. Follow the relevant instructions regarding the handling of flammable and/or toxic solvents and their disposal.

2 Installation

2.1 Overview

2.1.1 Flow chart

The following flow chart provides an overview of all installation work. You will find more detailed information in the relevant Sections.



2.1.2 Connections in the 861 Advanced Compact IC

The two following illustrations show the internal connections in the 861 Advanced Compact IC in schematic form. The meanings of the various numbered components are given in the detailed illustrations and descriptions in Sections *2.2 – 2.11*.

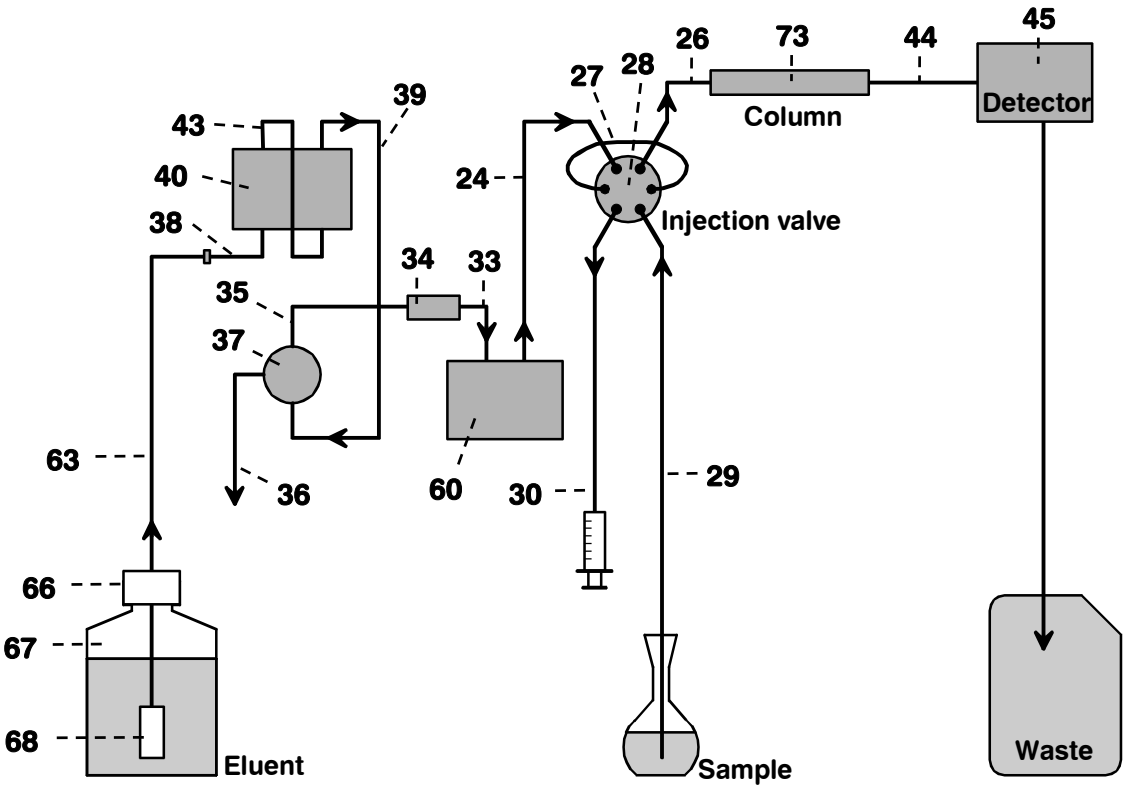


Figure 6: Connecting diagram for 2.861.0010 Compact IC without suppressor

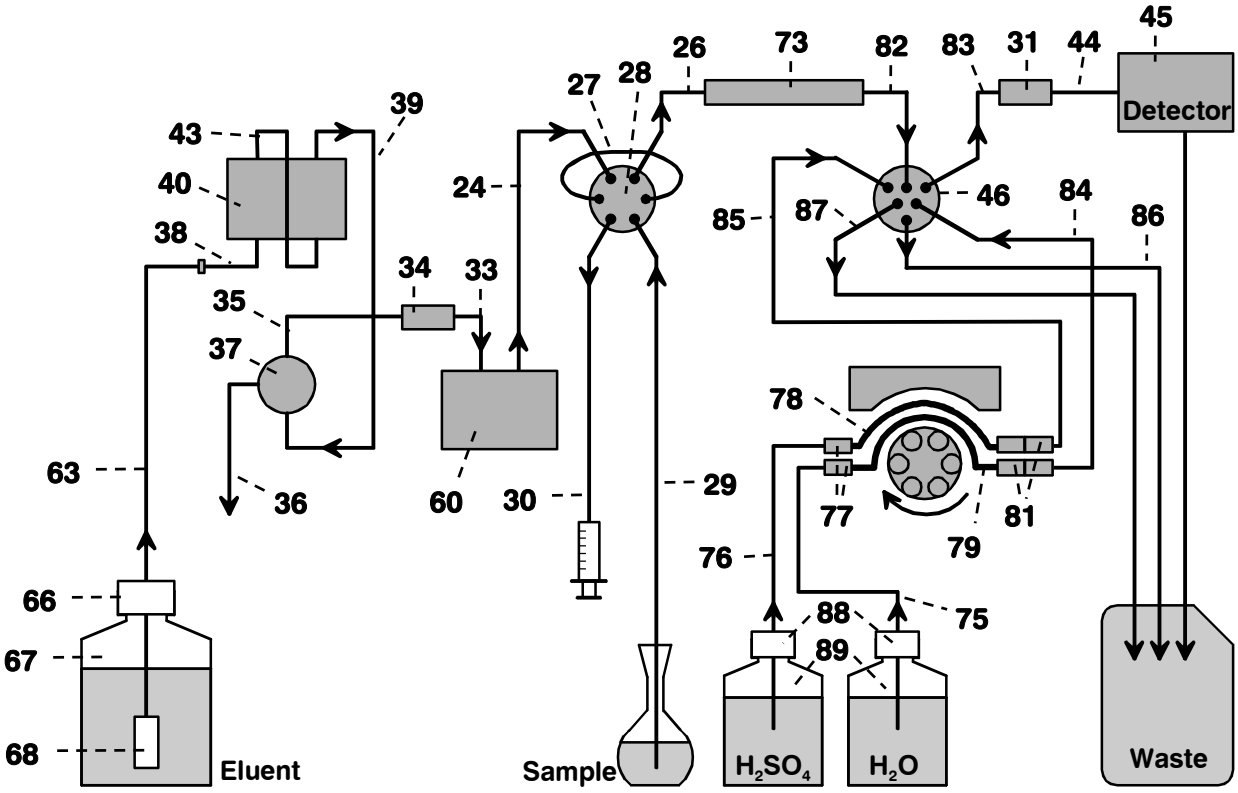


Figure 7: Connecting diagram for 2.861.0020 Compact IC with suppressor module «MSM II» 46

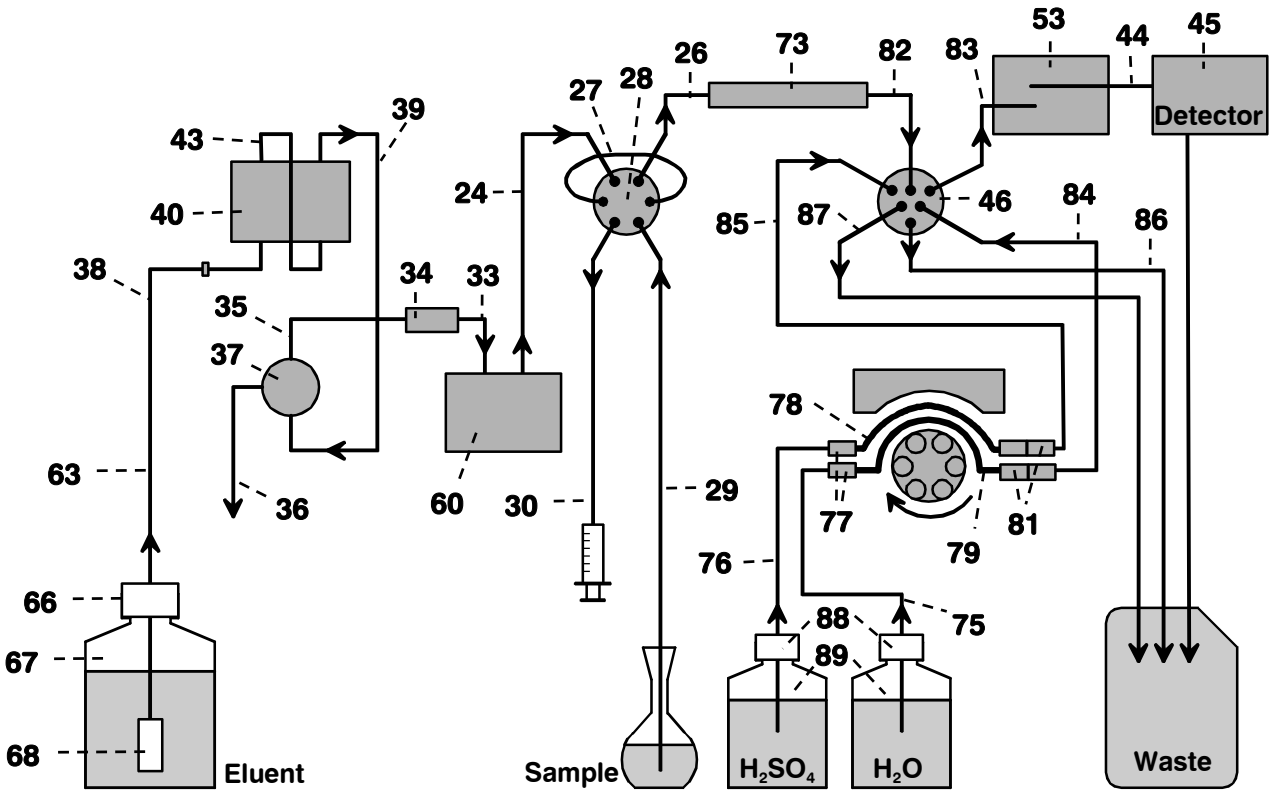


Figure 8: Connecting diagram for 2.861.0040 Compact IC with suppressor module «MSM II» 46 and 853 CO_2 Suppressor MCS 53.

2.2 Setting up the instrument

2.2.1 Packaging

The 861 Advanced Compact IC is supplied together with the separately packed accessories in special packagings containing shock-absorbing foam linings designed to provide excellent protection. The instrument itself is packed in an evacuated polyethylene bag to prevent the ingress of dust. Please store all these special packagings as only they assure transport of the instrument free from damage.

2.2.2 Check

After receipt, immediately check whether the shipment is complete and has arrived without damage (compare with delivery note and list of accessories in *Section 5.2*). In the case of transport damage, see instructions in *Section 5.4.1* "Warranty".

2.2.3 Location

Position the instrument in the laboratory at a location convenient for operation, free from vibrations and protected against a corrosive atmosphere and contamination by chemicals.

To avoid disturbing temperature influences on the insulated column compartment, the instrument must be protected against direct sunlight.

2.3 Attaching the accessories

2.3.1 Connection of detector block

The metal-free **1.732.0110 Detector block** belongs to the scope of supply of the 861 Advanced Compact IC; it must be inserted in the instrument and connected up. Proceed as follows:

If the detector block needs to be replaced then the cell constant of the new one must be entered. On the rear of the detector block the cell constant measured in the factory is printed on: c = XX.X /cm. This value should be entered in the software (see Cap. 3.3.2) in order to ensure that the conductivity is displayed accurately.

1 Install detector block

- Unscrew the four knurled screws **13** from the top rear panel **14** of the 861 Advanced Compact IC and remove rear panel (see *Figure 2*)
- Position detector block **45** from the back in the space provided in the 861 Advanced Compact IC and push fully to the front (see *Figure 3*, *Figure 4 and Figure 5*).
- Insert the cable permanently attached to the detector block **45** in one of the openings **12** and the outlet capillary in one of the openings **8** of the rear panel **14**.

*You can now place the 853 CO_2 Suppressor beside the detector block of Version 2.861.0040 so that you do not have to remove the rear panel again (see Figure 5). Connecting the 853 is described in detail in Section 2.9. Pull the Remote cable and the mains cable out of opening **11** in the rear panel.*

2 Replace rear panel

- Replace rear panel **14** and screw onto the 861 Advanced Compact IC using the four knurled screws **13**.

3 Connect detector block

- Plug the gray connecting cable permanently attached to the detector block **45** into connection **22** "Detector Block" of the 861 Advanced Compact IC and fasten to the instrument by tightening the screws in the cable connector (see *Figure 2*).

4 Connect waste container

- Lead the outlet capillary of the detector block **45** to a sufficiently large waste container and fix in place.

2.3.2 Connection of syringe and aspirating tubing

For manual filling of the sample loops **27** mounted on the injection valves, the 6.2816.020 Syringe and the PTFE aspirating tubing **29** already screwed to the valve are needed. These accessories are mounted or adjusted as follows:

1 Connect syringe

- Remove the plastic stopper from connection socket **3** on the front side of the 861 Advanced Compact IC (see *Figure 1*).
- Push 6.2816.020 Syringe (without needle) as far as it will go into connection socket **3**.

2 Lead aspirating tubing to the outside

- Lead the PTFE aspirating tubing **29** connected to the injection valve **28** through one of the feedthroughs **4** to the outside.

2.3.3 Connection of the drain tube for the inner compartment

The 861 Advanced Compact IC has a connection at the front to which a drain tube for discharged liquids in the inner compartment can be attached. Proceed as follows:

1 Connect drain tube

- Mount 6.1816.020 Silicone tubing on connection nipple on the lower right side.

2 Lead drain tube to collecting vessel

- Lead the other end of the drain tube to a suitable collecting vessel and fix in place.

2.3.4 Connection of the drain tube for bottle rack

The 861 Advanced Compact IC has a connection at the rear to which a drain tube for discharged liquids in the bottle rack can be attached. Proceed as follows:

1 Connect drain tube

- Mount 6.1816.020 Silicone tubing on connection nipple **9** (see *Figure 2*).

2 Lead drain tube to collecting vessel

- Lead the other end of the drain tube to a suitable collecting vessel and fix in place.

2.3.5 Connection of PEEK capillaries

For the connections between high-pressure pump and detector block **6.1831.010 PEEK capillaries** (i.d. = 0.25 mm, o.d. = $^1/_{16}$") are used which are connected using either **6.2744.010 PEEK compression fittings (long)** or **6.2744.070 PEEK compression fittings (short)**.

These PEEK connectors can also be used to connect 6.1822.010 PTFE microcapillaries (i.d. = 0.3 mm). Proceed as follows:

*Capillaries fitted with new connectors must have a perfectly flat cut surface. To cut PEEK or PTFE capillaries it is best to use the **6.2621.080 Capillary tubing cutter**.*

1 Mount compression fitting

- Slide a compression fitting **54** (6.2744.010) or a compression fitting **55** (6.2744.070) over the end of the capillary **56** to be fastened as shown in *Figure 9*.

2 Insert capillary in connection

- Push capillary end in the corresponding connection as far as it will go (to avoid dead volume).

3 Tighten compression fitting

- Tighten compression fitting **54** or **55** by hand (never use tools).

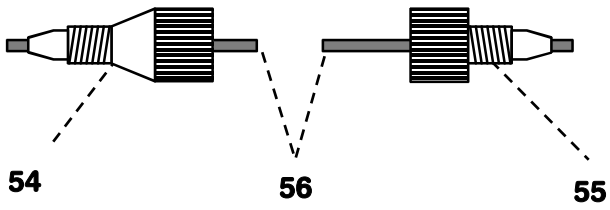


Figure 9: Connectors for capillaries

54 Compression fitting (6.2744.010)

55 Compression fitting (6.2744.070)

56 Capillary
6.1831.010 PEEK capillary or
6.1822.010 PTFE microcapillary

2.3.6 Filter unit PEEK

One **6.2821.120 Filter unit PEEK** (see *Figure 10*) is installed between the high-pressure pump and injection valve **28**. This filter unit serves to avoid contamination by abrasive particles of the piston seals.

The Filter unit PEEK **34** consists of the filter-housing **59**, the filter-screw **57** and the 6.2821.130 Filter **58**. For the connection of capillaries **56** PEEK compression fittings **54**/**55** (6.2744.010 or 6.2744.070) must be used. New filters **58** are available as an option with the ordering number 6.2821.130 (set of 10).

When connecting the filter unit please note the flow direction arrow printed on the housing.

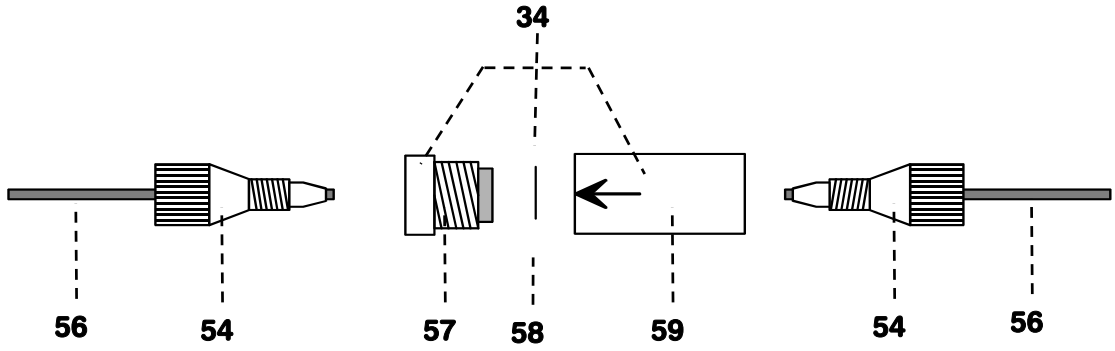


Figure 10: 6.2821.120 Filter unit PEEK

34 **Filter unit PEEK (6.2821.120)**

54 **Compression fitting (6.2744.010)**

56 **Capillary**
6.1831.010 PEEK capillary or 6.1822.010 PTFE microcapillary

57 **Filter screw of filter unit**
Part of 6.2821.120 Filter unit

58 **6.2821.130 Filter**

59 **Filter housing of filter unit**
Part of 6.2821.120 Filter unit

2.4 Mains connection

Follow the instructions below for connecting to the power supply. If the instrument is operated with a mains voltage set wrongly and/or wrong mains fuse, there is a danger of fire!

2.4.1 Setting the mains voltage

Before switching on the 861 Advanced Compact IC for the first time check that the mains voltage set on the instrument (see *Figure 11*) matches the local mains voltage. If this is not the case, you must reset the mains voltage on the instrument as follows:

1 Disconnect mains cable

Disconnect mains cable from mains connection plug **17** of the 861 Advanced Compact IC.

2 Remove fuse holder

Using a screwdriver, loosen fuse holder **18** below the mains connection plug **17** and take out completely.

3 Check and change fuse if necessary

Carefully take the fuse installed for the desired mains voltage out of fuse holder **18** and check its specifications (the position of the fuse in the fuse holder is marked by the white arrow imprinted next to the mains voltage range):

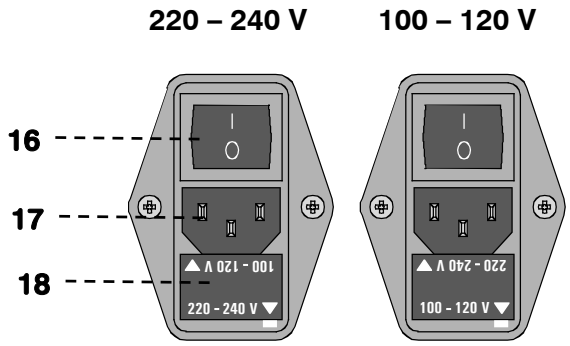
100…120 V	**1.0 A (slow-blow)**	Metrohm No. U.600.0016
220…240 V	**0.5 A (slow-blow)**	Metrohm No. U.600.0013

4 Insert fuse

Change fuse if necessary and reinsert in fuse holder **18**.

5 Install fuse holder

Depending on the desired mains voltage, insert fuse holder **18** in the 861 Advanced Compact IC so that the corresponding mains voltage range can be read normally and the adjacent white arrow points to the white bar imprinted below the fuse holder (see *Figure 11*).



16 Mains switch
to switch instrument on and off:
I = ON 0 = OFF

17 Mains connection plug
Mains connection, see *Section 2.4.3*

18 Fuse holder

Figure 11: Setting the mains voltage

2.4.2 Fuses

One of the two fuses 1 A/slow-blow for 100…120 V or 0.5 A/slow-blow for 220…240 V is installed in fuse holder **18** of the 861 Advanced Compact IC as standard.

Ensure that the instrument is never put into operation with fuses of another type, otherwise there is danger of fire!

When checking or changing fuses proceed as described in *Section 2.4.1*.

2.4.3 Mains cable and mains connection

Mains cable

The instrument is supplied with one of three mains cables

- 6.2122.020 with plug SEV 12 (Switzerland, …)
- 6.2122.040 with plug CEE(7), VII (Germany, …)
- 6.2133.070 with plug NEMA 5-15 (USA, …)

which are three-cored and fitted with a plug with a grounding pin. If a different plug has to be fitted, the yellow/green lead (IEC standard) must be connected to protective ground (protection class 1).

Any break in the grounding inside or outside the instrument can make it a hazard!

Mains connection

Plug the mains cable into mains connection plug **17** of the 861 Advanced Compact IC (see *Figure 11*).

2.4.4 On/off switching of the instrument

The 861 Advanced Compact IC is switched on and off using mains switch **16**. When the instrument is switched on, the mains pilot lamp **5** lights up.

2.5 Connection to PC

2.5.1 Connecting cable

Always switch off 861 Advanced Compact IC and PC before you connect the two instruments with the 6.2134.100 Cable.

Connect the RS232 interface **23** at the 861 Advanced Compact IC to the serial COM1 port at the PC using the 6.2134.100 Cable (9-pin/9-pin). If only a 25-pin COM interface is available on the PC then the 6.2125.110 Adapter cable or a commercially available adapter must be used.

2.5.2 Software installation

The operation of the 861 Advanced Compact IC requires the PC program **«IC Net»**, which is part of the 6.6034.033 CD (included in the accessories). This program runs under Windows 2000 and Windows XP operating systems and is installed as follows:

1 Install program

- Insert the installation CD 6.6034.033 into your CD-ROM drive.
- If the autorun option for the CD drive is disabled, select **<Start>** and **Run**. Browse for the **Setup.exe** file on the installation CD and click on **<OK>**.
- Click "**IC Net**" and follow the on-screen prompts of the Setup program (see *Instructions for Use «IC Net», Section 1.5* for a more detailed description).

2 Files

The software package will be installed in the desired directory. Icons are created in the program folder and in the startup folder. In addition to the program files, the following folders are installed:

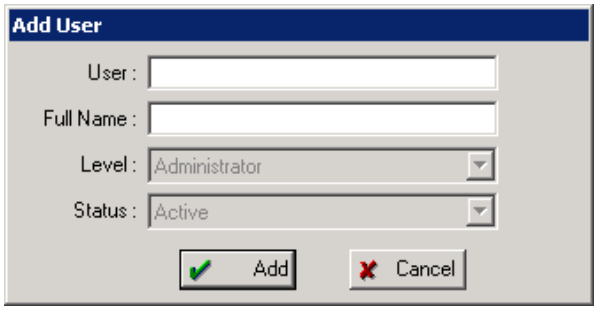
Data	Folder for storage of chromatogram files (***.chw**) and batch reprocessing files (***.bar**)
Devices	Folder for storage of device files (***.dev**)
Excelreport	Folder for Excel reports (***.xls**)
Methods	Folder for storage of method files (***.mtw**)
Reports	Folder for storage of report files (***.txt**) and graphic files (***.wmf**)
Systems	Folder with subfolders with system files (***.smt**) and sample queue files (***.que**).

The installed files (incl. system and method files) are generally not write-protected. To prevent these files from being deleted by mistake, switch on the write-protection or make a backup copy in another directory.

2.5.3 First Login

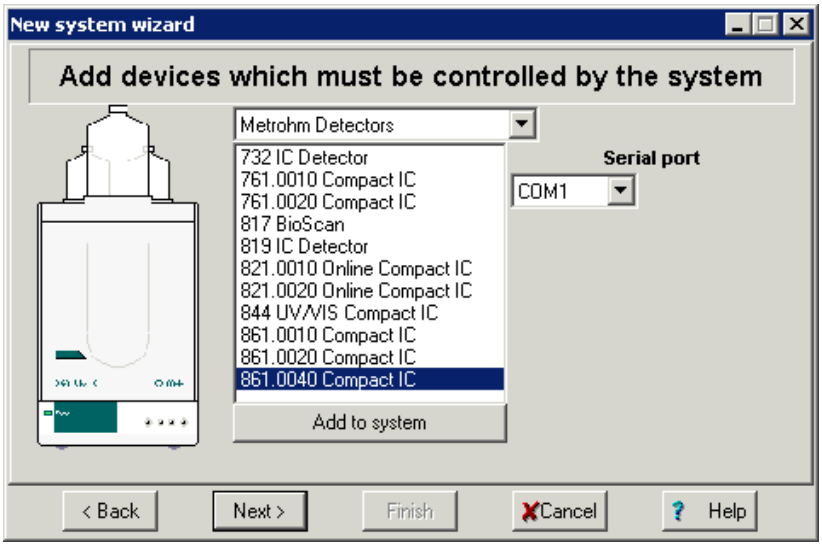
Starting and closing of the Software is described in the provided *Software Instructions for Use «IC Net», Section 2*.

*The **Add User** window (see below) opens the first time you launch the program after installing the software and a user with Administrator access rights is created.*



2.5.4 Create a system

Create in **«IC Net»** a system to control the 861 Advanced Compact IC. Proceed as described in *Section 4.4.1* of the *Software Instructions for Use «IC Net»: System wizard*. Add your version of the 861 Advanced Compact IC (they are listed under "Metrohm Detectors") to the system, and choose the port to which it is connected.



2.6 High-pressure pump

In order to avoid damage to the pump it must never be operated dry. Each time that the pump is switched on always first check that the eluent supply has been connected up correctly and that sufficient eluent is present in the eluent bottle.

2.6.1 Removing the transport security screws

In order to prevent the pump drive from being damaged during transport the pump head is fitted with three transport security screws **15** (see *Figure 2*). These transport security screws must be removed before the high-pressure pump is started up. Also remove the red sticker attached to the pump head.

In order to avoid damage to the pump head these three security screws should be attached to the pump head each time that the 861 Advanced Compact IC is to be transported.

2.6.2 Installing the pulsation dampener

To protect the column material against pressure drops caused by the injection valve, the **6.2620.150 Pulsation dampener MF** has to be installed between the high-pressure pump and the injection valve of the 861 Advanced Compact IC. Proceed as follows (see *Figure 12*):

1 Install pulsation dampener

- Position the pulsation dampener **60** in the interior of the Compact IC on the base.

2 Connection to the pump

- Unscrew PEEK capillary **33** of coupling **31** and attach it to connection **62** of the pulsation dampener **60**.

3 Connection to injection valve

- Unscrew PEEK capillary **24** of coupling **31** and attach it to connection **61** of the pulsation dampener **60**.

The pulsation dampener is filled with isopropanol and must be rinsed with eluent before connection to a separating column (see Section 2.6.4).

The 6.2620.150 Pulsation dampener can be operated in both directions.

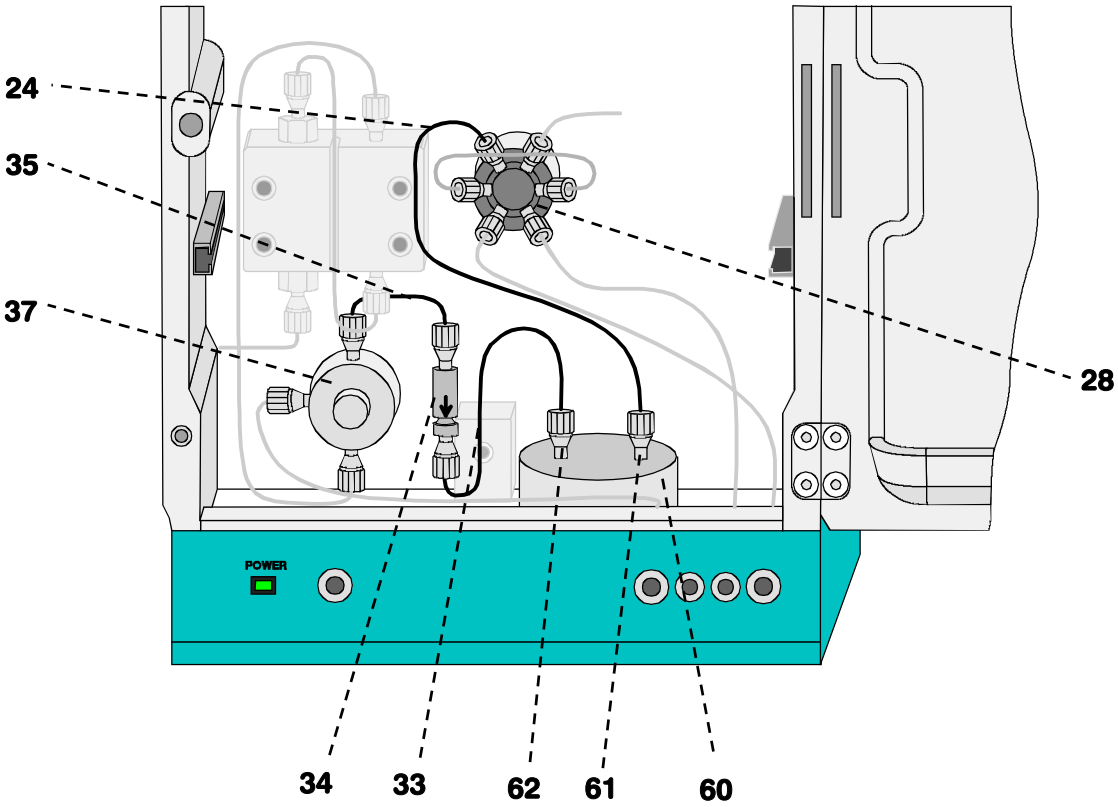


Figure 12: Connection of the pulsation dampener

24 Inlet capillary for injection valve PEEK capillary 6.1831.010, length *L* = 24 cm	**35 Connection capillary** 6.1831.010 PEEK capillary, length *L* = 13 cm
28 Injection valve	**37 Purge valve**
33 Inlet capillary for injection valve PEEK capillary 6.1831.010, length *L* = 13 cm	**60 Pulsation dampener (6.2620.150)**
	61 Connection to injection valve
34 Filter unit PEEK (6.2821.120)	**62 Connection to purge valve**

2.6.3 Connecting the eluent bottle

The eluent supply line from the storage bottle to the high-pressure pump is connected as follows (see *Figure 13*):

*Only **degassed** (with N_2, He or vacuum) and **microfiltered** (0.45 µm filter) **eluents** should be used!*

*The 6.1608.070 Eluent bottle (2 L) supplied is **not suitable for vacuum degassing**. Use a pressure-resistant container for this.*

*Care must be taken that the **eluent** used is **freely miscible** with any solvent remaining in the pump head (the pump head leaves the fac-*

tory filled with either isopropanol or methanol/water). If this is not the case then the pump must first be rinsed with a solvent which is miscible with both the previous eluent and the following eluent (e.g. acetone).

1 Prepare eluent bottle

- Prepare, microfilter (0.45 µm microfilter) and degas (with N_2, He, or vacuum) the suitable eluent for the required application and separating column.
- Fill eluent into eluent vessel **67** (clear glass, 2 L).
- Place eluent bottle **67** at the front in bottle holder **6** on the 861 Advanced Compact IC (see *Figure 1*).

2 Install bottle attachment

- Firmly screw threaded stopper **65** (6.1446.040; part of 6.1602.160) into the smaller threaded opening (M6) of bottle attachment **66** (6.1602.105; part of 6.1602.160).
- Firmly screw aspirating filter **68** onto aspirating tubing **63**.
- Pull the other end of aspirating tubing **63** through the larger threaded opening (M8) of bottle attachment **66** from below.
- Push O-ring (E.301.0021; part of 6.1602.160) over the free end of aspirating tubing **63** and move it towards bottle attachment **66**.
- Push tubing nipple **64** (4.420.4300; part of 6.1602.160) over the free end of aspirating tubing **63,** move it as far as required towards bottle attachment **66** and screw it loosely in the larger opening of bottle attachment **66**.
- Insert aspirating tubing **63** with screwed-on aspiration filter **68** into eluent bottle **67** and screw bottle attachment **66** onto eluent bottle **67**.
- Pull aspirating tubing **63** so far through the opening of tubing nipple **64** that aspirating filter **68** is touching the bottom of eluent bottle **67**.
- Fix aspirating tubing **63** in place by screwing shut tubing nipple **64**.

3 Mount CO_2 absorber tube

- First place a piece of cotton wool **70** followed by CO_2 absorber **69** (e.g. Merck soda lime pellets with indicator, no. 6839.1000) in the large opening of absorber tube **72** and then close it with the plastic lid.
- Fasten absorber tube **72** to bottle attachment **66** with the aid of SGJ clip .

4 Connect aspirating tubing to pump

- Insert the free end of aspirating tubing **63** into one of the openings **8** in the interior of the 861 Advanced Compact IC (see *Figure 2*).
- Pull aspirating tubing **63** sufficiently far into the interior of the

861 Advanced Compact IC, cut off to the required length and push at least 5 mm of it onto aspirating capillary **38** (see *Figure 3* and *Figure 4* and *Figure 5*) of the high-pressure pump (it may be necessary to use emery paper).

- If necessary, fix aspirating tubing **63** in the required position in the interior with the aid of the Y.107.0150 self-adhesive strap.

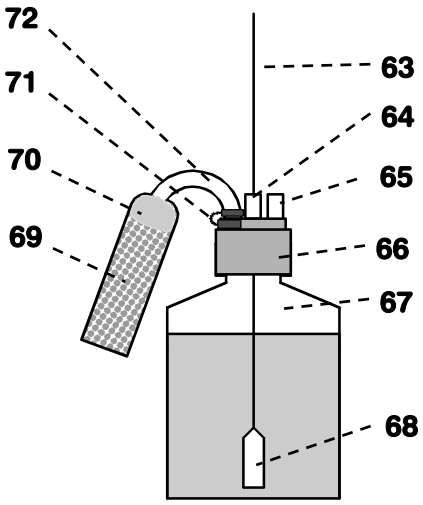


Figure 13: Connection of eluent bottle

63	**Aspirating tubing (6.1834.010)**
64	**Tubing nipple (4.420.4300; M8)** with E.301.0021 O-ring
65	**Threaded stopper (6.1446.040; M6)**
66	**Bottle attachment (6.1602.105)**
67	**Eluent bottle (6.1608.070)**
68	**Aspirating filter (6.2821.090)**
69	**CO_2 absorber**
70	**Cotton wool**
71	**SGJ clip (6.2023.020)**
72	**Absorber tube (6.1609.000)**

2.6.4 Deaerating the pump and rinsing the pulsation dampener

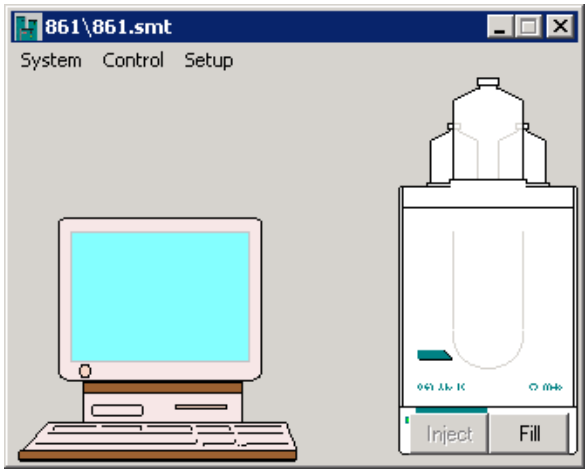
The first time that it is started up the high-pressure pump must be deaerated. Proceed as follows:

1 Prepare for deaeration

- Open the rotary knob on purge valve **37** by approx. ½ turn in the counterclockwise direction (see *Figure 3* and *Figure 4* and *Figure 5*).
- Remove the plastic stopper from connection **2** on the front panel of 861 Advanced Compact IC (see *Figure 1*).
- Push 6.2816.020 Syringe (without needle) into connection **2** until the stop is reached.

2 Open and connect system

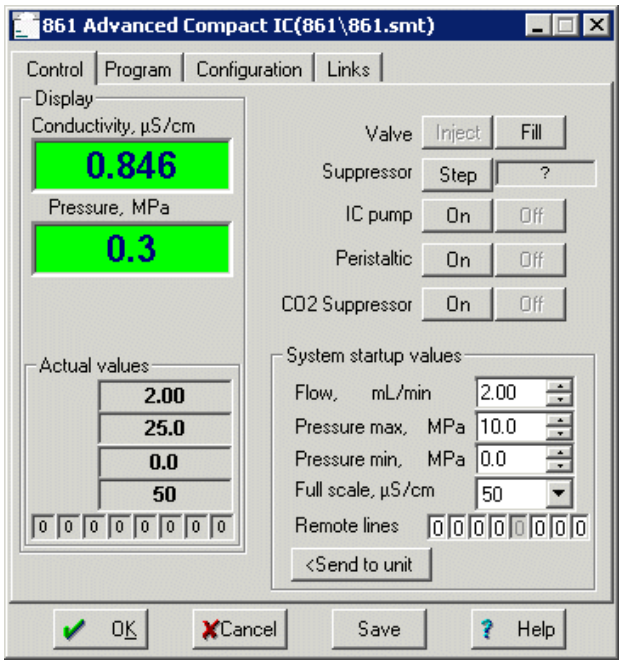
- Start the «**IC Net**» PC program, if it has not been already been started (see *Section 2.5.3*).
- Select **File** / **Open** / **System** in the main window. Select the system created in Section *2.5.4*, and click on **<Open>**.



- Select the **Connect to workplace** item of the **Control** menu in this window.

3 Set flow rate to 2 mL/min

- Double-click the 861 icon in the system window to open the window for manual control of the 861 Advanced Compact IC (see below).
- Set the flow rate to **2 mL/min** in the **Flow** field.
- Click to **<Send to unit>** to send this value to the 861 Advanced Compact IC.



4 Deaerate pump

- Make sure that the aspirating tubing **63** for the high-pressure pump has been immersed into the eluent.
- Click the **<On>** button for **IC pump** to switch on the high-pressure pump.
- Use the syringe inserted into connection **2** to aspirate air until eluent flows bubble-free into the syringe.
- Click the **<Off>** button for **IC pump** to switch off the high-pres-

sure pump.

- Close the rotary knob on purge valve **37** by turning it in a clockwise direction (see *Figure 3* and *Figure 4* and *Figure 5*).
- Remove the syringe from connection **2**.

5 Rinse pulsation dampener

- Place a beaker beneath the column connection capillary **26**.
- Click the **<On>** button for **IC pump** to switch on the high-pressure pump and rinse the pulsation dampener **60** filled with isopropanol for approx. 10 min with eluent.
- Click the **<Off>** button for **IC pump** to switch off the high-pressure pump.

6 Reduce flow rate

- Reset the original flow rate under **Flow** (e.g. **0.5 mL/min**).
- Click **<Send to unit>** to send this value to the 861 Advanced Compact IC.
- Click **<Save>** to save the values.

2.7 Precolumns and separating columns

2.7.1 Precolumns

The use of easily exchangeable precolumns protects the separating columns and prolongs their lifetime. The precolumns available from Metrohm are either real precolumns or precolumn cartridges, which are used together with a cartridge holder. For the installation of a precolumn cartridge into the accompanying cartridge holder see the attached leaflet.

*The precolumn that is suitable for your separating column can be found in the **Metrohm IC Column Catalog** which can be obtained from your local Metrohm agency, the data sheet accompanying your separating column, the product information about separating columns that can be found under http://www.metrohm.com, ion chromatography products, or let your agency advise you directly.*

New IC precolumns are normally filled with solution and sealed at both ends. Before the precolumn is installed in the system, it must be ensured that this solution is freely miscible with the eluent used (check manufacturer's specifications).

1 Connect precolumn

- Remove end caps from the precolumn.
- Fit compression fitting to the connection capillary **26** mounted to the injection valve (see *Section 2.3.5*).
- Screw column connection capillary **26** to precolumn.
- Cut off a small piece, approx. 5 cm, from the 6.1831.010 PEEK capillary and fit compression fittings to both ends (see *Section 2.3.5*).
- Mount the prepared capillary to the outlet of the precolumn.

When you install the column always ensure that this is inserted correctly in accordance with the flow direction (if existent) shown.

2 Rinse the precolumn

- Place a beaker beneath outlet capillary.
- Switch on IC Pump in «IC Net» and rinse precolumn for approx. 10 min with eluent.
- Switch off IC Pump.

2.7.2 General information on separating columns

*The precolumn that is suitable for your separating column can be found in the **Metrohm IC Column Catalog**, the product information about separating columns that can be found under http://www.metrohm.com, ion chromatography products, or let your agency advise you directly.*

New IC columns are normally supplied filled with liquid and sealed at both ends. Before inclusion in the system you must make sure that this solution is fully miscible with the eluent to be used (observe the information provided by the manufacturer).

The separating columns and precolumns currently available from Metrohm can be found in the **Metrohm IC Column Catalog**, or on the Internet under http://www.metrohm.com in the ion chromatography product section. Each column is supplied with a test chromatogram and a data sheet. More detailed information about special IC applications can be found in the relevant **"Application Bulletins"** or **"Application Notes"**; these are available on the Internet under http://www.metrohm.com in the applications sector, or can be requested free of charge from your local Metrohm agency.

When you install the column always ensure that this is inserted correctly in accordance with the flow direction shown.

2.7.3 Selecting the sample loop

Selection of the sample loop depends on the separating column used. Normally the following sample loops are used:

Anion columns	100 µL
Cation columns	10 µL
Columns for suppressor technique	20 µL

The following sample loops are installed in the 861 Advanced Compact IC:

Version	*Sample loop*	*Volume*
2.861.0010	6.1825.210 (PEEK)	20 µL
2.861.0020	6.1825.210 (PEEK)	20 µL
2.861.0040	6.1825.210 (PEEK)	20 µL

If desired, the built-in sample loop can be replaced by one of the sample loops available as an option (see Section *5.3.1*).

2.7.4 Installation of the separating column without suppressor module «MSM II»

With the 2.861.0010 Compact IC without suppressor module «MSM II», the IC separating column is installed as follows (see *Figure 14*):

1 Connect column to injection valve

- Remove end caps from column **73**.
- *without precolumn:*
  Screw inlet end of separating column **73** (note flow direction) to column connection capillary **26** mounted on the injection valve.
- *with precolumn:*
  See relevant leaflet.

2 Rinse column

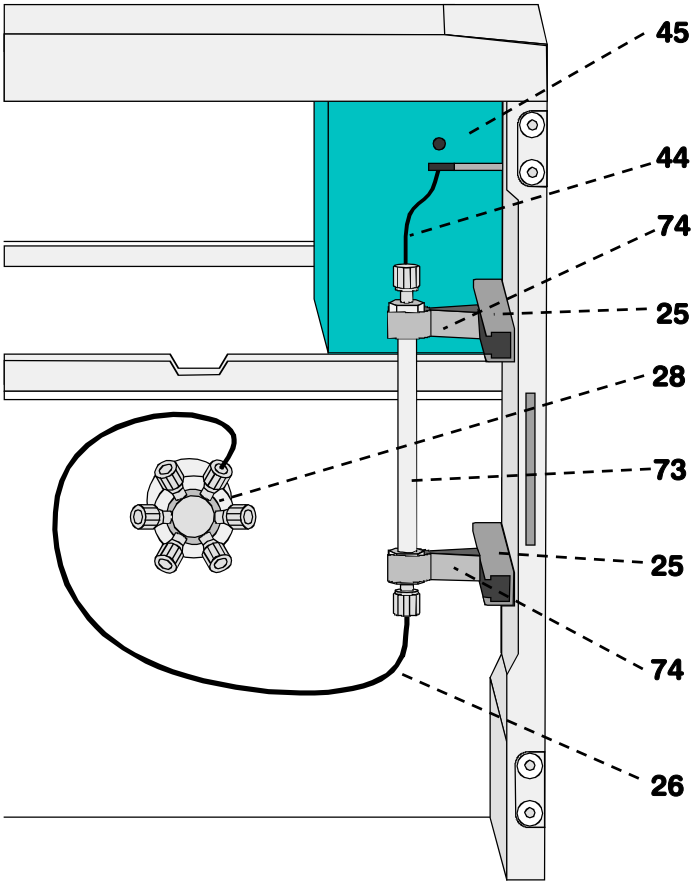
- Place a beaker beneath the column outlet.
- Open software window for manual system control.
- If necessary, modify Flow rate to the value suited for the inserted separating column and click on <Send to unit> to send this value to the 861 Advanced Compact IC.
- Switch on high-pressure pump (IC pump) by clicking <On> and rinse column with eluent for approx. 10 min.
- Switch off high-pressure pump by clicking <Off>.

3 Connect column to detector block

- Screw outlet end of separating column **73** to the inlet capillary **44** permanently mounted on the detector block **45**.

4 Column attachment

- Insert one or two column holders **74** (6.2027.030, 6.2027.040 or 6.2027.050) in the mounting rails **25** and fasten separating column **73** in the column holder **74**.



25 **Mounting rail**
for column holder **74**

26 **Column connection capillary**
Connection injection valve **28** – separating column **73**

28 **Injection valve**

44 **Inlet capillary for detector block**
PEEK capillary, fixed mounting

45 **Detector block (1.733.0110)**

73 **Separating column**

74 **Column holder (6.2027.0X0)**

Figure 14: Installation of column without suppressor

2.7.5 Installation of the separating column with suppressor module «MSM II»

With the versions 2.861.0020 and 2.861.0040 Compact IC with suppressor module «MSM II», the IC separating column is first connected to the injection valve or precolumn. The connection to the suppressor module «MSM II» and the detector block is described in *Section 2.8*.

1 **Connect column to injection valve**

- Remove end caps from column **73**.
- Screw inlet end of separating column **73** (note flow direction) to column connection capillary **26** or to the already installed precolumn (procedure see *Section 2.7.4*).

2 **Rinse column**

- Place a beaker beneath the column outlet.
- Open software window for manual system control.
- If necessary, modify Flow rate to the value suited for the inserted separating column and click on <Send to unit> to send this value to the 861 Advanced Compact IC.
- Switch on high-pressure pump (IC pump) by clicking <On> and rinse column with eluent for approx. 10 min.
- Switch off high-pressure pump by clicking <Off>.

3 Connect column to suppressor module «MSM II»

- Screw the outlet end of separating column **73** to the "Suppressor inlet capillary for eluent" **82**, which is permanently attached to the suppressor module «MSM II» **46**.

4 Fix column

- Insert one or two column holders **74** (6.2027.030, 6.2027.040 or 6.2027.050) in the mounting rails **25** and fasten separating column **73** in the column holder **74**.

2.8 Suppressor module «MSM II»

2.8.1 General information on suppressor module «MSM II»

The **suppressor module «MSM II»** for chemical suppression installed in the 2.861.0020 and 2.861.0040 Compact IC comprises a total of 3 suppressor units which are in turn used for suppression, regenerated with sulfuric acid and rinsed with water. To record every new chromatogram under comparable conditions, work is normally carried out with freshly regenerated suppressor. Switching is either automatic together with the valve switching or manual.

The suppressor units must never be regenerated with H_2SO_4 in the same flow direction used for the eluent. You should thus always install the inlet and outlet capillaries as described in Section 2.8.4 *according to the scheme shown in Figure 18.*

For operation of the suppressor module «MSM II» the **two-channel peristaltic pump** built into the versions 2.861.0020 and 2.861.0040 is used which conveys the regeneration solution (normally **20 mmol/L H_2SO_4**) and the rinsing solution (normally **dist. H_2O**) to the suppressor units (flow rate of 0.5 mL/min).

The three inlets and outlets numbered 1...3 on the suppressor module «MSM II» each have 2 permanently mounted PTFE capillaries, which must be connected as described in *Section 2.8.4* (see *Figure 16* and *Figure 18*).

In order to protect the suppressor module «MSM II» from foreign bodies or bacterial growth a 6.2821.130 Filter **58** (forms part of "PEEK coupling **81** with filter and tubing security device" 6.2744.180) must be mounted between the peristaltic pump and the inlet capillary of suppressor module «MSM II».

The suppressor module «MSM II» must never be switched in the dry state as there is a danger of blocking. Before every switching operation of the suppressor module «MSM II», the three suppressor units must have been rinsed for at least ½ h with eluent, regeneration and rinsing solution.

2.8.2 Preparation of the peristaltic pump

Before start-up the accessories for the 2-channel peristaltic pump built into the 861 Advanced Compact IC must be mounted according to *Figure 15.* Proceed as follows:

1 Remove tubing cartridges

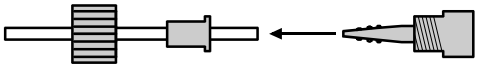
- Loosen both tubing cartridges **47** from the holding clamp **49** by pressing down snap-action lever **50** and remove from mounting pin **52** (see *Figure 16*).

2 Insert pump tubings

- Press contact pressure lever **48** on both tubing cartridges down as far as it will go.
- Insert the pump tubings **78** and **79** (6.1826.110) into each of the tubing cartridges as shown in *Figure 15*. The orange-yellow stopper **80** must click into the corresponding holder on the left-hand side of the tubing cartridge.

3 Attach coupling to pump tubing

- Attach PEEK coupling **77** to the aspiration end of pump tubings **78** / **79** (see *Figure 15*).
- Mount PEEK coupling **81** with filter and tubing security device (6.2744.180) to the delivery end of pump tubing **78** / **79**. This is done by dismantling the tubing security device and first pushing the sleeve nut and the compression piece onto the tubing.



Attach the tubing to the PEEK coupling and screw the sleeve nut onto the coupling in order to secure the tubing.

4 Attach tubing cassettes

- Hinge the tubing cassettes on holding pin **52** and press down on the right-hand side until spring lever **50** clicks into position in holding clip **49**. Take care that the pump tubing does not kink.

5 Connect suppressor inlet capillary

- Attach "Suppressor inlet capillary for H_2O" **84** / "Suppressor inlet capillary for H_2SO_4" **85** with a compression fitting **54** to the Coupling **81**.

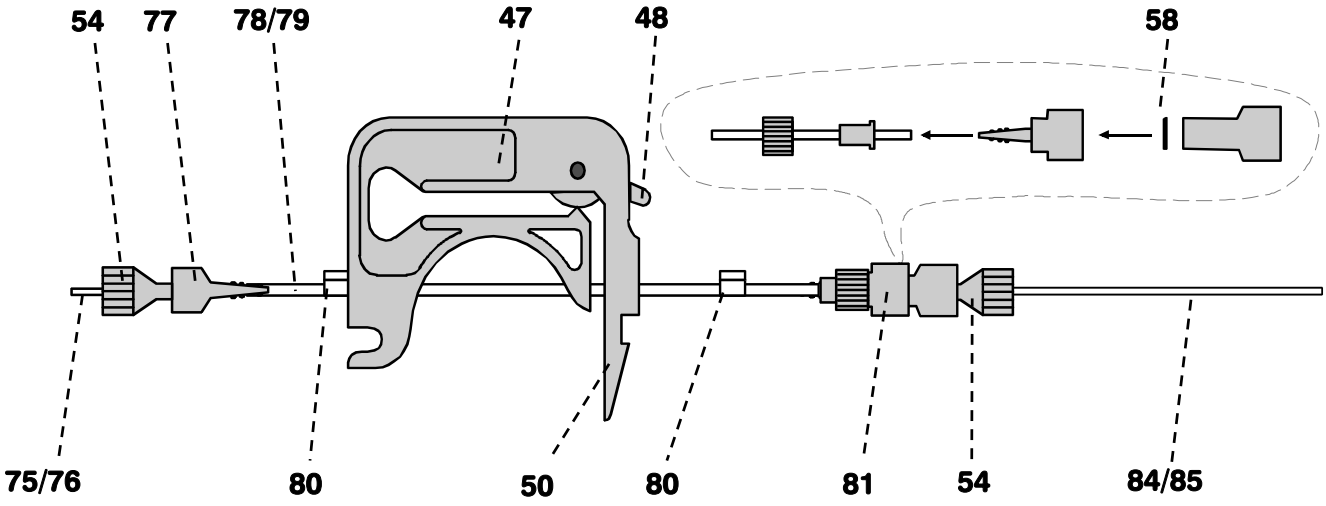


Figure 15: Installing pump tubings

47 **Tubing cartridge (6.2755.000)**

48 **Contact pressure lever**
for adjusting the contact pressure

50 **Snap-action lever**
for releasing the tubing cartridge

54 **Compression fitting (6.2744.010)**

58 **Filter 6.2821.130**

75 **Aspirating tubing for H_2O**

76 **Aspirating tubing for H_2SO_4**

77 **Coupling (6.2744.034)**

78 **Pump tubing (6.1826.110) for H_2SO_4**

79 **Pump tubing (6.1826.110) for H_2O**

80 **Stopper (orange-yellow)**

81 **PEEK coupling with filter and tubing security device 6.2744.180**

84 **Suppressor inlet capillary for H_2O**

85 **Suppressor inlet capillary for H_2SO_4**

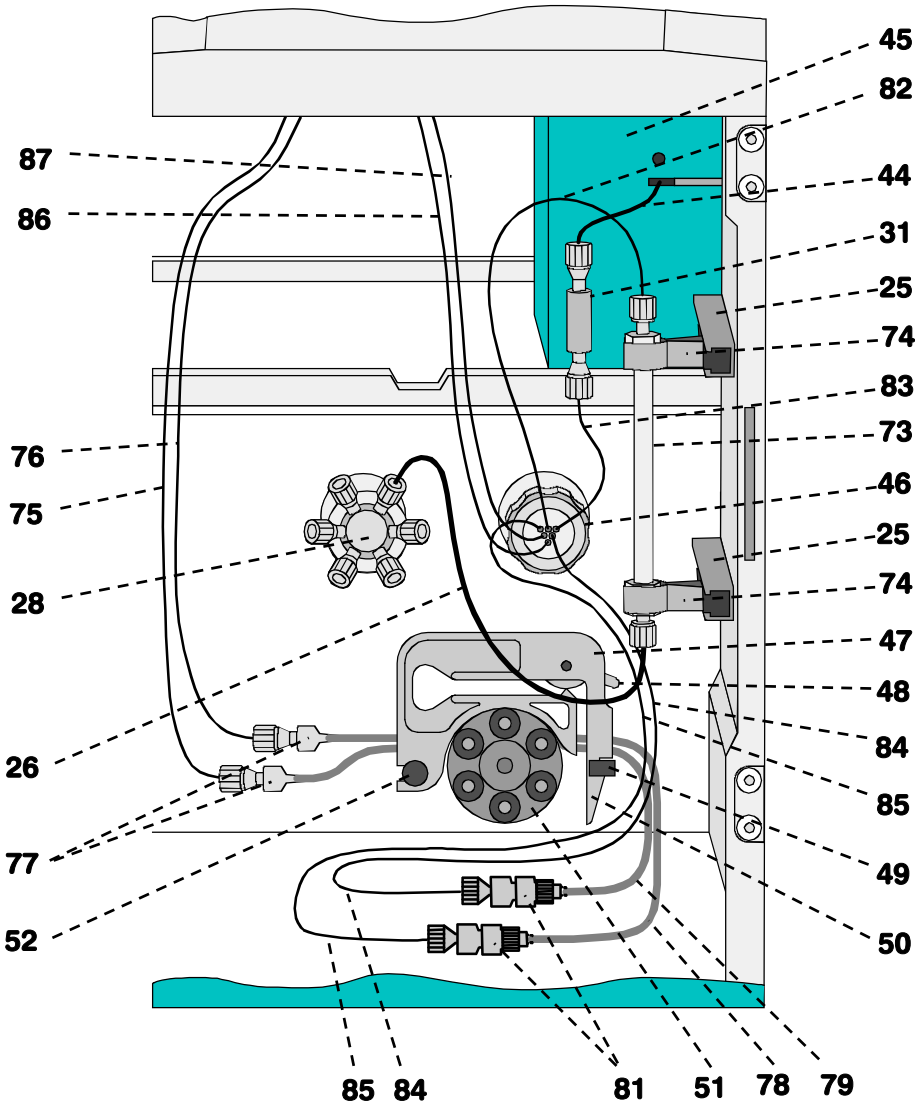


Figure 16: Connection of separation column with suppressor module «MSM II»

25 Mounting rail
for 6.2027.0X0 column holder

26 Column connection capillary
6.1831.010 PEEK capillary, length L = 30 cm

28 Injection valve

31 PEEK coupling (6.2744.040)

44 Inlet capillary for detector block
PEEK capillary, fixed mounting

45 Detector block (1.732.0110)

46 Suppressor module «MSM II»
(inlet and outlet capillaries are not shown)

47 Tubing cartridge (6.2755.000)
for pump tubing **78/79**

48 Contact pressure lever
for adjusting the contact pressure

49 Holding clamp
for locking the tubing cartridge into place

50 **Snap-action lever**
for releasing the tubing cartridge

51 **Pump drive**
roller head with contact rollers

52 **Mounting pin**
for attaching the tubing cartridges

73 **Separating column**

74 **Column holder (6.2027.0X0)**

75 **Aspirating tubing for H_2O**

76 **Aspirating tubing for H_2SO_4**

77 **Coupling (6.2744.034)**

78 **Pump tubing (6.1826.110) for H_2SO_4**

79 **Pump tubing (6.1826.110) for H_2O**

81 **PEEK coupling with filter and tubing security device 6.2744.180**

82 **Suppressor inlet capillary for eluent**

83 **Suppressor outlet capillary for eluent**

84 **Suppressor inlet capillary for H_2O**

85 **Suppressor inlet capillary for H_2SO_4**

86 **Suppressor outlet capillary for H_2O**

87 **Suppressor outlet capillary for H_2SO_4**

2.8.3 Connection of supply bottles

The supply lines for the regeneration and rinsing solution between the storage bottles and the peristaltic pump are installed as follows (see *Figure 17*):

1 **Prepare supply bottle for H_2SO_4**

- Prepare regeneration solution suited for the desired application and separating column (normally 50 mmol/L H_2SO_4).
- Fill regeneration solution into supply bottle **89** (amber glass, 1 L) and label the bottle.
- Screw bottle attachment **88** on to supply bottle **89**.
- Place supply bottle **89** at one of the rear positions of the bottle rack **6** on the 861 Advanced Compact IC (see *Figure 1*).

2 **Connect aspirating tubing for H_2SO_4**

- Prepare aspirating tubing **76**: Cut a piece of the 6.1803.020 PTFE tubing to the required length (normally approx. 120 cm).
- Pull one end of aspirating tubing **76** through a PEEK compression fitting **54** (6.2744.010) so that approx. 30 cm of the tubing projects.
- Screw PEEK compression fitting **54** with tubing into one opening of bottle attachment **88** attached to the regeneration solution storage bottle and tighten it so that the tubing is firmly held.
- Insert the free end of aspirating tubing **76** into one of the openings in **8** of the 861 Advanced Compact IC (*see Figure*

2) from above and pull it sufficiently far into the interior.

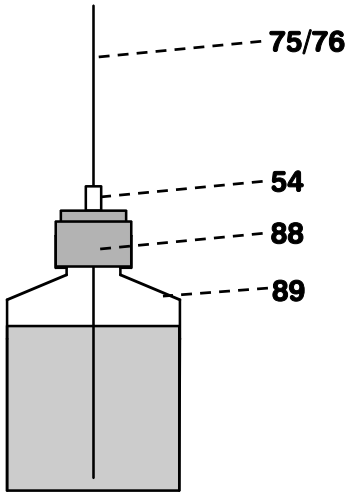
- Mount a coupling **77** (6.2744.030) to the inlet end of the rear pump tubing **78**.
- Mount a 6.2744.010 Compression fitting at the end of the aspirating tubing **76** and screw this compression fitting on to the coupling **77** (see *Figure 16*).

3 Prepare supply bottle for H_2O

- Prepare rinsing solution suited for the desired application and separating column (normally dist. H_2O).
- Fill rinsing solution into supply bottle **89** (amber glass, 1 L) and label the bottle.
- Screw bottle attachment **88** on to supply bottle **89**.
- Place supply bottle **89** beside the other supply bottle on the bottle rack **6** on the 861 Advanced Compact IC (see *Figure 1*).

4 Connect aspirating tubing for H_2O

- Prepare aspirating tubing **75**: Cut a piece of the 6.1803.020 PTFE tubing to the required length (normally approx. 120 cm).
- Pull one end of aspirating tubing **75** through a PEEK compression fitting **54** (6.2744.010) so that approx. 30 cm of the tubing projects.
- Screw PEEK compression fitting **54** with tubing into one opening of bottle attachment **88** attached to the rinsing solution storage bottle and tighten it so that the tubing is firmly held.
- Insert the free end of aspirating tubing **75** into one of the openings in **8** of the 861 Advanced Compact IC (*see Figure 2*) from above and pull it sufficiently far into the interior.
- Mount a coupling **77** (6.2744.030) to the inlet end of the front pump tubing **79**.
- Mount a 6.2744.010 Compression fitting at the end of the aspirating tubing **75** and screw this compression fitting on to the coupling **77** (see *Figure 16*).



54	**Compression fitting (6.2744.010)**
75	**Aspirating tubing for H_2O**
76	**Aspirating tubing for H_2SO_4**
88	**Bottle attachment (6.1602.150)**
89	**Supply bottle 6.1608.023**

Figure 17: Connection of supply bottles

2.8.4 Connection of the suppressor module «MSM II»

The three inlets and outlets numbered 1...3 on the suppressor module «MSM II» **46** each have 2 permanently mounted PTFE capillaries, which must be connected as follows (see *Figure 16* and *Figure 18*).

1 Inlet capillary for eluent

- Screw inlet capillary **82** marked with "Eluent" of suppressor module «MSM II» **46** to outlet end of separating column **73** using a 6.2744.010 Compression fitting.

2 Outlet capillary for eluent

- Screw outlet capillary **83** marked with "Detector" of suppressor module «MSM II» **46** to coupling **31** using a 6.2744.010 Compression fitting.
- Screw inlet capillary **44** of detector block **45** to other end of coupling **31**.

*For Version 2.861.0040 the outlet capillary **83** (marked with "Detector") of suppressor module «MSM II» **46** should be connected to the inlet **Eluent in** of the 853 CO_2 Suppressor (see Section 2.9).*

3 Inlet capillary for H_2SO_4

- Attach inlet capillary **85** marked with "H_2SO_4" of suppressor module «MSM II» **46** using a 6.2744.010 Compression fitting to the PEEK Coupling **81** connected to the rear pump tubing **78**.

4 Outlet capillary for H_2SO_4

- Pull outlet capillary **87** marked with "Waste" of the suppressor

module «MSM II» **46** from below through one of the openings **8** out of the inner compartment of the 861 Advanced Compact IC.

- Lead outlet capillary **87** to a sufficiently large waste container and fix it in place.

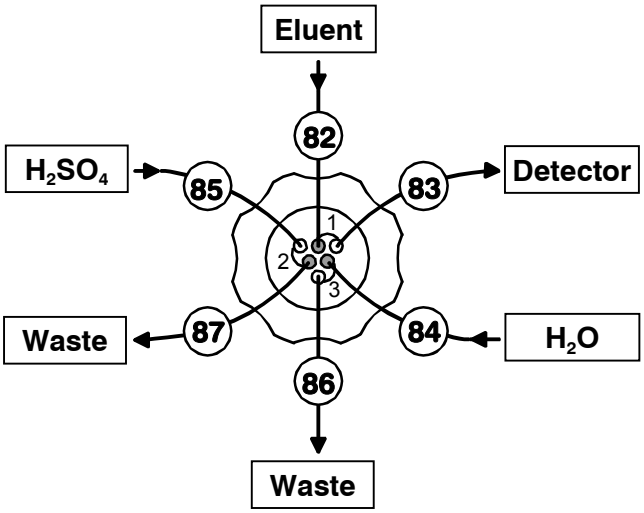


Figure 18: Connections at suppressor module «MSM II»

82 Suppressor inlet capillary for eluent

83 Suppressor outlet capillary for eluent

84 Suppressor inlet capillary for H_2O

85 Suppressor inlet capillary for H_2SO_4

86 Suppressor outlet capillary for H_2O

87 Suppressor outlet capillary for H_2SO_4

5 Inlet capillary for H_2O

- Attach inlet capillary **84** marked with "H_2O" of suppressor module «MSM II» **46** using a 6.2744.010 Compression fitting to the PEEK Coupling **81** connected to the front pump tubing **79**.

6 Outlet capillary for H_2O

- Pull outlet capillary **86** marked with "Waste" of the suppressor module «MSM II» **46** from below through one of the openings **8** out of the inner compartment of the 861 Advanced Compact IC.
- Lead outlet capillary **86** to a sufficiently large waste container and fix it in place.

7 Fasten capillaries to the side walls

- If necessary, the two aspirating tubings **75** and **76** can be fixed in the required position in the interior with the help of a Y.107.0150 self-adhesive strap.
- If necessary, the two outlet capillaries **86** and **87** can be fixed in the required position in the interior with the help of a Y.107.0150 self-adhesive strap.

2.9 853 CO_2 Suppressor

More detailed information about the 853 CO_2 Suppressor can be found in the 8.853.1003 Instructions for Use provided.

Compact IC Version 2.861.0040 is supplied with the **853 CO_2 Suppressor**.

2.9.1 853 CO_2 Suppressor - Installation

The 853 CO_2 Suppressor should be placed beside detector block **45** (see *Section 2.3.1* and *Figure 5*). The power supply of the 853 must be placed outside the 861 housing. Lead the Remote cable and the mains cable out through opening **11** of the rear panel (the rear panel must be removed for this).

Make sure that the power supply always has a dry location and protect it against the direct effects of liquids.

2.9.2 853 CO_2 Suppressor – Mains connection

The 853 CO_2 Suppressor has an external power supply (6.2152.020) supplying it with a voltage of 15V (DC). The 853 CO_2 Suppressor is controlled via a Remote line to the 861 Advanced Compact IC.

1 Connection 853 – Power supply

- Connect the external power supply (6.2152.020) with the 6.2108.120 Cable to the 853 CO_2 Suppressor (use the ***15V DC*** connections on the rear panels of each instrument).

2 Mains connection

- Insert the mains cable into the mains connection of the external power supply (6.2152.020) then connect it to the mains supply (100-240 V).

Mains cable

The instrument is supplied with one of three mains cables

- 6.2122.020 with plug SEV 12 (Switzerland, …)
- 6.2122.040 with plug CEE(7), VII (Germany, …)
- 6.2133.070 with plug NEMA 5-15 (USA, …)

which is three-cored and fitted with a plug with an earthing pin. If a different plug has to be fitted, the yellow/green lead (IEC standard) must be connected to protective earth (protection class 1).

2.9.3 853 CO_2 Suppressor – Connection to 861

The 853 CO_2 Suppressor is controlled from the 861 Advanced Compact IC.

1 Electrical connection 853 – 861

- Use the 6.2143.230 Cable to connect the Remote input of the 853 CO_2 Suppressor to Remote interface **21** of the 861 Advanced Compact IC.
- On the rear of the Remote connector further devices can be connected via Remote connections.

In the PC program **«IC Net»** (from Version 2.3 SR2) the 853 CO_2 Suppressor can be controlled by the system driver of the 861 (Version 2.861.0040) (see *«IC Net» Instructions for Use, Section 6.26*).

2.9.4 853 CO_2 Suppressor – Tubing connection

The 853 CO_2 Suppressor is included between suppressor module «MSM II» **46** and detector block **45**.

1 Connection suppressor module «MSM II» – 853

- Connect outlet capillary **83** (marked with "Detector") of suppressor Module «MSM II» **46** to the inlet ***Eluent in*** of the 853 CO_2 Suppressor using a 6.2744.010 Compression fitting.

2 Connection Detector block – 853

- Connect inlet capillary **44** of detector block **45** to the outlet ***Eluent out*** of the 853 CO_2 Suppressor using a 6.2744.010 Compression fitting.

2.10 Putting into operation

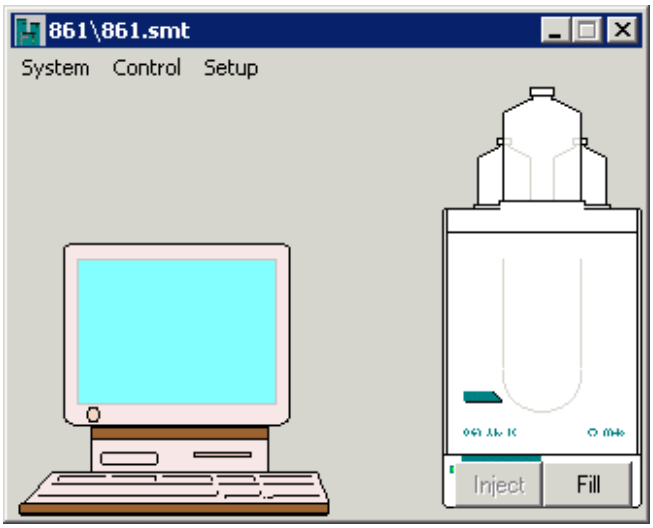
2.10.1 Putting into operation without suppressor module «MSM II»

Before sample solutions can be injected at the **2.861.0010 Compact IC** (without suppressor), the entire system must be tested for leaks and then conditioned with eluent until the baseline is stable. Proceed as follows:

When inserting the column always make sure that it is inserted correctly in the flow direction shown on the sticker (the arrow must point in the flow direction).

1 Open and connect system

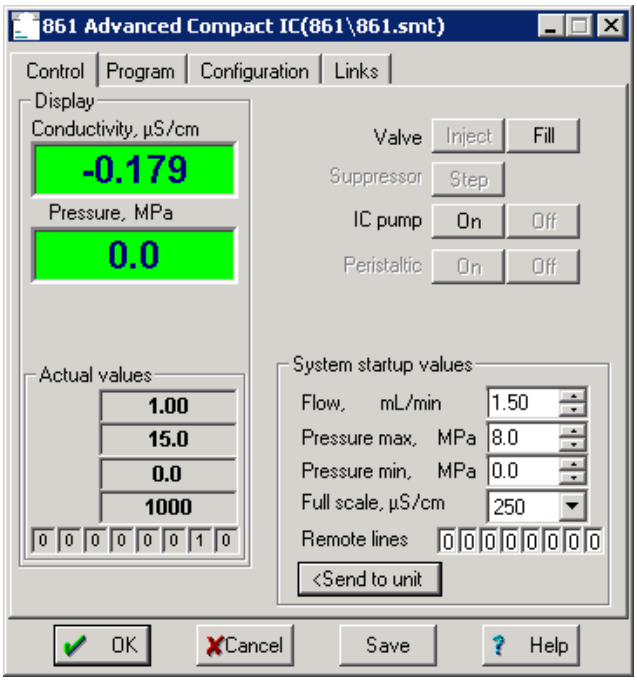
- Start the **«IC Net»** PC program, if it has not already been started (see *Section 2.5.3*).
- Select **File** / **Open** / **System** in the main window. Open the system file created in Section *2.5.4* for the 861 Advanced Compact IC.



- Select the **Connect to workplace** item from the **Control** menu of the system window.

2 Open control window

- Double-click the 861 icon in the system window. The control window for manual control of the 861 Advanced Compact IC appears, which indicates conductivity, pressure and current system parameters.



Make sure that the set flow does not exceed the maximum permissible flow for the particular column (see column data sheet).

3 Start system

- Make sure, that the aspirating tubing **63** for the high-pressure pump is immersed in the eluent.
- Select **Startup hardware (Measure baseline)** from the **Control** menu in the system window. The high-pressure pump is started, at the same time, a chromatogram window is opened where the baseline is recorded continuously.

4 Check for leaks

- Check all capillaries and their connections between the high-pressure pump and the detector block for escaping liquid. If eluent escapes anywhere then the appropriate compression fitting must be tightened further or changed.

5 Condition system

- Rinse the system with eluent until the desired stability of the baseline is reached (normally 30…60 min; if the eluent is changed, the establishment of the ion exchanger equilibrium on the separating column can take longer).
- The instrument is now ready for sample determinations using the selected system.

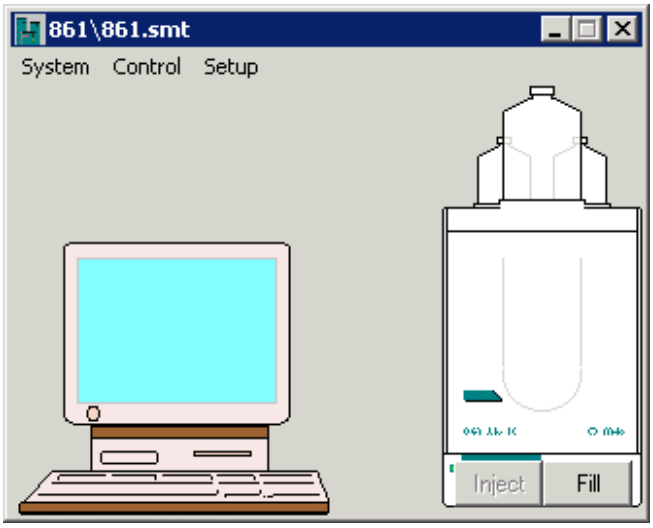
2.10.2 Putting into operation with suppressor module «MSM II»

Before sample solutions can be injected at the versions **2.861.0020** and **2.861.0040** (with suppressor module «MSM II» **46**), the entire system must be tested for leaks and then conditioned with eluent until the baseline is stable. At the same time, the suppressor module must be conditioned. Proceed as follows:

When inserting the column always make sure that it is inserted correctly in the flow direction shown on the sticker (the arrow must point in the flow direction).

1 Open and connect system

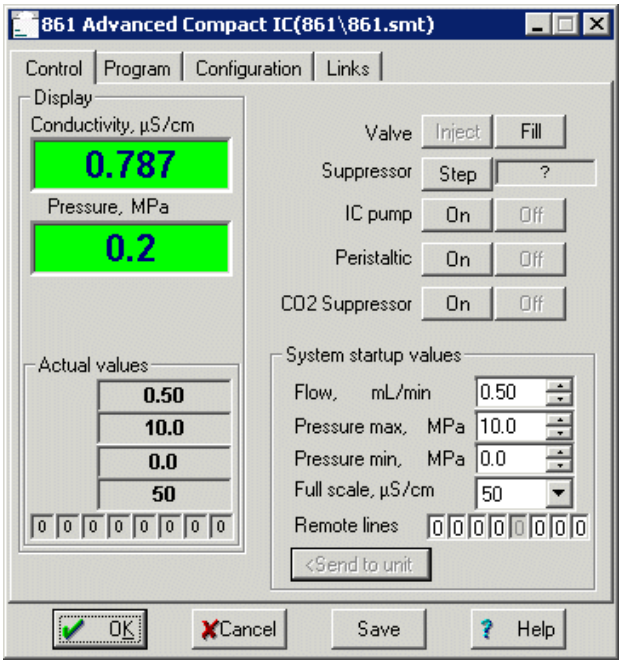
- Start the **«IC Net»** PC program, if it has not already been started (see *Section 2.5.3*).
- Select **File** / **Open** / **System** in the main window. Open the system file created in Section *2.5.4* for the 861 Advanced Compact IC.



- Select **Connect to workplace** in the **Control** menu in this window.

2 Open control window

- Double-click the 861 icon in the system window. The control window for manual control of the 861 Advanced Compact IC appears, which indicates conductivity, pressure and current system parameters.



Make sure that the set flow does not exceed the maximum permissible flow for the particular column (see column data sheet).

3 Start system

- Make sure that the aspirating tubing **63** for the high-pressure pump is immersed in the eluent.
- Select **Startup hardware (Measure baseline)** in the **Control** menu of the system window. The high-pressure pump, peristaltic pump and, if present and activated under **Configuration** (see

Section 3.3.1), the 853 will start up. At the same time a chromatogram window opens in which the baseline is shown continuously.

4 Set contact pressure for pump tubings

- Press contact pressure lever **48** on both tubing cartridges **47** upwards until regeneration and rinsing solution just start to be drawn in.
- Then press contact pressure lever **48** upward by 1 more click in order to achieve an optimal contact pressure.

5 Check for leaks

- Check all capillaries and their connections between the high-pressure pump and the detector block and between the peristaltic pump and the suppressor module «MSM II» for escaping liquid. If eluent escapes anywhere then the appropriate compression fitting must be tightened further or changed.

6 Condition system

- Rinse the system with eluent until the desired stability of the baseline is reached (normally 30…60 min; if the eluent is changed, the establishment of the ion exchanger equilibrium on the separating column can take longer). During that time, step the suppressor at least 3 times (approx. every 10...20 minutes), so that after this time the suppressor module is sufficiently conditioned too.
- The instrument is now ready for sample determinations using the selected system.

Pump tubings are consumable material with a lifetime which depends on the contact pressure. This is why the tubing cartridges should be raised completely by loosening snap-action lever on the right-hand side if the pump is to remain switched off for a considerable length of time (the set contact pressure remains unchanged).

2.11 Connection of external devices

2.11.1 Connection of the 838 Advanced Sample Processor

The 838 Advanced Sample Processor, which is optionally available from Metrohm, is an automatic sampler for ion chromatography. The 838 Advanced Sample Processor (RS232 interface) is connected to the PC. The control programs are drawn up in the «IC Net» software. In order to synchronize program sequences the 838 Advanced Sample Processor and the 861 Advanced Compact IC are connected via the 6.2141.190 Remote cable.

Proceed as follows (after the connection of the 861 Advanced Compact IC):

1 Electrical connection 838 – PC

- Connect the RS232 interface of the 838 Advanced Sample Processor to a serial COM interface of the PC using a 6.2134.100 Connection cable(9-pin/9-pin).

2 Electrical connection 861 – 838

- Connect Remote connection **21** of the 861 Advanced Compact IC and the Remote connection of the 838 Advanced Sample Processors using a 6.2141.190 Cable (see *838 Instructions for Use*).

*On Version 2.861.0040 the 853 CO_2 Suppressor is already connected to Remote interface **21**. Connect the 6.2141.190 Cable to the rear of the Remote connector.*

3 Tubing connection 838 – Injection valve

- Screw off aspirating tubing **29** from injection valve **28** and remove from feedthrough **4**.
- Cut the PEEK capillary tubing mounted on the 838 Advanced Sample Processor to the required length (so that it can be connected to injection valve **28** of the 861).
- Pull the free end of the PEEK capillary tubing through opening **8** of the 861 Advanced Compact IC and use a 6.2744.010 PEEK Compression fitting to screw it onto injection valve **28**.

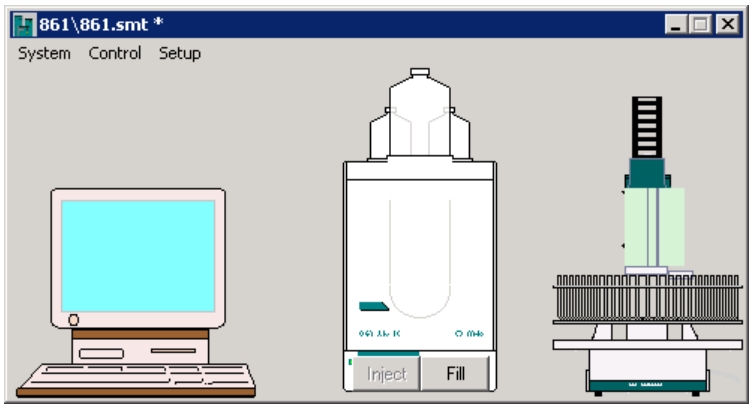
4 Tubing connection Injection valve – Waste

- Insert 6.2744.020 Coupling (from the 861 accessories) into connection **3** of the 861 Advanced Compact IC.
- Screw aspirating tubing **29** into the 6.2744.020 Coupling and insert into the waste container.

5 Setting up the 861/838 system

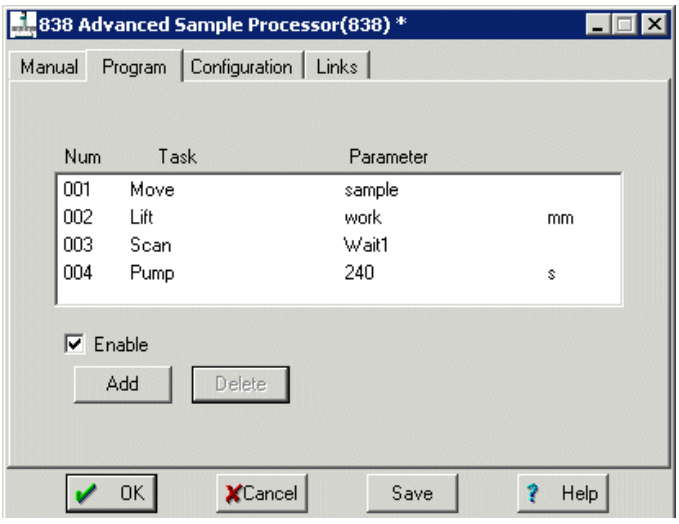
- Select **File** / **Open** / **System** in the main window of the «IC Net » software. Open the system for the 861 Advanced Compact IC that you have created in Section *2.5.4*.

- Add the 838 Advanced Sample Processor to the system (via **Setup** / **New devices** / **Install new devices..**, see *«IC Net» Instructions for Use, Section 4.4.4*):



6 Creating a program for the 838

- Open the window with the system settings of the 838 (with a double-click on the 838 icon or via the right-hand mouse key **open**).
- Click on the **Program** tab. The 838 Advanced Sample Processor is controlled by a command sequence on the **Program** tab.
- Create a program (see *«IC Net» Instructions for Use, Section 6.26.3*):



At the command **Scan Wait1** the 838 will wait for an incoming Remote signal on line 3 (defined in the subtab **Configuration** / **Scan**). It will receive this Remote signal from a **Remote** command included in the time program of the 861 (see below). The 861 and 838 are synchronized in this way.

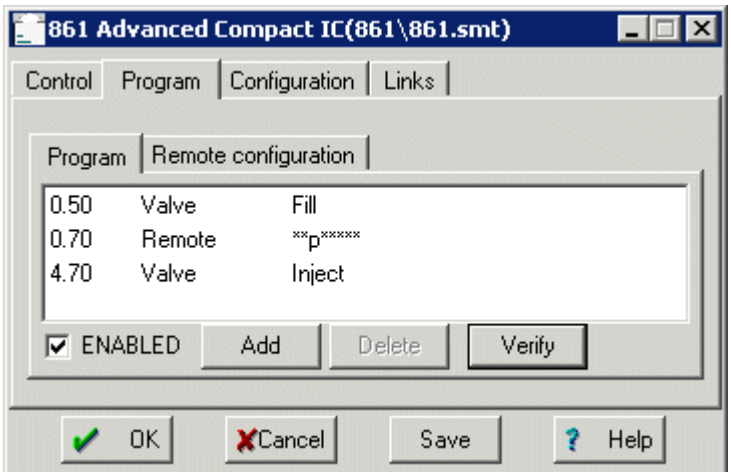
For more detailed information about the control of the 838 Advanced Sample Processors via «IC Net» please refer to *«IC Net» Software Instructions for Use, Section 6.26.3*.

7 Creating a time program for the 861

- Open the window with the system settings of the 861 (with a

double-click on the 838 icon or via the right-hand mouse key **open**).

- Open the **Program** tab.
- Create a time program:



The **Remote** command sends a signal to the 838 via Remote line 3. This signal tells the 838 (which is waiting after the **Scan** command) to continue with its command sequence.

The two **Valve** commands switch the injection valve at the 861 to the positions **Fill** and **Inject**.

For more detailed information about the control please refer to Section *3.3.1* or *the «IC Net» Software Instructions for Use*.

*In order for the 861 – 838 connection to function properly Remote line 3 at the 861 Advanced Compact IC must be set to 0 each time that a determination is started (**System startup values**: Set **Remote line 3 = 0**).*

2.11.2 Connection of the 813 Compact Autosampler

The 813 Compact Autosampler, which is optionally available from Metrohm, is an automatic sampler for ion chromatography. The 813 Compact Autosampler (Remote connection) is connected to Remote connection **21** of the 861 Advanced Compact IC using the 25-pin 6.2141.130 Remote cable. The control of the 813 Compact Autosampler takes place using **Remote** commands in the time program of the 861 Advanced Compact IC.

Proceed as follows:

1 Electrical connection 861 – 813

- Connect Remote connection **21** of the 861 Advanced Compact IC and the Remote connection of the 813 Compact Autosampler using the 6.2141.130 Cable (see *813 Instructions for Use*).

*On Version 2.861.0040 the 853 CO_2 Suppressor is already connected to Remote interface **21**. Connect the 6.2141.190 Cable to the rear of the Remote connector.*

2 Tubing connection 813 – Injection valve

- Screw off aspirating tubing **29** from injection valve **28** and remove from feedthrough **4**.
- Cut the PEEK capillary tubing mounted on the 813 Compact Autosampler to the required length (so that it can be connected to injection valve **28** of the 861).
- Pull the free end of the PEEK capillary tubing through opening **8** of the 861 Advanced Compact IC and use a 6.2744.010 PEEK Compression fitting to screw it onto injection valve **28**.

3 Tubing connection Injection valve– Waste

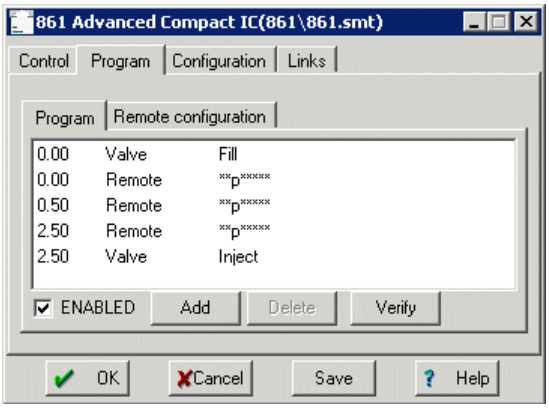
- Insert 6.2744.020 Coupling (from the 861 accessories) into connection **3** of the 861 Advanced Compact IC.
- Screw aspirating tubing **29** into the 6.2744.020 Coupling and insert into the waste container.

4 Setting a method on the 813

- Use the 813 keyboard on the 813 Compact Autosampler to set the required method (see *813 Instructions for Use*).

5 Creating a time program for the 861

- In the main window of the «IC Net» software select **File** / **Open** / **System**. Open the system for the 861 Advanced Compact IC that you have created in Section *2.5.4*.
- Open the window with the system settings of the 861 (with a double-click on the 861 icon or via the right-hand mouse key **open**).
- Open the **Program** tab.
- Create a time program:



The **Remote** command sends a signal to the 813 via Remote line 3. The function of this signal depends on the method

selected at the 813 (see *813 Instructions for Use, Section 3.4*).

The two **Valve** commands switch the injection valve of the 861 to the positions **Fill** and **Inject**.

For more detailed information about the control please refer to *Section 3.3.1* or *the «IC Net» Software Instructions for Use*.

*In order for the 861 – 813 connection to function properly Remote line 3 at the 861 Advanced Compact IC must be set to 0 each time that a determination is started (**System startup values**: Set **Remote line 3 = 0**).*

3 Operation

This Section describes only the most important points concerning the operation of the 861 Advanced Compact IC. For further details please refer to the «IC Net» Instructions for Use and to the on-line help in the PC program.

3.1 «IC Net» - Terms

System

In the «IC Net» software a **System** contains the devices set under Settings for this system, the created time programs, the data acquisition parameters and the methods that have been optimized for a specific separating column and the determination to be carried out with it. Several systems can be defined and saved as **system files** (***.smt**) in the **Systems** folder (see *«IC Net» Software Instructions for Use, Section 4*). Determinations (single determinations or using a sample table) are started via the system.

Each system is linked to a method.

Method

A **Method** contains all the information necessary for **data acquisition**, **integration**, **peak evaluation** and **results calculation**. It can be regarded as being a skeleton chromatogram, i.e. a chromatogram without any data. Methods are saved as **method files** (***.mtw**) in the **Methods** folder.

Chromatogram

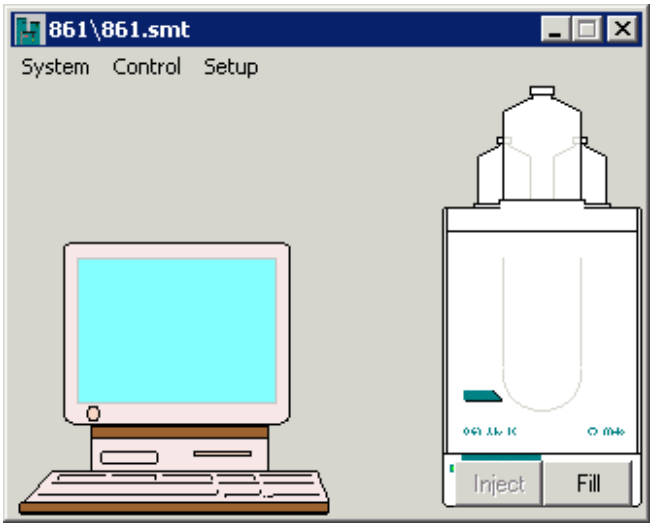
A chromatogram is the graphical presentation of the elution curve (signal vs. time) that is recorded after chromatographic separation has taken place on the column.

Chromatograms are saved as **chromatogram files** (***.chw**) in the **Data** folder. In addition to the measuring data, the chromatogram files also contain the method parameters and system settings used for data acquisition, processing and remote control.

3.2 Measuring operation

3.2.1 Opening a system

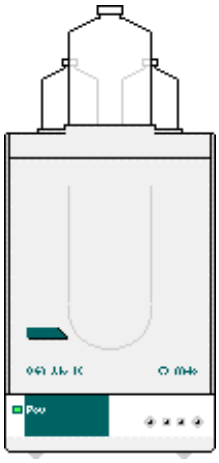
A system window can be opened with **IC Net** / **File** / **Open** / **System** and selecting the required system file. It contains icons for **data recorders**, **Watch window** (screen) and all **devices** which have been installed in the system. Opening displays the System window on the screen. Here we can see the example system window for a 861 Advanced Compact IC:



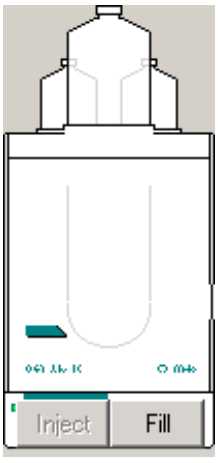
3.2.2 Connect a system

The selected system must be linked to the workplace for controlling the instrument and starting determination processes. Systems are linked by selecting **SYSTEM** / **Control** / **Connect to workplace** (see also *Software Instructions for Use «IC Net 2.3», Section 4.3.1*).

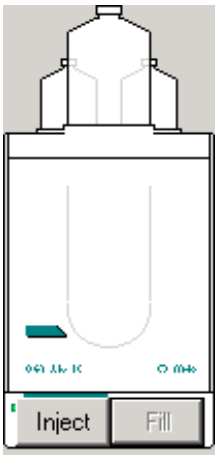
3.2.3 Instrument icon



System disconnected



System connected
Injection valve in "**INJECT**" position



System connected
Injection valve in "**FILL**" position

The instrument icon for the 861 Advanced Compact IC is one of the three elements in the System window. If the system is linked (see *Section 3.2.2*), the icon is provided with two buttons for manual operation of the injection valve:

<Inject> Switch over the injection valve to position "INJECT".

<Fill> Switch over the injection valve to position "FILL".

When you click with the right mouse button on the instrument icon, you will see the following menu:

Open	Opens the window for **System Settings**.
Hardware	Opens the window for **Hardware Settings**.
Diagnostics	Opens the **Diagnosis window**.¨
Unlink	Delete the **861 icon** from the system.

3.2.4 Hardware start/stop and baseline recording

Start

Starting the hardware (by selecting **SYSTEM** / **Control** / **Startup hardware**) on the 861 Advanced Compact IC includes sending the **System startup values** defined for the system, starting the high-pressure pump, (if present) the peristaltic pump and (if present and activated under **Configuration**, see *Section 3.3.1*) the 853.

At the same time **recording the measuring signal** is started, using the method defined for the system. The measuring signal is recorded regardless of the set chromatogram **Duration**, until either data recording is stopped with **SYSTEM** / **Control** / **Stop data acquisition** or a new determination is started. Alternatively data recording can also be stopped by clicking on ☒ in the chromatogram window. In this case the user will be asked if the recorded baseline is to be saved or not.

Stop

If **SYSTEM** / **Control** / **Shutdown hardware** is selected then the high-pressure pump and (if present) peristaltic pump at the 861 Advanced Compact IC are stopped immediately. The current determination and processing an active sample table are also stopped. In addition the Remote output lines are set to the values defined under **Hardware** / **Remote lines after power on**.

3.2.5 Determination start/stop

Start

By selecting **SYSTEM** / **Control** / **Start determination** a determination is **started** using the settings of the selected system. At the start the startup values defined under **System startup values** will be set at the 861 Advanced Compact IC. If they are not already in operation the high-pressure and peristaltic pumps will be started. Depending on the set **Start mode,** the time program and data recording will either start immediately (for **Start with determination**) or only when the injection valve is switched to the "INJECT" position (for **Start with inject**).

Stop

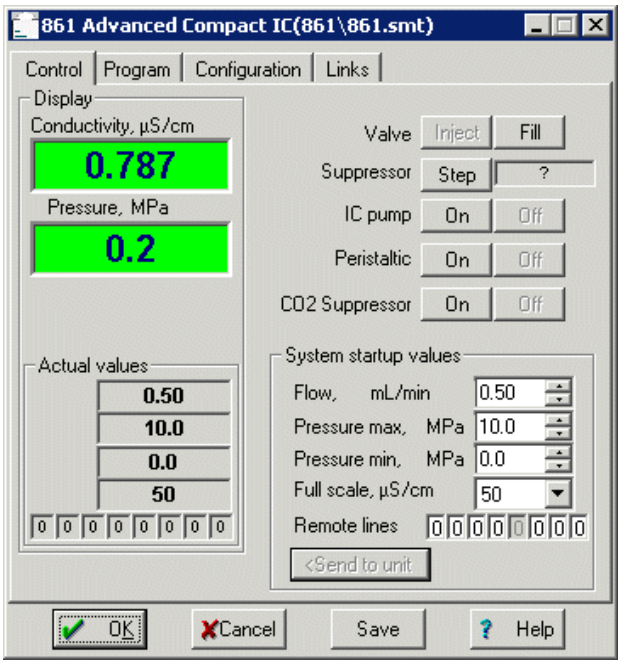
If **SYSTEM** / **Control** / **Stop determination** is selected then the current determination is **stopped**. Data recording and the time program are stopped immediately. The recorded chromatogram is saved automatically, if the option **Save chromatogram after the run** has been switched on under **Passport** / **Processing**.

Alternatively the determination can also be stopped by clicking on ☒ in the chromatogram window. In this case the user will always be asked if the recorded baseline is to be saved or not.

3.3 Settings

3.3.1 Instrument control for connected system

A double-click on the instrument icon or selection of the **Open** menu item using the right mouse button opens the system settings window. For a connected system, the **Control** tab is displayed. It allows manual control of the 861 Advanced Compact IC functions and setting of start-up values to be sent to the instrument. This tab shows the current measurement values for conductivity and pressure.



Conductivity, µS/cm	Live display of measured conductivity.
Pressure, MPa	Live display of measured pressure. The color settings for this two fields can be changed by clicking the fields with the right mouse button and selecting the menu item **Choose color / ...** .
Actual values	Display of actual values
Flow, mL/min	Display of flow rate of the high-pressure pump.
Pressure max, MPa	Display of maximum pressure limit for high-pressure pump.
Pressure min, MPa	Display of minimum pressure limit for high-pressure pump.
Full scale, µS/cm	Display of selected full scale range.
Remote lines	Display of current remote line settings.
Valve	Injection valve
<Inject>	Switch injection valve to "INJECT" position.
<Fill>	Switch injection valve to "FILL" position.

Suppressor Suppressor module «MSM II»
(inactive with version 2.861.0010)

<Step>	Switch the suppressor module to the next position. The time since the last switching of the suppressor module is displayed in the field beside the **<Step>** button.

IC pump High-pressure pump

<On>	Start high-pressure pump.
<Off>	Stop high-pressure pump.

Peristaltic pump Peristaltic pump
(inactive with version 2.861.0010)

<On>	Start peristaltic pump.
<Off>	Stop peristaltic pump.

CO_2 Suppressor 853 CO_2 Suppressor
(only displayed with version 2.861.0040)

<On>	Start 853 CO_2 Suppressor.
<Off>	Stop 853 CO_2 Suppressor.

System startup values The system startup values are sent and applied to the 861 Advanced Compact IC each time the system is connected, a determination is started, or the values are sent manually with **<Send to unit>**.

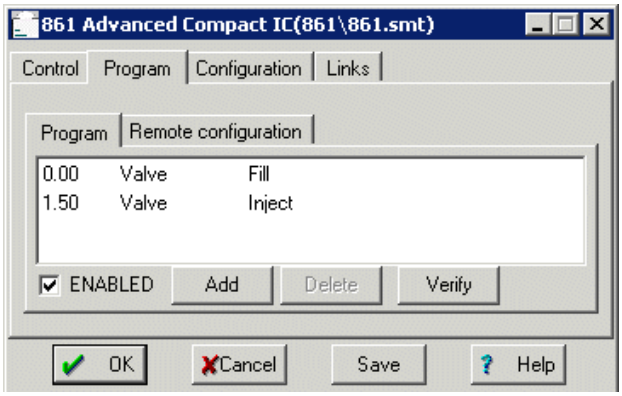
Flow, mL/min	Startup value for flow rate of the high-pressure pump. Entry range: **0.20** ... **2.50 mL/min**
Pressure max, MPa	Startup value for maximum pressure limit for high-pressure pump. This limit is controlled even without connection to the PC. Entry range: **0.0** ... **35.0 MPa**

*If the **Flow** is higher than 1.5 mL/min, the defined **Pressure max** must not exceed 25.0 MPa (250 bar).*

Pressure min, MPa	Startup value for minimum pressure limit for high-pressure pump. This limit is controlled even without connection to the PC. Entry range: **0.0** ... **35.0 MPa**
Full scale, µS/cm	Startup value for full scale range. Selection: **50**, **250**, **1000, 5000 µS/cm**
Remote lines	Startup value for remote line settings 1…8. Selection: **0**, **1**

Time program

On the **Program** tab of the system settings window a user-defined time program for instrument control can be entered. This program is started automatically as defined in the **Start mode** window (see *Section 4.3.3*) either at the moment the determination is started (**Start with determination**) or at the moment the sample is injected (**Start with inject**).



The **Program** tab contains the two following subpages:

Program	Main time program with all program steps.
Remote configuration	Possibility for creation of user-defined remote commands.

Program

On the **Program** subpage, program steps including time, program instruction and parameter can be entered.

Time (1st column)	Time at which program instruction is applied. Entry range: **0.0 ... 999.9 min** If no time is entered, the program instruction is applied together with the last instruction with time entry.
Command (2nd column)	Program instruction (see *List of program instructions*). In addition to these predefined instructions, user-defined remote commands can be entered if activated on the **Remote configuration** tab.
Parameter (3rd column)	Parameter for program instruction (see *List of program instructions*).
ENABLED	Enable program start (a disabled program is not started).
<Add>	Add new program instruction.
<Delete>	Delete selected program instruction.
<Verify>	Test the time program (error messages are displayed if program is wrong).

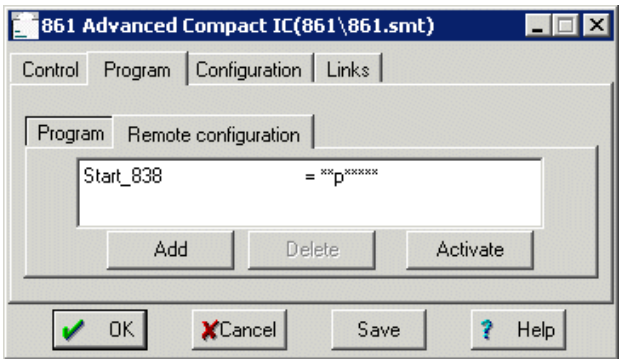
List of program instructions

The following program instructions can be added to the time program on the **Program** subpage:

Valve	**Inject, Fill**	Switch **injection valve** to "INJECT" or "FILL" position.
FullScale	**50, 250, 1000, 5000 µS/cm**	Set **full scale range** to the selected value.
ICPump	**on, off**	Switch **on** or **off** the **high-pressure pump**.
Flow	**0.2 ... 2.5 mL/min**	Set **flow rate** of the high-pressure pump to the desired value.
Pmax	**0.0 ... 35.0 MPa**	Set **maximum pressure limit** for the high-pressure pump to the desired value.
Pmin	**0.0 ... 35.0 MPa**	Set **minimum pressure limit** for the high-pressure pump to the desired value.
Remote	**0, 1, *, p**	Set **remote output lines** 1...8 to the desired values. For entry of the first value, enter **1**, **0**, **p** or *****. For entry of the other values, move the cursor in front of the value to be changed and enter **1**, **0**, **p** or *****.
Program	**END, RESET**	The **END** flag can be used to end a program, especially if the program time should be longer than the chromatogram duration. Additional steps after this flag are not allowed. The **RESET** flag is used to reset the parameters to the system startup values.
Suppressor		Switch **suppressor module «MSM II»** to the next position.
Peristaltic	**on, off**	Switch **on** or **off** the **peristaltic pump**.

Remote configuration

On the **Remote configuration** subtab user-defined remote commands can be defined, which can be inserted into a time program.



Name (1st column) User-definable name of the remote command (e.g. **Start_838**).

Remote command (2nd column)

Setting the remote output lines 1…8.
Selection:
- **0** (line off, inactive, open)
- **1** (line on, active, 0 V)
- **p** (pulse)
- ***** (leave line in current status)

For entry of the first value, enter **1**, **0**, **p** or *****. For entry of the other values, move the cursor in front of the value to be changed and enter **1**, **0**, **p** or *****.

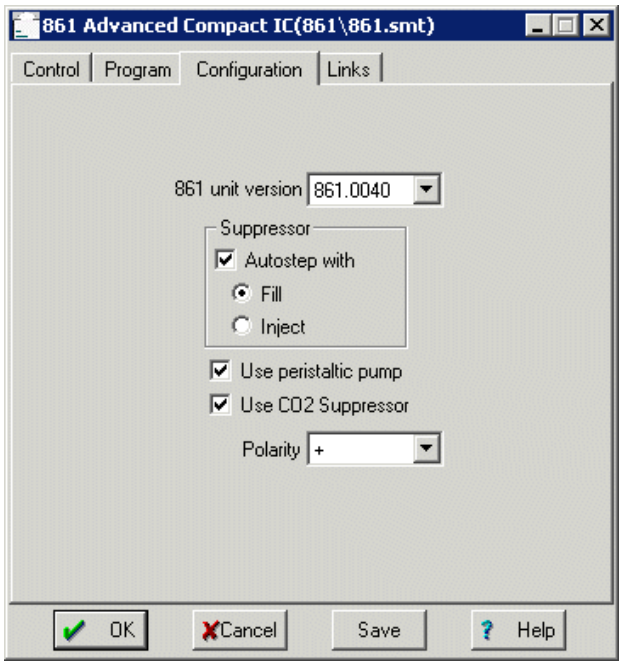
<Add> Add new remote command.

<Delete> Delete selected remote command.

<Activate> Activate the defined remote commands for insertion into the time program.

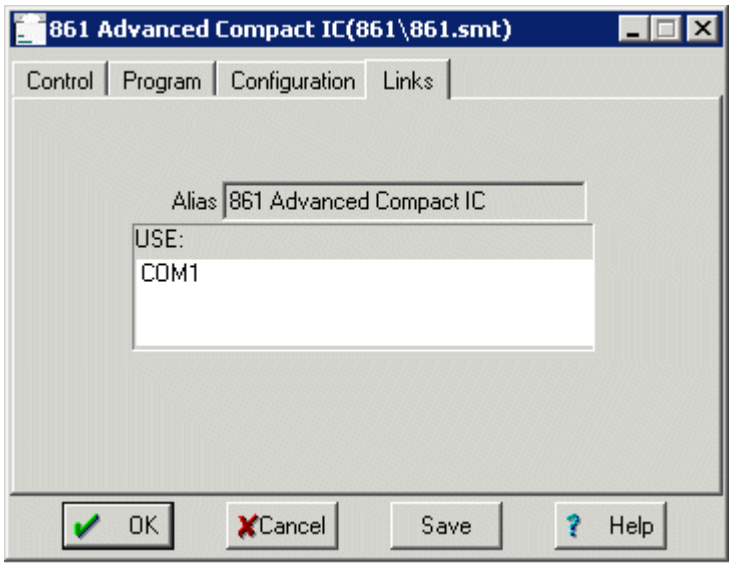
Configuration

The **Configuration** tab in the system settings window contains configuration settings for the 861 Advanced Compact IC.



861 unit version	Selection of instrument version:
Suppressor	Suppressor module «MSM II»:
Autostep with	Switches automatically to next position when the injection valve is switched to **Fill** or **Inject**.
Use peristaltic pump	If this option is disabled, the peristaltic pump is not switched on automatically at the start of a determination or with **Startup hardware**.
Use CO2 Suppressor (only displayed with version 2.861.0040)	If this option is disabled, the 853 CO_2 Suppressor is not switched on automatically at the start of a determination or with **Startup hardware**.
Polarity	Selection of the polarity of the output signal: + positive polarity (for anions) – negative polarity (for cations)

Links



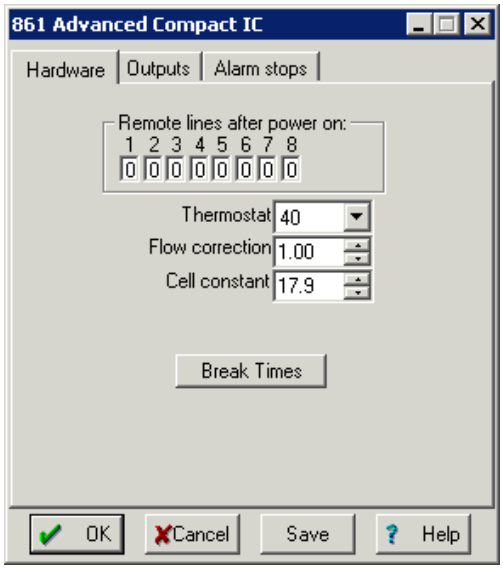
The **Links** tab in the window for the system settings serves to select and set the COM port (for details see *Software Instructions for Use «IC Net 2.3», Section 5.2.4 Links*).

3.3.2 Hardware settings

Selection of the **Hardware** menu item using the right mouse button opens the hardware settings window consisting of the three tabs **Hardware**, **Outputs** and **Alarm stops**.

Hardware

This tab of the hardware settings window defines general parameters which are set automatically at power on of the instrument.



Remote lines after power on

The remote output lines 1…8 are set to these values after power on or a manual stop with **Shutdown hardware**.
Selection: **0**, **1**

Thermostat

Operating temperature of the conductivity cell.
Selection: **25**, **30**, **35**, **40**, **45 °C**, **off**

Thermostatting functions only if the ambient temperature is at least 5°C lower than the operating temperature. It normally takes 30…60 min after power on until a temperature stability of ± 0.01 °C is attained.

Flow correction

Factor for correction of the difference between displayed and actual flow rate of the high-pressure pump.
Range: **0.9** ... **1.09**

The correction factor is determined as follows by measuring the actual flow rate using a graduated cylinder:

$$\textbf{Flow correction} = \frac{\textit{Displayed flow rate}}{\textit{Measured flow rate}}$$

Cell constant

Cell constant of the conductivity cell for correct display of the absolute conductivity. If you connect a new detector block enter the cell constant printed on the detector block into this field.
Range: **0.1** ... **1000 /cm**

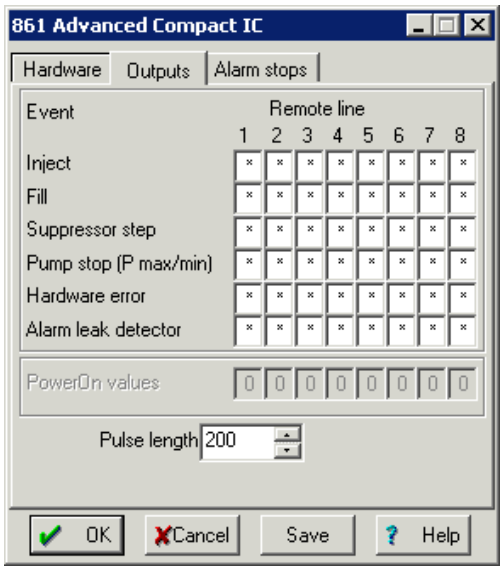
For a precise determination of the cell constant, pump a calibration solution of known conductivity through the IC system, observe the displayed conductivity and change the cell constant until the correct conductivity value is displayed.

<Break times>

Possibility for changing the break times for injection valve **Valve** and suppressor module **Suppressor**.

Outputs

The **Outputs** tab of the hardware settings window defines remote output signals to be set automatically if specific events occur.



Event — Events for automatic remote signal output:

- **Inject** — Switching of the injection valve to the "INJECT" position.
- **Fill** — Switching of the injection valve to the "FILL" position.
- **Suppressor step** — Switching of the suppressor module to the next position.
- **Pump stop (P max/min)** — Pump stopped because pressure limits are exceeded.
- **Hardware error** — Hardware error detected at the 861 Advanced Compact IC (high-pressure pump, injection valve, or suppressor not working correctly).
- **Alarm leak detector** — Internal leak.

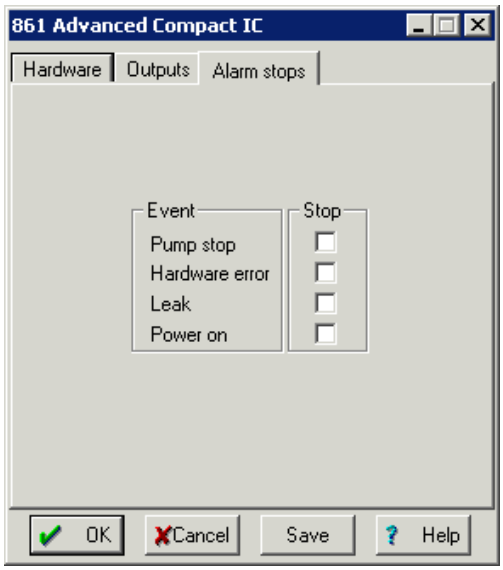
Remote line — Set remote output lines 1…8.
Selection:
- **0** (line off, inactive, open)
- **1** (line on, active, 0 V)
- **p** (pulse output)
- ***** (leave line in current status)

PowerOn values — Display of the power on startup values for remote output lines set on the **Hardware** tab.

Pulse length — Length of a pulse in ms.

Alarm stops

The **Alarm stops** tab of the hardware settings window defines the events for which the instrument is stopped immediately. At an alarm stop, high-pressure pump and peristaltic pump are stopped immediately, the running determination and the active sample queue are also stopped.



Event — Events for alarm stop:

- **Pump stop** — Pump stopped because pressure limits are exceeded.
- **Hardware error** — Hardware error detected at the 861 Advanced Compact IC (high-pressure pump, injection valve, or suppressor not working correctly).
- **Leak** — Leak detector has detected solvent in the instrument's interior. This information is also stored in the instrument itself, so that it is stopped automatically even without connection to the PC.
- **Power on** — Temporary power failure at the 861 Advanced Compact IC hardware.

4 Notes - Maintenance - Faults

4.1 Practical notes on ion chromatography

4.1.1 Separating columns

Separation efficiency

The attainable quality of analyses with the 861 Advanced Compact IC depends to a large extent on the separation efficiency of the column used. When purchasing an IC column you should ensure that the separation efficiency suffices for the analysis problems at hand. Ascertain the **characteristic data of the IC column** on the standard chromatogram enclosed with the column such as capacity factors, selectivity, plate number and resolution and check these data with your own measurements. If any difficulties arise, you should always first check the quality of the column by recording a **standard chromatogram**.

Detailed information about the separating columns available from Metrohm can be found in the data sheet accompanying your separating column, in the **Metrohm IC Column Catalog**, which is available from your local Metrohm agency, or on the Internet under http://www.metrohm.com in the ion chromatography product sector. Information about special IC applications can be found in the relevant **"Application Bulletins"** or **"Application Notes"**; these are available on the Internet under http://www.metrohm.com in the applications sector, or can be requested free of charge from your local Metrohm agency.

Protection

To protect the column against foreign particles which could have an adverse influence on the separation efficiency, we advise you to subject both the eluents and all samples to **microfiltration** (0.45 µm filter) and to siphon the eluent through the **6.2821.090 Aspirating Filter**.

To avoid contamination by abrasive particles arising from piston seals of the IC Pump, it is advantageous to install an **in-line filter** between the pump and the injection valve. In the 861 Advanced Compact IC a **6.2821.120 Filter unit PEEK** is already mounted for this purpose (see *Section 2.3.6*).

The use of readily interchangeable **precolumns** serves to protect the actual separating columns and increase their service life appreciably. The precolumn that is suitable for your separating column can be found in the **Metrohm IC Column Catalog** which is available from your local Metrohm agency, the data sheet accompanying your separating column, the product information about separating columns that can be found under http://www.metrohm.com, ion chromatography products, or let your agency advise you directly.

Storage

Always store the separating columns sealed when not in use and filled in accordance with the manufacturer's specifications.

Regeneration

If the separation properties of the column have deteriorated, it can be regenerated in accordance with the column manufacturer's specifications. With the separating columns available from Metrohm (see **Metrohm's "Range of IC columns"**), the instructions for regeneration can be found on the leaflet enclosed with every column.

In the case of separating columns with carrier material based on silica, ***only solutions with pH 2...7*** *may be used for regeneration, otherwise the columns could be damaged.*

4.1.2 High-pressure pump

Pulsation dampener

The **MF 6.2620.150 Pulsation dampener** belongs to the standard accessories of the 861 Advanced Compact IC; its installation is described in *Section 2.6.2*. It is used to reduce interfering pulsation in highly sensitive measurements and also protects the column material against pressure shocks caused by the injection.

Maintenance

To protect the pump against foreign particles we advise you to subject the eluent to **microfiltration** (0.45 µm filter) and siphon the eluent through the **6.2821.090 Aspirating filter**.

In many cases an unstable baseline (pulsation, flow fluctuations) can be traced to contaminated valves or faulty, leaky piston seals.

Contaminated valves are cleaned by rinsing with water, RBS solution or acetone (see *Section 4.2.6*). When the cleaned valves are reinstalled you must ensure that the flow direction is correct.

The **replacement of piston seals** is described in *Section 4.2.6*.

Salt crystals between the piston and the seal are the cause of abrasive particles, which can enter the eluent. These lead to contaminated valves, pressure rise and in extreme cases to scratched pistons. It is thus essential to ensure that **no precipitates** can appear (see also *Section 4.1.3*).

4.1.3 Eluents

Treatment

For the preparation of the eluents only chemicals of a purity degree of at least "**p.a.**" should be used. For diluting please use only **high purity water**.

Fresh eluents should always be **microfiltered** (0.45 µm filter) and **degassed** (with N_2, He or vacuum). For alkaline eluents and eluents with

low buffering capacity one should preferably use a **CO_2 absorber** (see *Section 2.6.3*).

The supply vessel containing the eluent must be closed as tightly as possible to avoid excessive evaporation. This is primarily important with eluents containing organic solvents (e.g. acetone), the evaporation of which can lead to drifts in the long term. If work is performed in a very sensitive range, even if one drop of condensate falls back in the eluent this can cause a noticeable change in the background conductivity.

Influence of various parameters on anion columns

- *Concentration:* An increase in the concentration usually leads to shorter retention times and quicker separation, but also to a higher background conductivity.
- *pH:* pH alterations lead to shifts in the dissociation equilibrium and thus to changes in the retention times.
- *Organic modifiers:* Addition of an organic solvent (e.g. methanol, acetone, acetonitrile) to aqueous eluents generally accelerates lipophilic ions.

Eluent change

When changing the eluent you must make sure that **no precipitation** can occur. This means that solutions used in sequence must be miscible. If the system needs to be rinsed with organic solvents then it may be necessary to use several solvents with increasing or decreasing lipophilicity (e.g. water ↔ acetone ↔ chloroform).

4.1.4 Peristaltic pump

The pump tubings used by the peristaltic pump are consumable material with a limited lifetime and should be exchanged at regular intervals (approx. every 4 weeks under continuous use; see *Section 4.2.10*).

The working life of pump tubing depends to a considerable extent on the contact pressure. This is why the contact pressure must be correctly set as described in *Section 2.10.2*. If the pump is to remain switched off for a lengthy period of time the tubing cartridges **47** should be raised completely by loosening the snap-action lever **50** on the right-hand side (the set contact pressure remains unchanged).

4.1.5 Suppressor module «MSM II»

Protection

To avoid contamination of the suppressor module «MSM II» by foreign particles or bacterial growth, a filter 6.2821.130 **58** (part of the "PEEK Coupling **81** with filter and tubing security device" 6.2744.180) must be installed between peristaltic pump and inlet capillaries of the suppressor module «MSM II» (see *Section 2.8.2*).

Operation

The **suppressor module «MSM II»** comprises a total of 3 suppressor units which are in turn used for suppression, regenerated with sulfuric acid and rinsed with water. To record every new chromatogram under comparable conditions, work is normally carried out with freshly regenerated suppressor. Switching takes place automatically together with the valve switching.

Suppressor units must never be regenerated with H_2SO_4 in the same flow direction in which the eluent was pumped. This is why you should always connect the inlet and outlet capillaries according to the arrangement shown in Figure 18 in Section 2.8.4.

Suppressor module «MSM II» must never be switched to the next position in a dry condition as this could cause a blockage. Each time before the suppressor module «MSM II» is switched on one further step the three suppressor units must be rinsed for at least 30 min with eluent, regenerating and rinsing solutions.

Maintenance

In the event of reduced capacity or high counter-pressure the suppressor module «MSM II» must be regenerated (*Section 4.2.7*), cleaned (*Section 4.2.8*) or exchanged (*Section 4.2.9*).

4.1.6 Connections

All connections between injection valve, column and detector must be as short as possible, have a low dead volume and be absolutely tight. The PEEK capillary after the detector block must be free from constriction (the measuring cell is tested to 5 MPa = 50 bar back pressure). Use PEEK capillaries with 0.25 mm i.d. for the capillary connection between injection valve **28** and detector block **45**.

4.2 Maintenance and servicing

4.2.1 General information

Care

The 861 Advanced Compact IC requires proper care and attention. Excessive contamination of the instrument could possibly lead to malfunctions and a shorter service life of the inherently rugged mechanical and electronic parts.

For protection against escaping liquids the two drain tubes for the inner compartment (*Section 2.3.3*) and for the bottle rack (*Section 2.3.4*) must be mounted.

Spilled chemicals and solvents should be wiped up immediately. It is especially important to protect the plug connections at the rear of the instrument (particular the mains plug) against contamination.

Although constructional measures have been designed to virtually eliminate such a situation, should corrosive media penetrate the interior of the instruments the mains plug of the 861 Advanced Compact IC must be immediately disconnected to prevent extensive damage to the instrument electronics. Inform Metrohm service if your instrument(s) have been damaged in such a way.

The instrument must not be opened by untrained personnel. Please comply with the safety notes in Section 1.4.1.

Maintenance by Metrohm service

Maintenance of the 861 Advanced Compact IC is best done as part of an annual service performed by specialists from the Metrohm company. If work is frequently performed with caustic and corrosive chemicals, it may be necessary to shorten the interval between servicing.

The Metrohm service department is always willing to offer expert advice on the maintenance and servicing of all Metrohm instruments.

4.2.2 Passivation

Passivation of the complete IC System (without column) by rinsing with 20...50 mL 0.2 mol/L HNO_3 is only required when unusual alterations to the measuring properties of the cell are observed. For passivation the separating column **73** is removed from the 861 Advanced Compact IC. The two in- and outlet capillaries are directly connected to each other using the Coupling (6.2620.060).

4.2.3 Recycling

To keep the eluent consumption between injections to a minimum when the system is at rest (e.g. overnight), the so-called recycling procedure can be used. In recycling the eluent exiting the outlet capillary of the detector block is led back directly to the eluent supply vessel **67**. The IC system is thus quickly ready for new injections without a long conditioning period.

Instead of threaded stopper **65** the 4.420.0311 Tubing nipple (M6), which belongs to the accessories of the 6.1602.160 Bottle attachment, can be used together with the second E.301.0021 O-ring (which is also included) for returning the eluent (see *Section 2.6.3*).

*The recycling procedure must **not** be used*

- *in operation with the suppressor module «MSM II»*
- *with alkaline eluents*
- *with the 6.1010.000 IC Cation column METROSEP Cation 1-2.*

4.2.4 Shutdown

If the 861 Advanced Compact IC is shut down for a considerable length of time, the entire IC system (**without** column and suppressor) must be

rinsed free from salt with methanol/water (1:4) to avoid crystallization of eluent salts with the corresponding subsequent damage.

For rinsing the connections to the separating column and the suppressor module are removed; the two capillaries **26** and **44** (see *Figure 14* and *Figure 16*) are directly connected to each other using a coupling. Rinse with methanol/water (1:4) until the conductivity drops below 10 µS/cm.

Before taking it back into operation, rinse the system with eluent (**before** the connection of the separation column).

4.2.5 Changing separating columns

It is recommended that the precolumn is also changed each time you change the separation column).

Identical separation system

If you wish to replace an IC separating column by a column of the same type, proceed as follows (see *Figure 14* and *Figure 16*):

1 Remove old column

- Switch off high-pressure pump and wait for pressure to drop.
- Unscrew column **73** from inlet capillary **44** of the detector block or from suppressor inlet capillary **82**.
- Unscrew column **73** from column connection capillary **26** or the precolumn.

2 Connect new column to injection valve

- Remove end caps from column **73**.
- Screw inlet end of separating column **73** (note flow direction) to column connection capillary **26** or to the precolumn (see *Section 2.7.4/2.7.5*).

3 Rinse column

- Place beaker beneath the column outlet.
- Switch on high-pressure pump and rinse column with eluent for approx. 10 min, then switch off pump.

4 Connect column to detector block

- Screw outlet end of separating column **73** to inlet capillary **44** or suppressor inlet capillary **82**.

Changing the separation system

If you wish to replace an IC separating column by a column of a different type, proceed as follows (see *Figure 14* and *Figure 16*):

1 Remove old column

- Switch off high-pressure pump and wait for pressure to drop.
- Unscrew column **73** from inlet capillary **44** of the detector block or from the suppressor inlet capillary **82**.

- Unscrew column **73** from column connection capillary **26** or the precolumn.

2 Rinse with eluent

- Place beaker beneath the column connection capillary **26**.
- Rinse IC system with eluent used for the separating column (flow rate 1 mL/min) for approx. 15 min.

3 Connect new column to injection valve

- Remove end caps from column **73**.
- Screw inlet end of separating column **73** (note flow direction) to column connection capillary **26** or to the precolumn (see *Section 2.7.4/2.7.5*).

4 Rinse column

- Place beaker beneath the column outlet.
- Set flow rate for new separating column.
- Switch on high-pressure pump and rinse column with eluent for approx. 10 min, then switch off pump.

5 Connect column to detector block

- Screw outlet end of separating column **73** to inlet capillary **44** or suppressor inlet capillary **82**.

4.2.6 Maintenance work at the pump head

In many cases, an unstable baseline (pulsation, flow fluctuations) can be traced to contaminated valves or faulty, leaky piston seals at the high-pressure pump. For cleaning contaminated valves and/or replacement of wear parts such as pistons, piston seals and valves, proceed as follows:

1 Detach pump head

- Switch off pump drive of the IC Pump.
- Disconnect aspirating tubing **63** from aspirating capillary **38** at the pump head **40** (see *Figure 3* / *Figure 4* / *Figure 5*).
- Unscrew connection capillary **39** from the pump head **40**.
- Remove the pump head **40** by slackening the 4 securing screws on the front of the pump head with the aid of the Allen key 6.2621.030 from the pump housing. The main piston is located at the left (when viewed from the front) and the auxiliary piston is located at the right.

2 Disassemble pump head

- Strip down pump head **40** in accordance with *Figure 19*. Main and auxiliary pistons are identical with the following exceptions:
  - The spring **93** of the auxiliary piston (right piston) is more powerful (longer) than that of the main piston (left piston).
  - Inlet and outlet valve are not present in the secondary cylinder.

*To prevent the piston **91** suddenly jumping out of the piston cartridge **93**, the screw **90** must be undone very carefully by hand.*

3 Cleaning/replacement of piston 91

- Pistons contaminated by abrasive particles or deposits are cleaned with scouring powder and rinsed free of any particles with dist. water.
- Relatively badly contaminated or scratched pistons must be replaced (spare part: 6.2824.070 Zircon piston).

4 Replacement of piston seal 98

- To remove damaged piston seals **98** the special tool **102** is used. This is screwed into the seal **98**, which can then be pulled out (see *Figure 20A*).

*When the special tool **102** is screwed into the piston seal **98** the latter is completely destroyed!*

- To install a new piston seal **98** the special tool **103** is used.
- First the new seal is inserted firmly in the recess of tool **103** by hand (see *Figure 20B*). The seal spring must be located on the outside.
- The tool **103** together with the seal is then inserted in the pump head **40** and the seal pressed into the pump head recess with the aid of tool **102** (see *Figure 20C*).

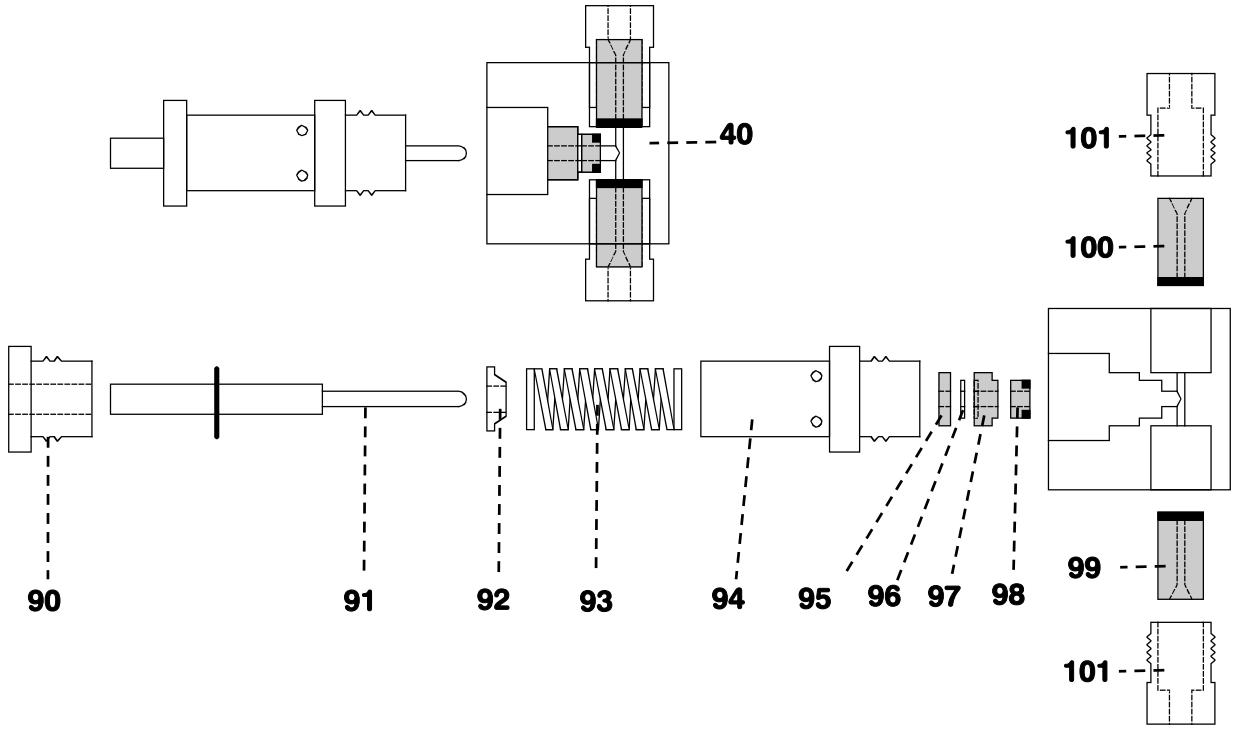


Figure 19: Components of the pump head

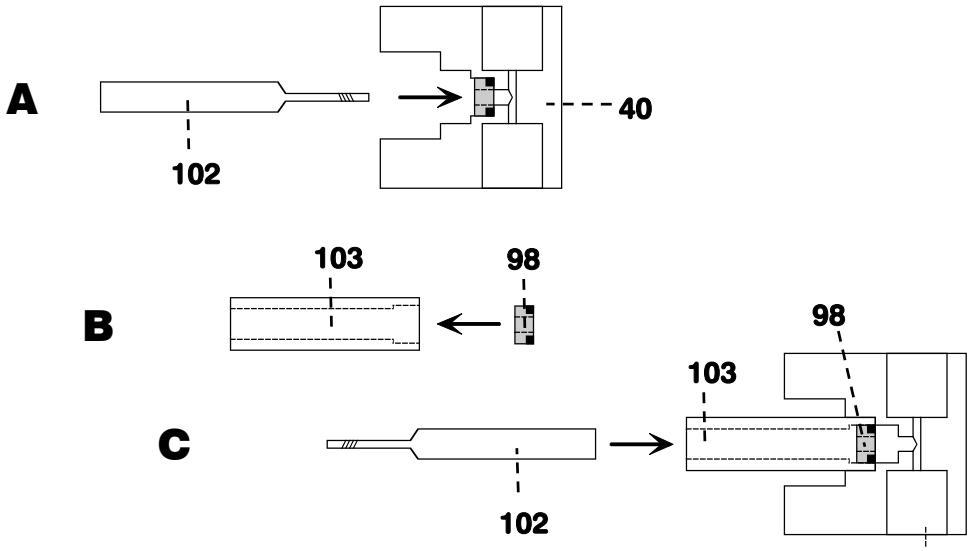


*Figure 20: Replacement of the piston seal **98***

40	**Pump head (6.2824.100)**
90	**Screw (3.709.1100)** for piston cartridge **94**
91	**Zirconium piston (6.2824.070)** with piston shaft
92	**Spring retainer**
93	**Spring (6.2824.050)** for main piston or **Spring (6.2824.060)** for auxiliary piston
94	**Piston cartridge (4.709.0760)**
95	**Piston guide sleeve (4.709.4380)**
96	**Sapphire supporting ring (6.2824.030)**
97	**Piston guide sleeve (4.709.4370)**
98	**Piston seal (6.2741.020)**
99	**Inlet valve (6.2824.090)**
100	**Outlet valve (6.2824.080)**
101	**Screw holder** for valve
102	**Special tool (6.2617.010)** to remove the piston seal **98**
103	**Special tool (6.2617.010)** to install the piston seal **98**

*The seal surface in the pump head **40** must not be damaged (avoid contact with tool)!*

5 Cleaning/replacement of inlet valve 99 and outlet valve 100

- Contaminated or blocked valves are cleaned by rinsing with dist. water, RBS solution or acetone. The rinsing effect can be reinforced by brief treatment in an ultrasonic bath (max. 20 s; if longer the sapphire sphere of the valve can be damaged).
- If this does not have the desired effect, the valves can be disassembled as shown in *Figure 21*. The valve components are pushed out with the aid of a syringe needle inserted through

the upper opening in the valve housing. The individual components are rinsed with dist. water and/or acetone, and the sapphire sphere cleaned with a paper towel. The valve is then reassembled in accordance with *Figure 21*. The components of the inlet and outlet valves are identical, they are distinguished only by the positioning of the sapphire sleeve **107** and the ceramic holder **109** (see *Figure 21*).

- Valves that fail to function faultlessly after such cleaning must be replaced.
- In the reinstallation of the inlet valve **99** or the outlet valve **100** on no account must the two outwardly identical valves be interchanged. To determine which valve is which, note that the liquid flows through the pump head from the bottom up. The flow direction of the valves can be checked simply by blowing through the clean valve. Both valves are installed with the black face in the direction of the pump head (see *Figure 19*).

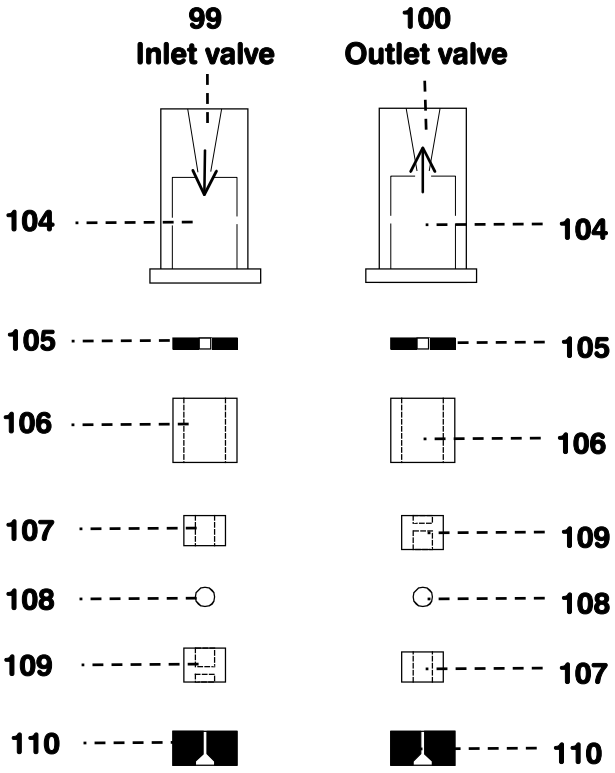
*If by mistake an inlet valve **99** is installed instead of the outlet valve **100**, an extreme pressure buildup occurs within the working cylinder, which is not detected by the pressure transducer and will destroy the piston seal **98**!*

6 Mounting the pump head

- Reassemble the components of the pump head **40** as shown in *Figure 19*. Tighten the screw **90** by hand. First screw in piston cartridge **94** manually until the stop is reached and then use a wrench to turn it through a further 15°. Firmly tighten the two valve screw holders **101** with a wrench.
- Reattach pump head **40** to the pump with the help of the 4 fixing screws. Firmly tighten them with the 6.2621.030 Allen key.

To ensure that the pump head is not positioned wrongly, the holes at the rear for the clamping bolts have different depths, i.e. 1 clamping bolt is longer than the rest. The deepest hole must naturally accommodate the longest bolt. If this is not the case, the pump will not function properly.

- Screw connection capillary **39** to pump head **40** (see *Figure 3* / *Figure 4* / *Figure 5*).
- Connect aspirating tubing **63** to aspirating capillary **38** at the pump head **40**.



104	**Valve housing**
105	**Sealing ring** (black)
106	**Sleeve**
107	**Sapphire sleeve** The bright side must point towards the sapphire sphere.
108	**Sapphire sphere**
109	**Ceramic holder for sapphire sphere** The large recess must point in the direction of the sapphire sphere
110	**Seal** The larger opening must point outwards

Figure 21: Components of inlet valve 99 and outlet valve 100

4.2.7 Regeneration of the suppressor module «MSM II»

Regenerating a suppressor operating at reduced capacity

If the suppressor units are exposed to certain heavy metals (e.g. iron) or organic contaminants for long periods of time, these can no longer be completely removed by the regeneration solution normally used (50 mmol/L H_2SO_4). This diminishes the capacity of the suppressor units, which, in milder cases, results in a reduced sensitivity to phosphates and, in severe cases, in a strong increase in the baseline. If such capacity problems occur at one or several positions, the suppressor units must be treated as follows:

1 Disconnect suppressor from IC system

- Disconnect suppressor from separating column and detector.

2 Regenerate suppressor

- Rinse each suppressor unit for about 15 min with one of the following solutions:

Contamination with heavy metals

1 mol/L H_2SO_4 / 0.1 mol/L oxalic acid

Contamination with organic cationic complexing agents

0.1 mol/L H_2SO_4 / 0.1 mol/L oxalic acid / acetone 5%

Severe contamination with organic substances
0.2 mol/L H_2SO_4 / acetone ≥ 20%

The 6.1826.110 Pump tubing is made of PVC and must not be used for rinsing with solutions which contain organic solvents. In such cases, rinse with different pump tubing or a different pump.

3 Connect suppressor to IC system

- Reconnect suppressor to the IC system. If capacity problems persist, replace the suppressor rotor (see *Section 4.2.9*).

4.2.8 Cleaning the suppressor

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

- High counterpressure on the suppressor connection tubing
- Irremediable blockage of the suppressor (the suppressor can no longer deliver solutions)
- Irremediable obstruction of the suppressor (the suppressor can no longer be switched to next position)

To clean the connection piece and the rotor, proceed as follows (see *Figure 22*):

1 Disconnect suppressor from IC system

- Disconnect input capillary **82** of the suppressor module «MSM II» **46** from the separating column **73** (see *Figure 16*).
- Disconnect output capillary **83** from inlet capillary **44**.
- Disconnect inlet capillaries **84** and **85** from the PEEK Coupling **81** (supply from peristaltic pump).

2 Dismantle suppressor

- Unscrew nut **111** from suppressor holder **114**.
- Pull out connection piece **112** and suppressor rotor **113** from suppressor holder **114** (the connection piece and the rotor normally stick together). If this is not the case, take a sharp object, insert it in slot **115** of the suppressor holder and use it to pull out suppressor rotor **113**).
- Loosen connection piece **112** from suppressor rotor **113**.

3 Clean input and output leads

- Connect each of the 6 capillary tubings attached to connection piece **112** to the high-pressure pump one after another, and pump through ultrapure water.
- Check whether solution emerges from connection piece **112**. If one of the input or output leads remains blocked, replace

the connection piece **112** (order number 6.2832.010).

4 Clean suppressor rotor

- Clean the sealing surface of suppressor rotor **113** using a lint-free cloth and ethanol.

5 Insert suppressor rotor

- Insert suppressor rotor **113** in suppressor holder **114** in such a way that the tubing connections at the rear of the rotor fit in the corresponding openings inside the rotor, and that one of the three holes in the rotor can be seen from below in one of the openings of the holder.
- If the rotor has been inserted correctly, its sealing surface will be about 4 mm inside the holder. If this is not the case, bring the rotor into the correct position from below with the aid of a sharp object (e.g. a screwdriver).

*Rotors which are not inserted correctly can be **destroyed** when starting operation.*

6 Clean connection piece

- Clean the sealing surface of connection piece **112** using a lint-free cloth and ethanol.

7 Insert connection piece

- Insert connection piece **112** in suppressor holder **114** in such a way that connection "1" is at the top, and that the three lugs on the connection piece fit in the corresponding openings of the holder.
- Screw nut **111** onto the thread of suppressor holder **114** manually (do not use tools).

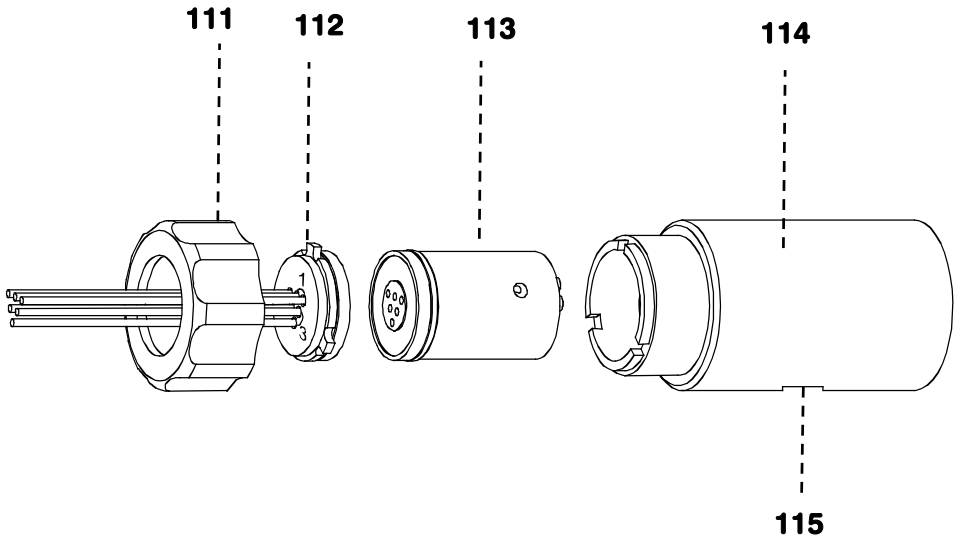


Figure 22: Assembling the suppressor

111 Screw nut	**114** Suppressor holder
112 Connection piece (6.2832.010) with input and output leads	**115** Slot in the suppressor holder
113 Suppressor rotor (6.2832.000)	

8 Connect and condition the suppressor

- Reconnect the suppressor to the IC system.
- Before switching the suppressor to the next position for the first time, rinse all 3 suppressor units with solution for 5 min.

4.2.9 Replacing the suppressor

The suppressor in the suppressor block may have to be replaced in the following cases:

- Irremediable loss of suppressor capacity (reduced phosphate sensitivity and/or strong rise in baseline)
- Irremediable blockage of the suppressor (the suppressor can no longer deliver solutions)

Both the 6.2832.000 Suppressor rotor and the 6.2832.010 Connection piece with the input and output leads can be replaced. To replace these components proceed as follows (see *Figure 22*):

1 Disconnect suppressor from IC system

- Disconnect all input and output leads of the suppressor from IC system and peristaltic pump.

2 Dismantle suppressor

- Unscrew nut **111** from suppressor holder **114**.
- Pull out connection piece **112** and suppressor rotor **113** from suppressor holder **114** (the connection piece and the rotor normally stick together). If this is not the case, take a sharp object, insert it in slot **115** of the suppressor holder and use it to pull out suppressor rotor **113**).
- Loosen connection piece **112** from suppressor rotor **113**.

3 Clean suppressor rotor

- Clean the sealing surface of new suppressor rotor **113** (6.2832.000) using a lint-free cloth and ethanol.

4 Insert suppressor rotor

- Insert new suppressor rotor **113** in suppressor holder **114** in such a way that the tubing connections at the rear of the rotor fit in the corresponding openings inside the rotor and that one of the three holes in the rotor can be seen from below in

one of the openings of the holder.

- If the rotor has been inserted correctly, its sealing surface will be about 4 mm inside the holder. If this is not the case, bring the rotor into the correct position from below with the aid of a sharp object (e.g. a screwdriver).

*Rotors which are not inserted correctly can be **destroyed** when starting operation.*

5 Clean connection piece

- Clean the sealing surface of new connection piece **112** (6.2832.010) with the aid of a lint-free cloth and ethanol.

6 Insert connection piece

- Insert new connection piece **112** in suppressor holder **114** in such a way that connection "1" is at the top and that the three lugs on the connection piece fit in the corresponding openings of the holder.
- Screw nut **111** onto the thread of suppressor holder **114** manually (do not use tools).

7 Connect and condition the suppressor

- Reconnect the suppressor to the IC system.
- Before switching the suppressor to the next position for the first time, rinse all 3 suppressor units with solution for 5 min.

4.2.10 Replacing the pump tubing

The pump tubings used by the peristaltic pump are consumable material with a limited lifetime and should be exchanged at regular intervals (approx. every 4 weeks under continuous use).

The working life of pump tubing depends to a considerable extent on the contact pressure. This is why the contact pressure must be correctly set as described in *Section 2.10.2*. If the pump is to remain switched off for a lengthy period of time the tubing cartridges **47** should be raised completely by loosening the snap-action lever **50** on the right-hand side (the set contact pressure remains unchanged).

As the pump is always operated on the same side the 6.1826.110 Pump tubings supplied can be used on both sides. To exchange a pump tubing proceed as follows:

1 Remove old pump tubing

- Press contact pressure lever **48** on the tubing cartridge **47** down as far as it will go.
- Release tubing cartridge **47** from holding clamp **49** by pressing down snap-action lever **50** and remove from mounting pin **52** (see *Figure 16*).
- Remove old pump tubing **78** or **79**.

2 Insert new pump tubing

- Insert the new pump tubing **78** or **79** in the tubing cartridge **47** as shown in *Figure 15*. The orange-yellow stopper **80** must click into the corresponding holder on the left-hand side of the tubing cartridge.
- Place the tubing cartridge **47** on mounting pin **52** and press down on the right-hand side until snap-action lever **50** clicks into position on holding clamp **49**. Take care that no kinks are formed in the pump tubing.

3 Set contact pressure

- Switch on peristaltic pump.
- Press contact pressure lever **48** upwards until the solution just starts to be drawn in. Then press contact pressure lever upwards until it clicks once more to obtain optimal contact pressure.
- Switch off peristaltic pump.

4.3 Faults and malfunctions

4.3.1 Error messages

If any type of malfunction occurs during operation of the 861 Advanced Compact IC, this is shown by error messages in the PC program, which appear either in an error window or in the **SYSTEM STATE** window.

Follow the instructions listed in the **Error window** and close this window with **<OK>**.

You will find further details of the error messages of the **SYSTEM STATE** window, their possible causes and the procedure for rectifying them in the *Software Instructions for Use «IC Net 2.3» Section 4.5*.

4.3.2 Malfunctions and their rectification

If difficulties appear with The 861 Advanced Compact IC during analyses, their causes are best investigated in the order **separating column → high-pressure pump → eluent → connections**. Several of The malfunctions which may appear are listed in the following table with details of possible causes and countermeasures.

Malfunction	*Cause*	*Rectification*
Baseline with high noise level, pulsation	• Contaminated pump valves • Defective piston seals	• Clean the valves (see *Section 4.2.6*) • Replace the piston seals (see *Section 4.2.6*)
Drift of the baseline	• Thermal equilibrium not yet reached • Leak in system • Evaporation of organic solvent in eluent	• Condition system with heating switched on • Check connections and make leakproof • Ensure better closure of eluent supply vessel
Considerable pressure drop	• Leak in system	• Check connections and make leakproof
Considerable pressure rise	• Contamination of the filter in the 6.2821.120 Filter unit PEEK • Blockage of the precolumn • Change of column packing by injection of contaminated samples	• Replace the 6.2821.130 Filter (see *Section 2.3.6*) • Change precolumn (see *Section 4.2.5*) • Regenerate column (see *Section 4.1.1*) or replace column (see *Section 4.2.5*) *Note:* *Samples should always be microfiltered.*
Chromatograms with poor resolution, change in the retention times	• Deterioration in separation efficiency of the IC column	• Regenerate column (see *Section 4.1.1*) or replace column

Malfunction	*Cause*	*Rectification*
Extreme peak broadening, splitting (double peaks)	• Dead volume at the column ends	• Check the connections (use PEEK capillaries with 0.25 mm i.d. between injection valve and detector block) • Turn separation column (if allowed), or replace it
No feed of regeneration or rinsing solution for suppressor	• Contact pressure too low • Leak in system • Defective pump tubing • Contamination of the filter in the 6.2821.120 Filter unit PEEK • Counterpressure at suppressor module «MSM II» too high	• Adjust contact pressure (see *Section 2.10.2*) • Check connections and make leakproof • Replace pump tubing (see *Section 4.2.10*) • Replace the 6.2821.130 Filter (see *Section 2.3.6*) • Clean or replace suppressor (see *Section 4.2.7…4.2.9*)

4.4 Diagnostic tests / Validation / GLP

The requirements of **GLP** (**G**ood **L**aboratory **P**ractice) include a periodic check of analytical measuring instruments with regard to their reproducibility and accuracy using **S**tandard **O**perating **P**rocedures, **SOP**.

Under the title **«Application Bulletin No. 277 – Validation of Metrohm ion chromatographs»** an example of such a standard operating procedure is available from Metrohm; it can be adapted and used with the 861 Advanced Compact IC.

Further information on the subjects of QA, GLP and validation can also be found in the brochure «**Quality management with Metrohm**», which is available from your local Metrohm agency.

Testing of the electronic and mechanical function groups of Metrohm instruments can and should be performed as part of a regular service by trained personnel of the manufacturing company (see *Section 4.2.1*). All Metrohm instruments are equipped with start-up-test routines which check for perfect functioning of the relevant assemblies when the instrument is switched on. If no error message is displayed, it may be assumed the instrument is operating without faults.

The Metrohm company also supplies its instruments with an integrated diagnostic program which, in the case of possible malfunctions or faulty behavior, allows the service technician to check the functioning of certain assemblies and localize the fault.

5 Appendix

5.1 Technical data

Unless otherwise specified, the published data comprises typical values for the 861 Advanced Compact IC at an ambient temperature of 25 °C.

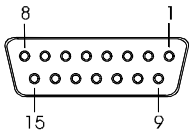
5.1.1 Conductivity measurement

Measurement range 1	0…5000 µS/cm (resolution: 2.80 nS/cm)
Measurement range 2	0…1000 µS/cm (resolution: 0.56 nS/cm)
Measurement range 3	0…250 µS/cm (resolution: 0.14 nS/cm)
Measurement range 4	0…50 µS/cm (resolution: 0.028 nS/cm)
Maximum error	± 1 % of full scale value and ± 1 % of measurement value (k = 16.7/cm)
Linearity	Deviations < ± 0.5 % of full scale value
Noise	typ. 0.2 nS/cm (Total noise of the system - chemical and electronical with separation column and sequential suppression)
Drift (electronic)	typ. < 10 ppm/h of full scale value
Temperature dependence	typ. < 40 ppm/°C of full scale value
Reserve range	> 33 % (k = 16.7/cm)
Sampling rate	10 measurements/s (fixed)

5.1.2 Conductivity detector

Construction	Thermostatted conductivity detector with 2 ring-shaped steel electrodes
Measurement principle	Alternating current measurement with 1 kHz frequency and approx. 1.7 V amplitude (peak to peak).
Effective cell volume	0.8 µL
Cell constant	approx. 17 /cm (the exact value is printed on the detector)
Maximum back pressure for measuring cell	5.0 MPa (50 bar)
Thermostatting	Connectable dynamic control to adjustable operating temperature
Operating temperature	Adjustable in steps of 5°C from 25…45°C

Max. temperature deviation	± 2.5°C
Heating time	≥ 30 min
Temperature stability	≤ 0.01°C at constant ambient temperature
Connection for detector block	Dsub 15 pin (female)



5.1.3 Injection valve

Actuator switching duration	100…150 ms
Pressure resistance	35 MPa (350 bar)

5.1.4 High-pressure pump

Type	Serial dual piston pump with two valves
Pump capacity	
Flow range	0.20...2.5 mL/min
Maximum error	< ± 2 % of set value
Flow constancy	< 0.5 % of set value
Reproducibility of eluent flow	typ. better than ± 0.1 %
Pressure measurement	
Pressure range	at flow 0.2 ... 1.5 mL/min: 0 ... 35.0 MPa (0 ... 350 bar) at flow 1.5 ... 2.5 mL/min: 0 ... 25.0 MPa (0 ... 250 bar)
Residual pulsation	< 10 % (at 1 mL/min water and 10 MPa pressure, without pulsation dampener)
Measurement principle	Piezoresistive measurement Response time: 3 ms Measurement volume: approx. 50 µL
Maximum error	± 3 % of set value
Resolution	0.1 MPa (conductivity measurements) 0.01 MPa (pressure measurements)
Sampling rate	1 measurement/piston stroke (pump running) 1 measurement/s (pump not running) 10 measurements/s (pressure measurements)
Safety shutdown	
Function	Automatic shutdown when upper and lower pressure limits violated
Maximum pressure limit	adjustable between 0.1...35.0 MPa (1...350 bar) Response time: 1 pump cycle

Minimum pressure limit	adjustable between 0.1 ... 35.0 MPa (1...350 bar), inactive at 0 MPa Response time: 5 pump cycles	
Pump head		
Pump head volumes	Main piston: Priming piston:	40 µL 20 µL
Pump displacement volumes	Main piston: Priming piston:	28.5 µL 14.25 µL
Length of stroke	Main piston: Priming piston:	3.6 mm 1.8 mm

5.1.5 Peristaltic pump

Type	2-channel peristaltic pump
Pump capacity	
Rotational speed	20 U/min at 50 Hz 24 U/min at 60 Hz
Flow range	0.4…0.5 mL/min with 6.1826.110 Pump tubing
Maximum error	± 5 %
Maximum pressure	0.4 MPa (4 bar)
Pumpable liquids	Clear liquids with no solid contents
Pump tubing material	PVC

5.1.6 Suppressor module «MSM II»

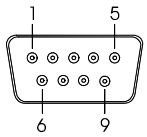
Switching duration	140 ms
Pressure resistance	2.5 MPa (25 bar)

5.1.7 Leak detector

Type	Detector with 2 electrodes approx. 1 mm above base of interior
Response level	Resistance < 1 MΩ (for deion. water)

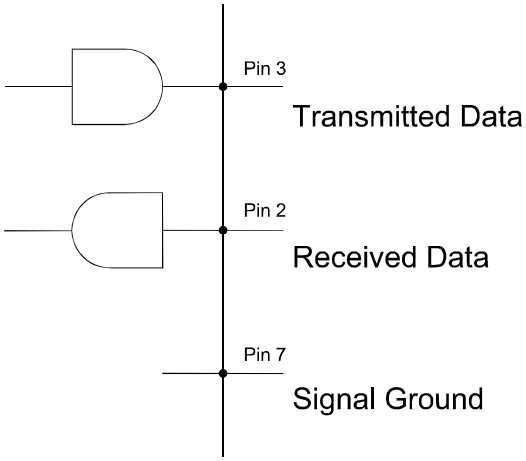
5.1.8 RS232 interface

Connector	Dsub 9 pin (male)



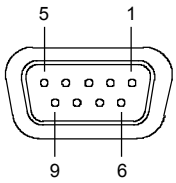
Function	TxD and RxD signal for connection with software handshake
Default settings	9600 baud, 8 bit, 1 stop bit, no parity, XON/XOFF

Pin assignment



5.1.9 Analog output

Connector Dsub 9 pin (female)



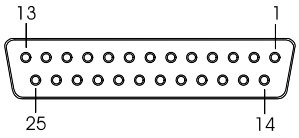
Pin

1	0 V
6	Signal 0...1 V

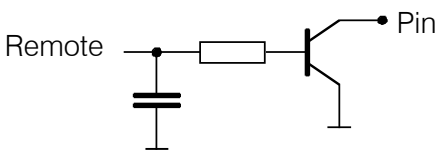
The other pins are not occupied.

5.1.10 Remote interface

Connector Dsub 25 pin (female)



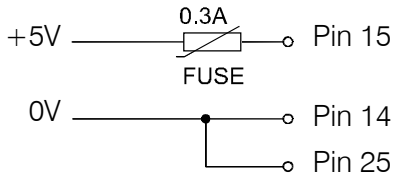
Circuit diagram for output lines 1…8



Assignment of output lines 1…8

Remote 1	Pin	18
Remote 2	Pin	4
Remote 3	Pin	3
Remote 4	Pin	1
Remote 5	Pin	2
Remote 6	Pin	16
Remote 7	Pin	17
Remote 8	Pin	5

Potentials



5.1.11 Mains connection

Voltage	115 V: 100...120 V ± 10 % 230 V: 220...240 V ± 10 %
Frequency	50...60 Hz
Power consumption	100 VA
Fuse	5 mm dia., 20 mm length 100…120 V: 0.63 A (slow-blow) 220…240 V: 0.315 A (slow-blow)

5.1.12 Safety specifications

Construction/testing	According to IEC 1010 / EN 61010 / UL 3101-1, protection class 1, degree of protection IP20
Safety directions	The Instructions for Use include information and warnings which must be heeded by the user to assure safe operation of the instrument.

5.1.13 Electromagnetic compatibility (EMC)

Emitted interference	Standards met: -IEC/EN 61326 -EN 55022 -CISPR 22 -IEC/EN 61000-3-2
Immunity to interference	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

5.1.14 Ambient temperature

Nominal operating range	+5…+45°C (at 20…80 % atmospheric humidity)
Storage	–20…+70°C
Transport	–40…+70°C

5.1.15 Housing

Material of cover	Polyurethane rigid foam (PUR) with fire protection for fire class UL94VO, CFC-free
Material of base	Steel, enameled
Width	259 mm
Height	446 mm
Depth	355 mm
Weight	
2.861.0010	13.5 kg (without accessories)
	15.7 kg (with accessories)
2.861.0020	14.7 kg (without accessories)
	21.7 kg (with accessories)

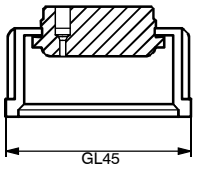
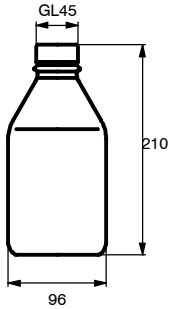
5.2 Standard equipment

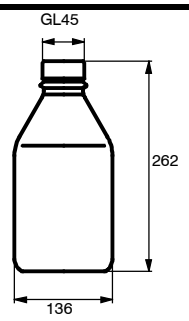
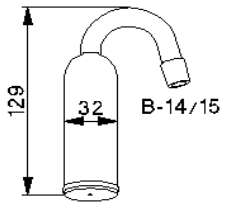
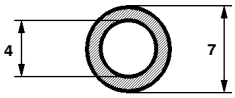
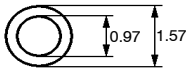
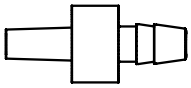
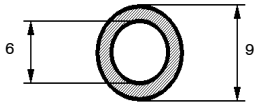
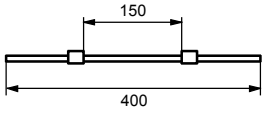
Subject to changes !
All dimensions are given in mm.

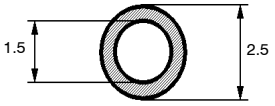
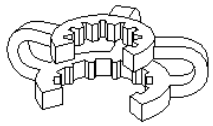
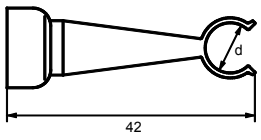
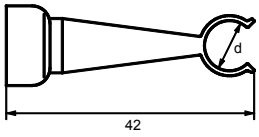
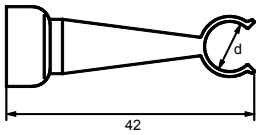
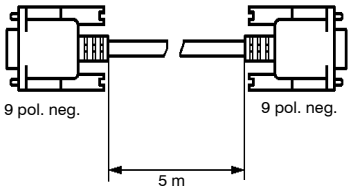
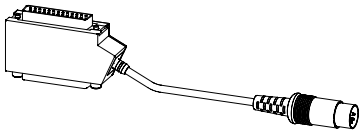
The 861 Advanced Compact IC is available in three versions:

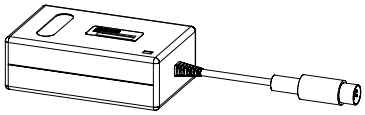
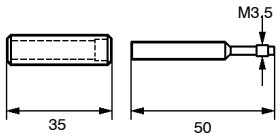
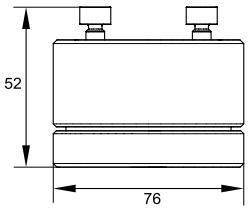
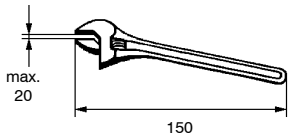
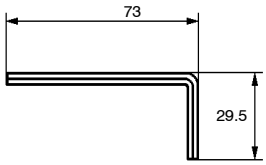
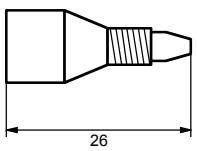
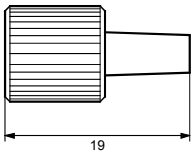
- **2.861.0010** Compact IC without suppressor
- **2.861.0020** Compact IC with suppressor module «MSM II»
- **2.861.0040** Compact IC with suppressor module «MSM II» and 853 CO_2 Suppressor (MCS)

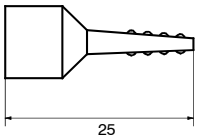
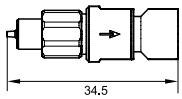
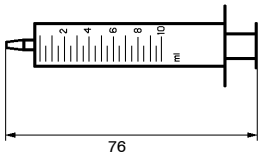
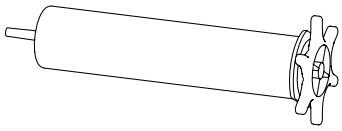
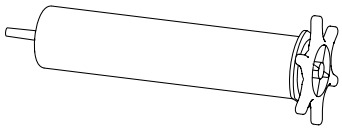
These instruments include the following parts:

Number			*Order no.*	*Description*
2.861.0010	**2.861.0020**	**2.861.0040**		
1	**-**	**-**	**1.861.0010**	**Advanced Compact IC** with 1.732.0110 detector block
-	**1**	**-**	**1.861.0020**	**Advanced Compact IC** with 1.732.0110 detector block and MSM II
-	**-**	**1**	**1.861.0040**	**Advanced Compact IC** with 1.732.0110 detector block, MSM II and 853 CO_2 Suppressor
-	**2**	**2**	**6.1602.150**	**Bottle attachment GL45** for 6.1608.023 Amber glass bottle (1 L) 
1	**1**	**1**	**6.1602.160**	**Bottle attachment GL45** for 6.1608.070 Clear glass bottle (2 L), incl. the following accessories: 1 × 6.1446.040 Thread stopper M6 1 × 6.1602.105 Bottle attachment GL 45 1 × 4.420.0311 Tubing nipple M6 1 × 4.420.4300 Tubing nipple M8 2 × E.301.0021 O-ring 
-	**2**	**2**	**6.1608.023**	**Amber glass bottle 1 L** Supply bottles for regeneration and rinsing solutions, with GL45 thread 

Number			Order no.	Description
2.861.0010	2.861.0020	2.861.0040		
1	1	1	6.1608.070	**Clear glass bottle 2 L** Eluent bottle, with GL45 thread 
1	1	1	6.1609.000	**CO_2 Absorber tube** incl. 6.2701.020 Stopper For 6.1602.160 Bottle attachment. 
-	-	1	6.1801.140	**PVC tubing** For the connection between CO_2 Absorber Cartridge and H_2O Absorber Cartridge with the 853 CO_2 Suppressor. L = 110 mm, d1 = 4 mm, d2 = 7 mm 
-	1	1	6.1803.020	**PTFE capillary** Length = 5 m 
-	-	1	6.1808.190	**Adapter tubing nozzle/Luer** For the connection between CO_2 Absorber Cartridge and H_2O Absorber Cartridge with the 853 CO_2 Suppressor. 
2	2	2	6.1816.020	**Silicone tubing** Drain tube for inner compartment and bottle rack, length = 1 m 
-	2	2	6.1826.110	**Pump tubing** made of PVC with 2 firmly attached orange-yellow stoppers; i.d. = 0.49 mm 

Number			Order no.	Description
2.861.0010	2.861.0020	2.861.0040		
1	1	1	6.1834.010	**Aspirating tubing** made of PTFE, with connector for 6.2821.090 aspirating filter Length = 2.5 m For the connection high-pressure pump – eluent bottle 
1	1	1	6.2023.020	**SGJ clip** 
1	1	1	6.2027.030	**Column holder** Diameter d = 8.5 mm 
1	1	1	6.2027.040	**Column holder** Diameter d = 11.3 mm 
-	-	1	6.2027.070	**Column holder** Holder for the CO_2 Absorber Cartridge of the 853 CO_2 Suppressors. Diameter d = 25.0 mm, 2 pieces 
1	1	1	6.2122.0X0	**Mains cable** to customer's specifications: Cable socket — Cable connector Type IEC 320/C 13 — Type SEV 12 (CH…) — 6.2122.020 Type IEC 320/C 13 — Type CEE (7), VII (D…) — 6.2122.040 Type CEE (22), V — Type NEMA 5-15 (USA…) — 6.2122.070
1	1	1	6.2134.100	**Connecting cable** Connecting cable 861 Advanced Compact IC (RS232) – PC 
-	-	1	6.2143.230	**Connecting cable 861/761-853** 

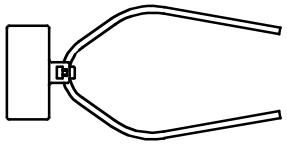
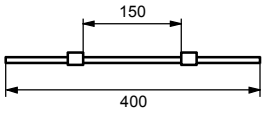
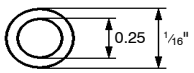
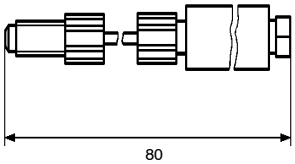
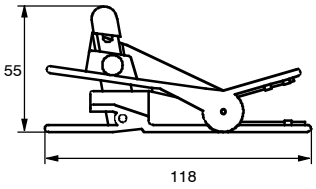
Number			Order no.	Description
2.861.0010	2.861.0020	2.861.0040		
-	-	1	6.2152.020	**Power Supply Unit** External Power Supply Unit for the electricity supply of the 853 CO_2 Suppressor (100-240V / 15V). 
-	1	1	6.2322.010	**PRIMUS multi-anion standard solution: Promo**
1	-	-	6.2322.020	**PRIMUS multi-cation standard solution: Promo**
1	1	1	6.2617.010	**Special tool** For removing the piston seal of the pump head 
1	1	1	6.2620.150	**Pulsation dampener MF** Metal-free pulsation dampener to reduce pulsation and prolong the life of separating columns. 
1	1	1	6.2621.000	**Adjustable spanner** 
1	1	1	6.2621.030	**Hexagon key 4 mm** For mounting the pump head of the high-pressure pump. 
1	3	3	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries or PTFE capillaries, set of 5 
1	1	1	6.2744.020	**Coupling 1⁄16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **3** of the 861 Advanced Compact IC when a Sample Changer is used 

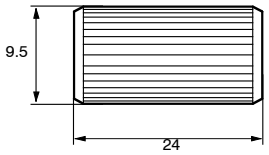
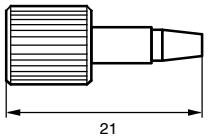
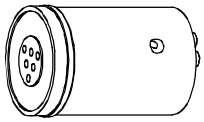
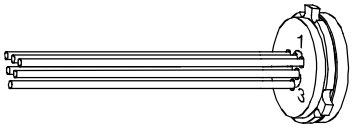
Number			Order no.	Description
2.861.0010	2.861.0020	2.861.0040		
-	1	1	6.2744.034	**PEEK coupling** Connection between 6.2744.010 PEEK compression fitting and 6.1826.110 Pump tubing; Set of 2 
-	2	2	6.2744.180	**PEEK coupling with filter and tubing security device** 
1	1	1	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop 
1	1	1	6.2821.090	**Aspirating filter** Pore dimension 20 µm For 6.1834.010 Aspirating tubing. Set of 5 
1	1	1	6.2821.130	**Filter** Spare filter. set of 10
-	-	1	6.2837.000	**CO_2 Absorber Cartridge** 
-	-	2	6.2837.010	**H_2O Absorber Cartridge** 
1	1	1	6.6034.033	**Software CD «IC Net 2.3»**
1	3	3	Y.107.0150	**Cable strap**
1	1	1	8.102.0013	**Software Manual** (English) for PC program «IC Net 2.3»
1	1	1	8.102.1013	**Administrator manual** (English) for PC program «IC Cap 2.2»
1	1	1	8.102.1119	**User manual** (multilingual) for PC program «IC Cap 2.2»
1	1	1	8.110.8213	**Software Manual** (English) for PC program «Autodatabase 1.0»

Number			Order no.	Description
2.861.0010	2.861.0020	2.861.0040		
1		1	8.110.8293	**Compliance white paper** (English) for PC program «IC Net 2.3»
1	1	1	8.792.5003	**Metrohm Monograph «Practical Ion Chromatography»** (English)
-	-	1	8.853.1003	**Software Manual** (English) for 853 CO_2 Suppressor
1	1	1	8.861.1033	**Software Manual** (English) for 861 Advanced Compact IC

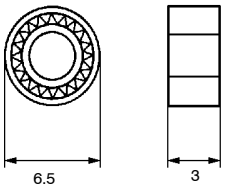
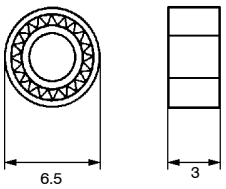
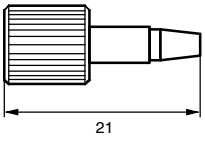
5.3 Optional accessories

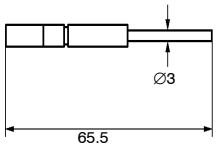
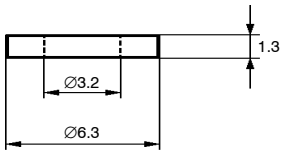
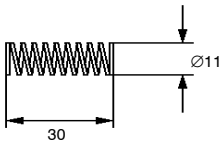
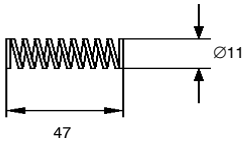
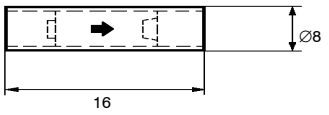
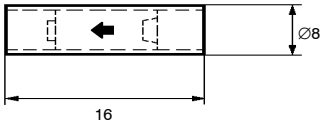
5.3.1 General accessories

Order no.	Description	
6.1825.XXX	**Sample loop, made of PEEK** For injection valve; incl. two 6.2744.010 PEEK compression fittings 6.1825.210: Volume = 20 µL 6.1825.220: Volume = 100 µL 6.1825.230: Volume = 10 µL	
6.1826.060	**Pump tubing** made of PP (polypropylene) with 2 firmly attached white-yellow stoppers; i.d. = 0.51 mm, o.d. = 2.31 mm	
6.1831.010	**PEEK capillary** Length = 3 m	
6.2620.040	**Coupling 1/16" – 1/4"** Connector for plastic separating columns with 1/4"-28 thread.	
6.2621.080	**Capillary cutter for plastic capillaries** for PEEK capillaries and PTFE capillaries with 5 spare blades	

Order no.	Description
6.2744.040	**PEEK coupling** For connection of 1/16" capillaries 
6.2744.070	**PEEK compression fitting short** Spare part for 6.2824.100 Pump head Set of 5 
6.2821.130	**Filter for Filter unit PEEK** Spare part for 6.2821.120 Filter unit PEEK. Set of 10
6.2832.000	**Suppressor rotor** Replacement cartridge for suppressor module «MSM II» 
6.2832.010	**Connection piece for suppressor rotor** with input and output leads 

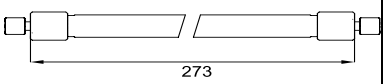
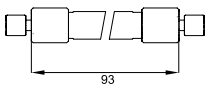
5.3.2 High-pressure pump

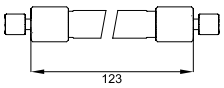
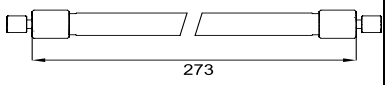
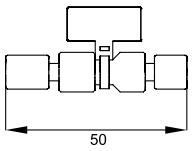
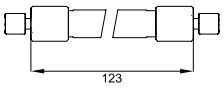
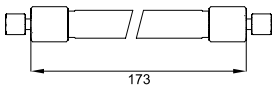
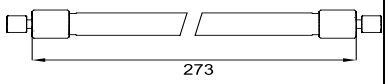
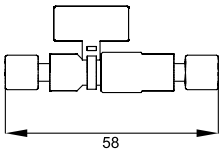
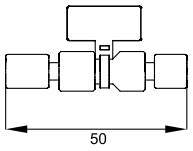
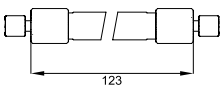
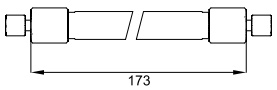
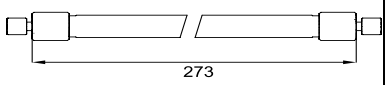
Order no.	Description
6.2824.100	**Pump head (metal-free)** Complete, with fixations screws
6.2741.000	**Piston seal** Spare part for 6.2824.100 Pump head 
6.2741.020	**PE piston seal** 
6.2744.070	**PEEK compression fitting short** Spare part for 6.2824.100 Pump head Set of 5 

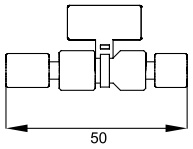
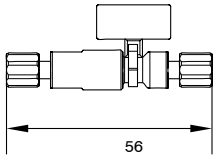
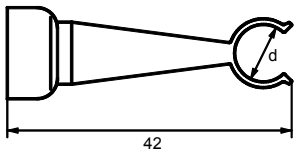
Order no.	Description
6.2824.070	**Zircon piston** Spare part for 6.2824.100 Pump head 
6.2824.030	**Sapphire supporting ring** Spare part for 6.2824.100 Pump head 
6.2824.050	**Spring for main piston** Spare part for 6.2824.100 Pump head 
6.2824.060	**Spring for auxiliary piston** Spare part for 6.2824.100 Pump head 
6.2824.080	**Outlet valve (metal-free)** Spare part for 6.2824.100 Pump head 
6.2824.090	**Inlet valve (metal-free)** Spare part for 6.2824.100 Pump head 

5.3.3 Separating columns and precolumns

This is a selection of standard columns from our comprehensive range of columns. Our complete range of columns can be found on the Internet under http://www.metrohm.com or request our free-of-charge column catalog.

Order no.	Description
6.1005.200	**Ion exclusion column Metrosep Organic Acids** Universal exclusion column for determining organic acids. Column dimensions: 250 × 7.5 mm 
6.1006.100	**Metrosep Anion Dual 2** For the determination of anions with and without chemical suppression. Column dimensions: 75 × 4.6 mm Precolumn: 6.1005.050 (installation with 6.2821.050 Twin cartridge holder) 

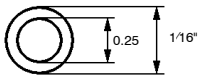
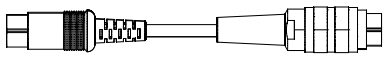
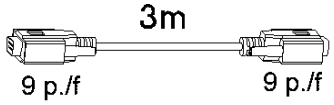
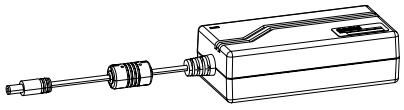
Order no.	Description
6.1006.120	**Metrosep Anion Dual 3** Anion column for use with and without chemical suppression. Column dimensions: 100 × 4.0 mm 
6.1006.430	**Metrosep A Supp 4 - 250** Robust anion column for use with chemical suppression. Column dimensions: 250 × 4.0 mm 
6.1006.500	**Metrosep A SUPP 4/5 Guard (on-column)** Guard column for A SUPP 4 and A SUPP 5 columns. Column dimensions: 5.0 × 4.0 mm 
6.1006.510	**Metrosep A Supp 5 - 100** Anion column for use with chemical suppression. For rapid separations. Column dimensions: 100 × 4.0 mm 
6.1006.520	**Metrosep A Supp 5 - 150** Anion column for use with chemical suppression. For standard applications. Column dimensions: 150 × 4.0 mm 
6.1006.530	**Metrosep A Supp 5 - 250** Anion column for use with chemical suppression. For complex separation problems. Column dimensions: 250 × 4.0 mm 
6.1006.540	**Metrosep A Supp 4/5 S-Guard** Separate guard column for A SUPP 4 and A SUPP 5 columns. Column dimensions: 5.0 × 4.0 mm 
6.1010.200	**Metrosep C 2 Guard (on-column)** For protecting Metrosep cation columns. Column dimensions: 5.0 × 4.0 mm 
6.1010.210	**Cation column Metrosep C 2 - 100** Cation column for determining monovalent and divalent cations. PEEK column. Column dimensions: 100 × 4.0 mm 
6.1010.220	**Cation column Metrosep C 2 - 150** Cation column for determining monovalent and divalent cations. PEEK column. Column dimensions: 150 × 4.0 mm 
6.1010.230	**Cation column Metrosep C 2 - 250** Cation column for determining monovalent and divalent cations. PEEK column. Column dimensions: 250 × 4.0 mm 

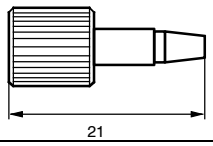
Order no.	Description
6.1010.240	**Metrosep C2 S-Guard** Separate guard column protecting Metrosep cation columns. Column dimensions: 5.0 × 4.0 mm 
6.1011.020	**Metrosep RP Guard** General guard column. For Metrosep Anion Dual 2 and Dual 3 in particular. 
6.1011.120	**Spare filter for RP Guard** 10 pieces
6.2027.050	**Column holder** Diameter d = 15.0 mm 

5.3.4 Column heating

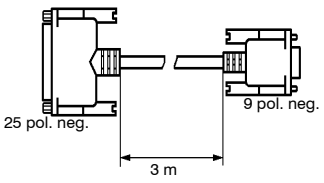
The 861 Advanced Compact IC can be used with a column heating device (see 8.861.1011 Instructions for Use). This column heating device together with the necessary accessories can be ordered from your local Metrohm agency under the Order no. 2.861.0500.

The 2.861.0500 Advanced Compact IC Column heating device consists of the following parts:

Number	Order No.	Description
1	1.861.0500	**Control unit for Advanced Compact IC Column heating**
1	1.820.0500	**IC Column heating**
1	6.1831.010	**PEEK Capillary** Length = 3 m 
1	6.2057.060	**Holder for Advanced Compact IC Column heating**
1	6.2108.150	**Cable to IC Column heating** Length = 1.2 m 
	6.2134.040	**Connection cable** RS 232 connection cable between Control unit – PC 
1	6.2152.010	**Power Pack** for the electric supply of the IC Column heating 

Number	Order No.	Description
1	6.2744.070	**PEEK compression fitting short** For the connection of PEEK Capillaries 6.1831.010 in a cramped environment Set of 5 

5.3.5 Communication

Order no.	Description
6.2125.110	**Cable** Connecting cable 861 Advanced Compact IC (9-pol RS232) – PC (25-pol RS232). 
2.145.0320	**Expansion Module USB - 4xDB9** (from Inside Out Networks) Converter USB to 4x serial RS 232 (COM). For the connection of 4 additional devices to the USB-Port of the PC.

5.4 Warranty and Conformity

5.4.1 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 of outside manufacture 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 material, construction or design as well as the absence of guaranteed features, the orderer 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 from any liability to pay compensation.

If any instruments and parts have to be returned, 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 dust-proof package (for instruments, use of a plastic bag is imperative). If open assemblies are enclosed in the scope of delivery that are sensitive to electromagnetic voltages (e.g. data interfaces etc.) these must be returned in the associated original protective packaging (e.g. conductive protective bag). (Exception: assemblies with built-in voltage source belong in a non-conductive protective packaging).

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

5.4.2 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.

Metrohm
Ion analysis
CH-9101 Herisau, Switzerland
Tel. +41 71 353 85 85
Fax +41 71 353 89 01
www.metrohm.com

Name of commodity	**861 Advanced Compact IC**
Name of manufacturer	Metrohm Ltd., Herisau, Switzerland

Description The 861 Advanced Compact IC is an instrument for ion chromatography analysis with electronic or chemical suppression.

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

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/UL 61010-1, EN/IEC 61010-2-081, CSA-C22.2 No. 61010-1

It has also been certified by ElectroSuisse, which is 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

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, March 24, 2005

D. Strohm Vice President Head of R&D	Ch. Buchmann Vice President Head of Production Responsible for Quality Assurance

5.4.3 Quality Management Principles

Metrohm Ltd., 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 organization 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 organization is equipped to support customers in implementing standards such as GLP, GMP, ISO 900X, in performing Operational Qualification and Performance Verification of the system components or in carrying out the System Validation for the quantitative determination of a substance in a given matrix.

5.5 Index