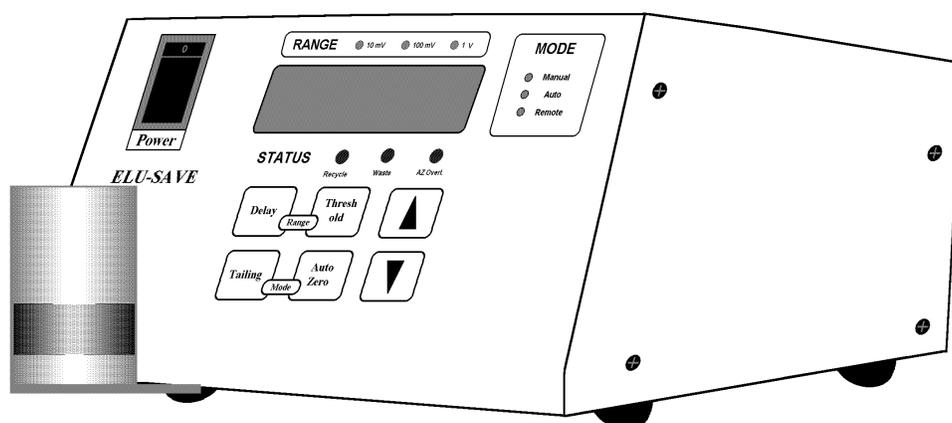


INSTRUCTION MANUAL

Solvent Recycler

Version 3.1



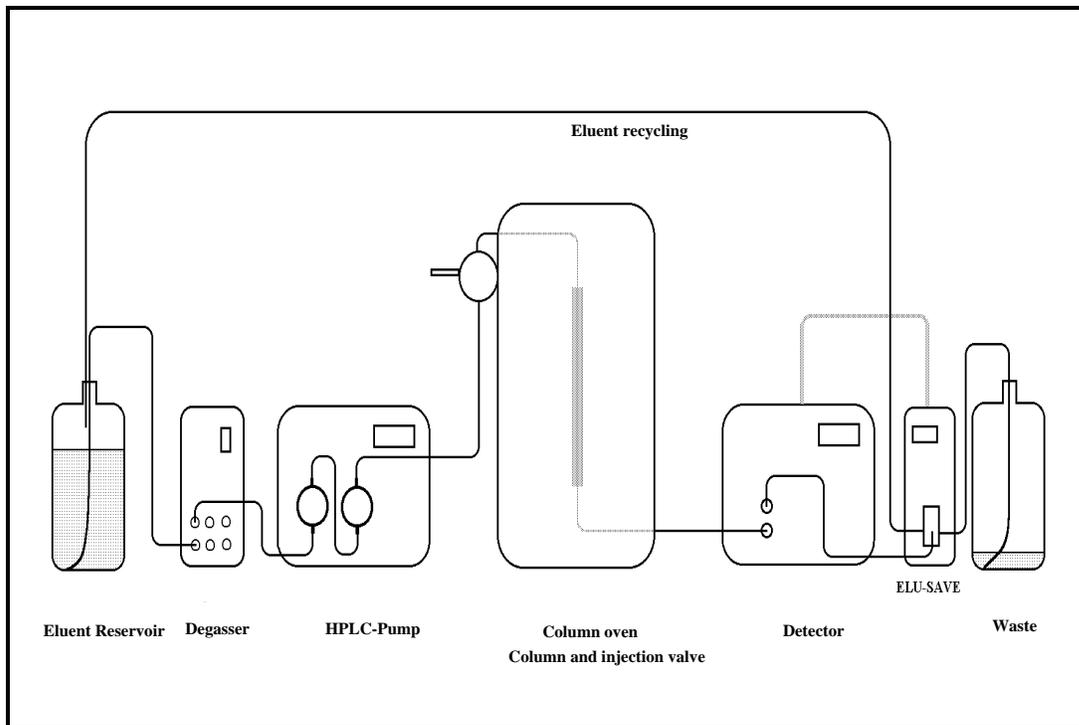
Introduction

The 7206 **SOLVENT RECYCLER** is a microprocessor-controlled valve for the recycling of clean eluents in the liquid chromatography.

The electronic threshold detector of **SOLVENT RECYCLER** controls constantly the signal generated by a detection system. When no peak is detected, the eluent will be passed to the eluent reservoir and recycled. When a peak appears the valve will switch and the eluent including the peak will be directed to the waste. The time difference of the peak appearance between the detector and the valve (due to the length of the capillary connecting both devices) as well as a tailing of the peak can be calculated and stored via the interactive LED-display in the **SOLVENT RECYCLER**.

All values will be stored, even after switch off, in the memory of **SOLVENT RECYCLER**.

Figure 1: Schematic drawing of the integration of **SOLVENT RECYCLER** in an isocratic HPLC-system



The first steps

- 1) Inspect the **SOLVENT RECYCLER**. Should you detect damages, please inform us immediatly.
- 2) The device should be already set to the voltage of your country. Please check the label on the backside.
- 3) Place the **SOLVENT RECYCLER** close to your detector.

4) Connect the signal cable of the **SOLVENT RECYCLER** with the recorder- or integratorport of your detector.

Table 1: Cable connections:

White	(+) - Pole
Brown	(-) - Pole
Black / Yellow	ground

Check the outgoing voltage at full range of your detector signal. Set the input range of the **SOLVENT RECYCLER** (1 V, 100 mV oder 10 mV) in accordance to the full scale output of your detector. The selection of the RANGE at the **SOLVENT RECYCLER** is made by the simultaneous pressing of the 'Delay'- and 'Threshold'-key. When pressing both keys the voltage-selection will change (check the display) one position to the right (10 mV \Rightarrow 100 mV \Rightarrow 1 V \Rightarrow 10 mV etc.). In case you find a full scale output different from the three available ranges at the **SOLVENT RECYCLER**, choose the next higher input range (i.e.: detector full scale output 0,8 V, input range **SOLVENT RECYCLER** 1 V).

5) Connect one of the enclosed capillaries with the valve at the position 'Recycle' and your eluent reservoir. Connect an other capillary with the valve at the position 'Waste' and your waste reservoir. With the last capillary connect your detector with the valve at the position 'Detector'.

6) After turning the power on, the build-in self diagnostics will automatically run and check the function of the memory and the valve.

The most important steps

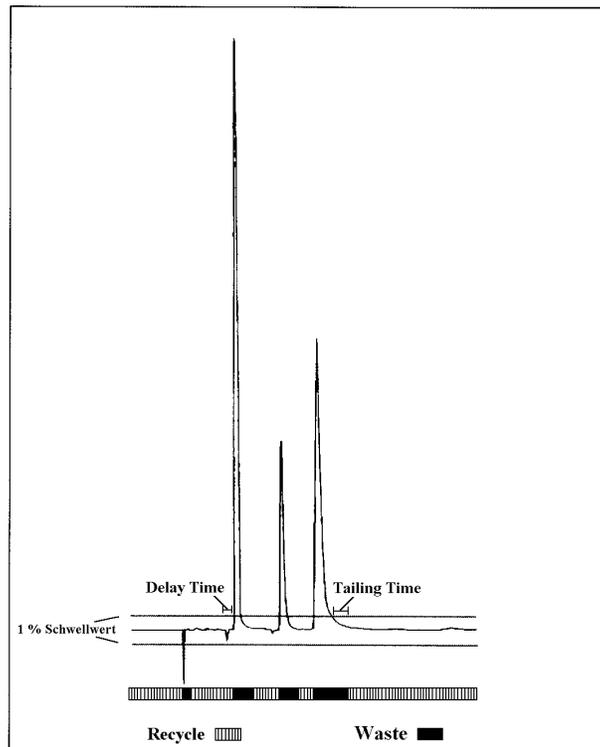
1) THRESHOLD

By pressing and holding the THRESHOLD-key and simultaneously pressing the cursor keys, the THRESHOLD-value can be increased (↑-key) or decreased (↓-key) in 0,1 percent steps. The response time of all keys is delayed in order to avoid unintended operation. After releasing the key the display will flash. This indicates that the values have been stored in the memory. After switch off of the **SOLVENT RECYCLER** these values will be stored for about 2 years.

The threshold-value determines at which deviation of the detector signal from the baseline (in percent of full scale) the valve will be operated. Is a peak detected (detector signal greater than threshold level) the valve will switch after the DELAY-time (see DELAY) in the automatic mode from the 'Recycle' to the 'Waste'-position. When the detector-signal is decreasing (end of the peak) and reaches a value below the chosen threshold-level the valve will switch after the TAILING-time (see TAILING) from the 'Waste' to the 'Recycle'-position.

The THRESHOLD-level is laying symmetrically around the Zero-point. This means in practice, that as well a negative as a positive change in the detector signal leads to a valve switching when the mathematical absolute detector signal-value is higher than the chosen THRESHOLD level. Not only positive, but also negative peaks will be discarded.

Figure 2: Use of the **SOLVENT RECYCLER** in the isocratic HPLC



2) DELAY

By pressing and holding the DELAY-key and simultaneously pressing the cursor keys, the DELAY-value can be increased (↑-key) or decreased (↓-key) in 0,5 second steps. The response time of all keys is delayed in order to avoid unintended operation. After releasing the key the display will flash. This indicates that the values have been stored in the memory. After switch off of the **SOLVENT RECYCLER** these values will be stored for about 2 years.

The DELAY-value determines the response time of the valve after recognition of a peak. In case the detector and the **SOLVENT RECYCLER** are placed with a long distance, you can correct the time of valve switching when you know the dead-volume. This decreases the amount of clean eluent to be wasted. During the DELAY-time the **SOLVENT RECYCLER** is in the 'Recycle'-mode. After the DELAY-time the valve will go into the 'Waste'-mode.

Table 2: Dead-volumes in capillaries

Length of capillary	Dead-volume 0,25 mm inner diameter	Dead-volume 0,5 mm inner diameter	Dead-volume 0,75 mm inner diameter
25 cm	12,3 µl	49,1 µl	110,4 µl
50 cm	24,6 µl	98,2 µl	220,9 µl
75 cm	36,8 µl	147,3 µl	331,3 µl
100 cm	49,1 µl	196,3 µl	441,8 µl

The volume of a capillary can be calculated by the following formula:

$$r^2 \times \pi \times l$$

with

r = Radius of the capillary (1/2 inner diameter)

π = 3.1415 and

l = length of the capillary.

When using both r and l in millimeters, the volume of the capillary will be calculated in microliters. Using centimeters, the volume of the capillary will be expressed in milliliters.

The **SOLVENT RECYCLER** is distributed with 0,75 mm inner diameter capillaries.

3) TAILING

By pressing and holding the TAILING-key and simultaneously pressing the cursor keys, the TAILING-value can be increased (↑-key) or decreased (↓-key) in 0,5 second steps. The response time of all keys is delayed in order to avoid unintended operation. After releasing the key the display will flash. This indicates that the values have been stored in the memory. After switch off of the **SOLVENT RECYCLER** these values will be stored for about 2 years.

The TAILING-value determines the response time of the valve after the end of a peak. In case the peaks have a tailing, you can correct the time of switching of the valve. During the TAILING-time the **SOLVENT RECYCLER** is in the 'Waste'-mode. After the TAILING-time the valve will go into the 'Recycle'-mode.

Independent of the peak width the **SOLVENT RECYCLER** will add the TAILING-time ('Waste'-mode) at the end of the peak when the detector signal remains under the THRESHOLD-value.

4) AUTOZERO

By pressing and holding the AUTOZERO-key the incoming detector signal, independent of its value within a range of $\pm 100\%$ full scale, is set in the **SOLVENT RECYCLER** electronically to the value of 'Zero'. The response time of all keys is delayed in order to avoid unintended operation. The detector signal itself will in no way be changed, even if a recorder or integrator is coupled with the **SOLVENT RECYCLER**.

When compensating the incoming detector signal in a range exceeding the 100 % full scale, the status LED-lamp AUTOZERO will flash. The new value for AUTOZERO can not be accepted. In order to display the actual detector signal (in the 'Auto'-MODE) value press one of the cursor keys (\uparrow -key or \downarrow -key). The display will show the signal value (the sum of compensated detector signal (AUTOZERO) and the **SOLVENT RECYCLER**-display). When the signal input exceeds 200 % full scale range only horizontal bars will be displayed. Anyhow, the function of the **SOLVENT RECYCLER** will not be disturbed.

Basic Functions

1) Range

Check the outgoing voltage at full range of your detector signal. Set the input range of the **SOLVENT RECYCLER** (1 V, 100 mV oder 10 mV) in accordance to the full scale output of your detector. In case you find a full scale output different from the three available ranges at the **SOLVENT RECYCLER**, choose the next higher input range (i.e.: detector full scale output 0,8 V, input range **SOLVENT RECYCLER** 1 V).

The selection of the RANGE at the **SOLVENT RECYCLER** is made by the simultaneous pressing of the 'Delay'- and 'Threshold'-key. When pressing both keys the voltage-selection will change (check the display) one position to the right (10 mV \Rightarrow 100 mV \Rightarrow 1 V \Rightarrow 10 mV etc.).

The flashing of the corresponding diode will show the chosen range.

The response time of all keys is delayed in order to avoid unintended operation.

2) Mode

The selection of the operation MODE of the **SOLVENT RECYCLER** is made by the simultaneous pressing of the 'Tailing'- and 'Auto-Zero'-key. When pressing both keys the MODE-selection will change (check the display) one position to the bottom (Manual \Rightarrow Auto \Rightarrow Remote \Rightarrow Manual etc.).

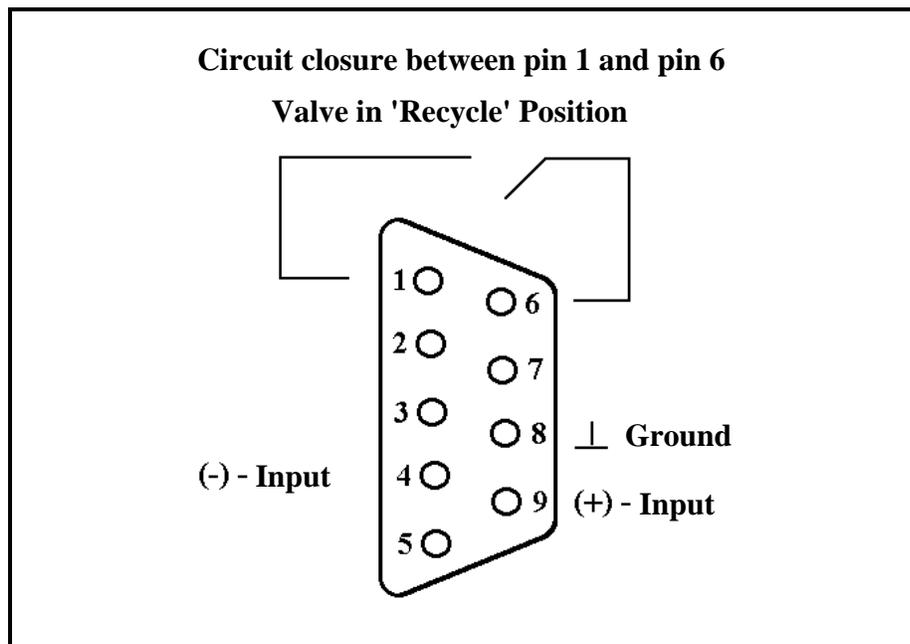
The flashing of the corresponding diode will show the chosen range.

The response time of all keys is delayed in order to avoid unintended operation.

In the 'Manual'-MODE the valve position can be controlled by pressing the cursor keys (\uparrow -key or \downarrow -key). The valves changes between the 'Recycle'- and 'Waste'-MODE. All other automatic function (i.e. peak detection etc.) are deactivated in the 'Manual'-MODE.

In the 'Remote'-MODE the valve is controlled by external devices. The contact is made by the 9-Pin connector on the backside of the **SOLVENT RECYCLER**. A permanent circuit closure between pin 1 and pin 6 sets the valve in the 'Recycle'-MODE. An open circuit between pin 1 and pin 6 sets the valve in the 'Waste'-MODE.

Figure 3: Signal input 9-pin-connector **SOLVENT RECYCLER**.



3) Status

Beneath the LED-Display you will find the optical control for the actual setting of the valve ('Recycle'- or 'Waste'-mode) and the control diode for the Autozero-warning AZ OVER.

The manual selection of the valve STATUS can only be controlled in the Manual mode. To select the MODE of the **SOLVENT RECYCLER** press simultaneously of the 'Tailing'- and 'Auto-Zero'-key. When pressing both keys the MODE-selection will change (check the display) one position to the bottom (Manual ⇒ Auto ⇒ Remote ⇒ Manual etc.).

The flashing of the corresponding diode will show the chosen range.

The response time of all keys is delayed in order to avoid unintended operation.

In the 'Manual'-MODE the valve position can be controlled by pressing the cursor keys (↑-key or ↓-key). In the 'Remote'-MODE the valve is controlled by external devices. The contact is made by the 9-pin connector on the backside of the **SOLVENT RECYCLER**. A permanent circuit closure between pin 1 and pin 6 sets the valve in the 'Recycle'-MODE. An open circuit between pin 1 and pin 6 sets the valve in the 'Waste'-MODE.

In the MODE 'Auto' the user can not change the STATUS of the valve. The control of the valve-STATUS is made by the internal logic.

When compensating the incoming detector signal in a range exceeding the 100 % full scale, the status LED-lamp AUTOZERO will flash. The new value for AUTOZERO can not be accepted.

What to do in case of trouble?

1) No eluent is exiting the valve.

Follow the scheme below!

Is the pump working?	Start the pump.
What is the flowrate?	Select an appropriate flowrate, otherwise check your pump.
What is the working pressure displayed on your pump?	No pressure: The pump does not work. Leak? High pressure: There is a blockage in your system.
Is eluent reaching your column?	Check your system for leaks.
Is eluent exiting your column?	Go back 2 steps. Blockage of your column? .
Is eluent exiting your detector?	Check for detector leaks (i.e. cell, connections).
Is eluent exiting your valve?	Go back 4 steps. Is the pump pressure normal switch the valve manually 3 to 5 times. Is the pressure too high, your valve is blocked. Try to clean it carefully.
You have checked all points and did not find a fault?	Applied Research Europe GmbH Telefon: +49 (0)30 37 888 754

2) No display on the LED of the **SOLVENT RECYCLER** after switching on.

Did you connect the power cord?	Connect powercord.
Is the main circuit on?	Check your main circuit with a different device.
Is the fuse undamaged?	Check the fuse.
You have checked all points and did not find a fault?	

3) Valve does not switch.

Did you start the SOLVENT RECYCLER ?	Start the SOLVENT RECYCLER .
Did you choose the right mode?	Select the mode as described on page 7.
What is the threshold value?	Select the Threshold level as describe on page 4.
What are the chosen times for Delay and Tailing?	Select the times as described on page 5.
You have checked all points and did not find a fault?	

Standard Accessoires of the Applied Research Europe **SOLVENT RECYCLER**

Art.-No.	Description	Amount
91.230.01	7206 SOLVENT RECYCLER	1 piece
42.159.075.00	Tubing, PTFE, 1/16" OD x 0.75 mm ID	3,50 m
58.8.2.062.47	Nut, Delrin, flangeless 1/16", black, 1/4-28	3 pieces
59.5.1.062.00	Ferrule, ETFE, single, 1/16"	3 pieces
91.000.10	Powercord	1 piece
91.000.11	Signalcord with 9-pin connector	1 piece
91.000.05	Instruction manual	1 piece

Spare Parts for the 7206 **SOLVENT RECYCLER**

Art.-No.	Description
91.100.01	Solvent Recycler, complete, 100 V
91.110.01	Solvent Recycler, complete, 110 V
91.230.01	Solvent Recycler, complete, 230 V
42.159.025.00	Tubing, PTFE, 1/16" OD x 0.25 mm ID
42.159.050.00	Tubing, PTFE, 1/16" OD x 0.50 mm ID
42.159.075.00	Tubing, PTFE, 1/16" OD x 0.75 mm ID
91.000.03	Solvent Recycler, Replacement Valve Kel-F
58.8.2.062.47	Nut, Delrin, flangeless 1/16", black, 1/4-28
59.5.1.062.00	Ferrule, ETFE, single, 1/16"
91.000.13	Fuse 20 x 5 mm, 250 V 100 mA
91.000.14	Fuse 20 x 5 mm, 120 V 250 mA
91.000.10	Powercord
91.000.11	Signalcord with 9-pin connector
91.000.93	Polypropylen Flange-Fittings and support rings (5 piece each)
70.0100.002	Flangy, combi kit in plastic case
91.000.05	Instruction Manual

Technical data **SOLVENT RECYCLER**:

Dimension: 250 (L) x 140 (B) x 80 (H) mm
Weight: 1,1 kg
Power: 10 W with 230 V, 50 Hz
Software: Exclusivly developed for HPLC-Recycling, entered method stored for permanent action in the memory.

Eluent-contacted parts are made of PEEK and Teflon.

Technical data valve:

Flowrate: 0,01 to 200 ml / min (up to 400 ml/min when using capillaries with 1,0 mm inner diameter)
Switching time: 30 mSek
Power: 24 V

This device is manufactured following the EEC-Norm for low-voltage laboratory equipment.