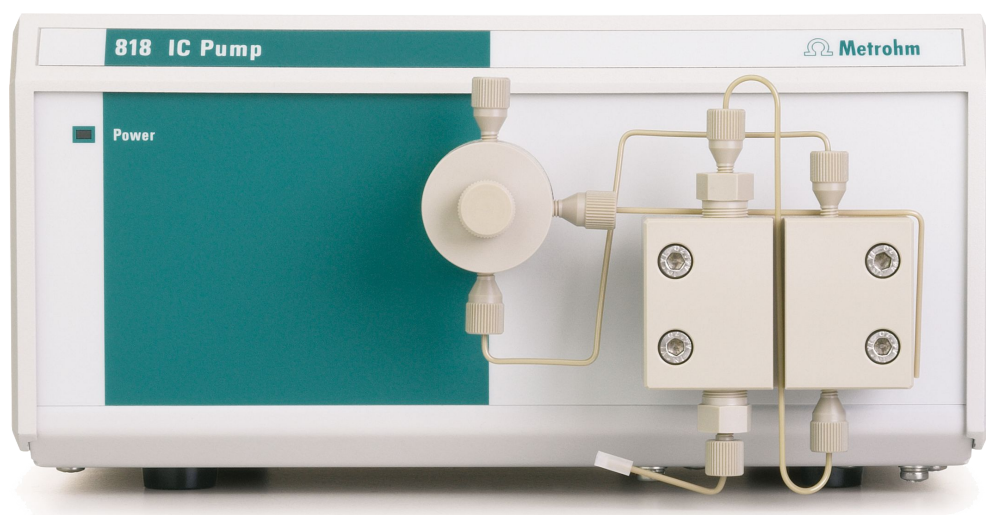


# 818 IC Pump



Manual  
8.818.1023





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# 818 IC Pump

5.818.0110 Program

## Manual

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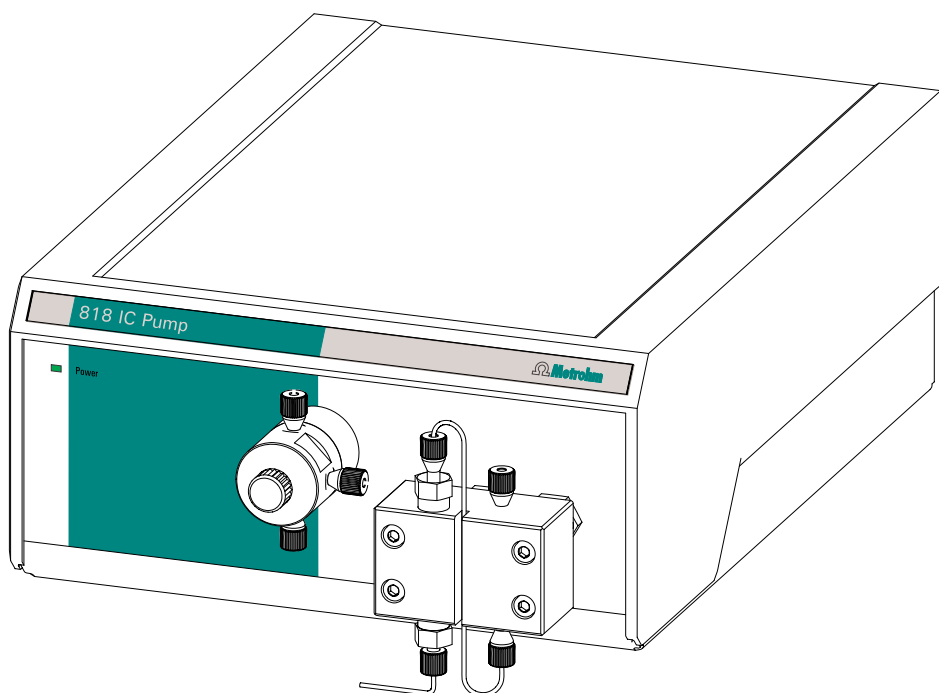
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# 1 Introduction

## 1.1 Instrument description

The **818 IC Pump** is a serial dual piston pump especially developed for ion chromatography and optimized for use with Metrohm ion chromatographic instruments (e.g. 819 IC Detector and 820 IC Separation Center). The 818 IC Pump operates with minimal residual pulsation and has an excellent flow constancy. All wet parts of the pump are **metal free**.

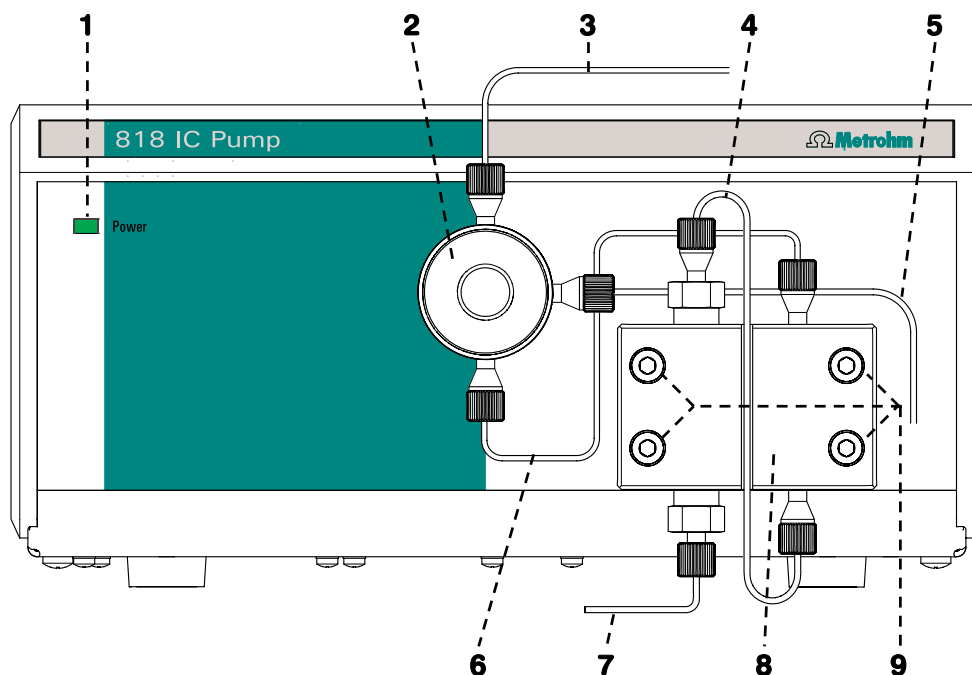
The **818 IC Pump** is completely remote controlled by the Metrohm software «IC Net» (version 2.3 or higher). All functions are fast and easily accessible via software and can be clearly arranged at the monitor. To assure optimum operational reliability, both lower and upper pressure limit values can be set. If such a limit is reached, the pump switches itself off automatically. An additional purge valve allows rapid removal of air from the pump system.



## 1.2 Parts and controls



In this section you will find the numbers and designations of the parts and controls of the 818 IC Pump. The numbering applies throughout the instructions for use, i.e. bold numbers in the text (e.g. **11**) refer to the parts and controls illustrated here.



**Fig. 1:** Front of 818 IC Pump

---

### 1 Mains pilot lamp

Lights up when instrument is switched on

---

### 2 Purge valve

---

### 3 Connection capillary

to injection valve of IC system.

---

### 4 Connection capillary

in pump head (intergal)

---



---

### 5 Outlet capillary

of Purge-Ventil.

---

### 6 Connection capillary

between pump head and purge valve.

---

### 7 Aspirating capillary

---

### 8 Pump head 6.2824.100

---

### 9 Fastening screws

for pump head

---

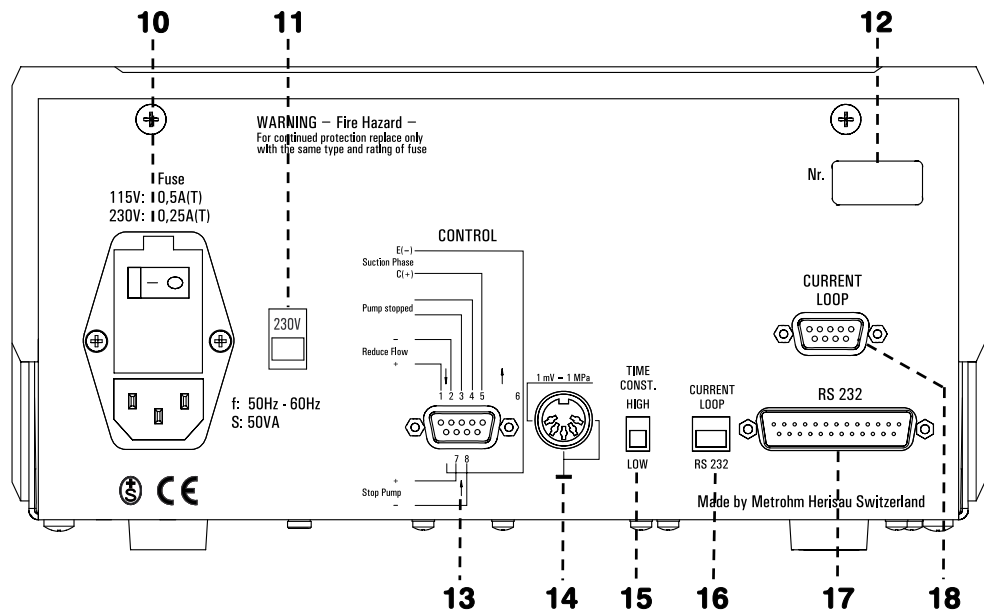


Fig. 2: Rear of 818 IC Pump

**10 Fuse cover**

Changing the fuses, see section 2.6.2.

**Mains switch**

For switching instrument on/off:

**I = ON    0 = OFF**

**Mains connector**

For mains connection see section 2.6.

**11 Mains voltage selector**

Voltage selection see section 2.6.1.

**12 Serial number**

**13 Control interface**

details see section 5.2.

**14 Recorder output**

For recording the pressure,  
1 mV = 1 MPa

**15 Switch "Time Constant"**

Time constant for the recorder output:  
**HIGH** ≈ 1 s; **LOW** ≈ 20 ms

**16 Switch for external control**

Selector to choose the interface for  
remot control of the pump  
**RS 232 / Current Loop**

**17 RS 232 interface**

**18 Current Loop interface**

(Details on request)

## 1.3 Information about the Instructions for Use



*Please read through these Instructions for Use carefully before operating the 818 IC Pump. The Instructions for Use contain information and warnings to which the user must pay attention in order to assure safe operation of the instrument.*

### 1.3.1 Organization

These **8.818.1023 Instructions for Use** for the 818 IC Pump provide a comprehensive overview of the installation, startup procedure, operation, fault rectification and technical specifications of this instrument. The Instructions for Use are organized as follows:

**Section 1 Introduction**

Description of the instrument, parts and controls, safety notes

**Section 2 Installation**

Mounting the pump head, 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.

**1.3.2 Notation and pictograms**

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

<b>Range</b>	<b>Menu item, parameter or entry value</b> in «IC Net» program
<b>SYSTEM STATE</b>	<b>Program window</b> in «IC Net» program
<b>&lt;OK&gt;</b>	<b>Button</b> in «IC Net» program
<b>10</b>	<b>Part or control of 818</b>
	<b>Danger/Warning</b> This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components by electricity.
	<b>Danger/Warning</b> This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components.
	<b>Attention</b> This symbol indicates important information that you should read before continuing.
	<b>Information</b> This symbol indicates additional information and tips which may be of particular use to you.

## 1.4 Safety notes

### 1.4.1 Electrical safety

While electrical safety in the handling of the 818 IC Pump is assured in the context of the specifications IEC 1010-1 (protection class 1, degree of protection IP40), the following points should be noted:

- **Mains connection**



Set the **mains voltage** and check the **mains fuse** and **mains connection** in accordance with the instructions in section 2.6.

- **Opening the instrument**

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



If the 818 IC Pump is connected to the power supply, the instrument must not be opened nor must parts be removed from it, otherwise there is a danger of coming into contact with components which are live. Hence, always disconnect the instrument from all voltage sources before you open it and ensure that the **mains cable is disconnected from mains connection 10 !**

- **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 818 IC Pump, 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.

### 1.4.2 General safety rules

- **Handling of solvents**



Check the pump tubing and all input and output leads 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

The 818 IC Pump is 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 818 IC Pump in the laboratory at a location convenient for operation, free from vibrations and protected against a corrosive atmosphere and contamination by chemicals.



*To avoid disturbing temperature influences on the insulated column compartment, the pump and eluent reservoir must be protected against direct sunlight.*

#### 2.1.4 Arrangement of the instruments

The 818 IC Pump should always be at the very bottom of a IC system.



*The 818 IC Pump should always be placed at the bottom of the instrument stack so that any leaks which may occur in the pump tubing or connections cannot cause damage to the other instruments by leakage liquids.*

## 2.2 Mounting the pump head

### 1 Remove the transportation lock

To ensure that the pump drive is not damaged during transport a black plastic block is mounted in place of the pump head on the right side of the 818 IC Pump front panel. This transport safeguard block has to be removed after undoing the four screws **9**.



*To avoid any damage to the pump head, the protective block must be remounted if the pump has to be moved any great distance.*

### 2 Mounting the pump head

The **Pump Head 8** (6.2824.100) with integrated piston units is unpacked and fixed in place of the transport safeguard block with the **four hexagon screws 9** as shown in Fig. 2 .



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

### 3 Connecting capillary to pump head

The **connection capillary 6** fastened to **purge valve 2** is screwed onto the **pump head 8** as shown in Fig. 2.



*The pressure range of the 818 IC Pump with the 6.28.24.100 PEEK pump head isf 0...30.0 MPa (0...300 bar)..*

## 2.3 Attaching the accessories

### 2.3.1 Capillaries

Some of the connections under high pressure between the 818 IC Pump and the IC system must be set up by the user, see *section 2.4*. For that the **6.1831.010 PEEK capillary** (i.d. = 0.25 mm, o.d. = 1/16", length = 3 m) supplied in the accessories of the 818 IC Pump can be used.



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**

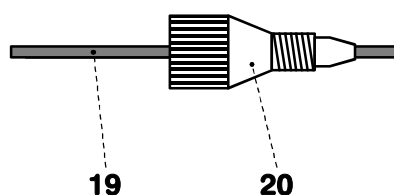


Fig. 3: Connect capillaries

---

**19 PEEK capillary (6.1831.010)**

---



---

**20 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 **20** (6.2744.010) over the end of the capillary **19** to be fastened as shown in *Fig. 3*.

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

### 2.3.2 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 MF** is very well suited to this purpose (see *section 6.3*).

The metal-free 6.2620.150 Pulsation dampener is supplied fully assembled and has two connections for capillaries, for which 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 819/820 Instructions for Use).



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

### 2.3.3 Filter unit PEEK

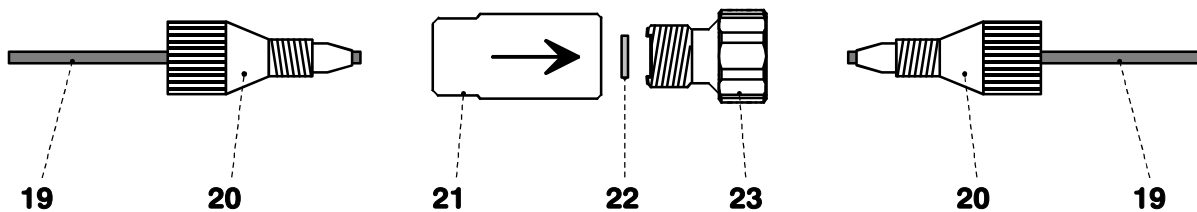
The **6.2821.120 Filter unit PEEK 24** supplied (see Fig. 4) serves to avoid contamination of the piston seals by abrasive particles and can be used in the pressure range 0...30 MPa (0...300 bar). The filter unit consists of the housing **21**, the filter **22** and the connector **23** to be screwed into the housing **21**. For the connection of capillaries **19**, PEEK compression fittings **20** (6.2744.010) must be used.

New filter **22** 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. 4: Filter unit PEEK (6.2821.120)**

<b>19 PEEK capillary (6.1831.010)</b>	<b>22 Filter 6.2821.130</b>
<b>20 Compression fitting (6.2744.010)</b>	<b>23 Filter connector</b>
<b>21 Filter housing</b>	

## 2.4 Connecting the tubing

### 2.4.1 Connection to injection valve

It is recommended to use 6.1831.010 PEEK capillaries, a 6.2620.150 Pulsation dampener (see *section 2.3.2*), and a Filter unit PEEK (see *section 2.3.3*) to connect the 818 IC Pump to the injection valve of the 820 IC Separation Center. Proceed as follows:

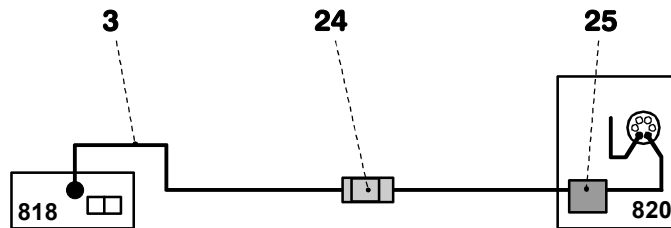


Fig. 5: Connection to injection valve

---

**3 Connection capillary**  
to 820 IC Separation Center.  
**PEEK capillary (6.1831.010)**

---



---

**24 Filter unit PEEK (6.2821.120)**

---



---

**25 Pulsation dampener (6.2620.150)**

---



---

#### 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*).

---

#### 2 Connection of filter unit PEEK

- Attach the other end of connection capillary **3** at the filter housing **21** of the filter unit **24** (see *Fig. 4*).
- Connect a PEEK capillary 6.1831.010 cut to the required length and equipped with connectors to the filter connector **23** of the filter unit **24**.

---

#### 3 Installation of the capillary in the IC Separation Center

- Procedure, see *819/820 Instructions for Use*.

---

#### 4 Connection of the pulsation dampener

- Procedure, see *section 2.3.2*.

---

#### 5 Connection to the injection valve

- Procedure, see *section 2.3.3*.

### 2.4.2 Connection to eluent container

The 6.1834.000 Aspirating tubing (i.d. = 1.5 mm, o.d. = 2.5 mm, length = 1.2 m) supplied is slid over the **aspirating capillary 7**. The 6.2821.090 Aspirating filter supplied is screwed onto the other end of the tubing. The end of the tubing with the aspirating filter is then introduced in the eluent container.



*Only degassed (with N<sub>2</sub>, He or vacuum) and microfiltered (0.45 μm filter) eluents may be used!*

*It must be ensured that the eluent used is freely miscible with any residual solvent in the pump head (the pump head is filled with isopropanol or methanol/water in the factory). If this is not the case, the pump must first be rinsed with a solvent that is miscible with both the previous and subsequent eluent (e.g. acetone).*



*If you use the optional available 6.5324.000 Bottle rack, the 6.1834.010 Aspirating tubing (accessory of the bottle rack, length = 2.5 m) must be installed instead of the 6.1834.000 Aspirating tubing. The end of the tubing with the screwed-on 6.2821.090 aspirating filter is then fixed in the eluent vessel according to the instructions on the leaflet supplied with the bottle rack.*

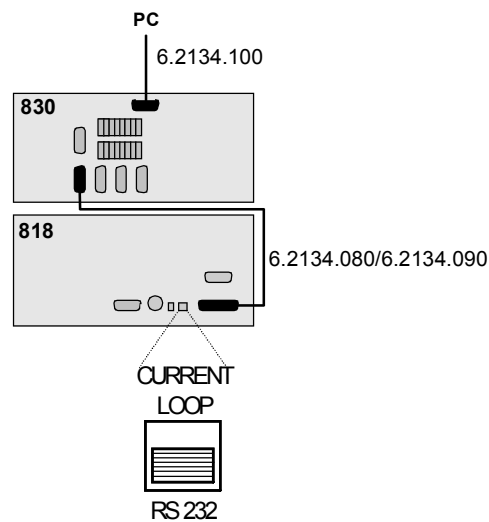
## 2.5 Electrical connection



Switch off both devices before connecting the 818 IC Pump to another instrument.

### 2.5.1 Connection to 830 IC Interface

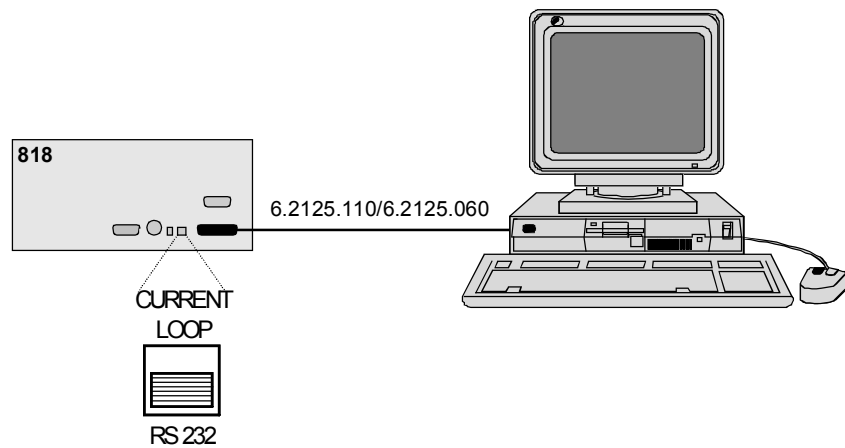
The **818 IC Pump** is normally integrated into the modular IC system via 830 IC Interface. Connect the RS 232 interface **17** of the 818 IC Pump with a free RS 232 interface at the 830 IC Interface using the 6.2134.080 or 6.2134.090 cable according to the figure below. To ensure proper functioning 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. 6:** Connection of 818 IC Pump to 830 IC Interface

### 2.5.2 Connection to PC

The **818 IC Pump** can also be connected directly to a PC. Connect the RS 232 interface **17** of the 818 IC Pump with a free COM port at the PC using the 6.2125.110 (for 9 pin COM port connector) or 6.2125.060 (for 25 pin COM port connector) according to the figure below. To ensure proper functioning of the communication between the PC and 818 IC Pump, the sliding switch **16** on the IC pump must be set to "RS 232".



**Fig. 7:** Connection of 818 IC Pump to PC



## 2.6 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!

### 2.6.1 Setting the mains voltage

Before switching on the 818 IC Pump for the first time, check whether the mains voltage set on the instrument (can be read in the mains voltage selector **11**) matches the local mains voltage. If this is not the case, you must switch the mains voltage by pushing the mains voltage selector **11** with a screwdriver:

Position of the mains voltage selector <b>11</b> :		230V: 220...240 V ± 10%
		115V: 110...120 V ± 10%

---

#### 1 Disconnect mains cable

Disconnect mains cable from mains connection plug **10** of the 818 IC Pump.

---

#### 2 Remove fuse cover

Using a screwdriver, lever out fuse cover **10** forwards until it opens.

---

#### 3 Check and change fuses if necessary

Carefully take the fuses installed for the desired mains voltage out of the fuse holder and check its specifications:

**100...120 V 0.5 A (slow blow)** Metrohm No. U.600.0013

**220...240 V 0.25 A (slow blow)** Metrohm No. U.600.0010

Change fuse if necessary and reinsert in fuse holder.

---

#### 4 Install fuse holder

Reinsert fuse holders in the instrument (the arrows printed on the holders must point in the same direction as the arrows on the inside of fuse cover **10**).

---

#### 5 Install fuse cover

Push in fuse cover **10** firmly until it clicks into place.

---

#### 6 Connect mains cable

Plug mains cable into mains connection plug **10**.

## 2.6.2 Fuses

The 818 IC Pump contains two fuses built in as standard, either of type 0.25 AT (for 230 V: 0.25 A, slow-blow, Metrohm ordering number U.600.0010) or 0.5 AT (for 110 V: 0.5 A, slow-blow, Metrohm ordering number U.600.0013). Ensure that the two fuses correspond to the fuse type specified for the local mains voltage (see also *Fig. 2*).



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

To change wrong or blown fuses, proceed as described in *section 2.6.1*.

## 2.6.3 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 **10** (see *Fig. 2*).

## 2.6.4 On/off switching of the instrument

The 818 IC Pump is switched on and off using mains switch **10** (see *Fig. 2*). When the instrument is switched on the mains pilot lamp **1** lights up.

## 2.7 Software installation

The PC program «**IC Net 2.3**» is required for the operation of the 818 IC Pump. This program runs under Windows 2000 and Windows XP operating systems and is installed according to *section 1.4.2* of the **Instructions for Use 8.110.8283** from the Metrodata software «**IC Net 2.3**».

The installation of 818 IC Pump is described in *section 6.1.2* of the **Instructions for Use 8.110.8283** from the Metrodata software «**IC Net 2.3**». Take care that the RS 232 settings are identical for the RS 232 interface of 818 IC Pump and 830 IC Interface. For the settings of 818 IC Pump see *section 6.10*.

## 2.8 Deaerating the pump

### 1 Start IC system

Switch the IC instruments on, start «**IC Net**» and open the device window **818 IC Pump**.



*Operation of 818 IC Pump via the software «**IC Net 2.3**» is described more detailed in section 3. For further information refer to the Instructions for Use of «**IC Net**» and to the online help of the program.*

### 2 Purge pump

The purge valve **2** is opened by turning anticlockwise and the pump can now be deaerated by starting the pump in «**IC Net**».



*The solvent bottle should be located somewhat above the pump, but at least at the same level as the pump head **8** (never below the pump).*

### 3 Deaerate pump

Should the pump not prime by itself, the 6.2816.020 syringe supplied is used to siphon off solvent via the outlet capillary **5** with opened purge valve through the pump head until there are no more bubbles in the solvent entering the syringe. The pump can then again be briefly purged.

### 4 Close purge-valve

On completion of this procedure, the purge valve **2** is closed by turning clockwise. The pump is now ready for operation.

## 3 Operation

The operation of 818 IC Pump is made completely via the Metrohm software «IC Net».

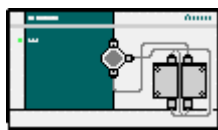


*This section describes only the most important points concerning the operation of the 818 IC Pump. For further details please refer to the «IC Net» Instructions for Use and to the on-line help in the PC program.*

### 3.1 Switch instrument on/off

The 818 IC Pump is switched on and off using mains switch **10** on the rear of the instrument (see Fig. 2). When the instrument is switched on the mains pilot lamp **1** lights up to show that the instrument is ready for use.

### 3.2 818 IC Pump icon



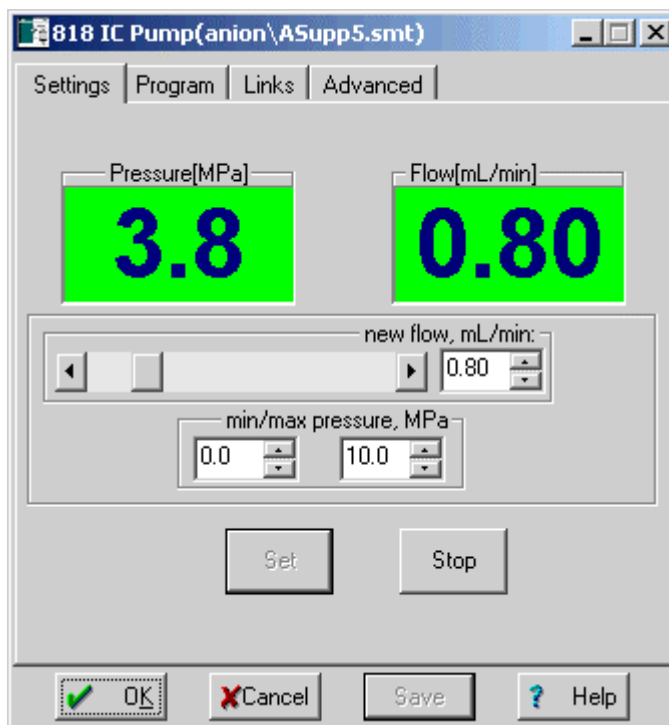
818 IC Pump

### 3.3 Settings in the "818 IC Pump" window

By double-clicking the 818 icon by clicking this icon with the right mouse button and selecting the **Open** menu item the **818 IC Pump** window for parameter settings is opened. It consists of the four tabs **Settings**, **Program**, **Links** and **Advanced**.

**Settings**

The **Settings** tab of the **818 IC Pump** window contains basic settings of the 818 IC Pump.



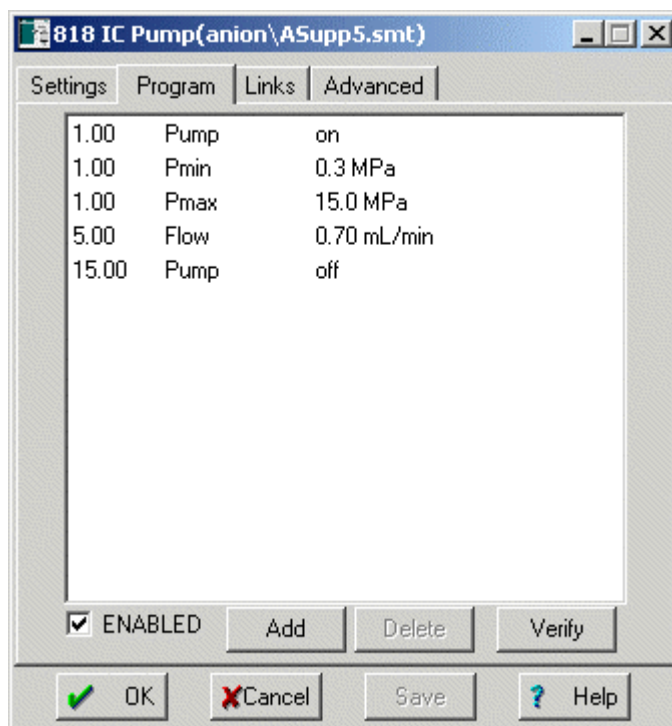
<b>Pressure</b>	Live display of current pressure in MPa.
<b>Flow</b>	Live display of current flow in mL/min.
<b>New flow</b>	A new flow can be set by moving the scroll bar, by entering a value or by changing the value using the up and down arrows. Entry range: <b>0.01 ... 5.00 mL/min</b>
<b>Min/Max pressure</b>	The minimum and maximum pressure limit for the 818 IC Pump can be set in steps of 0.1 MPa. Entry range: <b>0.0 ... 30.0 MPa</b> . The set <b>maximum</b> limit value should lie between <b>5 to 10 MPa</b> above the particular operating pressure or the maximum admissible operating pressure of the column used. If the pump exceeds the preset limit value during operation, it is switched off immediately. At the same time, the <b>Pressure</b> field color in the 818 settings window is changed to the value set for <b>Out of range</b> . The set <b>minimum</b> limit value should lie <b>far enough below</b> the particular operating pressure. If the pump pressure falls below this preset lower limit during operation and this pressure drop persist for several revolutions of the pump cam due to leaks or interrupted inflow of the eluent, the pump is automatically

switched off. At the same time, the **Pressure** field color in the 818 settings window is changed to the value set for **Out of range**.

<Set>	Send current parameters immediately to the 818 IC Pump (only available if pump is running). Parameters are not stored in the system file (*.smt) as long as the file is not saved.
<Start>	Set current parameters and start 818 IC Pump drive.
<Stop>	Stop 818 IC Pump drive.

### Time program

The **Program** tab of the **818 IC Pump** 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 «IC Net 2.3» Instructions for Use 8.110.8283*), either at the moment the determination is started (**Start with determination**) or at the moment the sample is injected (**Start with inject**).A



<b>First column</b>	<b>Time</b> at which program instruction is applied. Entry range: <b>0.0 ... 999.9 min</b>
<b>Second column</b>	If no time is entered, the program instruction is applied together with the last instruction with time entry.
<b>Third column</b>	<b>Program instruction</b> (see below).
	<b>Parameter</b> for program instruction (see below).

<b>ENABLED</b>	Enable program start (a disabled program is not started).
<b>&lt;Add&gt;</b>	Add new program instruction.
<b>&lt;Delete&gt;</b>	Delete selected program instruction.
<b>&lt;Verify&gt;</b>	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:

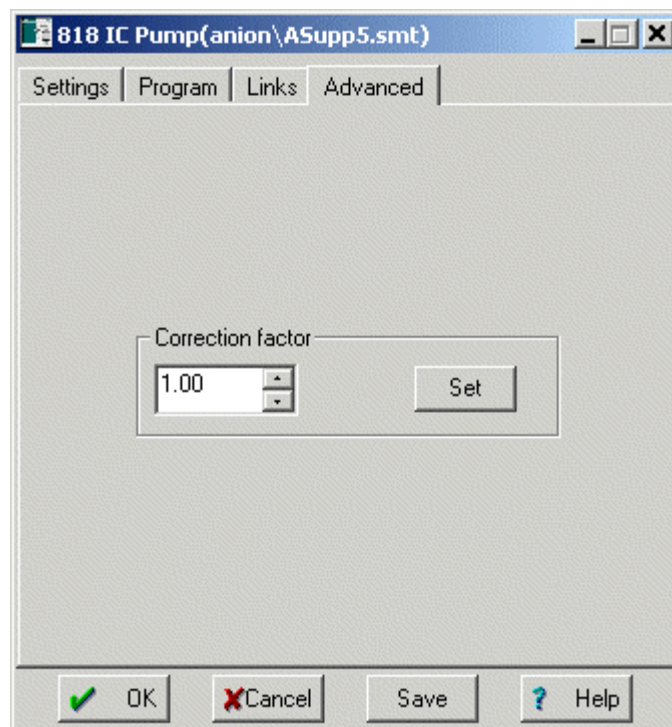
<b>Befehl</b>	<b>Parametereintrag</b>	<b>Bedeutung</b>
<b>Pump</b>	<b>on, off</b>	Switch the high pressure pump on or off.
<b>Flow</b>	<b>0.01 ... 5 mL/min</b>	Set flow rate of the high pressure pump to the desired value.
<b>Pmax</b>	<b>0.0 ... 30.0 MPa</b>	Set maximum pressure limit for the high pressure pump to the desired value.
<b>Pmin</b>	<b>0.0 ... 30.0 MPa</b>	Set minimum pressure limit for the high pressure pump to the desired value.

### Links

Die Registerkarte **Links** im Fenster **818 IC Pump** dient zur Wahl und Einstellung der COM-Schnittstelle (Details siehe *section 5.2.4 Links* of the «IC Net 2.3» Instructions for Use 8.110.8283).

### Advanced

The **Advanced** tab of the **818 IC Pump** window is only available for a **connected system**.



#### Correction factor

Flow correction factor to adjust the displayed flow to the actual flow measured with the aid of a measuring cylinder.

Entry range: **0.90 ... 1.10**

$$\text{Correction factor} = \frac{\text{Displayed flow rate (in mL/min)}}{\text{Measured flow rate (in mL/min)}}$$

#### <Set>

Send current **Correction factor** value to the 818 IC Pump. This parameter is not stored in the system file (\*.smt) as long as the file is not saved.



*The difference between displayed and actual flow rate can be maximum 3 % owing to unavoidable tolerances in the manufacture of mechanical parts. Examine therefore the flow rate after disassembling/assembling of the pump head and adjust the 818 IC Pump with the correction factor if necessary.*

## 4 Notes – Maintenance – Faults

### 4.1 Practical notes

#### 4.1.1 Protection against foreign particles

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 24** between the pump and the 820 IC Separation Center (see *Fig. 5*). We recommend to use the **6.2821.100 Filter unit PEEK** which is included in the standard accessories of the 818 IC Pump (see *section 2.3.3*).

#### 4.1.2 Pulsation dampener

To protect the column material against pressure shocks caused by injection we recommend to use a pulsation dampener between the 818 IC Pump and the 820 IC Separation Center (see *Fig. 5*). The optional **6.2620.150 Pulsation dampener MF** (see *section 2.3.2*) is eminently suitable for this purpose.

#### 4.1.3 Eluents

##### Treatment

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

Fresh eluents should always be **microfiltered** (0.45 µm filter) and **degassed** (with N<sub>2</sub>, He or vacuum). For in-line degassing of eluents the **837 IC Eluent Degasser** is available from Metrohm. 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 **CO<sub>2</sub> absorbers**.

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.

##### Precipitates

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, e.g. when the eluent is changed. 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).

## 4.2 Maintenance and servicing

### 4.2.1 General information

#### Care

The 818 IC Pump requires proper care and attention. Excessive contamination of the instrument could possibly lead to malfunctions and a shorter service life of the inherently rugged mechanical and electronic parts.

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 instrument the mains plug of the 818 IC Pump must be immediately disconnected to prevent extensive damage to the instrument electronics. Inform Metrohm service if your instrument has been damaged in such a way.*



*The instrument must not be opened by untrained personnel. Please comply with the safety notes in section **Fehler! Verweisquelle konnte nicht gefunden werden.***

#### Maintenance by Metrohm service

Maintenance of the 818 IC Pump 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 Maintenance work at the pump head

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

#### 1 Detach pump head

Unscrew connection capillary **6** from the pump head **8** with the aid of the ¼" wrench (see *Fig. 1*). Then remove the pump head **8** from the pump housing by loosening the 4 hexagon screws **9** using the 6.2621.030 hexagon key. The main piston is on the left (when viewed from front), the auxiliary piston on the right.

#### 2 Disassemble pump head

Strip down pump head **8** in accordance with *Fig. 8*. Main and auxiliary pistons are identical with the following exceptions:

- The spring **29** of the auxiliary piston (right piston) is more powerful (longer) than that of the main piston (left piston).
- Inlet and outlet valve are not present in the secondary cylinder.



*To prevent the piston **27** suddenly jumping out of the piston cartridge **30**, the screw **26** must be undone very carefully by hand.*

#### 3 Cleaning/replacement of piston **27**

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

#### 4 Replacement of piston seal **34**

To remove damaged piston seals **34** the special tool **38** is used. This is screwed into the seal **34**, which can then be pulled out (see *Fig. 9A*).



*When the special tool **38** is screwed into the piston seal **34** the latter is completely destroyed!*

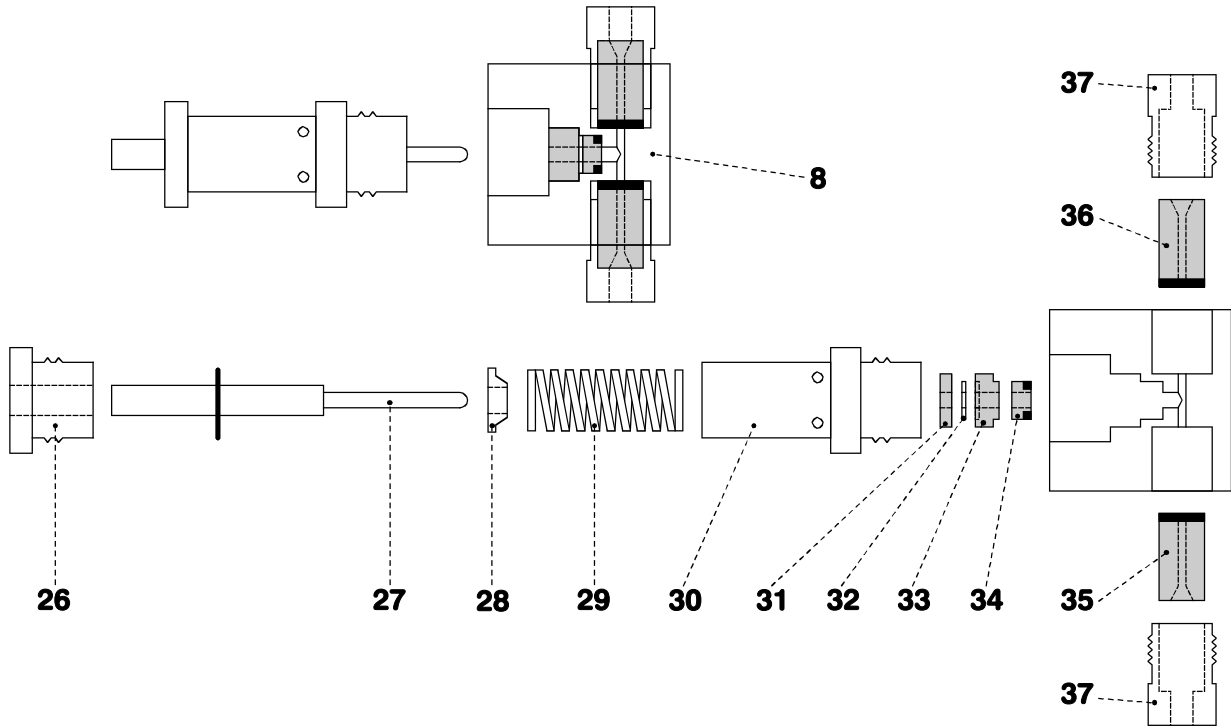


Fig. 8: Components of the pump head

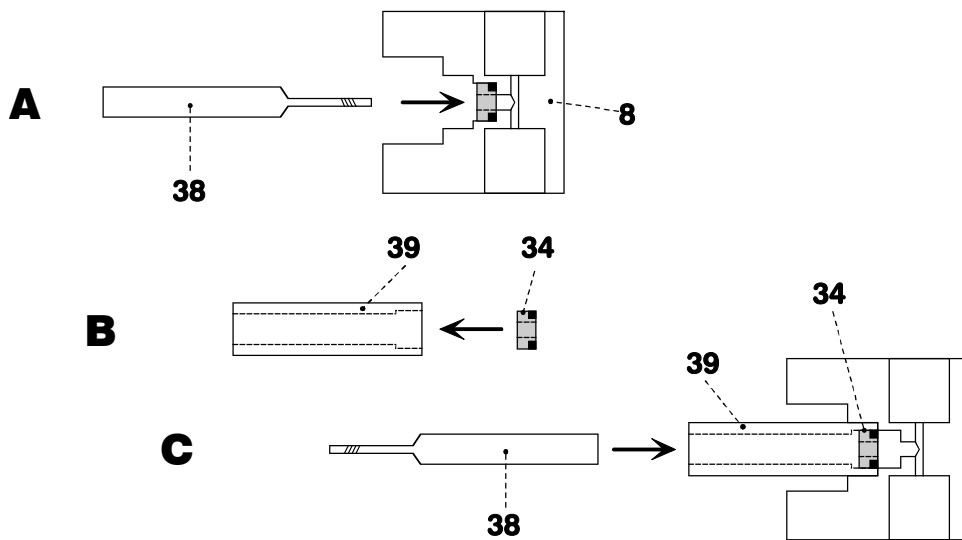


Fig. 9: Replacement of the piston seal 34

<b>8 Pump head 6.2824.100</b>	<b>(6.2824.030)</b>
<b>26 Screw</b> for piston cartridge <b>30</b> .	<b>33 Piston guide sleeve (4.709.4370)</b>
<b>27 Piston</b> with piston shaft (6.2824.070 zircon piston or 6.2824.000 sapphire piston)	<b>34 Piston seal 6.2741.020</b>
<b>28 Spring retainer</b>	<b>35 Inlet valve (6.2824.090)</b>
<b>29 Spring (6.2824.050)</b> (for main piston) or <b>Spring (6.2824.060)</b> (for auxiliary piston)	<b>36 Outlet valve (6.2824.080)</b>
<b>30 Piston cartridge (4.709.0760)</b>	<b>37 Screw holder</b> for valve.
<b>31 Piston guide sleeve (4.709.4380)</b>	<b>38 Special tool (6.2617.010)</b> to remove the piston seal <b>34</b> .
<b>32 Sapphire supporting ring</b>	<b>39 Special tool (6.2617.010)</b> to install the piston seal <b>34</b> .

To install a new piston seal **34** the special tool **39** is used:

- First the new seal is inserted firmly in the recess of tool **39** by hand (see *Fig. 9B*). The seal spring must be located on the outside.
- The tool **39** together with the seal is then inserted in the pump head **8** and the seal pressed into the pump head recess with the aid of tool **38** (see *Fig. 9C*).



*The seal surface in the pump head **8** must not be damaged (avoid contact with tool)!*

## 5 Cleaning/Replacement of inlet valve 35 and outlet valve 36

Contaminated or blocked valves are cleaned by rinsing with dist. water, RBS solution or acetone. The rinsing effect can be reinforced by brief treatment in an ultrasonic bath (max. 20 s; if longer the sapphire sphere of the valve can be damaged).

If this does not have the desired effect, the valves can be disassembled as shown in *Fig. 10*. Therefore the valves are inserted into the holder of 6.2617.020 special tool and the components of the valve are pushed out with the aid of the push rod (also included in 6.2617.020 special tool) inserted through the upper opening in the valve housing **40**. The individual components are rinsed with dist. water and/or acetone, and the sapphire sphere cleaned with a paper towel. The valve is then reassembled in accordance with *Fig. 10*. The components of the inlet and outlet valves are identical, they are distinguished only by the positioning of the sapphire sleeve **43** and the ceramic holder **45** (see *Fig. 10*).

Valves that fail to function faultlessly after such cleaning must be replaced.

In the reinstallation of the inlet valve **35** or the outlet valve **36** on no account must the two outwardly identical valves be interchanged. To determine which valve is which, note that the liquid flows through the pump head from the bottom up. The flow direction of the valves can be checked simply by blowing through the clean valve. Both valves are installed with the black face in the direction of the pump head (see *Fig. 8*).



*If by mistake an inlet valve **35** is installed instead of the outlet valve **36**, an extreme pressure buildup occurs within the working cylinder, which is not detected by the pressure transducer and will destroy the piston seal **34**!*

## 6 Mounting the pump head

The components of the pump head **8** are reassembled as shown in *Fig. 8*. the screw **26** and the piston cartridge **30** may be tightened only by hand. On the other hand, the two valve screw holders **37** are tightened with a wrench. The pump head is then remounted on the pump (see *section 2.2*).

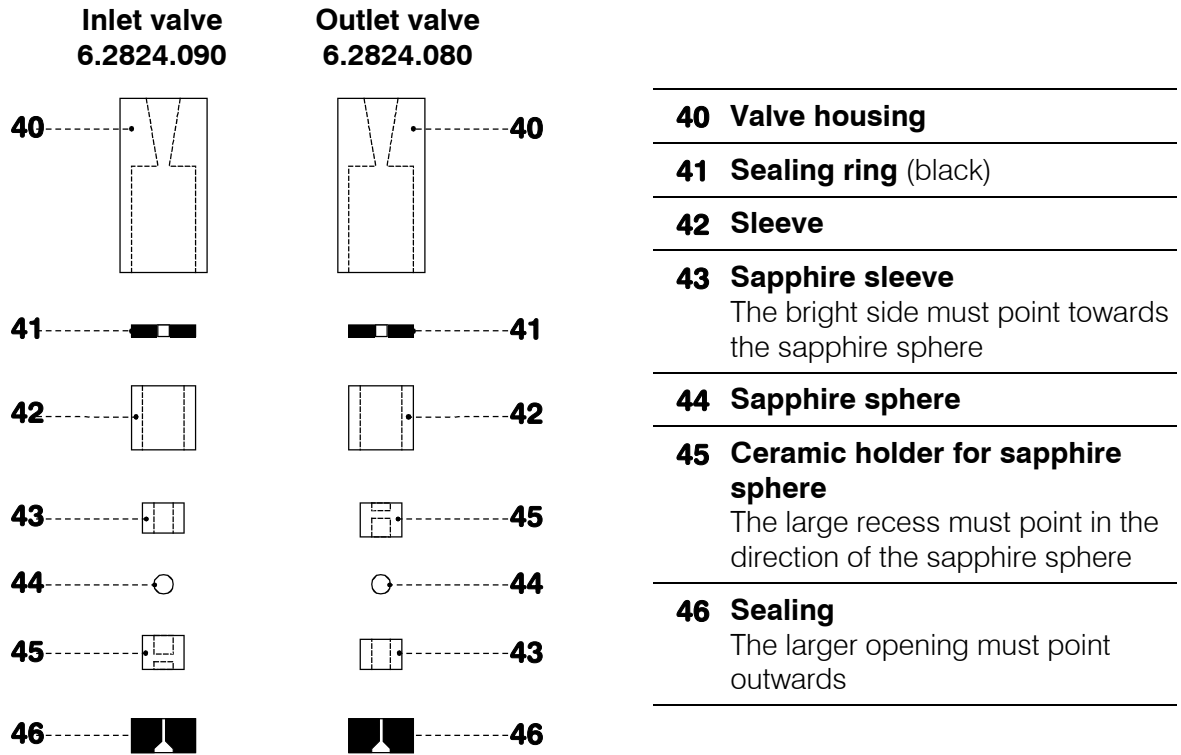


Fig. 10: Components of inlet valve 35 and outlet valve 36

## 4.3 Faults and malfunctions

If difficulties appear with the IC system during analyses, their causes are best investigated in the order **separating column → 818 IC Pump → eluent → 819/820 IC System** (see 819/820 Instructions for Use, section *Faults and malfunctions*). Several of the malfunctions which may appear with the 818 IC Pump are listed in the following table with details of possible causes and countermeasures.

<b>Malfunction</b>	<b>Cause</b>	<b>Rectification</b>
<b>Baseline with high noise level, pulsation</b>	<ul style="list-style-type: none"> <li>Contaminated pump valves</li> <li>Faulty piston seals</li> <li>Quality of the pump does not suffice for the selected sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>Clean the valves (see section 4.2.2)</li> <li>Replace the piston seals (see section 4.2.2)</li> <li>Use pulsation dampener, use more powerful pump or lower the sensitivity</li> </ul>
<b>Drift of baseline</b>	<ul style="list-style-type: none"> <li>Thermal equilibrium not yet reached</li> <li>Leak in system</li> <li>Evaporation of organic solvent in eluent</li> </ul>	<ul style="list-style-type: none"> <li>Condition system with 820 heating switched on</li> <li>Check connections and make leakproof</li> <li>Ensure better closure of eluent supply vessel, stir</li> </ul>
<b>Considerable pressure drop</b>	<ul style="list-style-type: none"> <li>Leak in System</li> </ul>	<ul style="list-style-type: none"> <li>Check connections and make leakproof</li> </ul>
<b>Considerable pressure rise</b>	<ul style="list-style-type: none"> <li>Contamination of the filter in the 6.2821.100 Filter unit PEEK</li> </ul>	<ul style="list-style-type: none"> <li>Replace 6.2821.130 connector with filter</li> </ul>
<b>Pump is not recognized in «IC Net»</b>	<ul style="list-style-type: none"> <li>No RS connection</li> </ul>	<ul style="list-style-type: none"> <li>Switch instrument on.</li> <li>Check wiring.</li> <li>Check that the connection specified in the <b>818 IC Pump</b> window (see section 3.3 <b>Links</b>) matches the actual wiring</li> </ul>

# 5 Interfaces

## 5.1 RS 232 interface

### 5.1.1 Data transmission protocol

The RS 232 interface of the 818 IC Pump 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
- *Stopp Bits* 1
- *XON/XOFF* off
- *Control characters*

$C_R$	DEC 13	HEX 0D
$L_F$	DEC 10	HEX 0A
- *Max. line length* 80 characters +  $C_R$   $L_F$
- *Cable* For interconnections of the 818 IC Pump with non-Metrohm units, only a shielded data cable (e.g. Metrohm D.104.0201) may be used. The cable shielding must be faultlessly earthed at both units (pay attention to current loops; always use star-head earthing). Only connectors with adequate shielding may be used (e.g. Metrohm K.210.0001 with K.210.9004).
- *Cable length* max. ca. 15 m

### 5.1.2 Pin assignment

RS 232C interface	extern
<p><b>Transmitted Data (TxD)</b> 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.</p> <p><b>Received Data (RxD)</b> Data are received only when DCD is "ON".</p> <p><b>Request to Send (RTS)</b> ON condition: 818 IC Pump is ready to send data.</p> <p><b>Clear to Send (CTS)</b> ON condition: Remote station is ready to receive data.</p> <p><b>Data Set Ready (DSR)</b> ON condition: The transmission line is connected.</p> <p><b>Signal Ground (GND)</b></p> <p><b>Data Carrier Detect (DCD)</b> ON condition: The received signal level is within the tolerance range (remote station is ready to send data).</p> <p><b>Data Terminal Ready (DTR)</b> ON condition: 818 IC Pump is ready to receive data.</p>	
<p><b>Protective earth</b> Direct connection from cable connector to protective earth of the device.</p> <p><b>Polarity assignment of the signals</b></p> <ul style="list-style-type: none"> <li>Data lines (TxD, RxD) <ul style="list-style-type: none"> <li>Voltage negative (&lt;-3 V): signal status "ONE"</li> <li>Voltage positive (&gt; +3 V): signal status "ZERO"</li> </ul> </li> <li>Control or message lines (CTS, DSR, DCD, RTS, DTR) <ul style="list-style-type: none"> <li>Voltage negative (&lt;-3 V): OFF status</li> <li>Voltage positive (&gt; +3 V): ON status</li> </ul> </li> </ul> <p>In the transition region from +3 V to -3 V, the signal status is undefined.</p> <p><b>Driver 14C88</b> to EIA RS 232C specification</p> <p><b>Receiver 14C89</b> to EIA RS 232C specification</p>	<p><b>Contact arrangement at the connector (female) for socket "RS 232" (male)</b></p> <p>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.</p>
<p><i>No liability whatsoever will be accepted for damage arising from the improper connection of devices.</i></p>	

## 5.2 Control interface

### 5.2.1 Functions

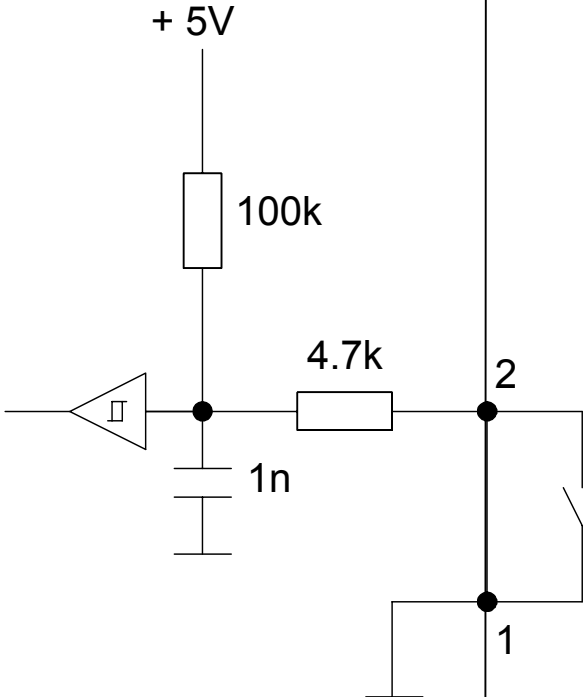
The 818 IC Pump has the following control inputs and outputs, which are accessible via the control interface:

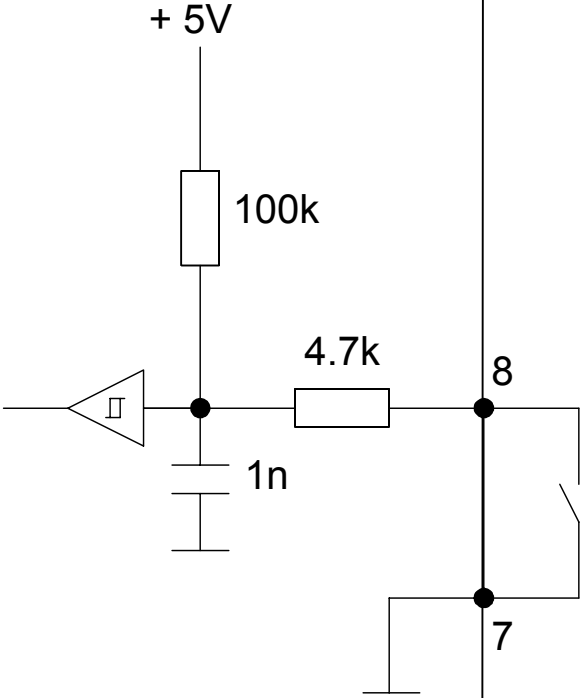
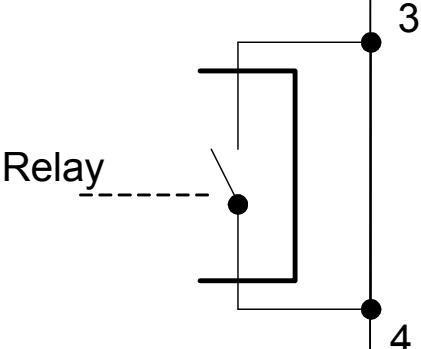
**Inputs**            Reduce flow rate via contact  
                          Stop pump via contact

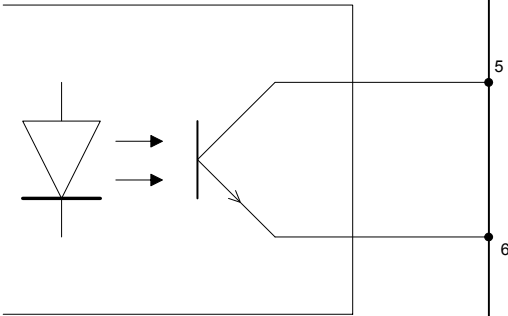

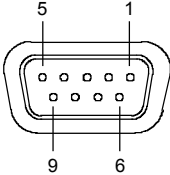
**Outputs**          Contact open, when pump has been stopped

You will find detailed information on these functions in the following section.

### 5.2.2 Control inputs and outputs

818 IC Pump	external	Function
<p><b>Inputs</b></p> 		<p><b>Reduced flow rate (Reduced Flow) with contact</b></p> <p>Contact open: Flow rate 100%</p> <p>Contact closed: Flow rate 10%</p>

818 IC Pump	external	Function
<p><b>Inputs</b></p> 		<p><b>Stop pump with contact</b> Contact closed: Pump is stopped</p>
<p><b>Outputs</b></p> 		<p><b>Pump stopped</b> Contact open: Pump stopped Contact closed: Pump running</p>

818 IC Pump	external	Function
		<p>Display of suction phase of the 818 IC Pump</p>
		<p>Connection not used</p>
<p><b>Contact arrangement at connector (male) for socket "Control" (female)</b></p> 		
<p><i>No liability whatsoever will be accepted for damage arising from the improper connection of devices.</i></p>		

# 6 Appendix

## 6.1 Technical specifications



*Provided that nothing to the contrary is mentioned, the published data are typical values for the 818 IC Pump at an ambient temperature of 25°C.*

<b>Type</b>	Serial dual piston with two valves
<b>Pump capacity</b>	
<i>Flow range</i>	0.05...5.00 mL/min
<i>Flow accuracy</i>	< 1.0 %
<i>Flow constancy</i>	< 0.5 % (after unit warmed up)
<i>Reproducibility of eluent flow</i>	< 0.1 %
<b>Pressure</b>	
<i>Pressure range</i>	0...30.0 MPa (0...300 bar)
<i>Resolution for pressure indicator</i>	0.1 MPa (1 bar)
<i>Pressure measurement</i>	Piezoresistive measurement principle Response time: 3 ms Measurement volume: ca. 50 µL
<i>Accuracy of pressure measurement</i>	< 3 %
<i>Residual pulsation</i>	< 1 %
<i>Recorder output for pressure indication</i>	1 mV/MPa (1 mV/10 bar) Time constant switchable: HIGH = 20 ms LOW = 1 s
<b>Safety shutdown</b>	
<i>Function</i>	Automatic shutdown when upper and lower pressure limits violated
<i>Maximum pressure limit</i>	Adjustable between 0.1...30.0 MPa (1...300 bar) Response time: 1 pump cycle
<i>Minimum pressure limit</i>	Adjustable between 0.1 ... 30.0 MPa (1...300 bar), inactive at 0 bar Response time: 3 pump cycles The cutoff function first becomes active 2 min after the pump flow has been switched on.

**Pump head**

<i>Pump head volumes</i>	Main piston:	40 µL
	Priming piston:	20 µL
<i>Pump displacement volumes</i>	Main piston:	28.5 µL
	Priming piston:	14.25 µL
<i>Length of stroke</i>	Main piston:	3.6 mm
	Priming piston:	1.8 mm

**Programming**

<i>Remote control</i>	Flow rate
	Maximum and minimum pressure limit values
	Correction factor for pump head
	Start/Stop

**Storage of entries**

<i>Type</i>	Flash-ROM
<i>Duration</i>	> 20 years

**Remote control**

<i>Interfaces</i>	RS 232 (syntax Metrohm, see <i>section 5.1</i> , details on request)
	Current Loop (details on request)
	Control (see <i>section 5.2</i> )

**RS 232 interface**

<i>Standard</i>	EIA RS 232C, CCITT V.24, ISO 2110, DIN 66020
<i>Plug</i>	D-Sub 25 pins, male
<i>Mode</i>	Full duplex (simultaneous sending and receiving)
<i>Parameters</i>	Baud rate: 9600
	Handshake: no Handshake
	Parity: none
	Stop bits: 1
	Data bits: 8

**Mains connection**

<i>Voltage</i>	115 V: 100...120 V ± 10 % 230 V: 220...240 V ± 10 % switchable
<i>Frequency</i>	50...60 Hz
<i>Power consumption</i>	50 VA
<i>Fuses</i>	Diameter = 5 mm, length = 20 mm 100...120 V: 0.5 A (slow blow) 220...240 V: 0.25 A (slow blow)

### Safety specifications

<i>Construction / Testing</i>	According to EN/IEC 61010-1 / UL 3101-1, protection class 1, degree of protection IP40
<i>Safety directions</i>	This Instructions for Use include information and warnings which must be heeded by the user to assure safe operation of the instrument.

### Electromagnetic compatibility (EMC)

<i>Emitted interference</i>	Standards met: - EN/IEC 61326 - EN 55022 - CISPR 22
<i>Immunity to interference</i>	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 61000-4-11 - EN/IEC 61000-4-14 - NAMUR

### Ambient temperature

<i>Nominal operating range</i>	+5...+45°C (at 5...85 % atmospheric humidity)
<i>Storage, transport</i>	-20...+70°C

### Diagnosis

<i>Self-diagnostic test</i>	Automatic self-diagnosis when instrument switched on
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### Materials (in contact with solvent)

Sapphire, ruby, ceramic, PCTFE, PTFE, PEEK

### Housing

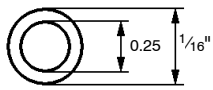
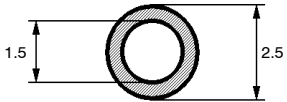
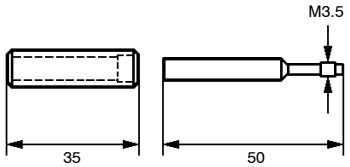
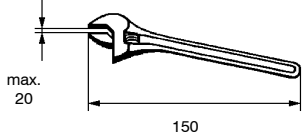
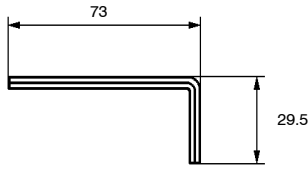
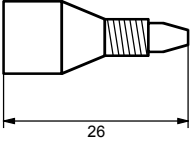
<i>Material of cover</i>	Polyurethane rigid foam (PUR) with fire protection for fire class UL94VO, FCH-free
<i>Material of base</i>	Steel enamelled
<i>Width</i>	260 mm
<i>Height</i>	130 mm
<i>Depth</i>	385 mm (with pump head)
<i>Weight</i>	10 kg (incl. accessories)

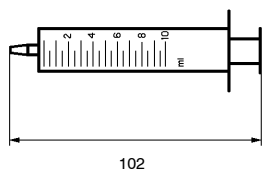
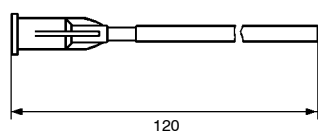
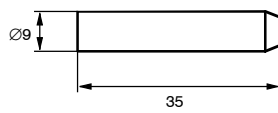
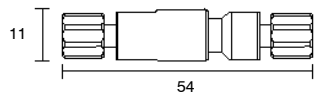
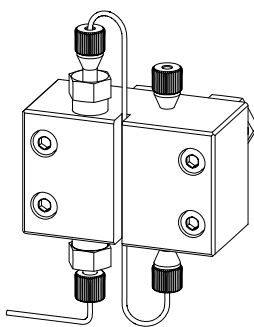
## 6.2 Scope of delivery



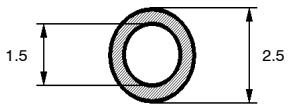
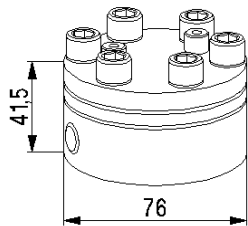
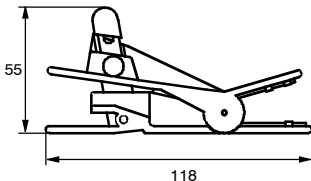
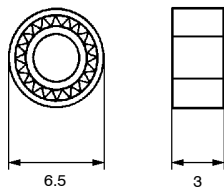
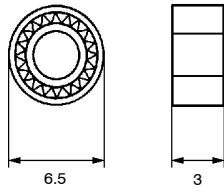
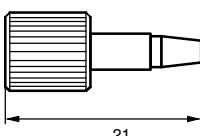
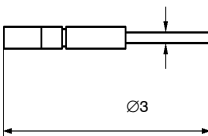
Subject to changes !  
All dimensions are given in mm.

The IC Pump 2.818.0110 (metal-free) includes the following parts:

Quant.	Order No.	Description
1	6.1831.010	<b>PEEK capillary</b> Length = 3 m 
1	6.1834.000	<b>Aspirating tubing</b> made of PTFE, with connector for 6.2821.090 Aspirating filter Length = 1.2 m For the connection 818 IC Pump – eluent container 
1	6.2122.0X0	<b>Mains cable</b> according to customer's specification: <u>Cable socket</u> <u>Cable plug</u> 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	6.2617.010	<b>Special tool</b> For removing the piston seal of the pump head 
1	6.2621.000	<b>Adjustable spanner</b> 
1	6.2621.030	<b>Hexagon key 4 mm</b> For mounting the pump head of the 818 Pump. 
1	6.2744.010	<b>PEEK compression fitting</b> For the connection of 6.1831.010 PEEK capillaries Set of 5 

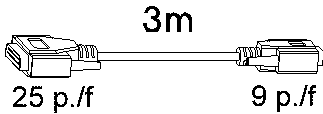
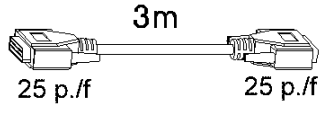
Quant.	Order No.	Description
1	6.2816.020	<b>Syringe</b> made of PP, volume = 10 mL with Luer connector 
1	6.2816.040	<b>Tubule</b> with PTFE tubing and Luer connection For 6.2816.020 syringe 
1	6.2821.090	<b>Aspirating filter</b> Pore dimension 20 µm For 6.1834.000 Aspirating tubing. Set of 5 
1	6.2821.120	<b>Filter unit PEEK 2 µm</b> To avoid contamination due to abrasive particles of piston seals Spare part: 6.2821.130 Filter 
1	6.2824.100	<b>Pump head PEEK (metal-free)</b> Complete, with fixation screws 
1	8.818.1023	<b>Instructions for Use (English)</b> for 818 IC Pump

## 6.3 Optional accessories

Order No.	Description	
6.1834.010	<p><b>Aspirating tubing</b> made of PTFE, with connector for 6.2821.090 Aspirating filter Length = 2.5 m For the connection 818 IC Pump – eluent vessel of 6.5324.000 Bottle rack</p>	
6.2620.150	<p><b>Pulsation dampener MF</b> Metal-free pulsation dampener for reduction of pulsation and preservation of separating columns.</p>	
6.2621.080	<p><b>Capillary tubing cutter</b> for 6.1831.010 PEEK capillaries and 6.1822.010 PTFE micro capillaries incl. 5 additional blades</p>	
6.2741.020	<p><b>Piston seal PE</b> Spare part for 6.2824.100 pump head (standard seal)</p>	
6.2741.010	<p><b>Piston seal PE</b> Spare part for 6.2824.100 pump head (only suitable for aqueous eluents)</p>	
6.2744.070	<p><b>PEEK compression fitting (short)</b> Spare part for 6.2824.100 pump head Set of 5</p>	
6.2821.130	<p><b>Filter for filter unit PEEK 2 µm</b> Spare part for 6.2821.120 Filter unit PEEK Set of 10</p>	
6.2824.070	<p><b>Zircon piston</b> Spare part for 6.2824.040 and 6.2824.100 pump head</p>	

65.5

Order No.	Description	
6.2824.030	<p><b>Sapphire supporting ring</b> Spare part for 6.2824.100 pump head</p>	
6.2824.050	<p><b>Spring for main piston</b> Spare part for 6.2824.100 pump head</p>	
6.2824.060	<p><b>Spring for auxiliary piston</b> Spare part for 6.2824.100 pump head</p>	
6.2824.080	<p><b>Outlet valve</b> Spare part for 6.2824.100 pump head</p>	
6.2824.090	<p><b>Inlet valve</b> Spare part for 6.2824.100 pump head</p>	
6.2617.020	<p><b>Special tool</b> For dismantling the valves</p>	
6.5324.000	<p><b>Bottle rack</b> For fixing 3 supply bottles for eluent, regeneration and rinsing solution, incl. accessories (bottles, siphon, etc.)</p>	
6.2115.040	<p><b>Connection cable</b> For the connection 818 IC Pump – recorder For plotting curves delivery vs time.</p>	
6.2134.080	<p><b>RS 232 connection cable</b> Connection cable 818 IC Pump – 830 IC Interface</p>	
6.2134.090	<p><b>RS 232 connection cable</b> Connection cable 830 IC Interface – 2 external devices (818, 819, etc.)</p>	

<b>Order No.</b>	<b>Description</b>
<p><b>6.2125.110</b></p>	<p><b>RS 232 connection cable</b>                      Connection cable 818 IC Pump – PC)</p> <div style="text-align: center;">  <p>3m</p> <p>25 p./f                      9 p./f</p> </div>
<p><b>6.2125.060</b></p>	<p><b>RS 232 connection cable</b>                      Connection cable 818 IC Pump – PC.</p> <div style="text-align: center;">  <p>3m</p> <p>25 p./f                      25 p./f</p> </div>

## 6.4 Validation / GLP

**GLP (Good Laboratory Practice)** requires, among other things, that the precision and correctness of analytical instruments is checked at regular intervals by using SOPs (**Standard Operating Procedures, 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.

The 818 IC Pump must be included as a part of the whole ion chromatography system, whose most important components include pumps, separation columns, detector 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 818 IC Pump. 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.

The 818 IC Pump 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 dustproof 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

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.


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<i>Name of commodity</i>	<b>818 IC Pump</b>
<i>System software</i>	Stored in ROMs
<i>Name of manufacturer</i>	Metrohm Ltd., Herisau, Switzerland
<i>Description</i>	Dual piston pump for use in Ion Chromatography (IC) and High Performance Liquid Chromatography (HPLC).
<p>This Metrohm instrument has been built and has undergone final type testing according to the standards:</p> <p><i>Electromagnetic compatibility: Emission</i> EN/IEC 61326, EN 55022 / CISPR 22</p> <p><i>Electromagnetic compatibility: Immunity</i> 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 61000-4-11, EN/IEC 61000-4-14, NAMUR</p> <p><i>Safety specifications</i> EN/IEC 61010-1, UL 3101-1 protection class I</p> <p>It has also been certified by ElectroSuisse, which is member of the International Certification Body (CB/IEC).</p> <p><i>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:</i></p>	
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
<p>Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.</p> <p>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.</p>	
<p>Herisau, May 28, 2003</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">             Dr. J. Frank            Development Manager         </div> <div style="text-align: center;">             Ch. Buchmann            Production and            Quality Assurance Manager         </div> </div>	

### 6.5.3 Quality Management Principles

Metrohm Ltd., CH-9101 Herisau, Switzerland



**Metrohm**  
l o n a n a l y s i s  
CH-9101 Herisau/Switzerland  
E-Mail info@metrohm.com  
Internet www.metrohm.com

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

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

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

#### **Instrument development**

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

#### **Software development**

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

#### **Components**

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

#### **Manufacture**

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

#### **Customer support and service**

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

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