819 IC Detector
820 IC Separation Center

5.819.0010 Program

Metrohm
ion analysis
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Instructions for Use
8.819.1013

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819 IC Detector
820 IC Separation Center

5.819.0010 Program

Instructions for Use

8.819.1013 05.2004 / pkl

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2nd Edition 2004

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

1.1.1 819 IC Detector

The **819 IC Detector** is a conductivity detector especially designed for ion chromatography with an extensive operating range and high sensitivity for the recording of chromatograms with and without chemical suppression. The associated thermostattable detector block is normally installed in the 819 IC Separation Center, but can also be used as a separate detector. The two following versions are available:

- **2.819.0010** IC Detector with metal detector block
- **2.819.0110** IC Detector with metal-free detector block

The **819 IC Detector** can be fully remotely controlled via the Metrohm «IC Net» software. All functions can be quickly and easily accessed by the software and can be clearly shown on the screen. Apart from setting the measuring parameters, it is possible to draw up any time programs required. These can be used to control a large number of instrument functions and freely programmable events.

The 819 IC Detector is connected via the 830 IC Interface or directly to a PC. The control of the instrument and the recording and evaluation of the chromatograms take place under «IC Net». It is also possible to control external devices or start functions in the IC system from these devices via a “Remote” interface using programmable signals.

1.1.2 820 IC Separation Center

The **820 IC Separation Center** is a thermally and electronically insulated wet-chemistry component that accommodates injectors, columns, column heating, detector blocks, suppressor module, pulsation dampeners and various optional sample preparation modules. The 820 IC Separation Center is also remotely controlled via the Metrohm «IC Net» software; it can either be connected to the 819 IC Detector and controlled through it, or connected directly to the 830 IC Interface and controlled directly from «IC Net».

The following versions are available:

- **2.820.0210** IC Separation Center with 1 injector for a one-channel system with column heating, metal-free
- **2.820.0220** IC Separation Center with 2 injectors for a two-channel system with column heating, metal-free
- **2.820.0230** IC Separation Center with 1 injector and 1 Metrohm Suppressor Module MSM for a one-channel system with column heating, metal-free
- **2.820.0310** IC Separation Center with 1 injector for a one-channel system, metal-free
- **2.820.0320** IC Separation Center with 2 injectors for a two-channel system, metal-free
- **2.820.0330** IC Separation Center with 1 injector and 1 Metrohm Suppressor Module MSM for a one-channel system; metal-free

1.1.3 Schematic arrangement of the IC systems

The 819 IC Detector and 820 IC Separation Center are the main components of a modular **ion chromatography system** that can be expanded to meet the wishes of the individual user (*see Fig. 1*). The minimum configuration of the one-channel system also includes a 818 IC Pump, a separating column, a 830 IC Interface and an PC. The two-channel system requires at least a second 819 IC Detector and a second 818 IC Pump. Both systems can be extended virtually without any limits by further modular Metrohm IC devices such as sample changers for automation, sample preparation devices, components for post-column derivation and other detectors. Further, practically all HPLC peripherals and parts available on the market such as precolumns, additional separating columns, additional detectors and other injection systems can be seamlessly integrated in the system.

However, the individual IC units can also be freely combined with common HPLC instruments. This offers the possibility of expanding your system to a stand-alone ion chromatograph.

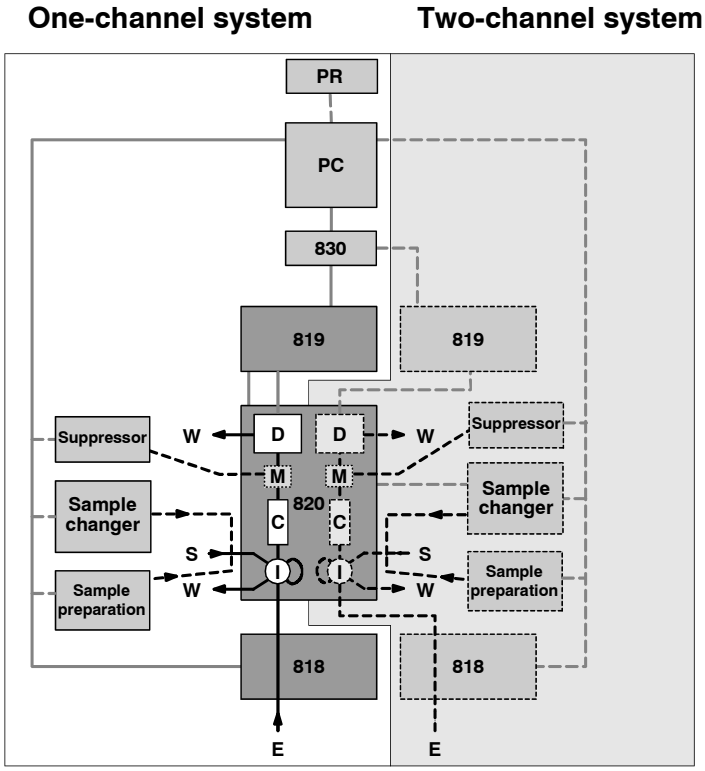


Fig. 1: Block diagram of the ion chromatography systems

C	**Separating Column**	**M**	**Suppressor module**	**818**	**IC Pump**
D	**Detector**	**PC**	**PC**	**819**	**IC Detector**
E	**Eluent**	**PR**	**Printer**	**820**	**IC Separation Center**
I	**Injector**	**S**	**Probe**		
IF	**Interface**	**W**	**Waste**		

1.2 Parts and controls

*In this Section you will find the numbers and designations of the parts and controls of the 819 IC Detector and 820 IC Separation Center. 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.*

1.2.1 819 IC Detector

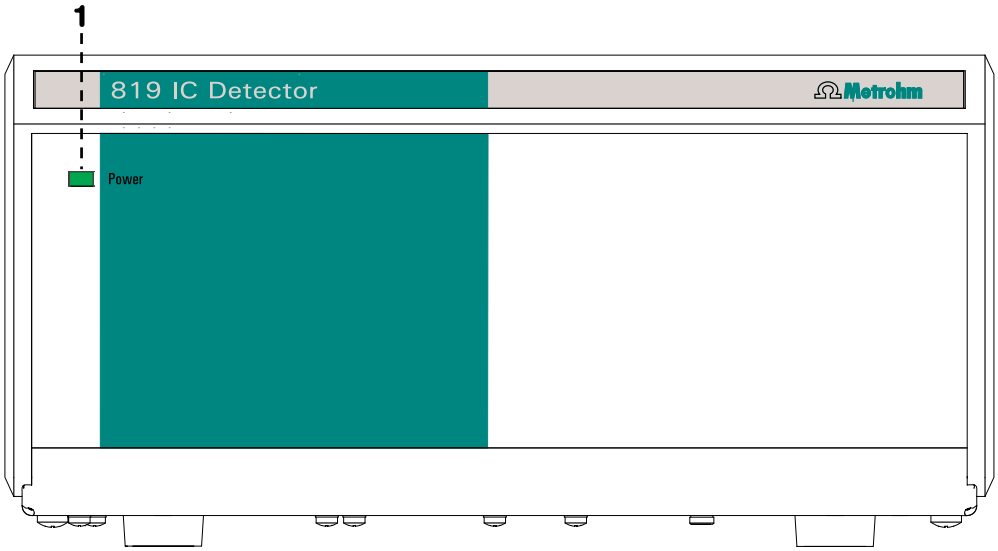


Fig. 2: Front of the 819 IC Detector

1 Mains pilot lamp
Lights up when instrument is switched on

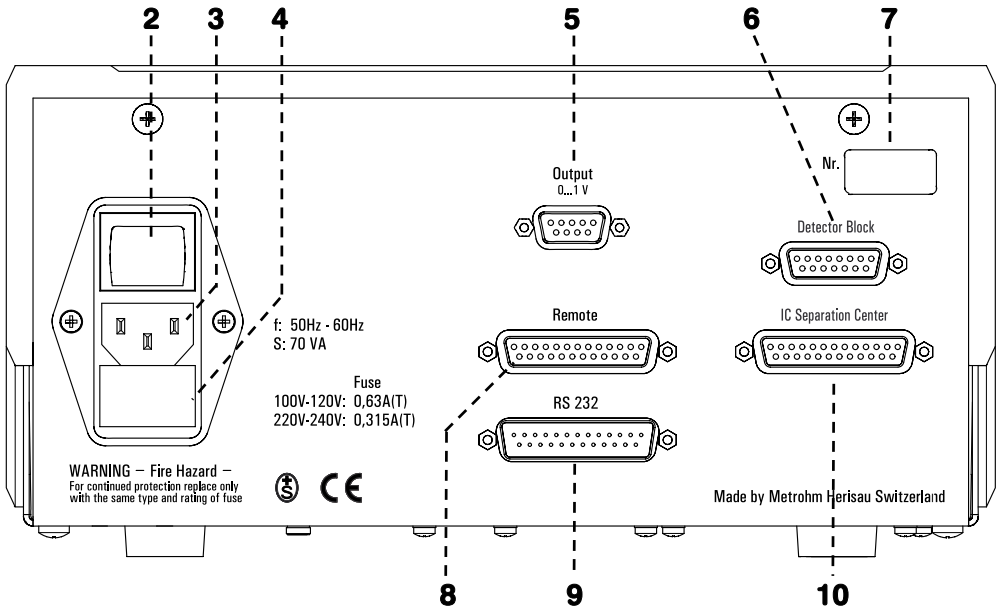


Fig. 3: Rear of the 819 IC Detector

2 Mains switch
For switching instrument on/off:
I = ON 0 = OFF

3 Mains connection plug
Mains connection see *Section 2.4.1*

4 Fuse holder
Changing the fuses, see *Section 2.4.1*

5 Analog output
0...1 V

6 Connection for detector block

7 Model plate with serial number

8 Remote interface
remote I/O lines for connection of external devices

9 RS 232 interface for connection of IC Interface 830 or PC

10 Connection for 820 IC Separation Center

1.2.2 820 IC Separation Center

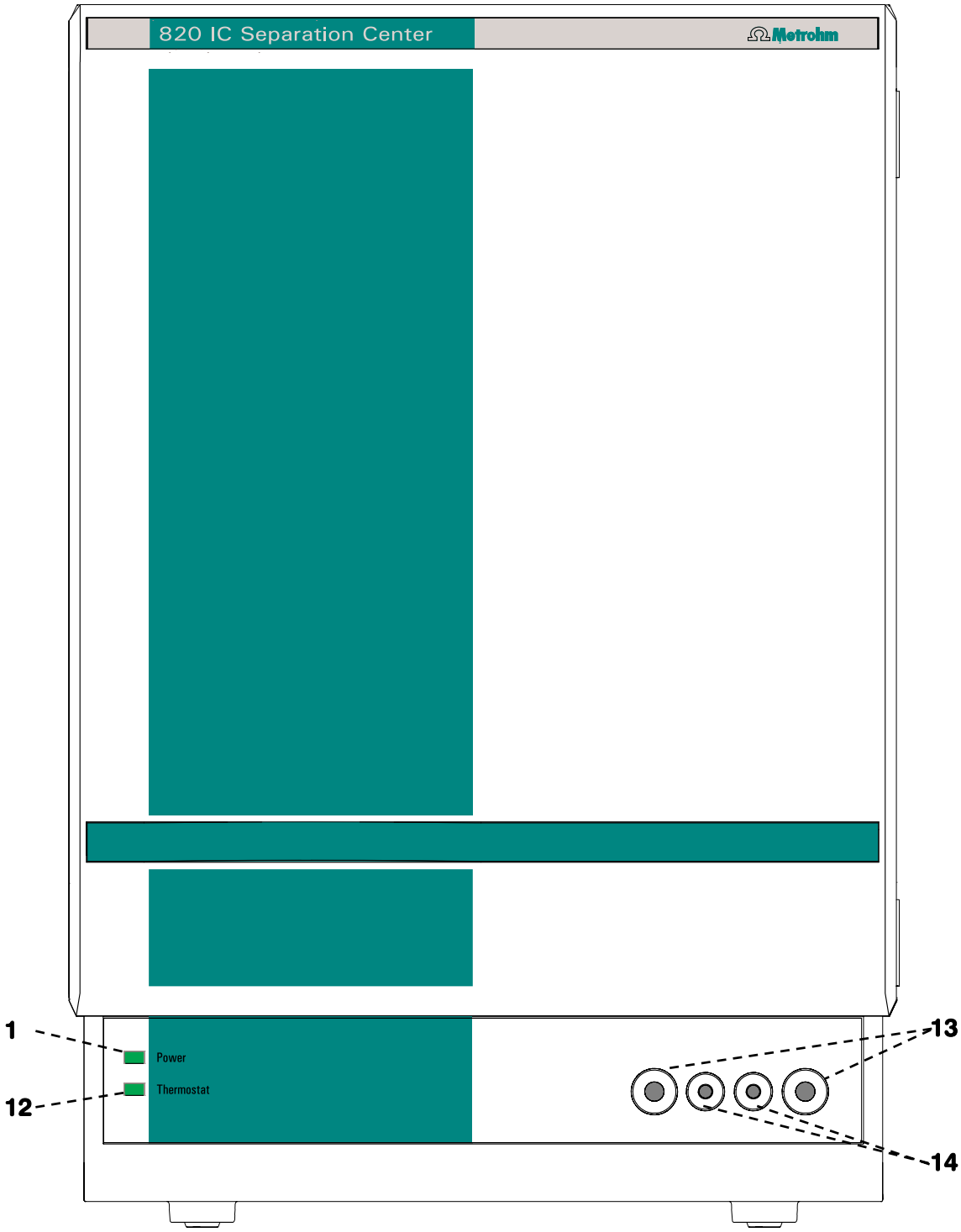


Fig. 4: Front of the 820 IC Separation Center

11 Mains pilot lamp
Lights up when instrument is switched on

12 Thermostat lamp
Lights up when column heating is connected, see *Section 2.2.2* and *Section 2.4.3*

13 Connection for syringe 6.2816.020

14 Feedthrough
for sample, eluent, suppressor reagent,…

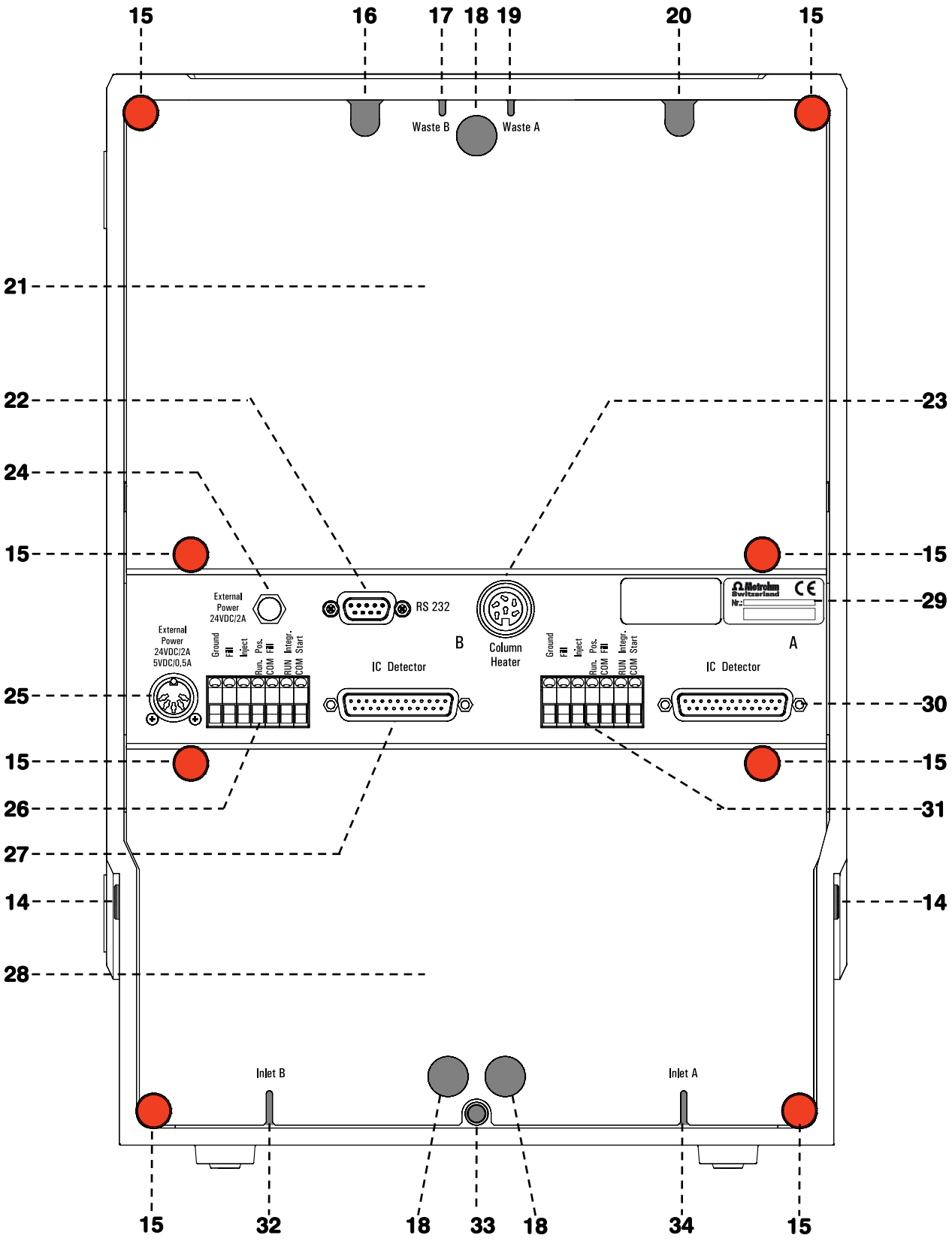


Fig. 5: Rear of the 820 IC Separation Center

14 Feedthrough
for sample, eluent, suppressor reagent,…

15 Knurled screw
for fastening rear panel **21**, resp. **28**.

16 Opening for detector cable B
opening for connecting cable:
detector block B – 819

17 Opening for outlet capillary B
discharge of the eluent of column B to waste

18 Rear panel opening
(closed with plastic stopper) for additional supply and discharge lines to and from the inner compartment

19 Opening for outlet capillary A
discharge of the eluent of column A to waste

20 Opening for detector cable A and for connecting cable to the column heating
opening for connecting cable:
detector block B – 819
column heating – 820 (6.2108.120)

21 Detachable rear panel
access to top part of the inner compartment

22 RS 232 interface for column heating
to connect to 830 IC Interface or PC with cable 6.2134.040

23 Connection for column heating
with cable 6.2108.120

24 Connection for external power supply of column heating
with power supply unit 6.2152010

25 Connection for external power supply of the Separation Center
connection of power supply unit 6.2152.000
(5 V, 0.5 A / 24 V, 2 A) in operation without 819 IC Detector

26 Terminal block for valve B
Ground, Fill, Inject:
inputs for control of the valve
RUN Pos. / COM Fill:
output signal on switching of the valve to position "FILL"
RUN Integr. / COM Start:
output signal on switching of the valve to position "INJECT"

27 Connection for 819 IC Detector

28 Detachable rear panel
access to bottom part of the inner compartment

29 Model plate with serial number

30 Connection for 819 IC Detector A

31 Terminal block for Valve A
Ground, Fill, Inject:
inputs for control of the valve
RUN Pos. / COM Fill:
output signal on switching of the valve to position "FILL"
RUN Integr. / COM Start:
Output signal on switching of the valve to position "INJECT"

32 Opening for inlet capillary B
supply of the eluent for column B

33 Connection for drain tube
for discharge of spilled liquid from the inner compartment

34 Opening for inlet capillary A
supply of the eluent for column A

Column heating

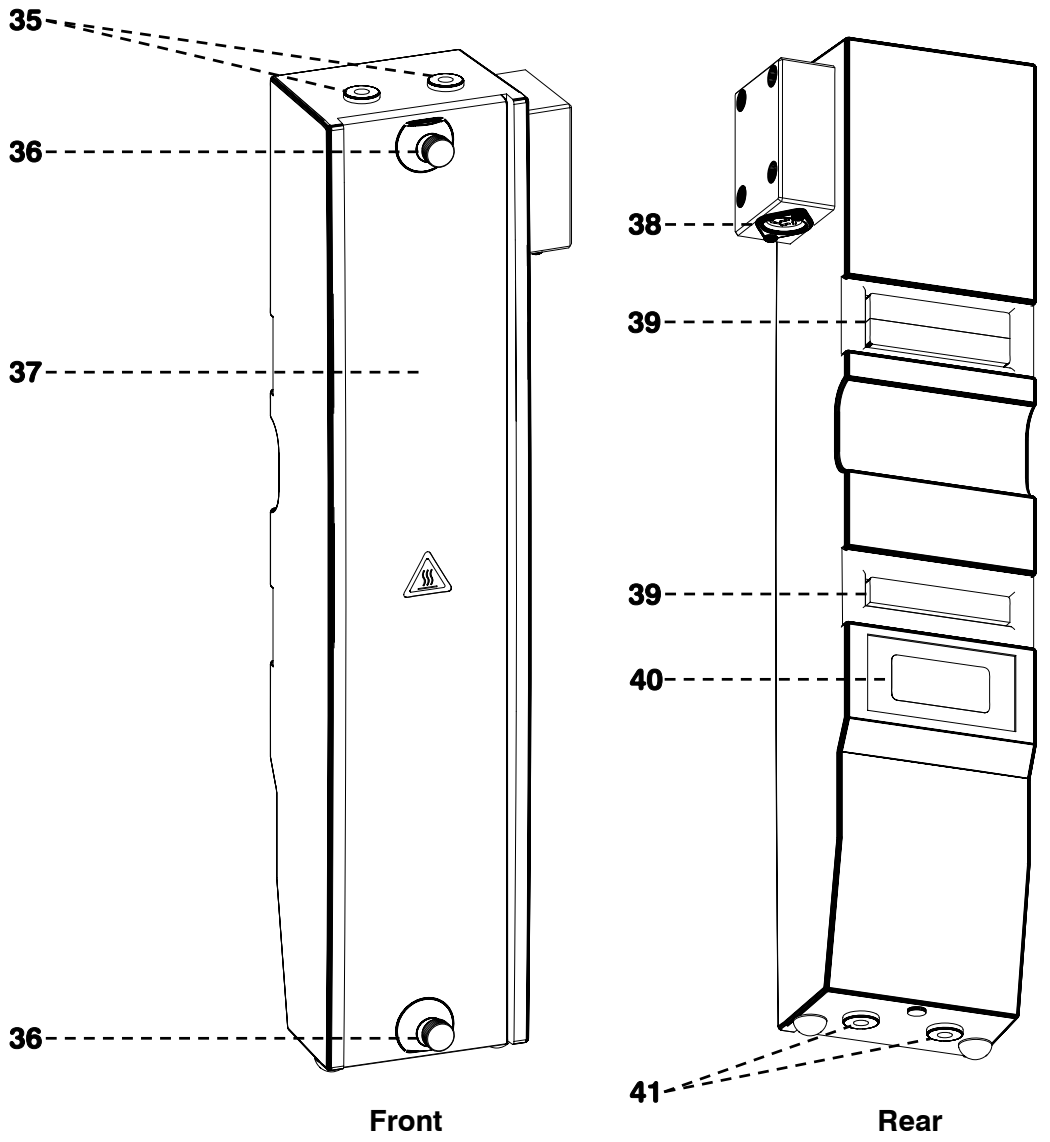


Fig. 6: Column heating closed

35 Feedthrough
for the capillary from the separating column to detector

36 Knurled screw
for fastening the heater cover **37**

37 Cover of column heating

38 Connection for Separation Center
with cable 6.2108.120

39 Magnetic holder
for fastening the column heater in the inner compartment of the Separation Center

40 Model plate with serial number

41 Feedthrough
for column connection capillary **50**

1.3 Information on the Instructions for Use

Please read through these Instructions for Use carefully before you put the 819 IC Detector and 820 IC Separation Center into operation. The Instructions for Use contain information and warnings which must be heeded the user to assure safe operation of the instruments.

1.3.1 Organization

These **8.819.1013 Instructions for Use** for the 819 IC Detector and 820 IC Separation Center provide a comprehensive overview of the installation, startup procedure, operation, fault rectification and technical specifications of these instruments. The Instructions for Use are organized as follows:

Section 1 Introduction
General description of instruments, parts and controls and safety notes

Section 2 Installation
Installation of 819 IC Detector / 820 IC Separation Center, electrical connections, tubing connections, mains connection

Section 3 Operation
Operation via «IC Net»

Section 4 Notes - Maintenance - Faults
Practical notes, maintenance, fault rectification

Section 5 Interfaces
Description of the interfaces

Section 6 Appendix
Technical data, standard equipment, options, validation, warranty, declaration of conformity, index

To find the information you require about the instrument please use either the **Table of contents** or the **Index** at the back.

As an addition to the Instructions for Use the **Metrohm Monographs** listed in *Section 6.3.4* can be requested on the Internet under http://www.metrohm.com in the literature section, or free of charge from your local Metrohm agency. Detailed information about separating columns 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 range of products. Information about special IC applications is given in the relevant **"Application Bulletins"** or **"Application Notes"**; these can be found on the Internet under http://www.metrohm.com in the applications section or can be requested free of charge from your local Metrohm agency.

1.3.2 Notation and pictograms

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

Range	**Menu item, parameter or entry value** in «IC Net» program
SYSTEM STATE	**Program window** in «IC Net» program
<OK>	**Button** in «IC Net» program
7	**Part or control of 819 / 820**
3	**Part or control of 818**
21	**Part or control of 833**
	**Danger/Warning** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components by electricity.
	**Danger/Warning** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components.
	**Attention** This symbol indicates important information that you should read before continuing.
	**Information** This symbol indicates additional information and tips which may be of particular use to you.

1.4 Safety notes

While electrical safety in the handling of the 819 IC Detector and 820 IC Separation Center is assured in the context of the specifications EN/IEC 61010-1 / UL 3101-1 (protection class I), 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 819 IC Detector**

Inside the instrument there are no parts which must be set or adjusted by the user.

*If the 819 IC Detector is connected to the mains then the instrument must not be opened, nor should any components be removed from it as otherwise you run the risk of coming into contact with current-carrying components. For this reason you should always separate the instrument from sources of electricity before opening it and also ensure that the **mains plug is removed from mains connector 3**!*

- **Opening the 820 IC Separation Center**

The instrument contains no components that can be set or adjusted by the user.

*Disconnect **all connecting cables on the rear of the 820 IC Separation Center** before you remove the middle housing panel with connectors.*

- **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 819 IC Detector or 820 IC Separation Center, you should earth yourself and any tools you are using by touching an earthed object (e.g. housing of the instrument or a radiator) to eliminate any static charges which exist.

1.4.1 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 Setting up the instrument

2.1.1 Packaging

819 IC Detector and 820 IC Separation Center are supplied together with the separately packed accessories in special packagings containing shock-absorbing foam linings designed to provide excellent protection. The actual instrument 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 instruments free from damage.

2.1.2 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 6.2*). In the case of transport damage, see instructions in *Section 6.5.1* "Warranty".

2.1.3 Location

Position the instrument 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 pump and eluent reservoir must be protected against direct sunlight.

2.1.4 Arrangement of the instruments

Modular IC instruments can be stacked on top of each other in any sequence.

In a modular system any instruments containing liquid-transporting assemblies should always be located as low down in the stack as possible, so that any leaks which may occur in tubing or connections will cause no damage to the other instruments by escaping liquids such as acids.

In one-channel operation, the 818 IC Pump, 820 IC Separation Center and 819 IC Detector are best stacked on top of one another in this order.

In two-channel operation (2.820.0X20 IC Separation Center), the optimum arrangement (1, 2 or 3 towers) depends on the laboratory space available. However, the 818 IC Pumps should be set up at the very bottom and the 819 IC Detectors at the very top.

To ensure that the arrangement of pumps and detectors for the two channels A and B is clearly apparent in two-channel operation, it is advantageous to mark the instruments. The 6.2248.000 Magnetic plate is enclosed with the 819 IC Detector for this purpose. It can be cut to the desired size, labeled (e.g. with "A" or "B") and affixed to the appropriate instrument.

2.2 Installation of accessories

2.2.1 Insert detector block

In order to operate an 820 IC Separation Center with an 819 IC Detector the detector block contained in the standard equipment of the detector (**1.732.0110 Detector block metal-free** or **1.732.0100 Metal**) must be inserted in the upper part of the Separation Center.

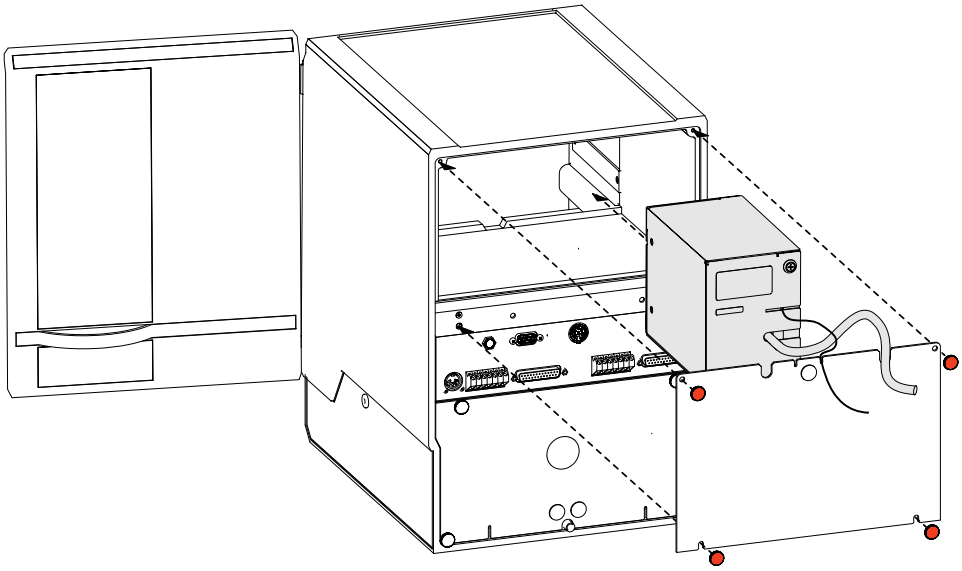


Fig. 7: Insert detector block in the Separation Center

2.820.0X10/2.820.0X30 IC Separation Center

The instrument versions 2.820.0X10 and 2.820.0X30 of the IC Separation Center are operated with one 819 IC Detector. It is best to proceed as follows when connecting the two instruments and the detector block:

1 Install detector block

- Unscrew the four knurled screws **15** from the top rear panel **21** of the 820 IC Separation Center and remove rear panel (see *Fig. 5*).
- Position detector block from the back in the space provided in the 820 IC Separation Center on the right and push fully to the front (see *Fig. 7,* resp. *Fig. 21* and *Fig. 23*).
- Insert the cable permanently attached to the detector block in opening **20** and the outlet capillary in opening **19** "Waste A" of the rear panel **21**.
- Replace rear panel **21** and screw to the 820 IC Separation Center using the four knurled screws **15**.

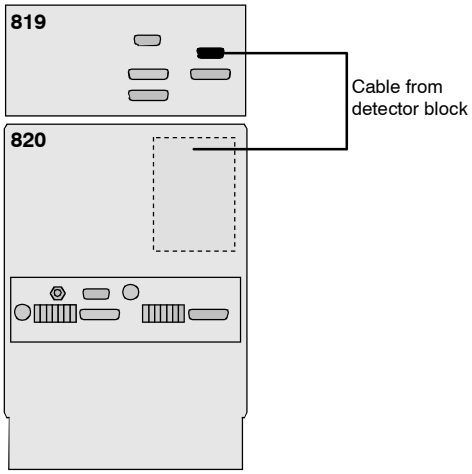


Fig. 8: Connection Detector 819 – 2.820.0X10/2.820.0X30

2 Connect detector block

- Plug the gray connecting cable permanently attached to the detector block into connection **6** „Detector Block“ of the 819 IC Detector and fasten to the instrument by tightening the screws in the cable connector (see *Fig. 8*).

3 Connect waste container

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

2.820.0X20 IC Separation Center

The two-channel versions 2.820.0X20 of the IC Separation Center can be operated with two 819 IC Detectors. It is best to proceed as follows when connecting the instruments and the two detector blocks:

1 Install detector blocks

- Unscrew the four knurled screws **15** from the top rear panel **21** of the 820 IC Separation Center and remove rear panel (see *Fig. 5*).
- Position first detector block from the back in the space provided in the 820 IC Separation Center on the right and push fully to the front (see *Fig. 7,* resp. *Fig. 22* and *Fig. 25*).
- Position second detector block from the back in the space provided in the 820 IC Separation Center on the left and push fully to the front (see *Fig. 7,* resp. *Fig. 22* and *Fig. 25*).
- Insert the cable permanently attached to the detector block A in opening **20** and the outlet capillary in opening **19** "Waste A" of the rear panel **21**.
- Insert the cable permanently attached to the detector block B in opening **16** and the outlet capillary in opening **17** "Waste B" of the rear panel **21**.

- Replace rear panel **21** and screw to the 820 IC Separation Center using the four knurled screws **15**.

2 Connect detector blocks

- Plug the gray connecting cable permanently attached to the detector block A into connection **6** „Detector Block“ of the **first 819 IC Detector** and fasten to the instrument by tightening the screws in the cable connector (see *Fig. 9*).
- Plug the gray connecting cable permanently attached to the detector block B into connection **6** „Detector Block“ of the **second 819 IC Detector** and fasten to the instrument by tightening the screws in the cable connector (see *Fig. 9*).

3 Connect waste container

- Lead the outlet capillary of both detector blocks to a sufficiently large waste container and fix in place.

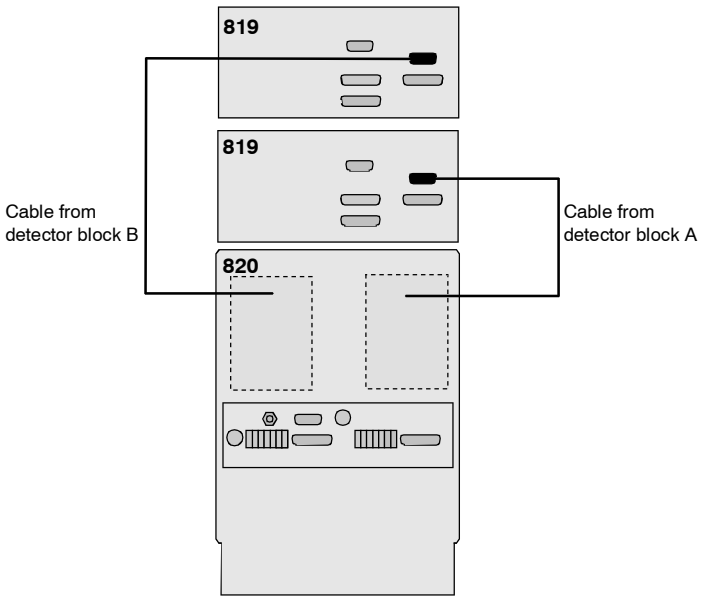


Fig. 9: Connection 2 x 819 Detector – 2.820.0X20

2.2.2 Connection of column heating

The instrument versions 2.820.02X0 of the IC Separation Center contain a column heating for thermostatting the separating column as an option. If you wish to use this column heating then it should be installed as follows:

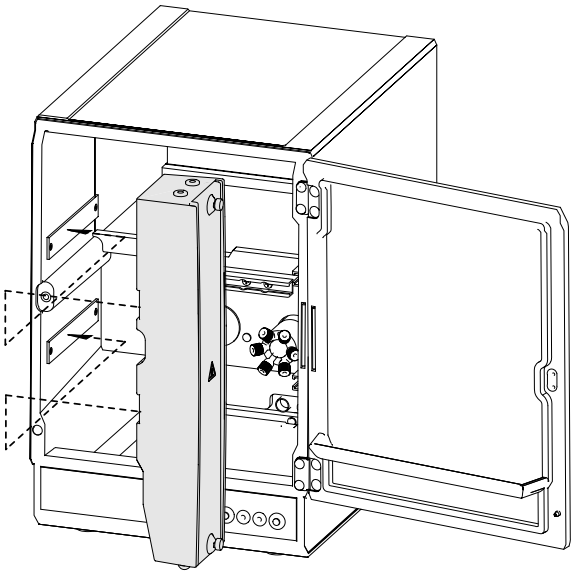


Fig. 10: Install column heating in Separation Center

1 Laying the connection cable

- Screw off the 4 knurled screws **15** from upper rear panel **21** of the 820 IC Separation Center and remove the rear panel (see *Fig. 5*).
- Lead 6.2108.120 Cable through opening **20**.
- Replace rear panel **21** and screw it onto 820 IC Separation Center using the 4 knurled screws **15**.

2 Insert column heating

- Carefully place the column heating inside the Separation Center. If the column has already been inserted in the heating then be careful with the capillaries at feedthroughs **35** and **41** (see *Section 2.9.2*).
- Use magnetic holder **39** and the corresponding counterpieces to attach the column heating to the left-hand inside wall of the Separation Center.

3 Connect column heating

- Insert 6.2108.120 Cable at connection **38** of the column heating (see *Fig. 6*) and at connection **23** on the rear panel of the Separation Center (see *Fig. 5*).

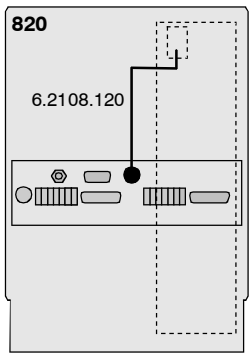


Fig. 11: Connection 820 – column heating

2.2.3 Connection of syringe and aspirating tubing

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

1 Connect syringe

- Push 6.2816.020 Syringe (without needle) as far as it will go into connection socket **13** (left for valve A, right for valve B) (see *Fig. 4*).

2 Lead aspirating tubing to the outside

- Lead the PTFE aspirating tubing **63** (see *Fig. 21*, *Fig. 22* resp. *Fig. 23*) through one of the feedthroughs **14** at the front or side of the separation center (see *Fig. 4* and *Fig. 5*) to the outside.

2.2.4 Connection of the drain tube

The 820 IC Separation Center has a connection at the rear to which a drain tube for discharged liquids can be attached. Proceed as follows:

1 Connect drain tube

- Mount 6.1816.00 Silicone tubing on connection nipple **33** (see *Fig. 5*).

2 Lead drain tube to collecting vessel

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

2.2.5 Connection of the 6.5324.000 Bottle rack (option)

The optional available 6.5324.000 Bottle rack for supply vessels can be placed on top of the IC system tower. The accessories include the supply vessels for eluent (2 L), regeneration solution (1 L) and rinsing solution (1 L). For the connection of the supply capillaries leading to the 818 IC Pump and the suppressor module, see the instructions given on the enclosed leaflet.

2.3 Electrical connection

2.3.1 Connection to 830 IC Interface

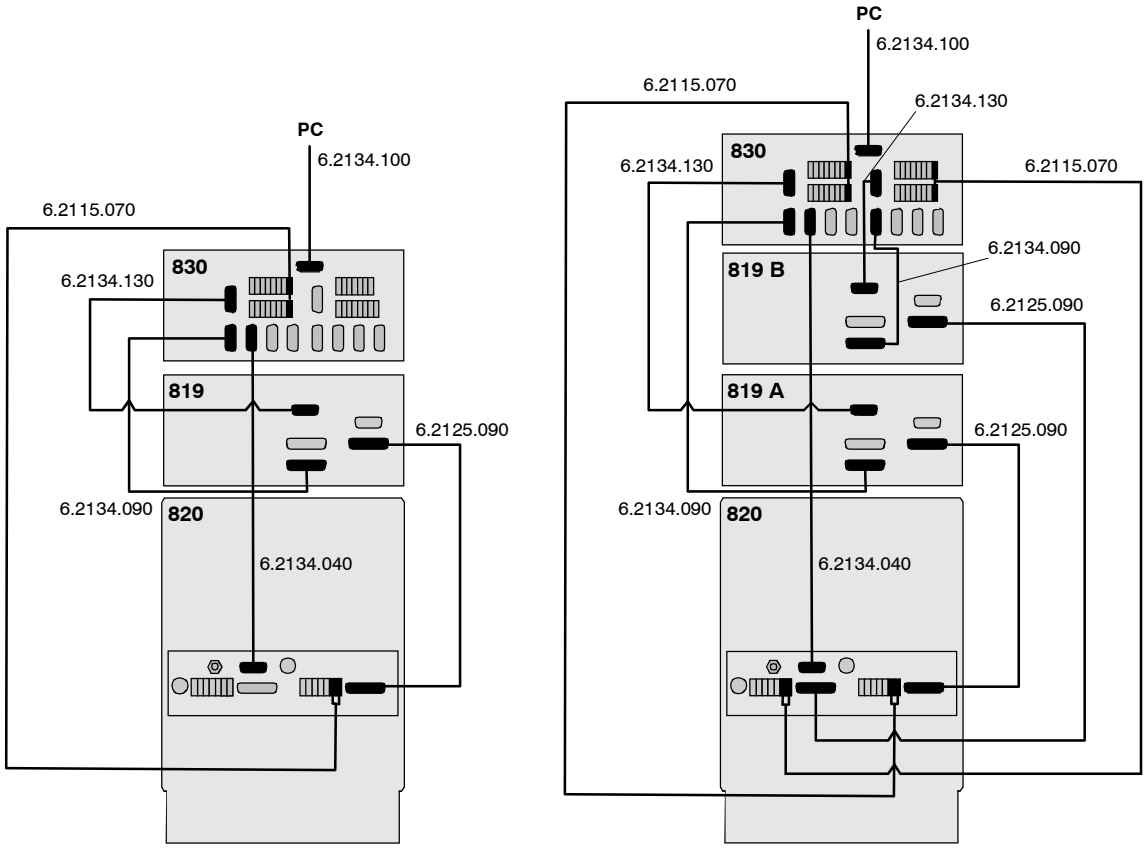
The instruments are controlled via the Metrohm **«IC Net»** software. They are normally connected to a **PC** via an **830 IC Interface**.

The **820 IC Separation Center** can be operated in two different ways. It can operated via the **819 IC Detector**, or included as an independent instrument in the **«IC Net»** via the **830 IC Interface**. Both the cable connections and the installation under **«IC Net»** depend on the type of control.

Control of the Separation Center via 819

Normally the Separation Center is controlled with **«IC Net»** via the time program of the detector. When a system is being set up either **820.02X0 to IC Detector** or **820.03X0 to IC Detector** must be selected for the Separation Center in **«IC Net»**.

In a 2-channel system each channel of the Separation Center is controlled via the time program of the assigned detector.



One-channel system **Two-channel system**

Fig. 12: Connection of 820 via 819 to 830

1 Connect 819 to 820

- Use 6.2125.090 Cable to connect Connection **10** "IC Separation Center" of the **819 IC Detector** to Connection **30** "IC Detector" of the **820 IC Separation Center** (see *Fig. 12*).

For the 2-channel versions 820.0X20 additionally:

- Use a further 6.2125.090 Cable to connect Connection **10** "IC Separation Center" of the **second 819 IC Detector** to Connection **27** "IC Detector" of the **820 IC Separation Center** (see *Fig. 12*).

2 Connect 819 to 830

- Use 6.2134.090 Cable (830 accessory) to connect Connection **9** "RS 232" of the **819 IC Detector** to a free RS 232 interface of **System 1** of the **830 IC Interface** (see *Fig. 12*).
- Use 6.2134.130 Cable to connect Connection **5** "Output" of the **819 IC Detector** to analog connection "Channels 1/2" of **System 1** of the **830 IC Interface** (see *Fig. 12*).

For 2-channel versions 820.0X20 additionally:

- Use a further 6.2134.090 Cable (830 accessory) to connect Connection **9** "RS 232" of the **second 819 IC Detector** to a free RS 232 interface of **System 2** of the **830 IC Interface** (see *Fig. 12*).
- Use 6.2134.130 Cable to connect Connection **5** "Output" of the **819 IC Detector** to analog connection "Channels 3/4" of **System 2** of the **830 IC Interface** (see *Fig. 12*).

3 Connect 820 to 830

This cable connection starts data recording (chromatogram window turns blue) when the valve in the 820 is switched to INJECT via a program command; not necessary if valve is operated manually:

- Use 6.2115.070 Cable to connect the positions **Integr.** and **Start** of terminal block **31** of the **820 IC Separation Center** to the event line **Start** of **System 1** of the **830 IC Interface** (see *Fig. 12*).

For 2-channel versions 820.0X20 additionally:

- Use a further 6.2115.070 cable to connect the positions **Integr.** and **Start** of terminal block **26** of the **820 IC Separation Centers** to the event line **Start** of **System 2** of the **830 IC Interface** (see *Fig. 12*).

*Take care that each of the **RUN** connections at 830 and 820 and the **COM** connections at 830 and 820 are connected to each other.*

4 Connect column heating to 830

For 820.02X0 only:

- Use 6.2134.040 Cable to connect RS 232 interface **22** of the **820 IC Separation Center** to a free RS 232 interface of the **830 IC Interface** (see *Fig. 12*).

Separate control of the Separation Center

Alternatively you have the possibility of controlling the Separation Center with its own time program from **«IC Net»**. This requires you to select the appropriate **820.0210 to Interface**, **820.0220 to Interface**, **820.0230 to Interface**, **820.0310 to Interface**, **820.0320 to Interface** or **820.0330 to Interface** for the Separation Center when setting up the systems in **«IC Net»**.

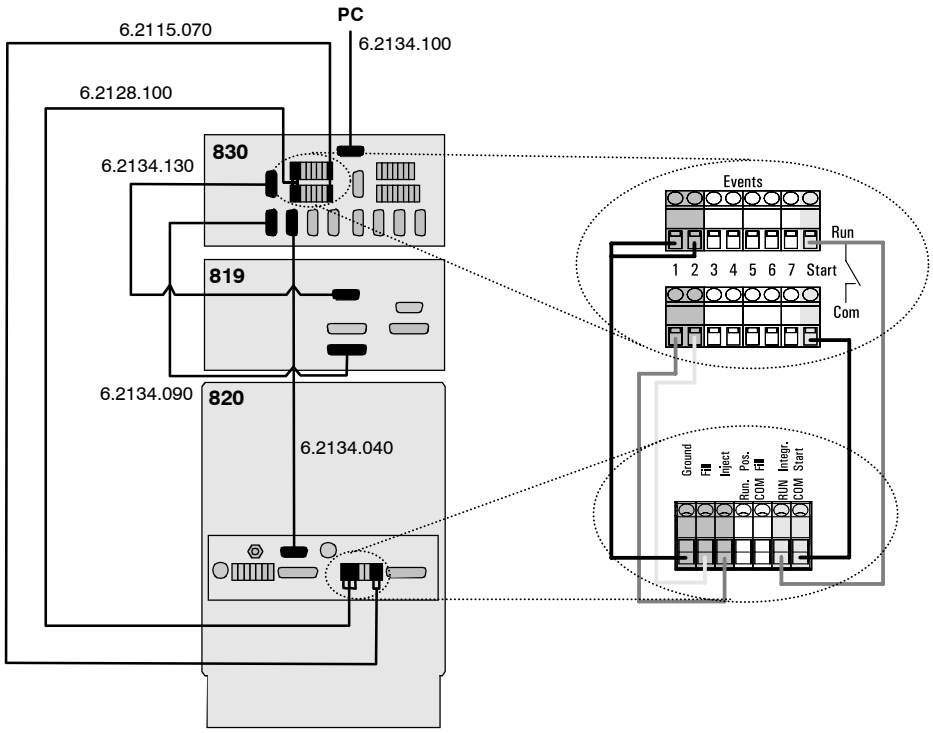


Fig. 13: Connection of 819 and 820 to 830

1 Connect 819 to 830

- Use 6.2134.090 Cable (830 accessory) to connect Connection **9** "RS 232" of the **819 IC Detector** to a free RS 232 interface of **System 1** of the **830 IC Interface** (see *Fig. 13*).
- Use 6.2134.130 Cable to connect Connection **5** "Output" of the **819 IC Detector** to the analog connection "Channels 1/2" of **System 1** of the **830 IC Interface** (see *Fig. 13*).

2 Connect 820 to 830

Control lines to switch the valve to FILL or INJECT:

- Use 6.2128.100 Cable to connect positions **Ground**, **Fill** and **Inject** of terminal block **31** of the **820 IC Separation Center** to two free event lines of **System 1** of the **830 IC Interface** (see *Fig. 13*).

Start data recording:

- Use 6.2115.070 Cable to connect positions **Integr.** and **Start** of terminal block **31** of the **820 IC Separation Center** to the event line **Start** of **System 1** of the **830 IC Interface** (see *Fig. 13*).

This cable connection starts data recording (chromatogram window turns blue) when the valve in the 820 is switched to INJECT via a program command; not necessary if valve is operated manually.

3 Connect column heating to 830

For 820.02X0 only:

- Use 6.2134.040 Cable to connect RS 232 interface **22** of the **820 IC Separation Center** to a free RS 232 interface of the **830 IC Interface** (see *Fig. 13*).

If a 2-channel system is used then the cable connections for the second detector and the second valve are made in a similar way.

2.3.2 Connection to PC

The 819 IC Detector can also be connected directly to a PC. In this case the 820 IC Separation Center must then be connected to the detector and controlled via its time program. In addition a 771 IC Compact Interface is required; this is included between the analog output of the detector and the RS 232 interface of the PC and carries out the A/D-conversion of the detector signal. If present, the column heating is also connected directly to an RS 232 interface of the PC.

This means that three free RS 232 interfaces are required at the PC for controlling the detector and Separation Center. If a complete IC system is to be operated directly from a PC then at least four free RS 232 interfaces are required (2 for detector, 1 for column heating and 1 for the high-pressure pump) at the PC.

Always switch off the 819 IC Detector, column heating and PC before connecting up the instruments with cables.

1 Connect 819 to 820

- Use 6.2125.090 Cable to connect Connection **10** "IC Separation Center" of the **819 IC Detector** to Connection **30** "IC Detector" of the **820 IC Separation Center** (see *Fig. 14*).

2 Connect 819 to PC

- Use 6.2125.110 Cable to connect Connection **9** “RS 232” of the **819 IC Detector** to a free RS 232 interface at the **PC** (see *Fig. 14*).

3 Connect 819 and 820 to 771

- Use 6.2134.140 Cable to connect Connection **5** “Output” of the **819 IC Detector** to Connection “Channel 1” of the **771 IC Compact Interface** (see *Fig. 14*). The cable end with the marking “Analog” is inserted into the detector.
- Attach the two cable ends “RUN” and “COM” of 6.2134.140 Cable to the positions **Integr.** and **Start** of terminal block **27** of the **820 IC Separation Center** (see *Fig. 14*).

3 Connect 771 to PC

- Use 6.2134.100 Cable to connect Connection “RS 232, PC” of the **771 IC Compact Interface** to a free RS 232 interface at the **PC** (see *Fig. 14*).

4 Connect column heating to PC

For 820.02X0 only:

- Use 6.2134.040 Cable to connect RS 232 interface **22** of the **820 IC Separation Center** to a free RS 232 interface at the **PC** (see *Fig. 14*).

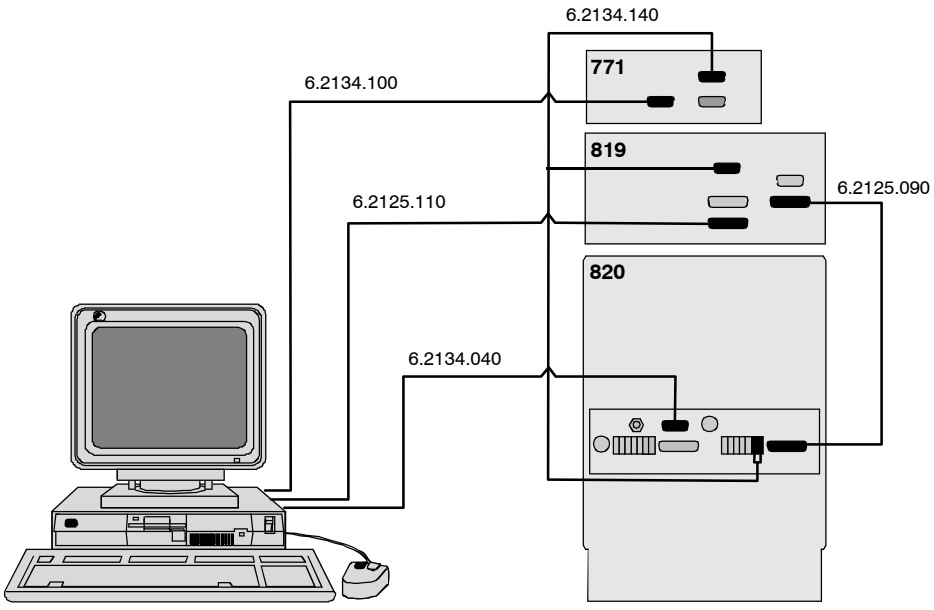


Fig. 14: Connection of 819 and 820 to a PC

If a 2-channel system is used then the cable connections for the second detector and second valve are made in a similar way.

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!

2.4.1 819 IC Detector

Setting the mains voltage

Before switching on the 819 IC Detector for the first time, check whether the mains voltage set on the instrument (see *Fig. 15*) 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 **3** of the 819 IC Detector.

2 Remove fuse holder

Using a screwdriver, loosen fuse holder **4** below the mains connection plug **3** and take out completely.

3 Change and check fuse if necessary

Carefully take the fuse installed for the desired mains voltage out of fuse holder **4** 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 0.63 A (slow blow) Metrohm-No. U.600.0014

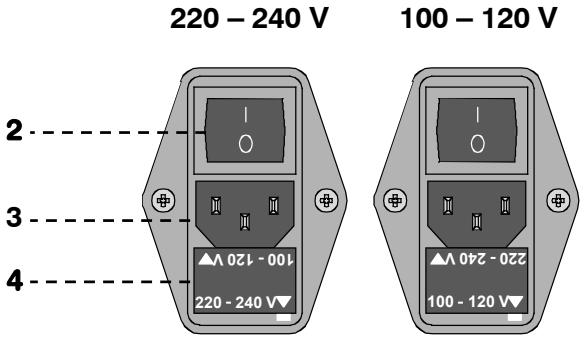
220…240 V 0.315 A (slow blow) Metrohm-No. U.600.0011

4 Insert fuse

Change fuse if necessary and reinsert in fuse holder **4**.

5 Install fuse holder

Depending on the desired mains voltage, insert fuse holder **4** in the 819 IC Detector 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 *Fig. 15*).



2	**Mains switch**
3	**Mains connection plug**
4	**Fuse holder**

Fig. 15: Setting the mains voltage

Fuses

One of the two fuses 0.63 A/slow-blow for 100…120 V or 0.315 A/slow-blow for 220…240 V is installed in fuse holder **4** of the 819 IC Detector as standard.

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

For checking or changing fuses, process as described above.

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 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).

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

Plug the mains cable into mains connection plug **3** of the 819 IC Detector (see *Fig. 3*).

On/off switching of the instrument

The 819 IC Detector is switched on and off using mains switch **2** (see *Fig. 3*). When the instrument is switched on the mains pilot lamp **1** lights up.

2.4.2 820 IC Separation Center

If an 820 IC Separation Center is included in a modular IC system via an 819 IC Detector then the power supply for the Separation Center is provided by the 6.2125.090 Cable (see *Fig. 12* and *Fig. 14*).

If the 820 IC Separation Center is controlled separately (see *Fig. 13*) then the optionally available 6.2152.000 Power Supply must be used and inserted in Connection **25** (see *Fig. 5*).

2.4.3 Column heating

The column heating contained in the 2.820.02X0 versions has its own power supply. You must connect the 6.2152.010 Power Supply contained in the standard equipment to Connection **24** on the rear panel of the Separation Center (see *Fig. 5*).

2.5 Software-installation

The PC program **«IC Net 2.3»** is required for the operation of 819 IC Detector and 820 IC Separation Center. This program runs under Windows 2000 and Windows XP operating systems and is installed according to *Section 1.5.2* of the **Instructions for Use 8.110.8283** from the Metrodata software «**IC Net 2.3**».

The installation of the instruments is described in *Section 6.1.1* / *Section 6.1.2* of the **Instructions for Use 8.110.8283** from the Metrodata software «**IC Net 2.3**». For the settings of the 819 IC Detector see *Section 6.4*, for the settings of 820 Separation Center see *Section 6.8*.

If the Separation Center is to be controlled via the time program of the detector (see *Fig. 12* and *Fig. 14*) then during installation the Separation Center must be installed appropriately as **820.02X0 to IC Detector** or **820.03X0 to IC Detector**. If the 820 IC Separation Center is to be controlled separately (see *Fig. 13*), then it must be installed as **820.0210 to Interface**, **820.0220 to Interface**, **820.0230 to Interface**, **820.0310 to Interface**, **820.0320 to Interface** or **820.0330 to Interface**.

2.6 Capillary connections

Some of the connections under high pressure between the feed pump and the detector block must be set up by the user. For that the **6.1831.010 PEEK capillary** (i.d. = 0.25 mm, o.d. = $^1/_{16}$", length = 3 m) and the **6.2744.010 Compression fittings** supplied in the accessories of the 820 IC Separation Center can be used. These capillaries can be used in the pressure range from 0…30 MPa (0…300 bar).

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

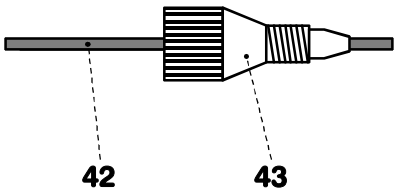


Fig. 16: Connect capillaries

42 PEEK capillary6.1831.010

43 Compression fitting 6.2744.010

For the connection of 6.1831.010 PEEK capillaries or of the 6.1834.000 PTFE aspirating tubing, the supplied **6.2744.010 PEEK Compression fittings** are used. It is best to proceed as follows:

1 Mount compression fitting

Slide a compression fitting **43** (6.2744.010) over the end of the capillary **42** to be fastened as shown in *Fig. 16*.

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 **43** by hand (never use tools).

2.7 Connection of 818 IC Pump

2.7.1 Electrical connection

For operation of the 819 IC Detector and 820 IC Separation Center you can use any commercial HPLC pump. However, as the attainable sensitivity depends to a large extent on the quality of the pump, Metrohm advises use of the **818 IC Pump**, which has been specially developed for the demands of ion chromatography and has minimal pump pulsation and an outstanding flow constancy.

Startup and operation of the 818 IC Pump are described in the *818 Instructions for Use*. The eluent, which must be degassed and filtered (cf. *Section 4.1.3*), is selected on the basis of the separating column installed in the 820 IC Separation Center and the current separation problem.

The **818 IC Pump** is normally integrated into the modular IC system via 830 IC Interface. Connect the RS 232 interface **17** of the 818 IC Pump with a free RS 232 interface at the 830 IC Interface using the 6.2134.080 or 6.2134.090 cable according to the figure below. To ensure proper functioning of the communication between the 830 IC Interface and 818 IC Pump, the sliding switch **16** on the IC pump must be set to "RS 232".

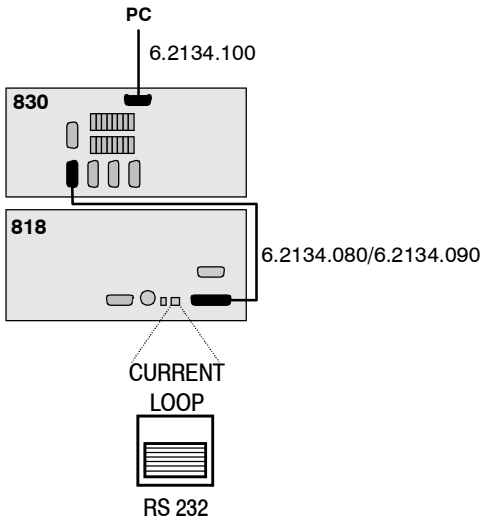


Fig. 17: Connection of 818 IC Pump to 830 IC Interface

2.7.2 Pulsation dampener

To protect the column material against pressure drops caused by the injector, the use of a pulsation dampener connected between the pump and the injection valve of the 820 IC Separation Center is recommended. The optional **6.2620.150 Pulsation dampener** (see *Section 6.3*) is very well suited to this purpose.

The metal-free 6.2620.150 Pulsation Dampener is supplied fully assembled and has two connections for capillaries, for which either the con-

nectors supplied or two 6.2744.010 PEEK compression fittings can be used. The flow direction is arbitrary. The pulsation dampener is positioned in the interior of the 820 IC Separation Center on the base below the injection valve (see *Fig. 21*, *Fig. 22*, *Fig. 23*, resp. *Fig. 25*).

The pulsation dampener is filled with isopropanol when new. Rinse your IC system carefully after the first installation of a new pulsation dampener.

2.7.3 Filter unit PEEK

The **6.2821.120 Filter unit PEEK 47** supplied (see *Fig. 18*) serves to avoid contamination of the piston seals by abrasive particles and can be used in the pressure range 0…30 MPa (0…300 bar). The filter unit consists of the housing **44**, the filter **45** and the connector **46** to be screwed into the housing **44**. For the connection of capillaries **42**, PEEK compression fittings **43** (6.2744.010) must be used.

New filter **45** are available as an option with the ordering number 6.2821.110 (10 pieces).

For the connection of the filter unit, please note the flow direction arrow printed on the housing.

The filter unit is filled with isopropanol when new. Rinse your IC system carefully after the first installation of a new filter unit.

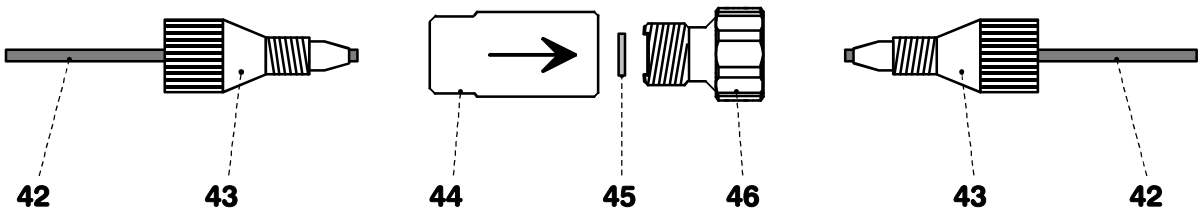


Fig. 18: Filter unit PEEK (6.2821.120)

42 PEEK capillary (6.1831.010)

43 Compression fitting (6.2744.010)

44 Filter housing

45 Filter 6.2821.130

46 Filter connector

2.7.4 Connection to injection valve

It is recommended to use 6.1831.010 PEEK capillaries, a 6.2620.150 Pulsation dampener (see *Section 2.7.2*) and a 6.2821.120 Filter unit PEEK (see *Section 2.7.3*) to connect the 818 IC Pump to the injection valve of the 820 IC Separation Center. Proceed as follows:

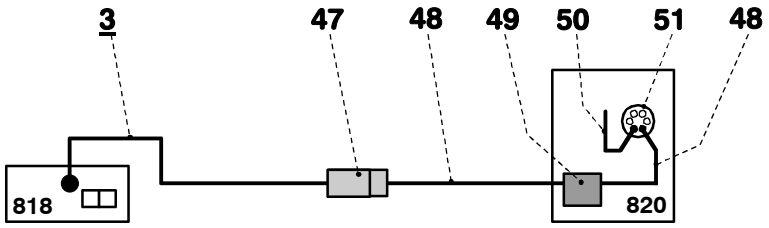


Fig. 19: Connection to injection valve

3 **Connection capillary**
to 818 IC Pump
PEEK capillary (6.1831.010)

47 **Filter unit PEEK (6.2821.120)**

48 **PEEK capillary (6.1831.010)**

49 **Pulsation dampener 6.2620.150**

50 **Column connection capillary**
PEEK capillary (6.1831.010)

51 **Injection valve**

1 Connection to 818 IC Pump

- Cut connection capillary **3** (6.1831.010 PEEK capillary) to the required length and equip it with compression fittings.
- Attach connection capillary **3** to the upper connection of the purge valve (see *Fig. 1 818 Instructions for Use*).

2 Connection of filter unit PEEK

- Attach the other end of connection capillary **3** at the filter housing **44** of the filter unit **47** (see *Fig. 18*).
- Connect a PEEK capillary 6.1831.010 cut to the required length and equipped with connectors to the filter connector **46** of the filter unit **47**.

3 Installation of the capillary in the IC Separation Center

- Unscrew the four knurled screws **15** of the bottom rear panel **28** of the 820 IC Separation Center and remove rear panel (see *Fig. 5*).
- Insert PEEK capillary **48** from the back into the inner compartment of the IC Separation Center.
- Install rear panel **28** so that the capillary is positioned in opening **34** „Inlet A“ or **32** „Inlet B“ and screw on with the four knurled screws **15**.

4 Connection of the pulsation dampener

- Procedure see section 2.7.2.

5 Connection to the injection valve

- Connect PEEK capillary **48** to pulsation dampener **49** (see *Section 2.7.2*). Using another PEEK capillary **48**, connect pulsation dampener to connection „**5**“ (see *Fig. 28*) of injection valve **51**.

6 Mount column connection capillary

This step is only necessary, if no column heating is used.

- Connect column connection capillary**50** (ca. 20 cm of 6.1831.010 PEEK capillary) to connection „**4**“ (see *Fig. 28*) of injection valve **51**.

2.8 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 **50** mounted to the injection valve (see *Section 2.6*).
- Screw column connection capillary **50** to precolumn.
- Cut off a small piece, ca. 5 cm, from the PEEK capillary 6.1831.010 and fit compression fittings to both ends (see *Section 2.6*).
- 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 818 IC Pump in «IC Net» and rinse precolumn for ca. 10 min with eluent.
- Switch off 818 IC Pump.

2.9 Separating columns and suppressor module

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

The separating columns currently available from Metrohm and precolumns 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.

2.9.2 Installing a separating column in the column heating

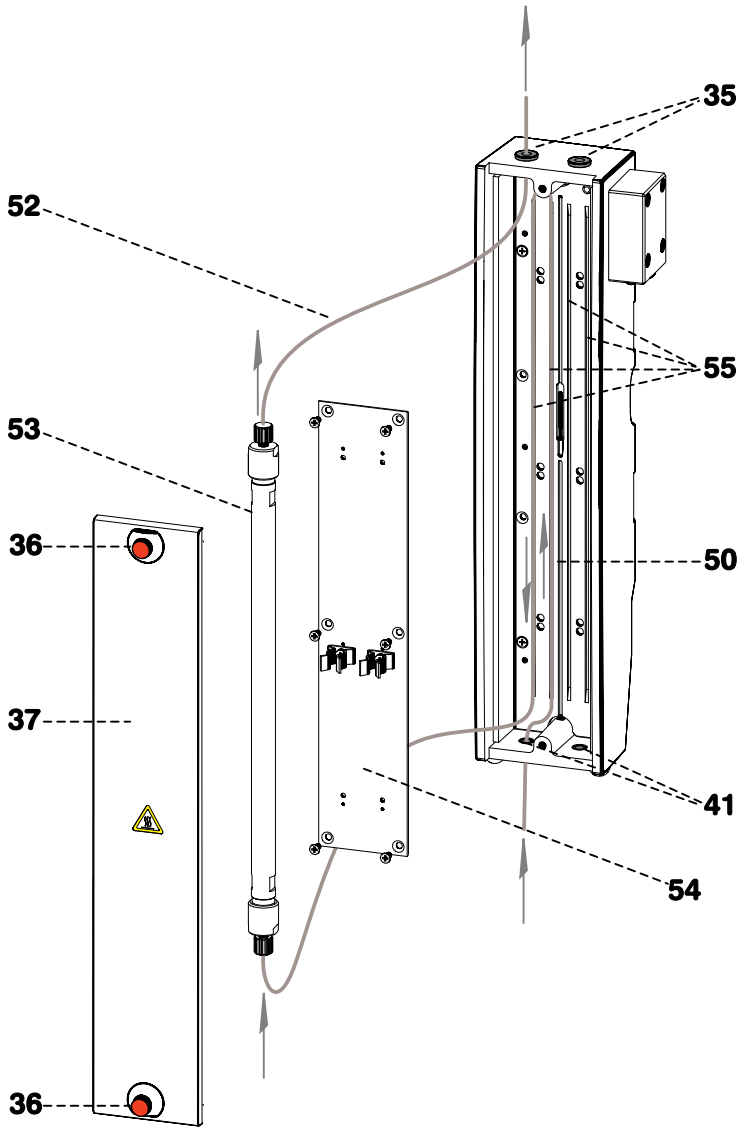


Fig. 20: Insert column in column heating

35 Feedthrough
for the capillary from separating column to detector

36 Knurled screw
for fastening the heater cover **37**

37 Cover of the column heating

41 Feedthrough
for column connection capillary **50**.

50 Column connection capillary
PEEK capillary 6.1831.010

52 Capillary to detector block
PEEK capillary 6.1831.010

53 Separating column

54 Holder plate
for separating column

55 Capillary prewarming
for column connection capillary **50**.

1 Open column heating

- Open the two knurled screws **36** and remove cover **37** of the column heating.

2 Prepare column heating

- Unscrew the six screws of holder plate **54** and remove the holder plate from the column heating.
- Lead column connection capillary **50** (approx. 1 m PEEK-Capillary 6.1831.010) through feedthrough **41** in the column heating and place in the recesses in capillary prewarmer **55** as shown in *Fig. 20*.
- Then screw down holder plate **54** again with the six screws.
- Cut off a further piece of 6.1831.010 PEEK Capillary, lead this Capillary **52** out through feedthrough **35** and provide its inner end with a 6.2744.010 Compression fitting **43**.

*If not much space is available then the **6.2744.070 PEEK compression fitting short** contained in the standard equipment can also be used for attaching the PEEK capillary.*

3 Insert separating column

- Press separating column **53** into the holding clips and fasten the column connection capillary **50** to the separating column inlet (bottom) with a 6.2744.010 Compression fitting **43**.
- Fasten capillary **52** from the detector to the outlet of the separating column (top) with a 6.2744.010 Compression fitting **43**.

4 Close column heating

- Screw down cover **37** on to the column heating again with the two knurled screws **36**.

2.9.3 Selection of 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

Depending on the instrument version, the following sample loops are installed in the 820 IC Separation Center:

Version	*Valve*	*Sample loop*	*Volume*
2.820.0X10	A	6.1825.210 (PEEK)	20 µL
2.820.0X20	A	6.1825.220 (PEEK)	100 µL
	B	6.1825.210 (PEEK)	20 µL
2.820.0X30	A	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 6.3.1*).

2.9.4 General information on suppressor module

The **Metrohm Suppressor Module MSM** for chemical suppression installed in the 2.820.0X30 IC Separation Center 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 2.9.7 according to the scheme shown in Fig. 23.

For operation of the suppressor module, a **two-channel peristaltic pump** is needed which conveys the regeneration solution (normally **50 mmol/L H_2SO_4**) and the rinsing solution (normally **dist. H_2O**) to the suppressor units. We advise working with a **flow rate of 0.5 mL/min**.

*The **2.833.0010 IC Liquid Handling Pump Unit** is available from Metrohm as an option. Two lengths of pump tubing (6.1826.050) are enclosed with this pump (flow rate 0.5 mL/min). Startup and operation of the 833 Pump Unit is described in the Instructions for Use enclosed with the pump.*

The three inlets and outlets numbered 1...3 on the suppressor module each have 2 permanently mounted PTFE capillaries, which must be connected as described in *Section 2.9.7* (see *Fig. 23* und *Fig. 24*).

To avoid contamination of the suppressor module by foreign particles or bacterial growth, it is advantageous to install an **in-line filter** between the 833 IC Liquid Handling Pump Unit and the suppressor module. For this the two **6.2821.120 Filter units PEEK** (mounting see *Fig. 18 Section 2.7.3*) supplied with the 2.833.0010 IC Liquid Handling Pump Unit should be used.

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

2.9.5 One-channel system without suppressor module

Make sure that the connection separating column outlet – detector inlet is as short as possible in order to prevent unnecessary peak widening after the separation.

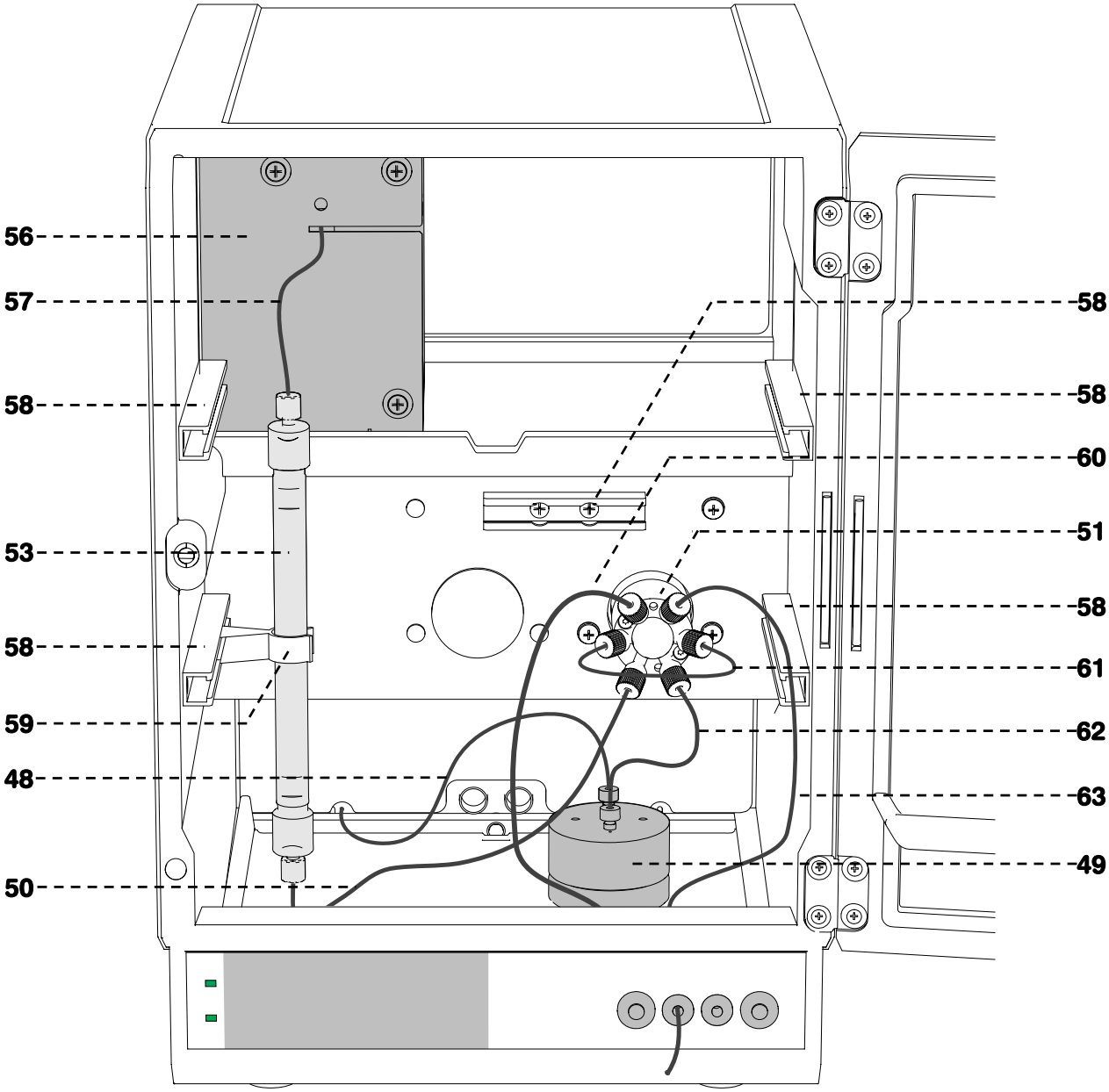


Fig. 21: Interior of the 2.820.0310 Separation Center

48 **PEEK capillary (6.1831.010)** to 818 IC Pump	**50** **Column connection capillary** PEEK capillary 6.1831.010
49 **Pulsation dampener (6.2620.150)**	**51** **Injection valve**

53 **Separating column**

56 **Detector block**

57 **Inlet capillary for detector block**
fixed mounting

58 **Mounting rail**

59 **Column holder (6.2027.0X0)**

60 **Capillary for syringe 13**
PEEK capillary, fixed mounting

61 **Sample loop (6.1825.210)**
20 µL, PEEK, fixed mounting

62 **Inlet capillary for injector**
PEEK-Capillary 6.1831.010

63 **PTFE aspirating tube**
fixed mounting

With the one-channel system without suppressor module, the IC separating column is installed in the 2.820.0X10 IC Separation Center as follows (see *Fig. 21*):

1 Connect column to injector

- Remove end caps from column **53**.
- *without column heating:*
  Screw inlet end of separating column **53** (note flow direction) to column connection capillary **50** mounted on the injector.
- *with column heating:*
  Prepare column heating according to *Section 2.9.2* and screw column connection capillary **50** (see *Fig. 20*) with a compression fitting to injection valve **51**.
- *With precolumn:*
  Install precolumn according to the supplied leaflet between inlet of the separating column and the injection valve.

2 Rinse column

- Place a beaker beneath the column outlet.
- Start 818 IC in «IC Net» with suitable flow (see *leaflet of the column*) and rinse column for ca. 10 min with eluent.
- Stop 818 IC Pump.

3 Connect column to detector block

- *without column heating*
  Screw outlet end of separating column **53** to the inlet capillary **57** permanently mounted on the detector block **56**.
- *with column heating*
  Connect outlet end of separating column **52** (see *Fig. 20*) with coupling (6.2744.040) to the inlet capillary **57** permanently mounted on the detector block **56**.

4 Fix column

- *without column heating*
  Insert one or two column holders **59** (6.2027.030, 6.2027.040 or 6.2027.050) in the mounting rails **58** and fasten separating column in the column holder.
- *with column heating*
  Insert column heating according to *Fig. 10* into the Separation Center.

2.9.6 Two-channel system without suppressor module

Make sure that the connection separating column outlet – detector inlet is as short as possible in order to prevent unnecessary peak widening after the separation.

With the two-channel system without suppressor module (2.820.0X20 IC Separation Center), the first IC separating column is connected on the left side to injection valve A and detector block A as with the one-channel system (see *Section 2.9.5* und *Fig. 21*). The second column is connected on the right side to injection valve B and detector block B in an analogous manner.

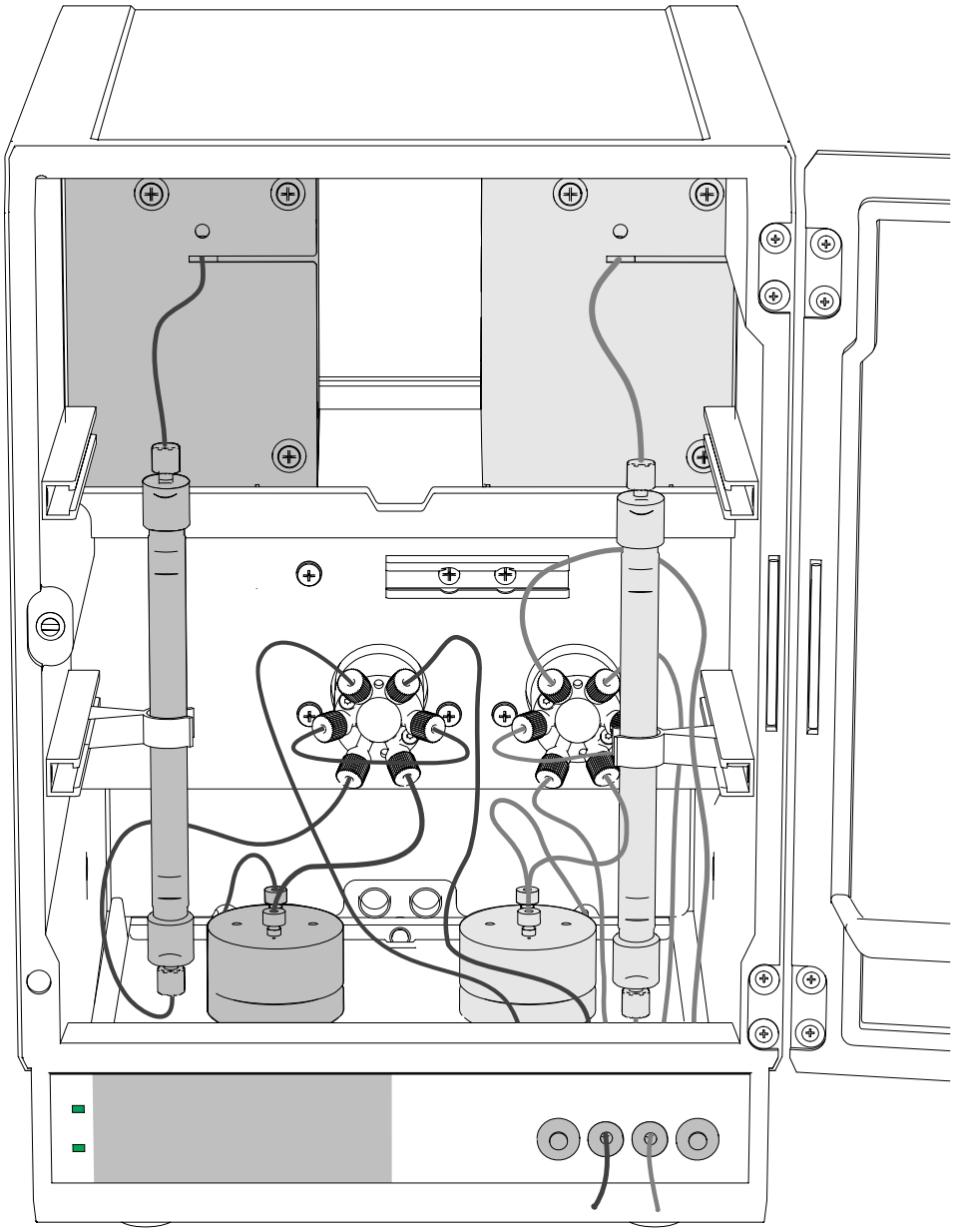


Fig. 22: Interior of the2.820.0320 Separation Center

2.9.7 One-channel system with suppressor module

Make sure that the connection separating column outlet – detector inlet is as short as possible in order to prevent unnecessary peak widening after the separation.

In the case of the one-channel system with suppressor module, first the IC separating column is installed in the 2.820.0X30 IC Separation Center (see *Fig. 23*) and then the suppressor module is connected to the 833 IC Liquid Handling Pump Unit needed for operation (see *Fig. 24*). Proceed as follows:

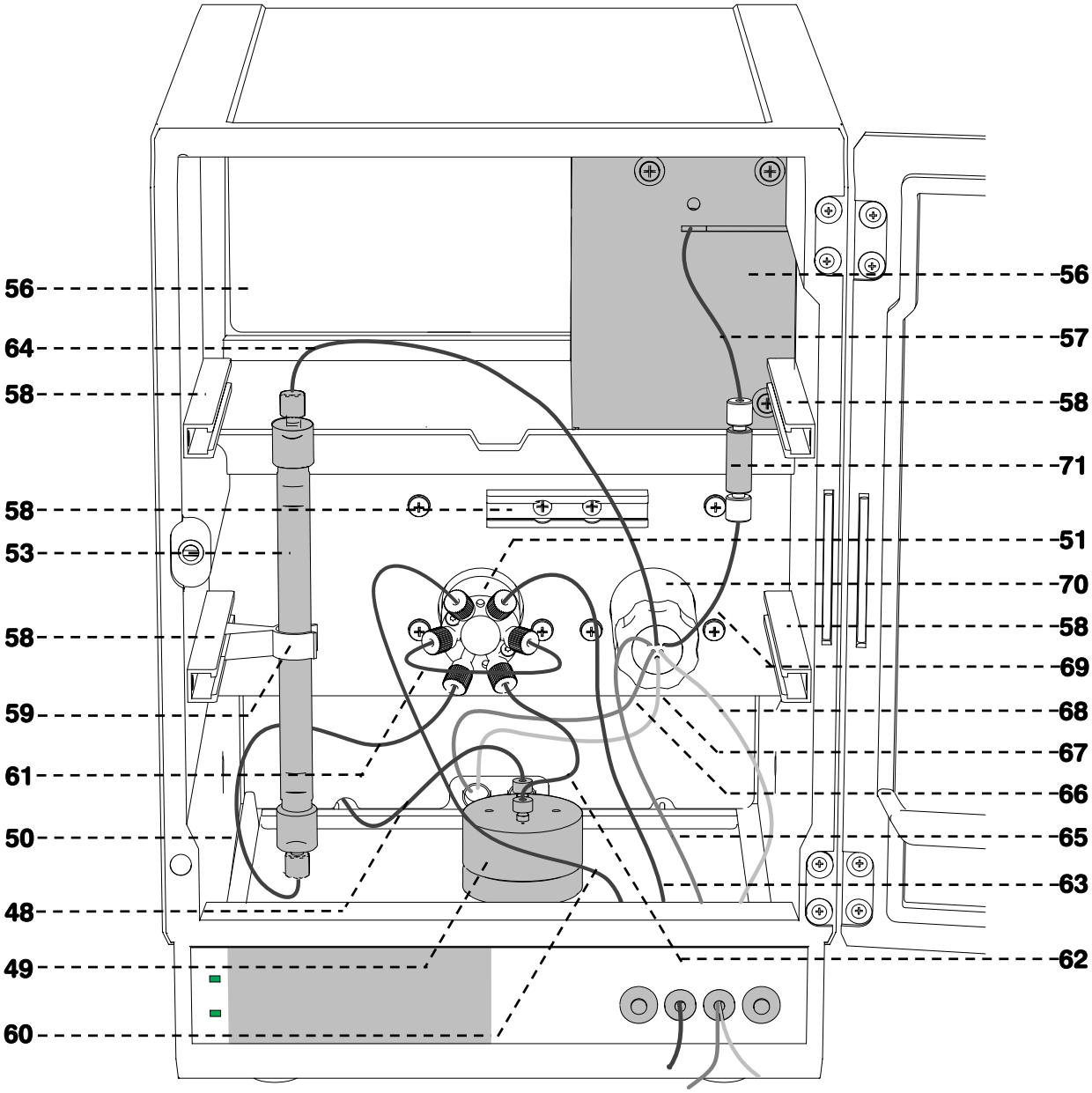


Fig. 23: Interior of 2.820.0330 Separation Center

48 **PEEK capillary (6.1831.010)**
to 818 IC Pump

49 **Pulsation dampener (6.2620.150)**

50 **Column connection capillary**
PEEK capillary 6.1831.010

51 **Injection valve**

53 **Separating column**

56 **Detector block**

57 **Inlet capillary for detector block**
fixed mounting

58 **Mounting rail**

59 **Column holder (6.2027.0X0)**

60 **Capillary for syringe 13**
PEEK capillary, fixed mounting

61 **Sample loop (6.1825.210)**
20 µL, PEEK, fixed mounting

62 **Inlet capillary for injector**
PEEK-Capillary 6.1831.010

63 **PTFE aspirating tube**
fixed mounting

64 **Suppressor inlet capillary for eluent**

65 **Suppressor inlet capillary for H_2SO_4**

66 **Suppressor outlet capillary for H_2SO_4**

67 **Suppressor outlet capillary for H_2O**

68 **Suppressor inlet capillary for H_2O**

69 **Suppressor outlet capillary for eluent**

70 **Suppressor module**

71 **Coupling (6.2744.040; PEEK)**

1 Connect column to injector

- Remove end caps from column **53**
- *without column heating:*
  Screw inlet end of separating column **53** (note flow direction) to column connection capillary **50** mounted on the injector.
- *with column heating:*
  Prepare column heating according to *Section 2.9.2* and screw column connection capillary **50** (see *Fig. 20*) with a compression fitting to injection valve **51**.
- *With precolumn:*
  Install precolumn according to the supplied leaflet between inlet of the separating column and the injection valve.

2 Rinse column

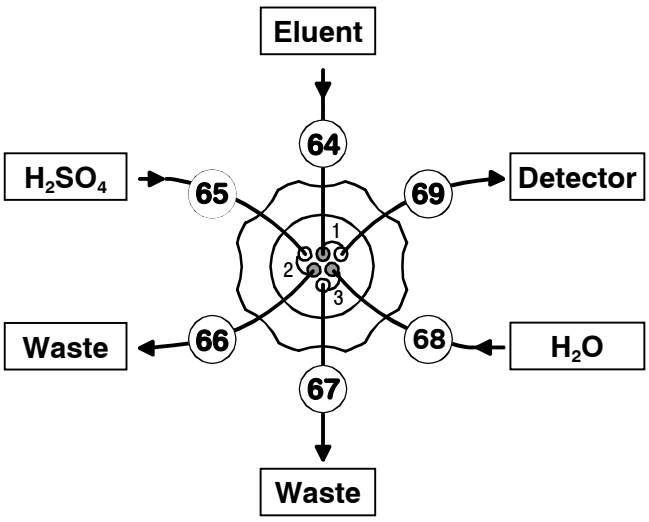
- Place a beaker beneath the column outlet.
- Start 818 IC Pump in «IC Net» with suitable flow (see *leaflet of the column*) and rinse column for ca. 10 min with eluent.
- Stop 818 IC Pump.

3 Connect column to suppressor module (Suppressor connection 1)

- Cut inlet capillary **64** (marked with "Eluent") of suppressor module **70** to the required length. Use the 6.2126.080 Capillary cutter available as an option.
- *without column heating*
  Screw inlet capillary **64** on to the outlet end of separating column **53** using a 6.2744.010 Compression fitting.
- *with column heating*
  Connect capillary **52** at the outlet of the separating column (see *Fig. 20*) to the inlet capillary **64** using the 6.2744.040 Coupling.

4 Fix column

- *without column heating*
  Insert one or two column holders **59** (6.2027.030, 6.2027.040 or 6.2027.050) in the mounting rails **58** and fasten separating column in the column holder.
- *with column heating*
  Insert column heating according to *Fig. 10* into the Separation Center.



64	**Suppressor inlet capillary for eluent**
65	**Suppressor inlet capillary for H_2SO_4**
66	**Suppressor outlet capillary for H_2SO_4**
67	**Suppressor outlet capillary for H_2O**
68	**Suppressor inlet capillary for H_2O**
69	**Suppressor outlet capillary for eluent**

Fig. 24: Suppressor module connections

5 Connect suppressor module to detector block (Suppressor connection 1)

- Cut outlet capillary **69** (marked with “Detector”) of suppressor module **70** to the required length. Use the 6.2126.080 Capillary cutter available as an option.
- Screw outlet capillary 69 on to coupling 71 by using a 6.2744.010 Pressure screw.
- Screw inlet capillary **56** of detector block **57** on to the other end of coupling **71**.

6 Prepare 833 IC Liquid Handling Pump Unit

- Mount the two lengths of **6.1826.050** Pump tubing (**white-yellow** stopper) with aspirating tube **16** and filter unit PEEK **22** 6.2821.120 as described in *Section 3.2, Fig. 7* of the *833 Instructions for Use*.
  For mounting of the filter unit PEEK see also section 2.7.3.

Pump tubing is a consumable whose working life depends on the contact pressure. This is why when the pump is switched off for a long time, the tubing cassette should be lifted by fully loosening spring lever on the right-hand side (in this way the correctly set optimal contact pressure is retained).

7 Suppressor connection 2: H_2SO_4

- Pull inlet capillary **65** (marked with "H_2SO_4") by hand as far as required through one of the feedthroughs **14** to the outside (see *Fig. 23* und *Fig. 24*).
- Screw the filter unit PEEK on to PEEK coupling **21** (6.2744.160) as described in *Section 3.2* of *833 Instructions for Use* at the outlet end of the **first** piece of pump tubing **19**.
- Fasten inlet capillary **65** (**23**) to the outlet of filter unit PEEK (6.2821.120) **47** by using a compression fitting screw (see *Fig. 7* of *833 Instructions for Use*).
- At the inlet end of the **first** piece of tubing **19** fasten a suitably long piece of PTFE tubing **16** (6.1803.020) to coupling **18** (6.2744.034) by using a compression fitting (6.2744.010) (see *Fig. 7* of *833 Instructions for Use*).
- Immerse the other end of the aspiration tubing in a container with regeneration solution (normally 50 mmol/L H_2SO_4) and fix it in position.
- Pull outlet capillary **66** of the suppressor module (marked with "Waste") through opening **18** on the rear panel, lead it into a sufficiently large waste bottle and fix it in position.

8 Suppressor connection 3: H_2O

- Pull inlet capillary **68** (marked with "H_2SO_4") by hand as far as required through one of the feedthroughs **14** to the outside (see *Fig. 23* und *Fig. 24*).
- Screw the filter unit PEEK on to PEEK coupling **21** (6.2744.160) as described in *Section 3.2* of *833 Instructions for Use* at the outlet end of the **second** piece of pump tubing **19**.
- Fasten inlet capillary **68** (**23**) to the outlet of filter unit PEEK (6.2821.120) **47** by using a compression fitting screw (see *Fig. 7* of *833 Instructions for Use*).
- At the inlet end of the **second** piece of tubing **19** fasten a suitably long piece of PTFE tubing **16** (6.1803.020) to coupling **18** (6.2744.034) by using a compression fitting (6.2744.010) (see *Fig. 7* of *833 Instructions for Use*).
- Immerse the other end of the aspiration tubing in a container with regeneration solution (normally 50 mmol/L H_2SO_4) and fix it in position.
- Pull outlet capillary **67** of the suppressor module (marked with "Waste") through opening **18** on the rear panel, lead it into a sufficiently large waste bottle and fix it in position.

2.9.8 Two-channel system with suppressor module

Make sure that the connection separating column outlet – detector inlet is as short as possible in order to prevent unnecessary peak widening after the separation.

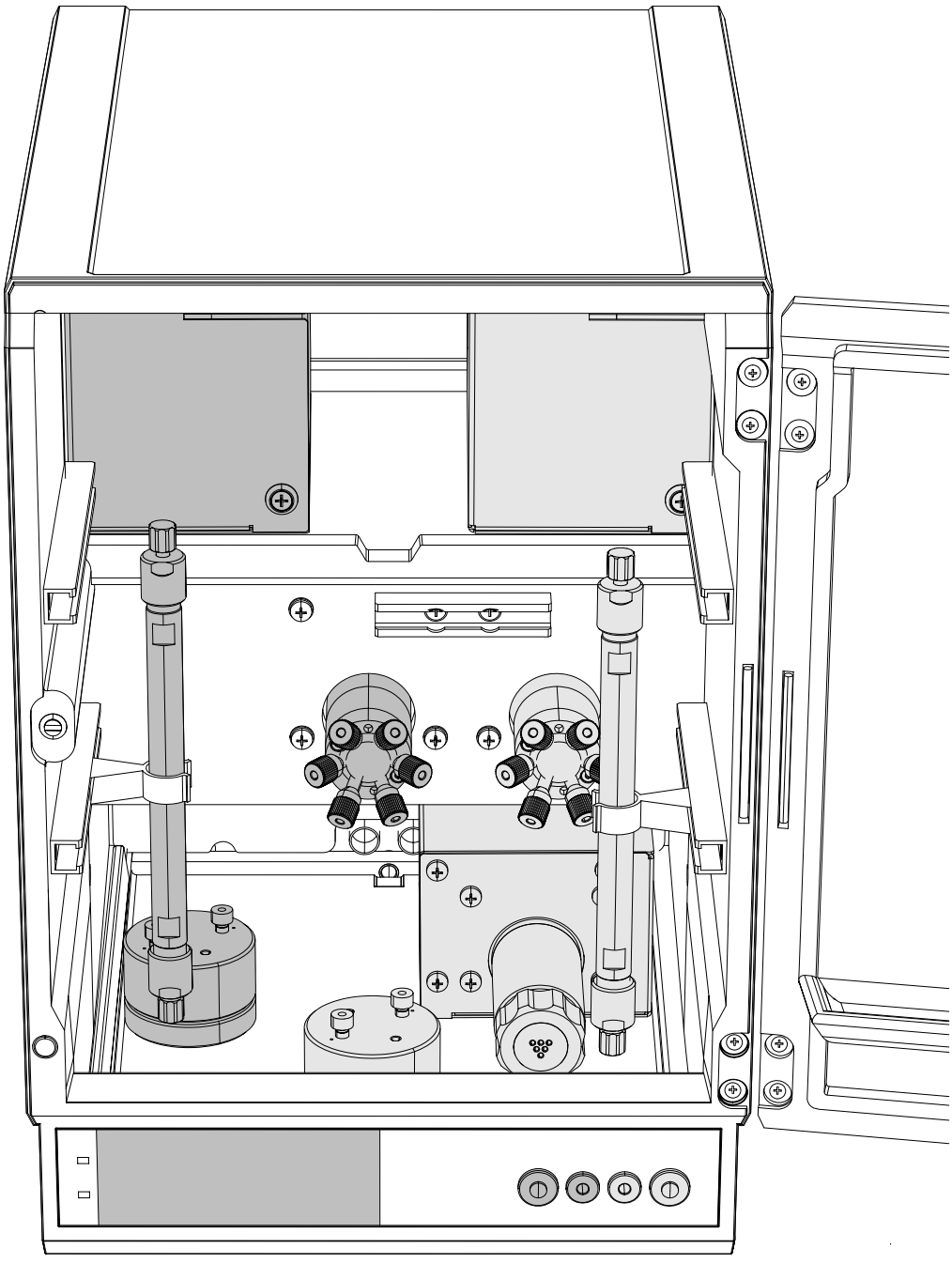


Fig. 25: Interior of 2.820.0320 Separation Center with suppressor module

In order to operate a 2-channel Separation Center with chemical suppression a 2.833.0020 IC Liquid Handling Suppressor Unit is additionally required. For this reason the 1.753.0100 Suppressor Module of the 833 IC Liquid Handling Suppressor Unit is placed on the floor of the inner compartment of the Separation Center (see *Fig. 25*).

In a 2-channel system with suppressor module the first IC separating column, just like in a 1-channel system, is connected on the left-hand side to injection valve A and detector block A (similar to *Section 2.9.5*, *Fig. 21*). Components of this channel are shown in dark gray in *Fig. 25*.

The second column, just like in a 1-channel system with suppressor module (see *Section 2.9.7* and *Fig. 23*), is connected on the right-hand side to injection valve B and detector block B. The installation of the 833 IC Liquid Handling Suppressor Unit is described in the *833 Instructions for Use*; connection to the 2.820.0X20 Separation Center is described there in detail in *Section 5*. Components of this channel are shown in light gray in *Fig. 25*.

2.9.9 Leak testing and conditioning

Before sample solutions can be injected in the IC system, the entire system must be tested for leaks and then conditioned with eluent until the baseline is stable. Proceed as follows:

1 Switch on instruments

- Switch on 818 IC Pump at mains switch.
- Switch on 819 IC Detector at mains switch **2**.
- The 820 IC Separation Center is normally supplied via the 819 IC Detector, see also *Section 2.4.2*.
- If present, switch on 833 IC Liquid Handling Pump Unit at the mains switch.
- If present, switch on 830 IC Interface at the mains switch.
- Switch on PC and start «IC Net», load a system corresponding to the device configuration or create a new one (see *«IC Net» Instructions for Use*).
- Start the system with **Control**/**Startup hardware**. The 818 IC Pump and, if present, the 833 IC Liquid Handling Unit will start to run, and the baseline will be shown in the chromatogram window.

2 Check 818 IC Pump

- Check that the aspiration capillary of 818 IC Pump is immersed in the eluent.
- In the loaded system open the **818 IC Pump** window and check/set the values for the flow rate and the maximum switch-off pressure under **Settings**.
- The recommended flow rate for the separating column used can be found in the corresponding *column data sheet* (normally 0.5…2 mL/min).
- The maximum switch-off pressure should normally be approx. 3 MPa above the pressure observed with the used column, for details see *818 Instructions for Use*.
- Start 818 IC Pump with **<Start>**.

3 Check for leaks

- Check all capillaries and their connections between the 818 IC Pump and the detector block for escaping liquid. If eluent escapes anywhere, the appropriate compression fitting must be tightened further or changed..
- Check also all tubing's and their connections between the 833 IC Liquid Handling Unit and the suppressor module (if present) for escaping liquid and tighten or change the fittings if necessary.

4 Check 819 IC Detector

- Open the window **819 IC Detector** of the loaded system and check/set the values of operating temperature, cell constant, measuring range and full-scale range on the **Method Parameter** tab (see *sec. 3.1.2*).
- Set **measuring range Range** so that the displayed absolute conductivity value of the eluent lies within the selected range (default value = 1 mS/cm).
- Set **full-scale range, Full scale** (default value = range/1). To start with, it is advisable not to set too narrow a full-scale range as the conductivity of the eluent in the conditioning phase can change greatly until attainment of a stable temperature.

5 Condition IC system

- Rinse the IC system with eluent until the desired stability of the baseline is reached (normally 30…60 min).

6 Condition suppressor (if present)

- Open window **820 IC Separation Center** and switch suppressor module at least three times to the next position every 10 min.

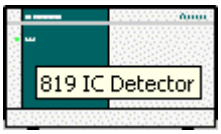
3 Operation

The operation of 819 IC Detector and 820 IC Separation Center is made completely via the Metrohm software **«IC Net»**.

This Section describes only the most important points concerning the operation of the 819 IC Detector and 820 IC Separation Center. For further details please refer to the «IC Net» Instructions for Use and to the on-line help in the PC program.

3.1 819 IC Detector

3.1.1 819 IC Detector icon

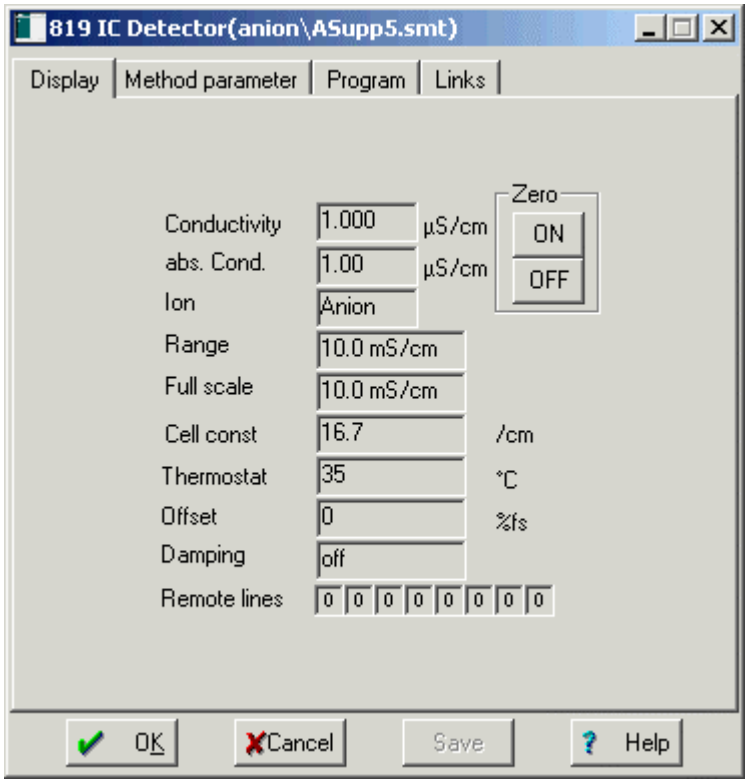


3.1.2 Settings in the "819 IC Detector" window

By double-clicking the 819 icon or by clicking this icon with the right mouse button and selecting the **Open** menu item the **819 IC Detector** window for parameter settings is opened. It consists of the four tabs **Display**, **Method parameter**, **Program** and **Links**.

Display

The **Display** tab of the **819 IC Detector** window is only available for a **connected system**. It displays the current measurement values and parameters settings of the 819 IC Detector.



Conductivity Live display of measured conductivity (auto-zero value) in µS/cm. This field is available for the **WATCH WINDOW**. The watch window color is changed to the **Out of range** color if the measured value is more than 80% outside the **Full Scale** range.

abs. Cond. Live display of absolute conductivity value in µS/cm. This field is available for the **WATCH WINDOW**. The watch window color is changed to the **Out of range** color if the measured value is bigger or equal to 110% of **Range**.

Ion Display of ion settings:
Anion: **polarity = +, temperature coeff. = 2.5**
Cation: **polarity = –, temperature coeff. = 1.5**

Range Display of measuring range in µS/cm.

Full scale Display of full scale range in µS/cm.

Cell const. Display of cell constant of the conductivity cell in /cm.

Thermostat Display of temperature within in the detector block.

Offset Display of offset of the zero point.

Damping Display of electronic damping of the analog output.

Remote lines Display value of remote line settings 1…8.

Zero <ON>	Triggers the auto-zero function.
Zero <OFF>	Switch off the auto-zero function.

"Auto-zero" is the name used for the automatic electronic background compensation, i.e. the current measured **Conductivity** value is set to zero and hence lies in the middle of the selected full-scale range.

The auto-zero function is disabled, if the actual value of the absolute conductivity **abs. Cond.** out of the limit set by the measuring **Range** (see *Fig. 27*), the diagram below shows the operating principle of the auto-zero function.

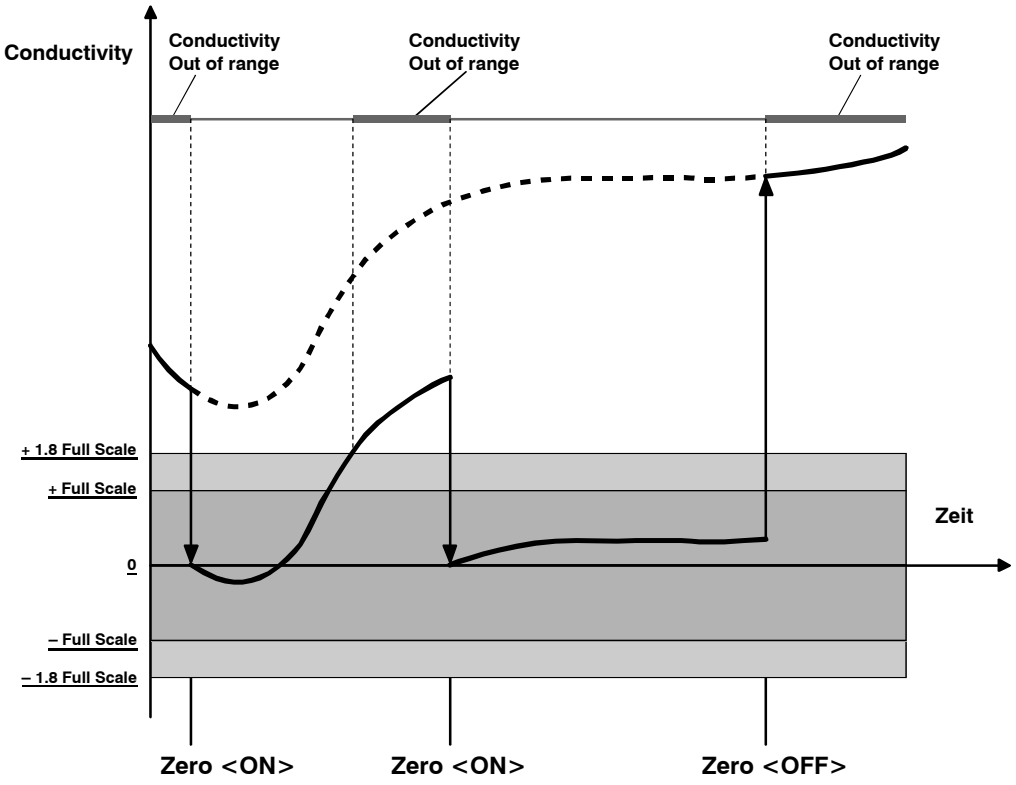


Fig. 26: Operating principle of Auto-zero

Before the auto-zero function is activated for the first time or after it has been switched off, the measuring signal lies outside the full-scale range; it is automatically set to 0 µS/cm each time the **Zero <ON>** key is pressed.

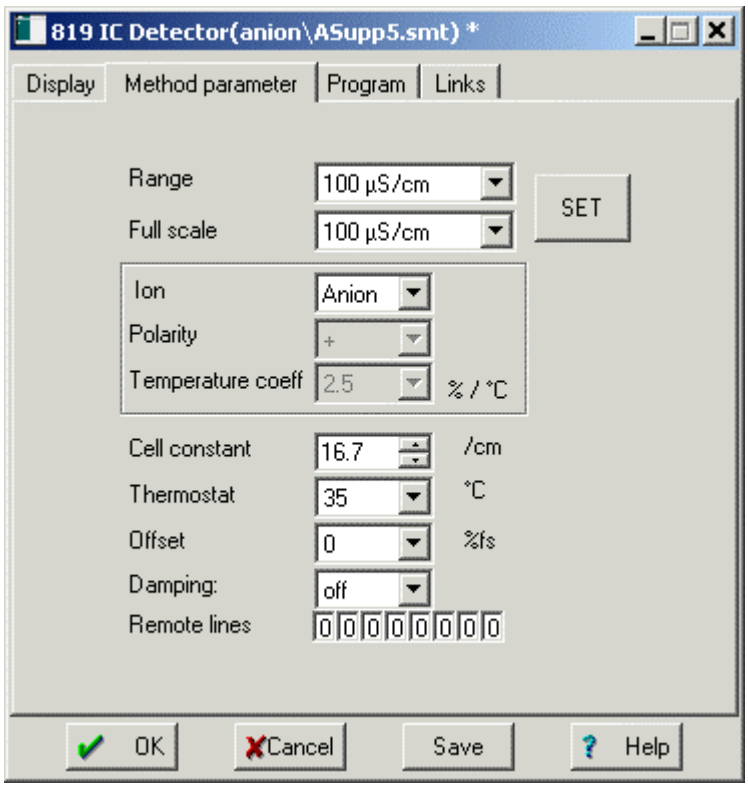
The auto-zero function can be triggered at any time using the **Zero <ON>** key.

The auto-zero function works properly only when the measured value remains relatively stable (e.g. not during the appearance of the injection peak at the start of the chromatogram).

If the measured conductivity value exceeds ±180% of the set full-scale range, the live display of **Conductivity** in the **WATCH WINDOW** changes it's color to the settings for **Out of range**. (default: red). At the same time the absolute conductivity is displayed instead of the auto-zero value.

Method parameter

The **Method parameter** tab of the **819 IC Detector** window contains the method startup values for the instrument. These values are sent and applied to the 819 IC Detector by **Start determination** and **Startup hardware**, or if the values are sent manually with **<SET>**.



Range

Measuring range in µS/cm
Selection: **100, 200, 500 µS/cm** and **1, 2, 5, 10 mS/cm**

Select the measuring range so that the conductivity value of the eluent used is always within the selected range. If the measured conductivity value exceeds the upper range limit by more than 10%, the live display of **abs. Cond.** in the **WATCH WINDOW** changes it's color to the settings for **Out of range**. (default: red). The selected measuring range limits the possible settings of the full-scale range, which can be selected to be maximum 2000 times more sensitive than the measuring range.

Full scale

The full scale range (operating range) sets the desired sensitivity for the analog output. The possible values of the full scale range in µS/cm depend on the preset measuring **Range**.

This value can be reduced in a total of 11 stages by a factor 1 (lowest sensitivity) up to maximum a factor of 2000 (highest sensitivity).

The full-scale range is primarily used to increase the sensitivity for the recording of the chromatogram following the electronic background compensation of the eluent sensitivity (auto-zero function, see also description of the auto-zero function above.

For the selected full-scale range (FS), the linearity of the conductivity measurement is assured in the range –1.8 Full Scale…+1.8 Full Scale. If the measured value violates these limits, the live display of **Conductivity** in the **WATCH WINDOW** changes it's color to the settings for **Out of range**. (default: red). At the same time the absolute conductivity is displayed instead of the auto-zero value.

The full-scale range determines the limits for the output of the analog signal at analog output **5** (0…1 V). The polarity of the output signal can be changed at any time with the parameter **Polarity** to **+** (0…+Full Scale) or **–** (0…–Full Scale).

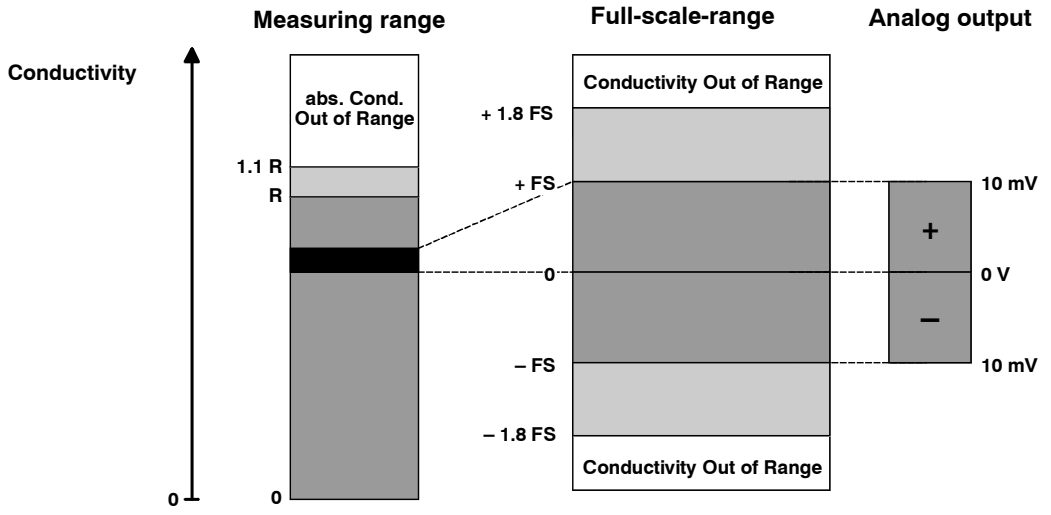


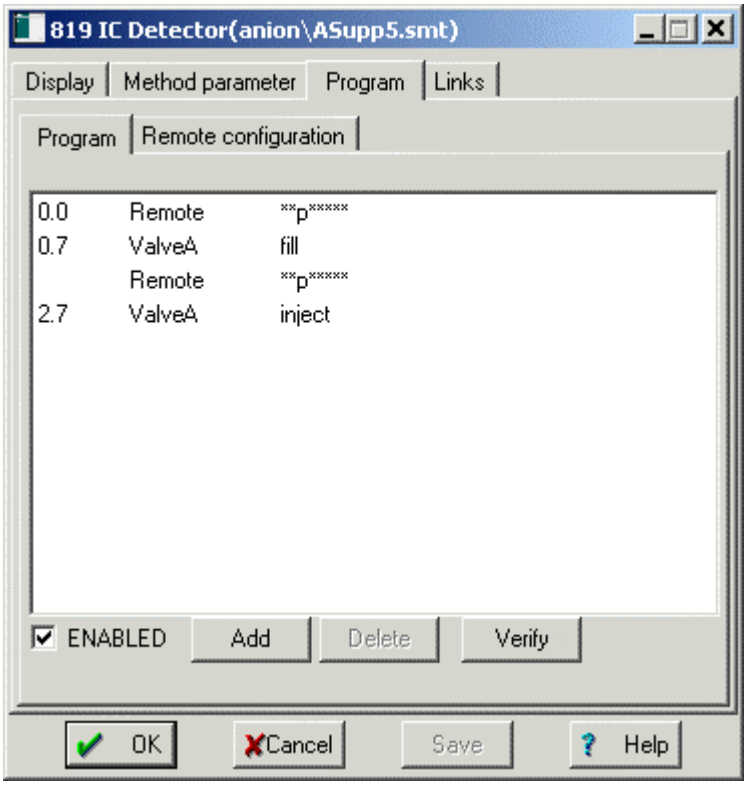
Fig. 27: Diagram of measuring and full-scale range

Ion	Combination of polarity and temperature coefficient:
Anion	**polarity = +, temperature coeff. = 2.5**
Cation	**polarity = –, temperature coeff. = 1.5**
Custom	independent selection of **polarity** and **temperature coeff.**
Polarity	Polarity of the analog output signal: **+** positive polarity (e.g. for **anions**) **–** negative polarity (e.g. for **cations**)
Temperature coeff.	Converts automatically the conductivity from the operating temperature of the measuring cell to the reference temperature of 20°C. Selection: **1.5, 2.5 %/°C**
Cell constant	Cell constant of the conductivity cell in /cm. Entry range: **13 ... 21 /cm** In ion chromatography, interest is normally centered only on relative changes in the conductivity and not on the absolute value. With the cell constant of 16.7/cm set in the factory, the error in the display of the absolute conductivity can be up to ca. ±10%. If you wish to have a more accurate display of the absolute conductivity, the cell constant must be determined by means of a calibration solution. To do this, pump a solution of known conductivity through the IC system, observe the display of the absolute conductivity and change the cell constant until the displayed value matches the actual value.
Thermostat	Operating temperature of the conductivity cell within in the detector block. Selection: **25, 30, 35, 40, 45 °C** and **off** At constant ambient temperature the heating built into the 819 IC Detector regulates the selected measuring cell temperature to an accuracy of ± 0.01 °C and thus establishes the precondition for highly sensitive determinations. It normally takes 30...60 min after the instrument has been switched on until this temperature stability is attained.
Offset	Offset of the zero point of the conductivity. Selection: **0, 10, 50 %full-scale range**

Damping	Electronic damping of the analog output Selection: **on, off** Damping to reduce disturbing pulsations or a high noise level. Standard solutions and samples must both be recorded with damping as this can influence the peak heights.
Remote lines	Startup value for remote line settings 1…8. Selection: **0**, **1**
<SET>	Send current parameters immediately to the 819 IC Detector. Parameters are not stored in the system file (***.smt**) as long as the file is not saved.

Time program

On the **Program** tab of the **819 IC Detector** window a user-defined time program for the remote output lines of the 819 IC Detector can be entered. This program is started automatically as defined in the **Start mode** window (see *Section 4.4.3* of the *«IC Net» Instructions for Use*) 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.

First 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.
Second column	**Program instruction** (see below). In addition to these predefined instructions, user-defined remote commands can be entered if activated on the **Remote configuration** tab.
Third column	**Parameter** for program instruction (see below).
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

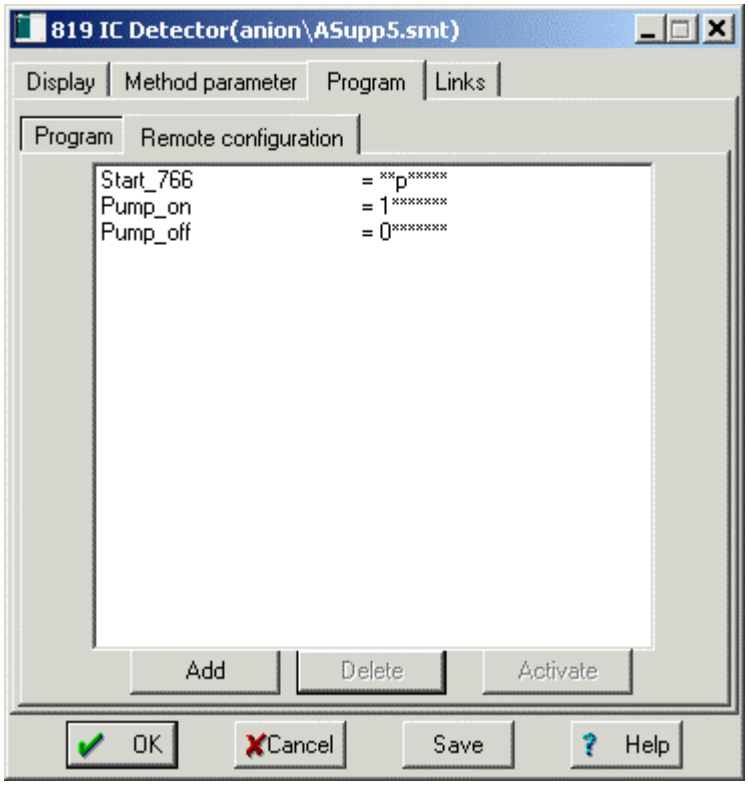
The following program instructions can be added to the time program on the **Program** subpage:

Instruction	*Parameter entry*	*Meaning*
Remote	**0, 1, ***	Set remote output lines 1...8 to the desired values. For entry of the first value, enter **1**, **0** or ***. For entry of the other values, move the cursor in front of the value to be changed and enter **1**, **0** or ***.
Range	**100, 200, 5000 µS/cm** **1, 2, 5, 10 mS/cm**	Set measuring range to the selected value.
FS	**0.05 µS/cm ...** **10 mS/cm**	Set full scale range to the selected value (depends on Range setting).
Zero	**on, off**	Switch on or off the auto-zero function.
Polarity	**+, –**	Reset the polarity of the output signal.
Mark		Trigger marking signal.

Instruction	*Parameter entry*	*Meaning*
ValveA	**fill, inject**	Switch injection valve A to "**inject**" or "**fill**" position.
ValveB	**fill, inject**	Switch injection valve B to "**inject**" or "fill" position.
Suppressor		Switch suppressor module to the next position.

Remote configuration

On the **Remote configuration** subtab user-defined remote commands can be defined, which can be inserted into a time program after being activated with **<Activate>**.



Name (1st column) User-definable name of the remote command (e.g. **Start_766**).

Remote command (2nd column)

Setting the remote output lines 1…8.

0 (line off, inactive, open)
1 (line on, active, 0 V)
***** (leave line in current status)

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

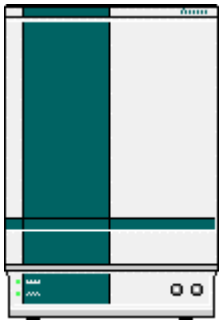
<Add>	Add new remote command.
<Delete>	Delete selected remote command.
<Activate>	Activate the defined remote commands for insertion into the time program.

Links

The **Links** tab of the **819 IC Detector** is used for COM port selection and settings (details see *Section 5.3.4 Links* of the *«IC Net» Instructions for Use*).

3.2 820 IC Separation Center

3.2.1 820 IC Separation Center icon



3.2.2 "820 IC Separation Center" window

By double-clicking the 819 icon or by clicking this icon with the right mouse button and selecting the **Open** menu item the **820 IC Separation Center** window for parameter settings is opened. It consists of the four tabs **Manual**, **Program**, **Thermostat** and **Links**.

The title bar of the window displays **820 IC Separation Center**, (if connected to IC Detector) or **820.01X0 IC Separation Center** (if connected to IC Interface).

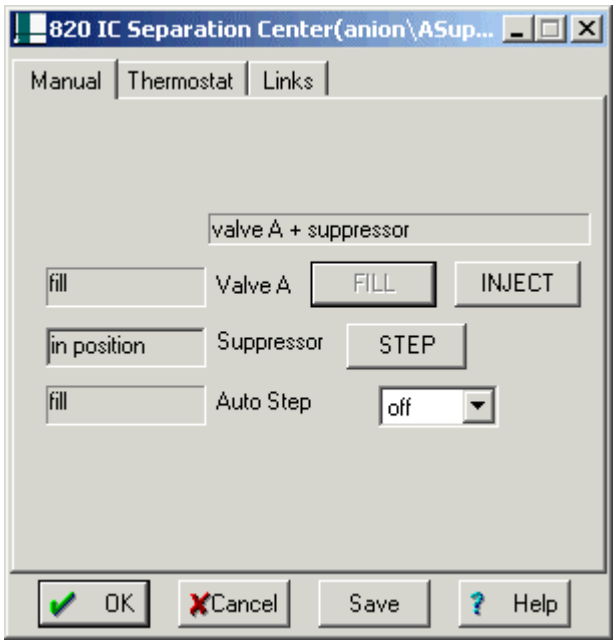
Pay attention when adding the Separation Center to the system! The kind of Separation Center you have to choose from the device list depends on the wiring of the instruments in your system.

*Choose the **820.02X0 to IC Detector** or **820.03X0 to IC Detector** from the device list, if the **Separation Center** is connected to the **819 IC Detector**. The type of Separation Center is recognized automatically.*

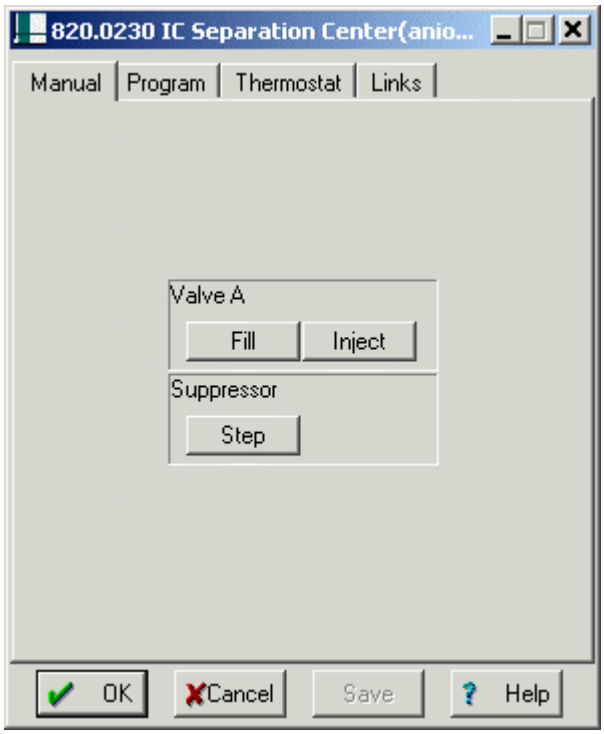
*Choose the appropriate **820.0210 to Interface**, **820.0220 to Interface**, **820.0230 to Interface**, **820.0310 to Interface**, **820.0320 to Interface** or **820.0330 to Interface** from the device list, if the **Separation Center** is connected to the **830 IC Interface**.*

Manual

The **Manual** tab of the **820 IC Separation Center** window is only available for a **connected system**. The parameters and buttons for manual operation depend on the type of instrument connected.



820 IC Separation Center connected to **819**



820.0230 Separation Center connected to **830**

Configuration	Display of current instrument configuration.*
valve A	820 IC Separation Center with 1 injector.
valve A + valve B	820 IC Separation Center with 2 injectors.
valve A + suppressor	820 IC Separation Center with 1 injector and 1 suppressor module.
Valve A	
fill/inject	Display of current valve position.*
<FILL>	Switch valve A to "fill" position.
<INJECT>	Switch valve A to "inject" position.
Valve B	
fill/inject	Display of current valve position.*
<FILL>	Switch valve B to "fill" position.
<INJECT>	Switch valve B to "inject" position.
Suppressor	
in position	Display of current suppressor status.*
<STEP>	Switch suppressor module to next position.

Auto Step	*
fill, inject, off	Display of current auto step status.
Entry field	Set automatic switching of the suppressor module after each "fill" or "inject" of valve A. Selection: **fill, inject, off**

* only available for **820 IC Separation Center** connected to 819

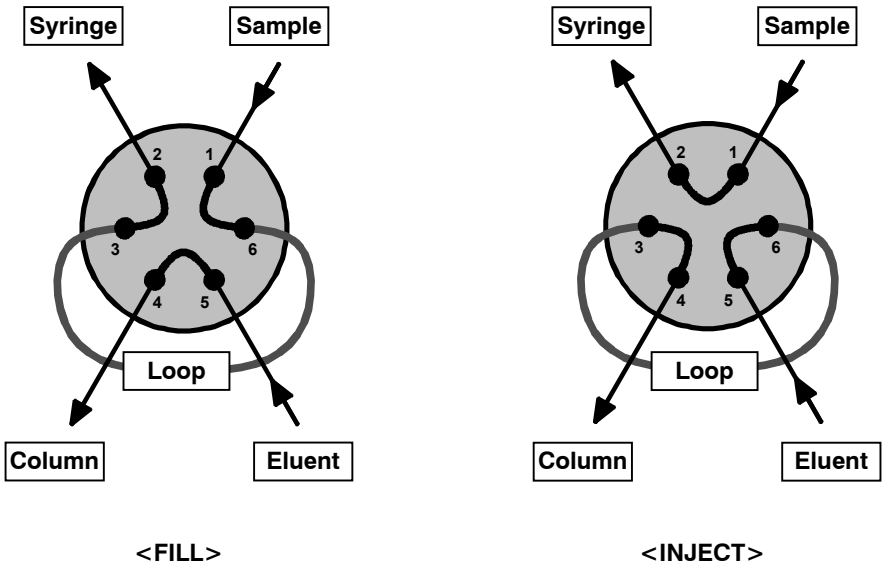


Fig. 28: Flow path of the injection valve

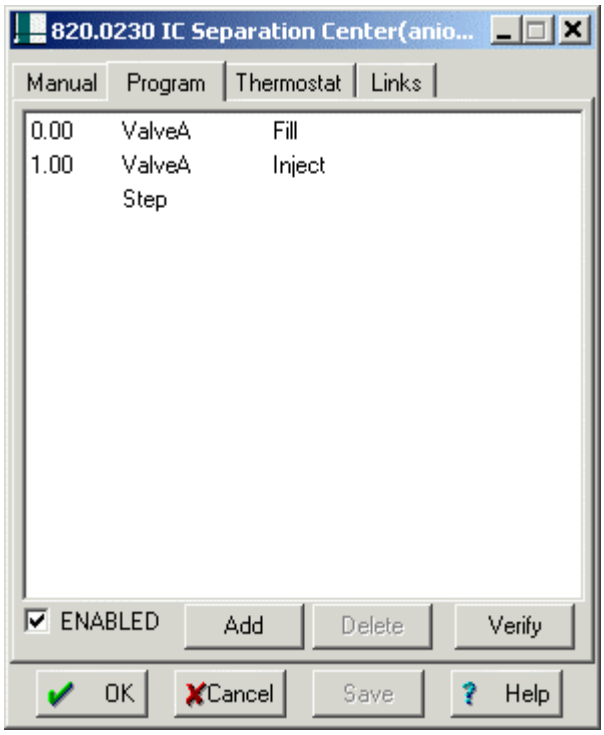
If the injection valve is in the **<FILL>** position, the sample loop **61** is filled by siphoning in the sample solution using the syringe. The eluent flows directly to the separating column.

If the injection valve is in the **<INJECT>** position the eluent flows via the sample loop to the separating column. This causes injection of the sample previously added to the sample loop. Sample inlet tubing and syringe are directly connected.

Time program

The **Program** tab is only available for a **820.0XX0 Separation Center connected to a 830 IC Interface**. The **820 IC Separation Center** that is **connected to a 819 IC Detector** is controlled by the time program of the detector.

On the **Program** tab of the **820.0XX0 Separation Center** window a user-defined time program can be entered. This program is started automatically as defined in the **Start mode** window (see *Section 4.4.3* of the *«IC Net» Instructions for Use*) either at the moment the determination is started (**Start with determination**) or at the moment the sample is injected (**Start with inject**).



First 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.
Second column	**Program instruction** (see below).
Third column	**Parameter** for program instruction (see below).
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

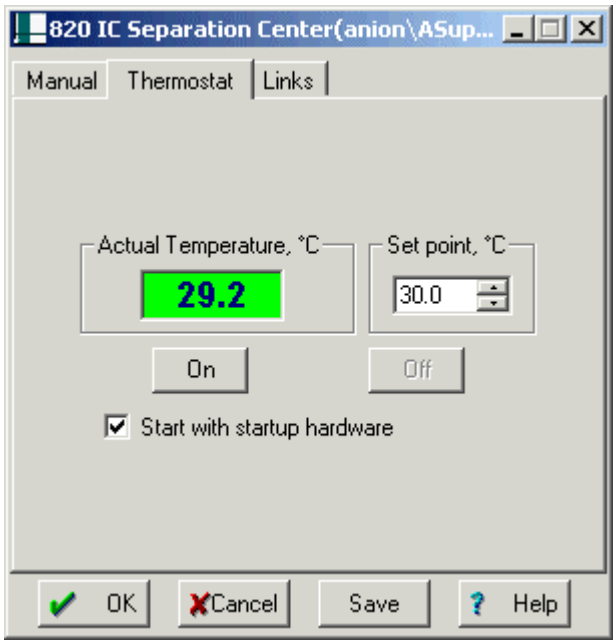
The following program instructions can be added to the time program on the **Program** page:

Instruction	*Parameter entry*	*Meaning*
ValveA	**fill, inject**	Switch injection valve A to "**fill**" or "**inject**" position.
ValveB	**fill, inject**	Switch injection valve B to "**fill**" or "**inject**" position.
Step		Rotate suppressor to the next position.

Thermostat

The **Thermostat** tab of the **820 IC Separation Center** or **820.02X0 IC Separation Center** window contains the temperature control of the column heating.

*Only available for a 2.820.02X0 Separation Center that is connected either to the 819 IC Detector and installed as **820.02X0 to IC Detector**, or to the 830 IC Interface and installed as **820.02X0 to Interface**.*



Actual temperature Display of **actual temperature** within the column heating in °C.

Set point **Operating temperature** of the thermostat within the column heating in °C.
Entry Range: **10.0 … 80.0**.

<On>	Only active if the thermostat is **off**. Switch the thermostat of the column heating **on** and apply the operating temperature specified under **Set point**, the button turns to **<Set>**.
<Set>	Only active if the thermostat is **on** and a new operating temperature is entered at **Set point**. Sets the new operating temperature.
<Off>	Only active if the thermostat is **on**. Switch the thermostat of the column heating **off**.

Start with startup hardware

Start the **Thermostat** with the startup of the system hardware.

Enabled

The temperature of the column heating **is monitored** by «IC Net», an injection is triggered, if the set operating temperature of the column heating is reached.

*The operating temperature is reached, when the actual temperature is within **± 1 °C** of the temperature set above.*

Disabled

The temperature of the column heating **is not monitored** by «IC Net». The proceeding of a determination or a queue is not affected if the set value is not reached.

Links

The **Links** tab of the **820 IC Separation Center** is used for COM port selection and settings (details see *Section 5.2.4 Links* of the *«IC Net» Instructions for Use*), resp. for Event line selection.

4 Notes - Maintenance - Faults

4.1 Practical notes on ion chromatography

4.1.1 Separating columns

The attainable quality of analyses with the 819/820 IC system 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 form 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 818 IC Pump, it is advantageous to install an **in-line filter** between the pump and the 820 IC Separation Center. **The 6.2821.120 Filter unit PEEK 47** (see *Section 2.7.3*) supplied with the 818 IC Pump for operation with PEEK capillaries in the pressure range 0…30 MPa.

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 closed when not in use and filled in accordance with the manufacturer's specifications.

Dead volume

Dead volume at the end of a column can be the cause of extreme peak broadening or splitting (appearance of double peaks). Filling the column with glass beads (∅ ≤ 100 µm) frequently improves the separation efficiency.

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 Pumps

Pulsation dampener

For sensitive measurements with the 819/820 IC System, high pressure pumps as free from pulsation as possible and with a very constant capacity are required. If the pulsations that appear are too large, a pulsation dampener between the pump and the 820 IC Separation Center may possibly help. The optional **6.2620.150 Pulsation dampener** (see *Section 6.3.1*), whose installation is described in *Section 2.7.2* is eminently suitable for this purpose. A pulsation dampener also offers protection against pressure shocks on the column material caused by 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 organic solvents. The rinsing effect is improved by brief treatment in an ultrasonic bath. When the cleaned valves are reinstalled, you must ensure that the flow direction is correct.

The **replacement of piston seals** has to be done in accordance with the pump manufacturer's directions. The corresponding maintenance work for the 818 IC Pump is described in *Section 4.2* of the *818 Instructions for Use*.

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 4.1.4*).

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 high sensitive measurements, the eluent should be continuously **stirred** with a magnetic stirrer, particularly when the recycling procedure is employed or when alkaline eluents are used. For alkaline eluents and eluents with low buffering capacity one should preferably use a **CO_2 absorber** (e.g. the absorber supplied with the optional 6.5324.000 Bottle rack).

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 the eluent is changed, it must be ensured that **no precipitates** can be formed. Solutions used in direct succession must therefore be miscible. If the system has to be rinsed with an organic solution, several solvents with increasing or decreasing lipophilic character may possibly have to be used (e.g. water ↔ acetone ↔ chloroform).

4.1.4 Suppressor module

To avoid contamination of the suppressor module by foreign particles or bacterial growth, it is advantageous to install an **in-line filter** between the 833 IC Liquid Handling Pump Unit and the suppressor module. The two **6.2821.120 Filter units PEEK** (see *Section 2.7.3* und *Section 2.9.4*) supplied with the 2.833.0010 IC Liquid Handling Pump Unit are eminently suitable for this purpose.

4.1.5 Connections

All connections between injector, 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).

4.2 Maintenance and servicing

4.2.1 General information

Care

The 819 IC Detector and 820 IC Separation Center require proper care and attention. Excessive contamination of the instruments could possibly lead to malfunctions and a shorter service life of the inherently rugged mechanical and electronic parts.

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 819 IC Detector 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 819 IC Detector and 820 IC Separation Center 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 entire IC system (without column) by rinsing with 20...50 mL 0.2 mol/L HNO_3 is appropriate only in the following case:

- if exceptional changes are observed in the measurement properties of the cell

For passivation the separating column is removed from the 820 IC Separation Center. The two capillaries **50** and **57** (see *Fig. 21* and *Fig. 23*) are connected directly to each other with the **6.2744.040 Coupling 71** included in the accessories.

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. The IC system is thus quickly ready for new injections without a long conditioning period.

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

- *in operation with the suppressor module,*
- *with alkaline eluents,*

with the 6.1010.000 IC Cation column METROSEP Cation 1-2.

4.2.4 Shutdown

If the 819/820 IC-System 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 separating column is removed; the two capillaries **50** and **57** (see *Fig. 21* and. *Fig. 23*) are directly connected to each other with the 6.2744.040 Coupling enclosed with the accessories. Rinse with methanol/water (1:4) until the conductivity drops below 10 µS/cm.

4.2.5 Changing separating columns

Identical separation system

If you wish to replace an IC separating column by a column of the same type, proceed as follows (see *Fig. 21* and *Fig. 23*):

1 Remove old column

- Switch off pump drive of the 818 IC Pump.
- Unscrew column from inlet capillary **57** of the detector block or from suppressor inlet capillary **64**.
- Unscrew column from column connection capillary **50** or the precolumn.

2 Connect new column to injector

- Remove end caps from column **53**.
- Screw inlet end of separating column **53** (note flow direction) to column connection capillary **50** or to the precolumn (see *Section 2.9.5*/*Section 2.9.7*).

3 Rinse column

- Place beaker beneath the column outlet.
- Switch on 818 IC Pump and rinse column with eluent for ca. 10 min, then switch off pump.

4 Connect column to detector block

- Screw outlet end of separating column **53** to inlet capillary **57** or suppressor inlet capillary **64**.

Changing the separation system

If you wish to replace an IC separating column by a column of a different type, proceed as follows (see *Fig. 21* and *Fig. 23*):

1 Remove old column

- Switch off pump drive of the 818 IC Pump.
- Unscrew column from inlet capillary **57** of the detector block or from suppressor inlet capillary **64**.
- Unscrew column from column connection capillary **50** or the precolumn.

2 Connect detector block to injection valve

- Connect column connection capillary **50** using a **6.2744.040 Coupling 71** directly to inlet capillary **57** of the detector block (see *Fig. 21*).

3 Rinse with dist. H_2O

- Rinse IC system with dist. or deionized water (flow rate 1 mL/min) for approx. 10 min.

4 Rinse with eluent

- Rinse IC system with the eluent needed for the separating column you intend to install until the absolute conductivity displayed on the 819 IC Detector is stable.

5 Remove coupling

- Remove **6.2744.040 Coupling 71** between column connection capillary **50** and inlet capillary **57** (see *Fig. 21*).

6 Connect new column to injector

- Remove end caps from column **53**.
- Screw inlet end of separating column **53** (note flow direction) to column connection capillary **50** or to the precolumn (see *Section 2.9.5*/*Section 2.9.7*).

7 Rinse column

- Place beaker beneath the column outlet.
- Switch on 818 IC Pump and rinse column with eluent for ca. 10 min, then switch off pump.

8 Connect column to detector block

- Screw outlet end of separating column **53** to inlet capillary **57** or suppressor inlet capillary **64**.

4.2.6 Regeneration of suppressor

Regenerating a suppressor with 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 (20 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 10 min with one of the following solutions:

Contamination with heavy metals

0.2 mol/L H_2SO_4
+ 0.1 mol/L oxalic acid (with Fe^{2+}/Fe^{+3})

Contamination with organic substances

0.2 mol/L H_2SO_4 / acetone ≥ 20%

The 6.1826.050 pump tubing is made of PVC and must not be used for rinsing with solutions which contain acetone. 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 4.2.8*).

4.2.7 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 *Fig. 29*):

1 Disconnect suppressor from IC system

- Disconnect input lead of suppressor from the separating column and output lead to the detector.

2 Dismantle suppressor

- Unscrew nut **72** from suppressor holder **75**.
- Pull out connection piece **73** and suppressor rotor **74** from suppressor holder **75** (the connection piece and the rotor normally stick together).
- Loosen connection piece **73** from suppressor rotor **74**.

3 Clean input and output leads

- Connect each of the 6 capillary tubings attached to connection piece **73** to the pump one after another, and pump through ultrapure water.
- Check whether solution emerges from connection piece **73**. If one of the input or output leads remains blocked, replace the connection piece **73** (order number 6.2832.010).

4 Clean suppressor rotor

- Clean the sealing surface of suppressor rotor **74** using a lint-free cloth and ethanol.

5 Insert suppressor rotor

- Insert suppressor rotor **74** in suppressor holder **75** 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).

6 Clean connection piece

- Clean the sealing surface of connection piece **73** using a lint-free cloth and ethanol.

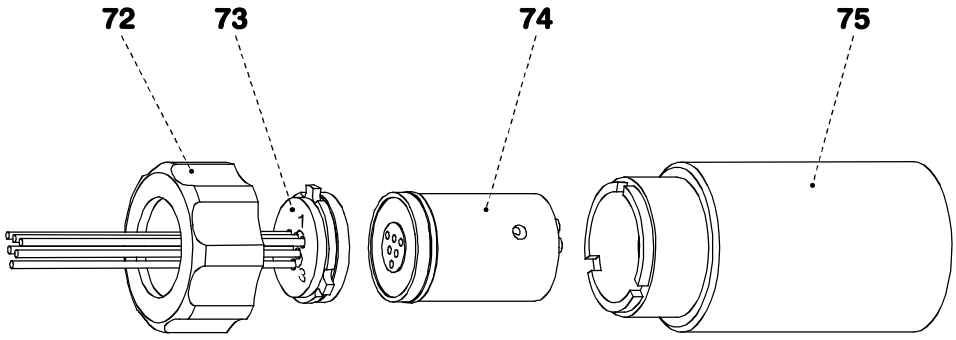


Fig. 29: Assembling the suppressor

72 **Screw nut**

73 **Connection piece with input and output leads (6.2832.010)** for suppressor module

74 **Suppressor rotor(6.2832.000)**

75 **Suppressor holder**

7 Insert connection piece

- Insert connection piece **73** in suppressor holder **75** 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 **72** onto the thread of suppressor holder **75** manually (do not use tools).

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.

4.2.8 Replacement of suppressor module

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 *Fig. 29*):

1 Disconnect suppressor from IC system

- Disconnect all input and output leads of the suppressor from IC system and the 833 IC Liquid Handling Pump Unit.

2 Dismantle suppressor

- Unscrew nut **72** from suppressor holder **75**.
- Pull out connection piece **73** and suppressor rotor **74** from suppressor holder **75** (the connection piece and the rotor normally stick together).
- Loosen connection piece **73** from suppressor rotor **74**.

3 Clean suppressor rotor

- Clean the sealing surface of new suppressor rotor **74** (6.2832.000) using a lint-free cloth and ethanol.

4 Insert suppressor rotor

- Insert suppressor rotor **74** in suppressor holder **75** 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).

5 Clean connection piece

- Clean the sealing surface of connection piece **73** using a lint-free cloth and ethanol.

6 Insert connection piece

- Insert connection piece **73** in suppressor holder **75** 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 **72** onto the thread of suppressor holder **75** 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.

4.3 Faults and malfunctions

4.3.1 Malfunctions and their rectification

If difficulties appear with the IC system during analyses, their causes are best investigated in the order **separating column → pump → eluent → 819/820 IC System**. 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 values • Faulty piston seals • Quality of the pump does not suffice for the selected sensitivity	• Clean the valves (see *Section 4.1.3*) • Replace the piston seals (see *Section 4.1.3*) • Use pulsation dampener, use more powerful pump or lower the sensitivity
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 • Change of column packing by injection of contaminated samples	• Replace the 6.2821.130 Filter (see *Section 2.7.3*) • Regenerate the column (see *Section 4.1.2*) or replace column *Note:* *Samples should always be microfiltered.*
Chromatograms with poor resolution, change in the retention times	• Deterioration in separation efficiency of the IC column	• Regenerate the column (see *Section 4.1.2*) or replace column
Extreme peak broadening, splitting (double peaks)	• Dead volume at the column ends	• Fill column with glass beads (Ø ≤ 100 µm) or replace column

No feed of regeneration or rinsing solution for suppressor	• Contamination of the filter in the 6.2821.120 Filter unit PEEK • Counterpressure too high in suppressor module	• Replace the 6.2821.130 filter(see *Section 2.7.3*) • Clean or replace suppressor module (see *Section 4.2.6…4.2.8*)
Detector is not recognized by «IC Net»	• No RS connection	• Switch instrument on • Check wiring • Check that the connection specified in the **819 IC Detector** window (see *Section 3.1.2* **Links**) matches the actual wiring

5 Interfaces

5.1 RS 232 interface

The RS 232 interface **9** of the 819 IC Detector is used for the connection of the 830 IC Interface or a PC (see *Section 2.3.1 – 2.3.2*) and allows remote operation of 819 IC Detector and 820 IC Separation Center.

5.1.1 Data transmission protocol

The RS 232 interface **9** of the 819 IC Detector is configured as DTE (Data Terminal Equipment) with the following technical specifications:

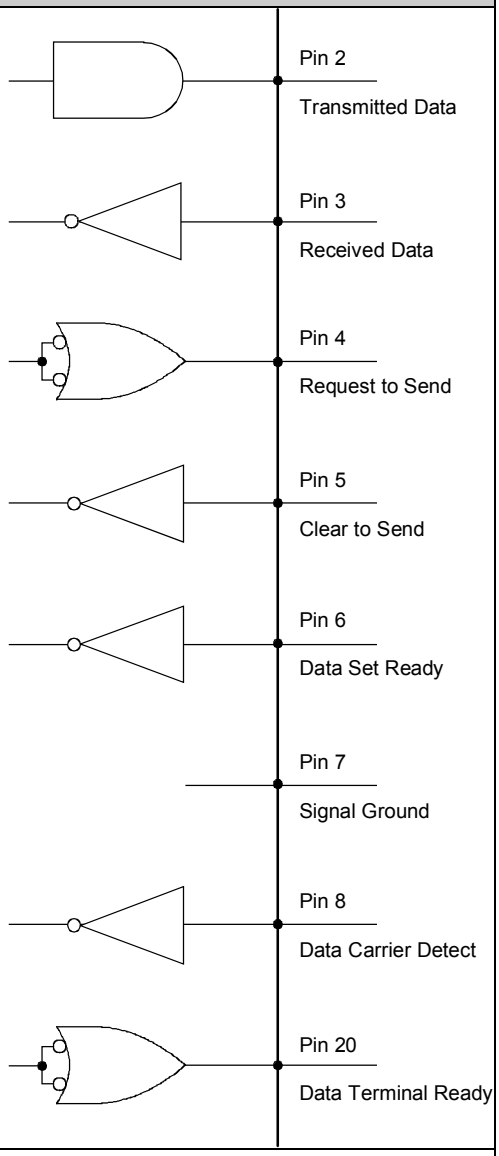
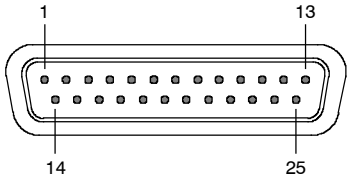
- *Standard* — Data interface in accordance with EIA standard RS 232C (DIN 66020, page 1)
- *Baud rate* — 9600
- *Data Bits* — 8
- *Stop Bits* — 1
- *XON/XOFF* — on
- *Control characters*

C_R	DEC 13	HEX 0D
L_F	DEC 10	HEX 0A
XON	DEC 17	HEX 11
XOFF	DEC 19	HEX 13

- *Max. line length* — 80 characters + C_R L_F
- *Mode* — Full duplex (simultaneous transmission and receiving)

  Restriction:
  If data are first received by the interface, transmission is not started until the receipt is at an end.
- *Cable* — For interconnection of the 819 IC Detector with third-party devices, only a shielded data cable may be used (e.g. Metrohm D.104.0201). The cable shield must be perfectly earthed at both devices (pay attention to current loops: always use star earthing). Use only connectors with sufficient shielding (e.g. Metrohm K.210.0001 with K.210.9004).
- *Cable length* — max. ca. 15 m

5.1.2 Pin assignment

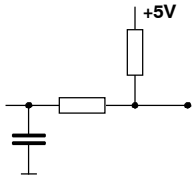
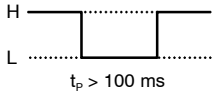
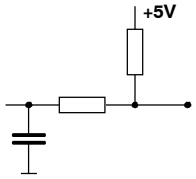
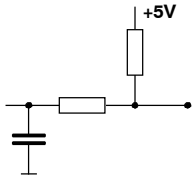
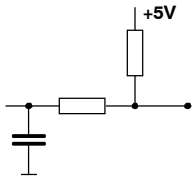
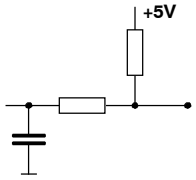
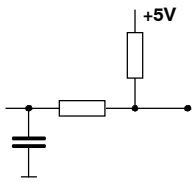
RS 232 C interface	*external*
Transmitted Data (TxD) If no data transmission takes place, the line is maintained in the "ON" condition. Data are sent only when CTS and DSR are in the "ON" condition and DCD is in the "OFF" condition.	
Received Data (RxD) Data are received only when DCD is "ON".	
Request to Send (RTS) ON condition: 819 IC Detector is ready to send data.	
Clear to Send (CTS) ON condition: Remote station is ready to receive data.	
Data Set Ready (DSR) ON condition: The transmission line is connected.	
Signal Ground (GND)	
Data Carrier Detect (DCD) ON condition: The received signal level is within the tolerance range (remote station is ready to send data).	
Data Terminal Ready (DTR) ON condition: 819 IC Detector is ready to receive data.	
Protective earth Direct connection from cable connector to protective earth of the device. **Polarity assignment of the signals** • Data lines (TxD, RxD) Voltage negative (<–3 V): signal status "ONE" Voltage positive (>+3 V): signal status "ZERO" • Control or message lines (CTS, DSR, DCD, RTS, DTR) Voltage negative (<–3 V): OFF status Voltage positive (>+3 V): ON status In the transition region from +3 V to –3 V, the signal status is undefined. **Driver 14C88** to EIA RS 232C specification **Receiver 14C89** to EIA RS 232C specification	**Contact arrangement at the socket "RS 232" (male)**  Connection cables to external devices must have an appropriate 25-pin connector (female). Metrohm offers connector sockets (K.210.9004) and the associated housing (K.210.0001) as an option for the preparation of such cables.
No liability whatsoever will be accepted for damage arising from the improper connection of devices.	

5.2 Remote interfaces

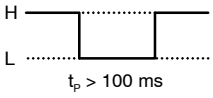
The 819 IC Detector has the two remote interfaces **8** "Remote" and **10** "IC Separation Center" (see *Fig. 3*) which each have 8 input and 8 output lines.

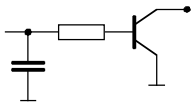
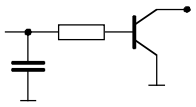
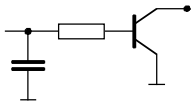
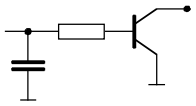
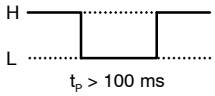
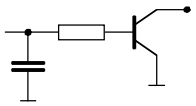
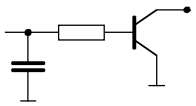
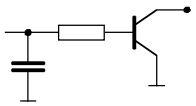
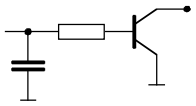
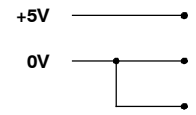
5.2.1 "Remote" interface

The remote interface **8** "Remote" is used for the connection of any type of external device and has the following pin assignment:

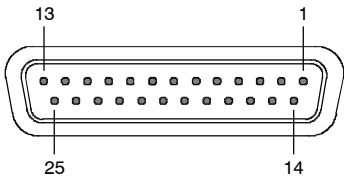
819 IC Detector *Pin*	*Function*
Inputs	
 **21**	**Print** **Triggering the print command** 
 **9**	2^0 **Triggering of functions (remote control)** Assignment of the input lines
 **22**	2^1
 **10**	2^2
 **23**	2^3
 **11** **24** **12**	**not assigned**

Input *23*	*10*	*22*	*9*	*Decimal code*	*Function (default settings)*
H	H	H	H	0	Inactive
H	H	H	L	1	PROG R/S
H	H	L	H	2	PUMP R/S
H	H	L	L	3	FILL B/STEP
H	L	H	H	4	FILL A
H	L	H	L	5	REPORT
H	L	L	H	6	ZERO
H	L	L	L	7	MARK
L	H	H	H	8	INJECT A
L	H	H	L	9	ZERO OFF
L	H	L	H	10	PLOT
L	H	L	L	11	Switch polarity
L	L	H	H	12	INJECT B
L	L	H	L	13	SELECT
L	L	L	H	14	QUIT
L	L	L	L	15	ENTER



819 IC Detector	Pin	Function
Outputs		
	5	**Ready** L = ready (program inactive or not started) H = not ready (program running) V_{CEO} = 40 V IC = 20 mA
	18	**Remote 1** Programmable remote output line 1 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	4	**Remote 2** Programmable remote output line 2 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	17	**Advance pulse (EOD)** The EOD signal is outputted in the following cases: • without program: on every "INJECT A" • with program: each time a program is ended and on every return to the loop start with loop programs  H L t_P > 100 ms
	3	**Remote 3** Programmable remote output line 3 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	16	**Error** L = instrument error (as long as it exists) H = instrument ok V_{CEO} = 40 V IC = 20 mA
	1	**Remote 4** Programmable remote output line 4 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	2	**Remote 5** Programmable remote output line 5 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
Voltages		
 +5V 0V	15 14 25	5 V: inactive High (H) I ≤ 40 mA 0 V: active Low (L) R_i ≅ 12 Ω

Contact arrangement at socket "Remote" (female)

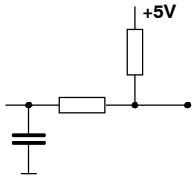
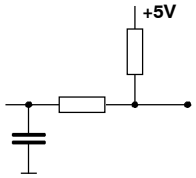
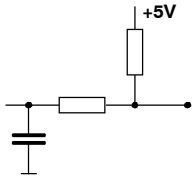
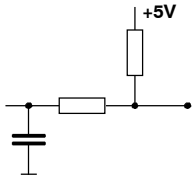
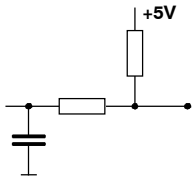
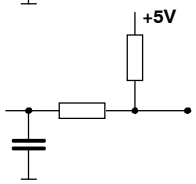
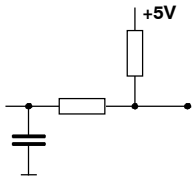
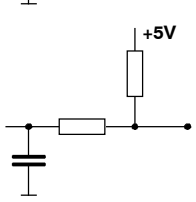


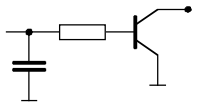
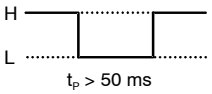
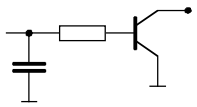
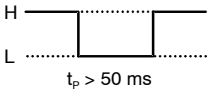
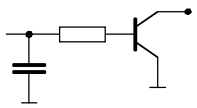
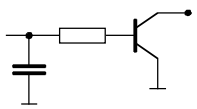
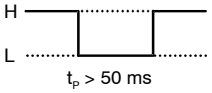
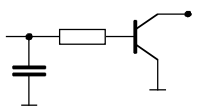
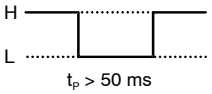
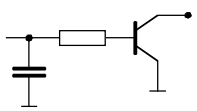
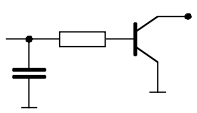
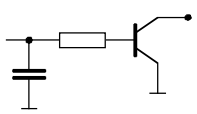
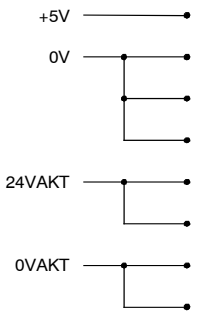
Connecting cables to external devices must have an appropriate 25-pin connector (male). Metrohm offers connector sockets (K.210.9060) and the associated housing (K.210.0002) as an option for the preparation of such cables.

No liability whatsoever will be accepted for damage arising from the improper connection of devices.

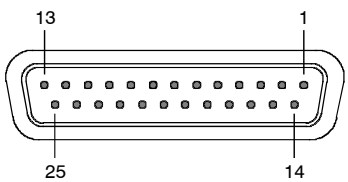
5.2.2 "IC Separation Center" interface

The 820 IC Separation Center is normally attached to remote interface **10** "IC Separation Center" (see *Section 2.3*). If the 819 IC Detector is operated without a Separation Center, this remote interface can also be used for the connection of external devices. The remote interface "IC Separation Center" has the following pin assignment:

819 IC Detector *Pin*	*Function*
Inputs	
	**Position "FILL" at injection valve A** L = Valve A in position "FILL" H = Valve A not in position "FILL"
	**Position "INJECT" at injection valve A** L = Valve A in position "INJECT" H = Valve A not in position "INJECT"
	**Position "FILL" at injection valve B or "in position" at suppressor** L = Valve B in position "FILL" or suppressor set to "in position" H = Valve B not in position "FILL" or suppressor not set to "in position"
	**Position "INJECT" at injection valve B** L = Valve B in position "INJECT" H = Valve B not in position "INJECT"
	**Configuration of the 820 IC Separation Center** **2^0** **2^1** *Input 11 / 23* — *Decimal code* — *Status*: H H — 0 — undefined H L — 1 — valve A L H — 2 — valve A + suppressor L L — 3 — valve A + valve B
	
	**Connection 820 IC Separation Center** L = 820 IC Separation Center connected H = 820 IC Separation Center not accessible
	**not assigned**

819 IC Detector	Pin	Function
Outputs		
	5	**Valve A → "FILL"** Valve A is switched to position "FILL". 
	18	**Valve A → "INJECT"** Valve A is switched to position "INJECT". 
	4	**Lock Terminal block 26, 31** L = functions <FILL> and <INJECT> are locked H = functions <FILL> and <INJECT> are not locked V_{CEO} = 40 V IC = 20 mA
	17	**Valve B → "FILL" or suppressor → "STEP"** Valve B is switched to position "FILL" or suppressor module is switched to next position. 
	3	**Valve B → "INJECT"** Valve B is switched to position "INJECT". 
	2	**Remote 6** Programmable remote output line 6 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	1	**Remote 7** Programmable remote output line 7 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
	16	**Remote 8** Programmable remote output line 8 (command "remote" in program or event) V_{CEO} = 40 V IC = 20 mA
Voltages		
	15 14 25 6 13 8 19 20	5 V: inactive High (H) I ≤ 40 mA 0 V: active Low (L) R_i ≅ 12 Ω

Contact arrangement at socket "IC Separation Center" (female)

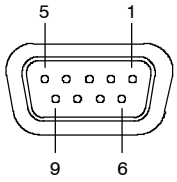


Connecting cables to external devices must have an appropriate 25-pin connector (male). Metrohm offers connector sockets (K.210.9060) and the associated housing (K.210.0002) as an option for the preparation of such cables.

No liability whatsoever will be accepted for damage arising from the improper connection of devices.

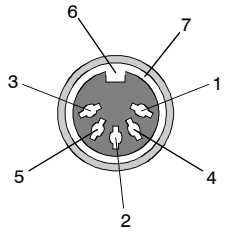
5.3 Analog output

Analog output **5** "Output“ (0…1 V) of the 819 IC Detector (see *Fig. 3*) is used for connecting a recording channel to 830 IC Interface or 771 IC Compact Interface or from an external recorder or integration system. The connection from 830 IC Interface and 771 IC Compact Interface is described in *Section 2.3*. The polarity of the output signal at the analog output connectors can be changed at any time under **Polarity** in the window **819 IC Detector** in «IC Net» (see *Section 3.1.2*). The switching of the analog output is as follows:

819 IC Detector	*Pin*	*Voltage*
Contact arrangement at socket "Output" (female) 	**1** **6**	**0 V** **Signal 0...1 V** The other pins are not assigned.

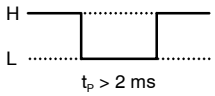
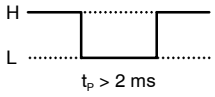
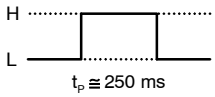
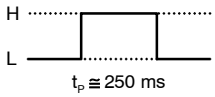
5.4 External power supply for 820 IC Separation Center

If the 820 IC Separation Center is operated without the 819 IC Detector, an external power supply must be attached to connection **25** "External Power". Power supply and connecting cable must comply with the following conditions:

"External Power" socket	*Function*		
	1 +5 V DC / 0.5 A 2 not assigned 3 +24 V DC / 2 A 4 0 V (digital) * 5 0 V (analog) * 6 Ground 7 Ground		* Pin 4 and pin 5 must be connected in the vicinity of the power source ("zero point of star")

5.5 Valve interfaces

The two valve interfaces **26** and **31** can be used to connect the 820 IC Separation Center directly to the 830 IC Interface (see *Section 2.3.1*) or external devices (e.g. 766 IC Sample Processor or 788 IC Filtration/Dialysis Sample Processor). The two valve interfaces for the injection valves A and B (or the suppressor module) are identical and have the following connections:

820 IC Sep. Center Connection	*Function*
Inputs	
0V — **Ground**	**Ground**
+5V, 10kΩ — **Fill**	**Valve → "FILL"** Valve is switched to the position "FILL" (or suppressor module is switched further) 
+5V, 10kΩ — **Inject**	**Valve → "INJECT"** Valve is switched to the position "INJECT" 
Outputs	
COM, **RUN**	**Position "Fill"** A pulse is outputted when the valve is switched to the position "FILL". 
COM, **RUN**	**Integrator Start** A pulse is outputted when the valve is switched to the position "INJECT". 

No liability whatsoever will be accepted for damage arising from the improper connection of devices.

6 Appendix

6.1 Technical data

Provided that nothing to the contrary is mentioned, the published data are typical values at an ambient temperature of 25°C.

6.1.1 819 IC Detector

Conductivity measurement

Measurement ranges	100, 200, 500, 1000, 2000, 5000, 10'000 µS/cm
Full Scale	0.05…10'000 µS/cm
Temperature correction	Automatic correction of the measured conductivity to reference temperature 20°C with the adjustable temperature coefficients (1.5 %/°C or 2.5 %/°C)
Accuracy, absolute value	< 4 % of full-scale value for all ranges under the following reference conditions: Adjustment with reference resistance to 1.000 V (range 1 mS/cm, cell constant 16.7 /cm, temp. coeff. 2.5 %/°C, frequency 5 kHz, room temperature) to accuracy < ± 2 mV, measurement accuracy < 0.5 % after 30 min warm-up time
Linearity	Up to ± 150 % of each full-scale range Deviations < 0.5 % of full-scale range
Temperature dependence	Typically 25 ppm/°C
Dependence of cell const..	< ± 1 % over entire adjustment range
Drift (electronic)	< 0.0013 % of selected measurement range /h/°C
Noise (electronic)	Typically < 0.0003 % of selected meas. range
Damping	2-stage damping (Bessel 4th order) "**Damping off**" 0.25 s (10…90 %) "**Damping on**" 2.00 s (10…90 %)

Autozero

Function	Automatic zero setting (electronic background compensation) over entire selectable measurement range
Maximum error	± 0.6 % of full-scale range
Linear range	± 150 % of full-scale range

Conductivity detector

Construction	Thermostatted conductivity detector with 2 ring-shaped steel electrodes
Measurement principle	Alternating current measurement with following cell supply:

Meas. Range	*Amplitude*	*Frequency*
100 µS/cm	1 V peak	714 Hz
200 µS/cm	1 V peak	5000 Hz
500 µS/cm	1 V peak	5000 Hz
1 mS/cm	1 V peak	5000 Hz
2 mS/cm	0.5 V peak	5000 Hz
5 mS/cm	0.2 V peak	5000 Hz
10 mS/cm	0.1 V peak	5000 Hz

Effective cell volume	0.8 µL
Cell constant	16.7 /cm; adjustable 13.0…21.0 /cm
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	± 1.5°C
Temperature stability	≤ 0.01°C at constant ambient temperature

Parts and controls

Indicator	Power LED **1**
ON/Off switch	At rear of instrument

Mains connection

Voltage	115 V: 100...120 V ± 10 % 230 V: 220...240 V ± 10 % Switching with mains voltage selector in fuse holder (see *Section 2.4.1*)
Frequency	50...60 Hz
Power consumption	70 VA
Fuse	5 mm Ø, 20 mm length 100…120 V: 0.63 A (slow-blow) 220…240 V: 0.315 A (slow-blow)

Interfaces

RS 232 interface	Specifications, see *Section 5.1*
Remote interfaces	Specifications, see *Section 5.2*
Analog output	Specifications, see *Section 5.3*

Safety specifications

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

Electromagnetic compatibility (EMC)

Emitted interference	Standards met: - EN/IEC 61326 - EN 55022 - CISPR 22 - EN/IEC 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

Ambient temperature

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

Reference conditions

Ambient temperature	+25°C (± 3 °C)
Rel. humidity	≤ 60%
Instrument condition	Instrument in operation for at least 30 min

Diagnostic test

Self-diagnostic test	Automatic self-diagnosis when instrument switched on

Housing

Material of cover	Polyurethane rigid foam (PUR) with fire protection for fire class UL94VO, FCH-free
Material of base	Steel, enameled
Width	255 mm

Height	130 mm
Depth	343 mm
Weight	8.2 kg (with detector block, without accessories)

6.1.2 820 IC Separation Center

Temperature control of the column heating

Temperature range	Ambient temperature +5°C...80°C, adjustable in steps of 0.1 °C.
Accuracy	± 0.5 °C
Stability	better than 0.05 °C

Parts and controls

Indicators	Power LED **11** for Separation Center Power LED **12** for Column heating

Power supply of separation center

Internal	Internal supply of 819 IC Detector via connecting cable
External	External supply via DIN socket with 6.2152.000 power supply unit: 5 V / 0.5 A 24 V / 2 A (transient, 200…300 ms)

Power supply of column heating

Via jack bush with 6.2152.010 power supply unit:
24 Vdc / 2 A

Interfaces

Valve interfaces	Specifications, see *Section 5.5*

Safety specifications

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

Electromagnetic compatibility (EMC)

Emitted interference	Standards met: - EN/IEC 61326 - EN 55022 - CISPR 22

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

Ambient temperature

Nominal operating range	+5…+45°C (at 20…80 % atmospheric humidity)
Storage	–20…+65°C
Transport	–20…+70°C

Reference conditions

Ambient temperature	+25°C (± 3 °C)
Rel. humidity	≤ 60%
Instrument condition	Instrument in operation for at least 30 min

Housing

Material	Polyurethane rigid foam (PUR) with fire protection for fire class UL94VO, FCH-free
Width	255 mm
Height	385 mm
Depth	343 mm
Weight	6.4 kg (without accessories)

6.2 Scope of delivery

Subject to changes !
All dimensions are given in mm.

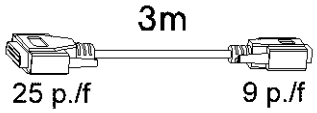
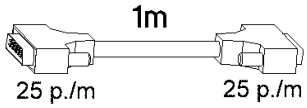
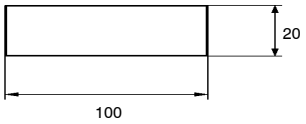
6.2.1 819 IC Detector

The 819 IC Detector is available in two versions:

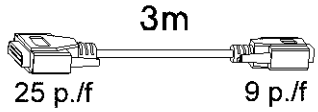
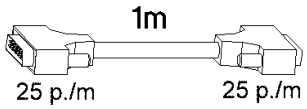
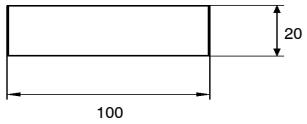
- **2.819.0010** IC Detector with metal detector block
- **2.819.0110** IC Detector with metal-free detector block

These instruments include the following parts:

2.819.0010 IC Detector

Quant.	*Order-No.*	*Description*
1	1.819.0010	**819 IC Detector**
1	1.732.0100	**Detector block** with permanently attached connecting cable to 819 IC Detector
1	6.2125.110	**Connecting cable** Connecting cable 819 IC Detector (RS 232) – PC 
1	6.2125.090	**Connecting cable** Connecting cable 819 IC Detector – 820 IC Separation Center 
1	6.2248.0000	**Magnetic plate** for identification of the 819 IC Detector 
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	8.819.1013	**Instructions for Use (English)** for 819 IC Detector and 820 IC Separation Center

2.819.0110 IC Detector

Quant.	*Order-No.*	*Description*
1	**1.819.0010**	**819 IC Detector**
1	**1.732.0110**	**Detector block** with permanently attached connecting cable to 819 IC Detector
1	**6.2125.110**	**Connecting cable** Connecting cable 819 IC Detector (RS 232) – PC 
1	**6.2125.090**	**Connecting cable** Connecting cable 819 IC Detector – 820 IC Separation Center 
1	**6.2248.0000**	**Magnetic plate** for identification of the 819 IC Detector 
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	**8.819.1013**	**Instructions for Use (English)** for 819 IC Detector and 820 IC Separation Center

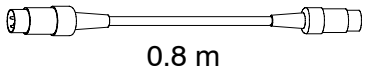
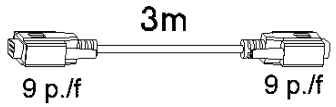
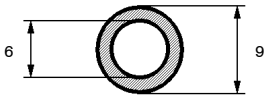
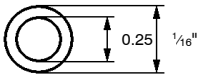
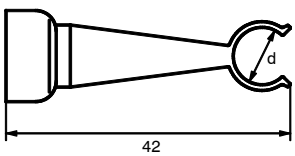
6.2.2 820 IC Separation Center

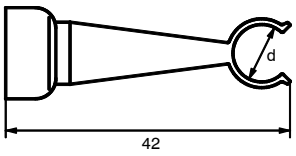
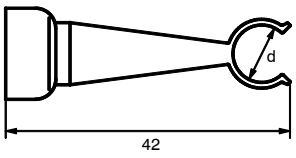
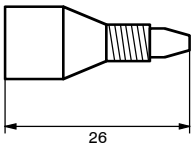
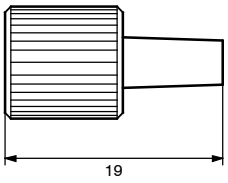
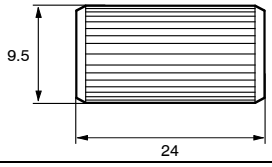
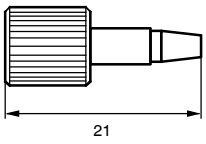
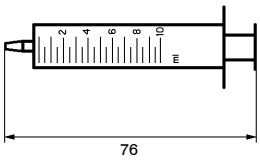
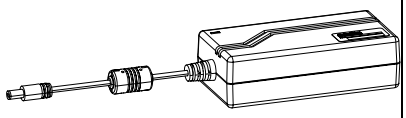
The 820 IC Separation Center is available in the following versions:

- **2.820.0210** IC Separation Center with 1 injector for a one-channel system with column heating, metal-free
- **2.820.0220** IC Separation Center with 2 injectors for a two-channel system with column heating, metal-free
- **2.820.0230** IC Separation Center with 1 injector and 1 Metrohm Suppressor Module MSM for a one-channel system with column heating, metal-free
- **2.820.0310** IC Separation Center with 1 injector for a one-channel system, metal-free
- **2.820.0320** IC Separation Center with 2 injectors for a two-channel system, metal-free
- **2.820.0330** IC Separation Center with 1 injector and 1 Metrohm Suppressor Module MSM for a one-channel system; metal-free

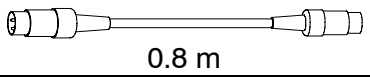
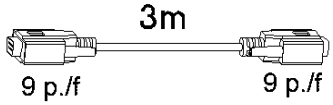
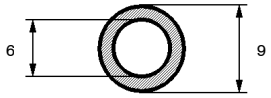
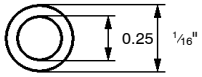
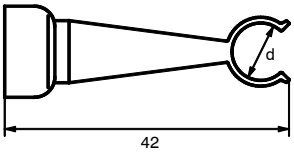
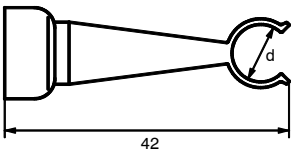
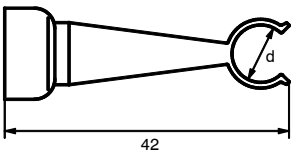
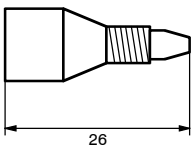
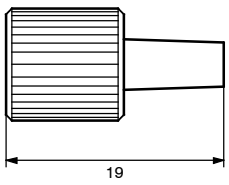
These instruments include the following parts:

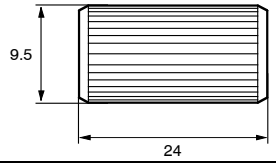
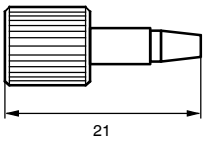
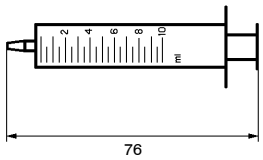
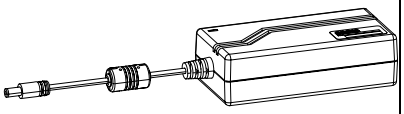
2.820.0210 IC Separation Center

Quant.	*Order-No.*	*Description*
1	1.820.0210	**820 IC Separation Center**
1	1.820.0500	**IC Column heating**
1	6.2108.120	**Connecting cable** Connecting cable Column heating – 820 IC Separation Center 
1	6.2134.040	**Connecting cable** RS 232-connecting cable 820 IC Separation Center (Connection **22**) – 830 IC Interface 
1	6.1816.000	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m 
1	6.1831.010	**PEEK capillary** Length = 3 m 
1	6.2027.030	**Column holder** diameter d = 8.5 mm 

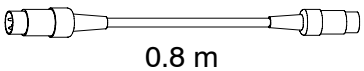
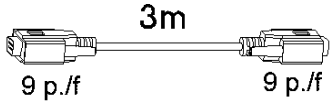
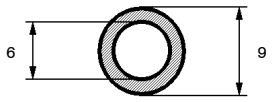
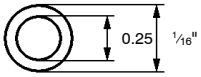
1	6.2027.040	**Column holder** diameter d = 11.3 mm 
1	6.2027.050	**Column holder** diameter d = 15.0 mm 
1	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5 
1	6.2744.020	**Coupling 1/16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used 
2	6.2744.040	**PEEK coupling** for the connection of 1/16" capillaries 
1	6.2744.070	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5 
1	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop 
1	6.2152.010	**Power supply unit** for column heating 
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	8.819.1013	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector

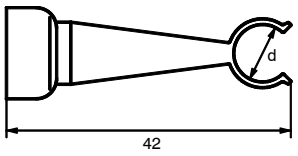
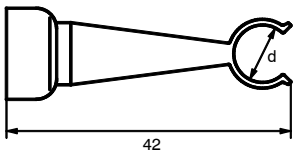
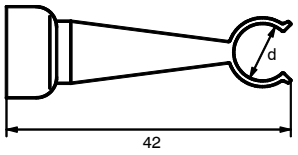
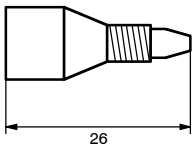
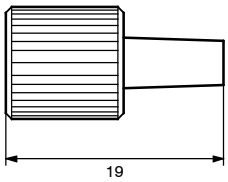
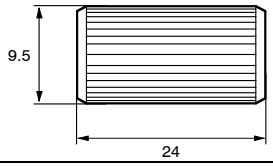
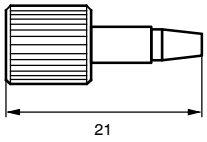
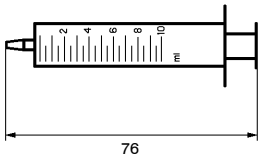
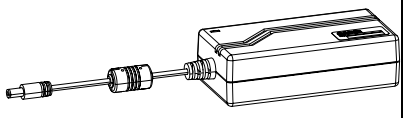
2.820.0220 IC Separation Center

Quant.	Order-No.	Description
1	1.820.0220	**820 IC Separation Center**
1	1.820.0500	**IC Column heating**
1	6.2108.120	**Connecting cable** Connecting cable Column heating – 820 IC Separation Center 
1	6.2134.040	**Connecting cable** RS 232-connecting cable 820 IC Separation Center (Connection **22**) – 830 IC Interface 
1	6.1816.000	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m 
1	6.1831.010	**PEEK capillary** Length = 3 m 
2	6.2027.030	**Column holder** diameter d = 8.5 mm 
2	6.2027.040	**Column holder** diameter d = 11.3 mm 
2	6.2027.050	**Column holder** diameter d = 15.0 mm 
2	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5 
2	6.2744.020	**Coupling 1/16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used 

4	6.2744.040	**PEEK coupling** for the connection of 1⁄16" capillaries 
1	6.2744.070	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5 
2	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop 
1	6.2152.010	**Power supply unit** for column heating 
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	8.819.1013	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector

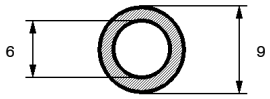
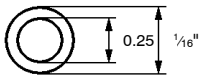
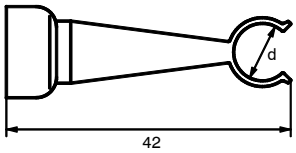
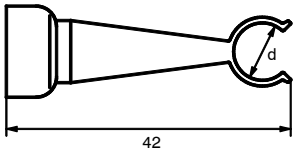
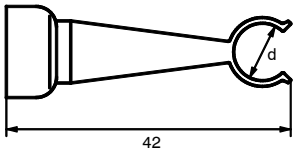
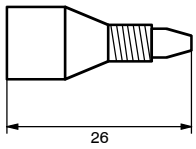
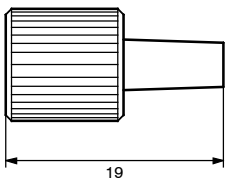
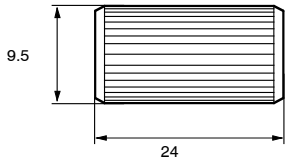
2.820.0230 IC Separation Center

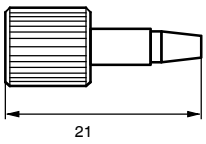
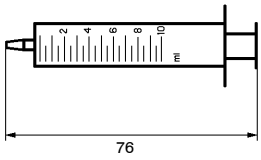
Quant.	*Order-No.*	*Description*
1	1.820.0230	**820 IC Separation Center**
1	1.820.0500	**IC Column heating**
1	6.2108.120	**Connecting cable** Connecting cable Column heating – 820 IC Separation Center 
1	6.2134.040	**Connecting cable** RS 232-connecting cable 820 IC Separation Center (Connection **22**) – 830 IC Interface 
1	6.1816.000	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m 
1	6.1831.010	**PEEK capillary** Length = 3 m 

1	6.2027.030	**Column holder** diameter d = 8.5 mm	
1	6.2027.040	**Column holder** diameter d = 11.3 mm	
1	6.2027.050	**Column holder** diameter d = 15.0 mm	
2	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5	
1	6.2744.020	**Coupling 1/16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used	
2	6.2744.040	**PEEK coupling** for the connection of 1/16" capillaries	
1	6.2744.070	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5	
1	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop	
1	6.2152.010	**Power supply unit** for column heating	
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	

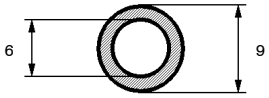
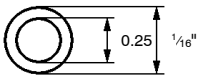
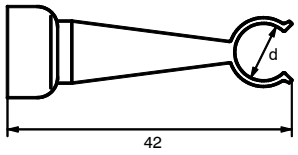
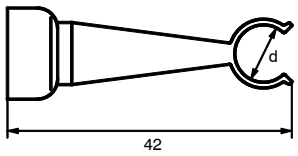
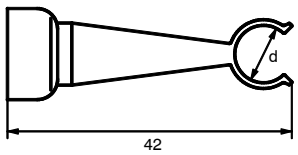
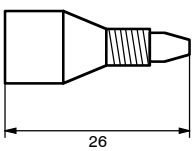
1	8.819.1013	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector

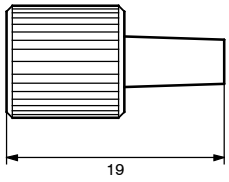
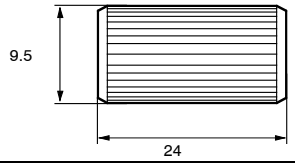
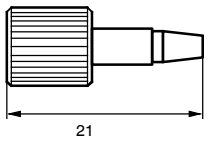
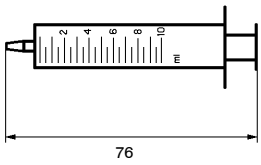
2.820.0310 IC Separation Center

Quant.	*Order-No.*	*Description*
1	1.820.0310	**820 IC Separation Center**
1	6.1816.000	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m 
1	6.1831.010	**PEEK capillary** Length = 3 m 
1	6.2027.030	**Column holder** diameter d = 8.5 mm 
1	6.2027.040	**Column holder** diameter d = 11.3 mm 
1	6.2027.050	**Column holder** diameter d = 15.0 mm 
1	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5 
1	6.2744.020	**Coupling 1/16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used 
2	6.2744.040	**PEEK coupling** for the connection of 1/16" capillaries 

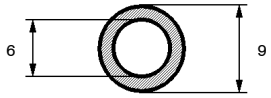
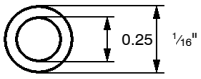
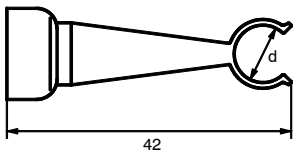
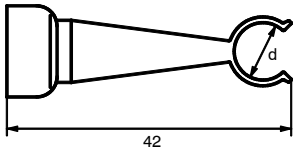
1	6.2744.070	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5	
1	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop	
1	8.819.1013	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector	

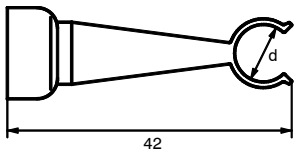
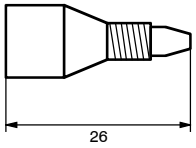
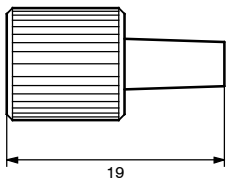
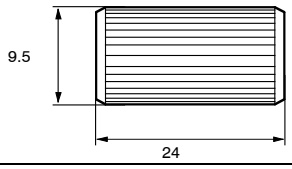
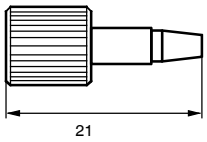
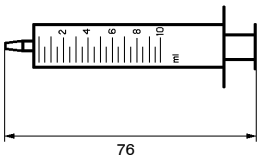
2.820.0320 IC Separation Center

Quant.	*Order-No.*	*Description*	
1	1.820.0320	**820 IC Separation Center**	
1	6.1816.000	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m	
1	6.1831.010	**PEEK capillary** Length = 3 m	
2	6.2027.030	**Column holder** diameter d = 8.5 mm	
2	6.2027.040	**Column holder** diameter d = 11.3 mm	
2	6.2027.050	**Column holder** diameter d = 15.0 mm	
2	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5	

2	**6.2744.020**	**Coupling 1⁄16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used 
4	**6.2744.040**	**PEEK coupling** for the connection of 1⁄16" capillaries 
1	**6.2744.070**	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5 
2	**6.2816.020**	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop 
1	**8.819.1013**	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector

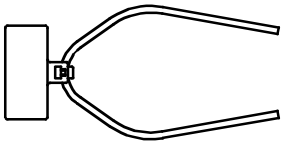
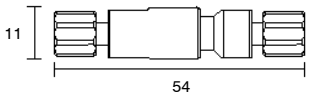
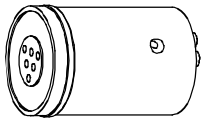
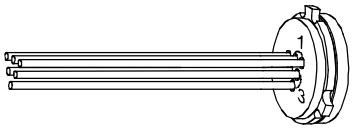
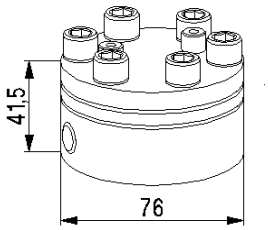
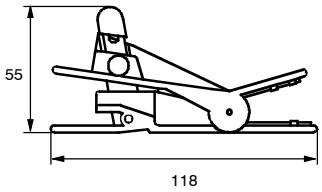
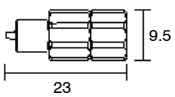
2.820.0330 IC Separation Center

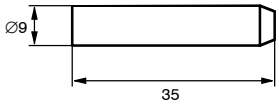
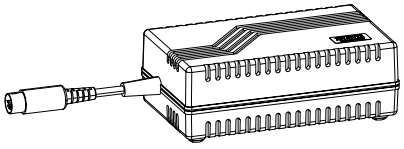
Quant.	*Order-No.*	*Description*
1	**1.820.0330**	**820 IC Separation Center**
1	**6.1816.000**	**Silicone tubing** Drain tube for inner compartment, length = 0.5 m 
1	**6.1831.010**	**PEEK capillary** Length = 3 m 
1	**6.2027.030**	**Column holder** diameter d = 8.5 mm 
1	**6.2027.040**	**Column holder** diameter d = 11.3 mm 

1	6.2027.050	**Column holder** diameter d = 15.0 mm	
2	6.2744.010	**PEEK compression fitting** For the connection of 6.1831.010 PEEK capillaries, set of 5	
1	6.2744.020	**Coupling 1/16" – Luer** Coupling for connection of a 6.1803.000 PTFE capillary to connection **13** of the 820 IC Separation Center when a sample changer (766, 788, 813) is used	
2	6.2744.040	**PEEK coupling** for the connection of 1/16" capillaries	
1	6.2744.070	**PEEK compression fitting-(short)** for the connection of 6.1831.010 PEEK capillaries in cramped conditions, e.g. in the column heating, set of 5	
1	6.2816.020	**Syringe** made of PP, volume = 10 mL; for manual filling of the sample loop	
1	8.819.1013	**Instructions for Use (English)** for 820 IC Separation Center and 819 IC Detector	

6.3 Optional accessories

6.3.1 Accessories for 820 IC Separation Center

Order No.	*Description*	
6.1825.XXX	**Sample loop PEEK** For injection valve; incl. 2 PEEK compression fittings 6.2744.010 6.1825.230: Volume = 10 µL 6.1825.210: Volume = 20 µL 6.1825.220: Volume = 100 µL	
6.2821.120	**Filter unit PEEK 2 µm** To avoid contamination. Spare part: 6.2821.130 Filter	
6.2821.130	**Filter for filter unit PEEK 2 µm** Spare part for 6.2821.120 Filter unit PEEK Set of 10	
6.2832.000	**Suppressor rotor** Replacement cartridge for Metrohm suppressor module	
6.2832.010	**Connection piece for suppressor rotor** with input and output leads	
6.2620.150	**Pulsation dampener** Metal-free pulsation dampener for reduction of pulsation and preservation of separating columns.	
6.2621.080	**Capillary tubing cutter** for 6.1831.010 PEEK capillaries and 6.1822.010 PTFE micro capillaries incl. 5 additional blades	
6.2744.160	**PEEK coupling** with tubing security device for connection to pressure side of 6.1826.0X0 Pump tubing	

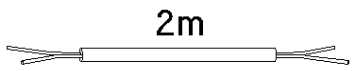
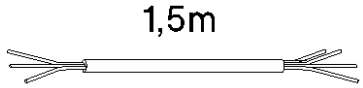
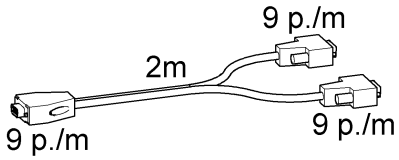
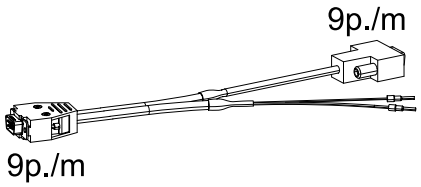
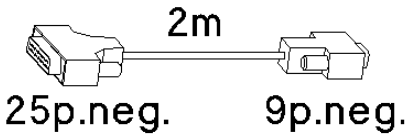
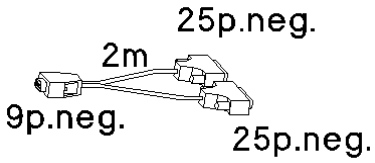
6.2821.090	**Aspirating filter PE 20 µm** For 6.1834.000 Aspirating tubing (supplied with the 818 IC Pump); set of 5. 
6.5324.000	**Bottle rack** For holding 3 supply bottles with eluent, regeneration solution and rinsing solution, incl. accessories (bottles, siphon, etc.)
6.2152.000	**Power supply unit** for 820 Separation Center  (without mains cable, pleas order the cable suitable for your country separately) 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

6.3.2 Column heating

Order No.	*Description*
2.820.0500	**Add-on kit Column Heating** including power supply unit and all connection cables
6.5858.000	**Conversion set for column heating**

To upgrade an IC Separation Center without column heating (2.820.03X0) to one with column heating (2.820.02X0) you require the 2.820.0500 Add-on kit Column Heating and the 6.5858.000 conversion set. This conversion can only be carried out by Metrohm Service technicians.

6.3.3 Cable

Order No.	Description
6.2115.070	**Remote Connection cable** Connection cable 820 IC Separation Center – 830 IC Interface 
6.2128.100	**Remote Connection cable** Connection cable 820 IC Separation Center – 830 IC Interface for direct control of 820 
6.2134.130	**Connection cable** Connection cable 830 IC Interface – 819 IC Detector 
6.2134.140	**Connection cable** Connection cable 771 IC Compact Interface – 819 IC Detector and 820 IC Separation Center 
6.2134.080	**RS 232 Connection cable** Connection cable 830 IC Interface – 1 external device (818, 819, 766, etc.) 
6.2134.090	**RS 232-Connection cable** Connection cable 830 IC Interface – 2 external devices (818, 819, 766, etc.) 

6.3.4 Literature

Order No.	Description
8.732.2003	**Monograph Ion Chromatography (English)** Fundamentals of Ion Chromatography
8.792.5003	**Monograph Practical Ion Chromatography (English)**
8.025.5003	**Monograph Sample Preparation Techniques for Ion Chromatography (English)**

6.4 Validation / GLP

GLP (**G**ood **L**aboratory **P**ractice) requires, among other things, that the precision and correctness of analytical instruments is checked at regular intervals by using SOPs (**S**tandard **O**perating **P**rocedures, **SOP**). An example of such a standard operating procedure is available from Metrohm under the title **«Application Bulletin No. 277 – Validation of Metrohm Ion Chromatography Systems by using Standard Operating Procedures (SOP)»**. This SOP can be adapted for your ion chromatography system and used for its validation.

819 IC Detector and 820 IC Separation Center must be included as a part of the whole ion chromatography system, whose most important components include the pumps, separation columns and evaluation system, in the all-embracing validation of the whole system.

Please contact your local Metrohm agency in order to receive support in validating your 819 IC Detector and 820 IC Separation Center. It can also provide you with validation documentation which will help you to carry out your installation qualification (IQ) and operational qualification (OQ).

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

Checking the electronic and mechanical assemblies of Metrohm instruments can and should be undertaken within the framework of regular servicing by Metrohm technicians. All Metrohm instruments are equipped with start-up check routines which check that the relevant assemblies are functioning perfectly when the instrument is switched on. If no error message appears it can be assumed that the instrument is functioning properly.

819 IC Detector and 820 IC Separation Center also contains a built-in diagnosis program which allows the service technicians to check the functioning of particular assemblies should faults or malfunctions occur and to localize them.

6.5 Warranty and Conformity

6.5.1 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.

6.5.2 Declaration of Conformity

Metrohm
Ion analysis

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.

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

Name of commodity	**819 IC Detector**
System software	Stored in ROMs
Name of manufacturer	Metrohm Ltd., Herisau, Switzerland

Description Thermostatted conductivity detector for ion chromatographic analyses with electronic or chemical suppression.

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

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

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

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

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

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, May 28, 2003

Dr. J. Frank
Vice President
Head of R&D

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

6.5.3 Declaration of Conformity

Metrohm
Ion analysis

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.

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

Name of commodity	**820 IC Separation Center**
System software	Stored in ROMs
Name of manufacturer	Metrohm Ltd., Herisau, Switzerland

Description Thermally and electronically isolated wet room for ion chromatographic analyses, optionally with thermostatted column heating.

This Metrohm 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 61010-1, UL 3101-1 protection class III

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

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.

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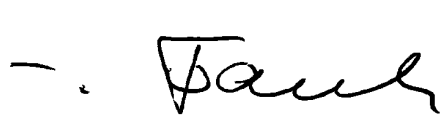
Herisau, May 28, 2003



Dr. J. Frank
Vice President
Head of R&D

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

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

Software development

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

Components

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

Manufacture

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

Customer support and service

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

6.6 Index

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