



Biotech SPR-200 Solvent Recycler

User's Manual

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Rev. A

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Information on safe use of product

The device complies with European CE Mark including the Low Voltage Directive. The device will be shipped from the factory in a safe condition.



WARNING! This device must be used as DESCRIBED in this manual. Any use of the device in another manner than that DESCRIBED below may result in damage or injury to the operator.

In the text of this manual safety guidelines provides that can prevent personal injury, damage and loss of data, if properly adhered to. All warnings highlighted in bold and the icons:

	Sign DANGER indicates a hazard. Indicates a procedure, practice, or prohibited activities, which, if not correctly performed adhered or it could result in serious injury, or damage or destruction of a part or the entire device. Do not proceed until these conditions are fully understood and met.
	Sign WARNING indicates a hazard. Indicates a procedure, practice, or prohibited activities, which, if not correctly performed adhered or it could result in serious injury, or damage or destruction of a part or the entire device. Do not proceed until these conditions are fully understood and met.
	Sign ATTENTION indicates important information. First read this information, it might be useful or necessary for the continuation.
	Sign NOTE indicates additional information. It provides the user with advice and suggestions to help you use the device.

Introduction

SPR-200 Solvent Recycler can reduce the mobile phase in isocratic HPLC for up to 90% by redirecting uncontaminated mobile phase into the container.

The level of the input signal and setting parameters are displayed on a well-read four-digit LCD display. Valve position and the current display mode are indicated by LEDs placed next to the display. Instrument functions are operated via a membrane keyboard with six keys.



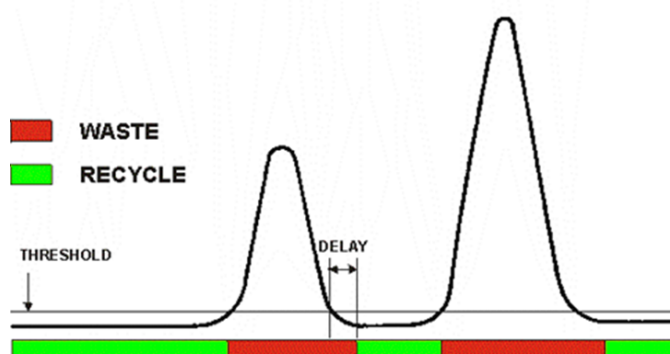
SPR-200 Solvent Recycler

Comfortable setting of operating parameters and online device activity tracking can also be operated from a PC using any terminal application.

SPR-200 analog input accepts unipolar and bipolar signals in ranges of $\pm 1V$ or ± 100 mV alternatively. Analog-to-digital converter provides data for further processing in embedded microcontroller. TTL (contact closure) input is used for the auto-zero function.

Principle of operation

SPR-200 Solvent Recycler continuously monitors the output signal of the chromatographic detector. If the signal level exceeds the set limit (*Threshold*), the mobile phase is diverted to waste. Otherwise, the "pure" mobile phase is returned to the reservoir. Activity of *SPR-200* is illustrated in the following figure.



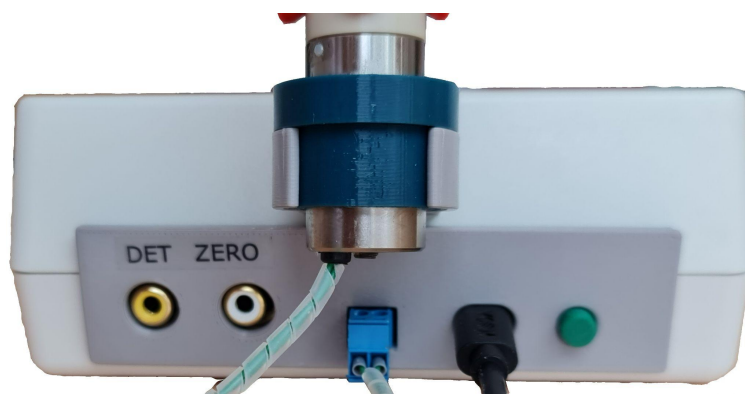
Principle of SPR-200 operation

Threshold based *SPR-200* operation: if the input signal level exceeds the threshold value, the *SPR-200* redirects the flow of eluent to waste (red position). Once the signal falls below the threshold value, the *SPR-200* waits for the completion of liquid transfer from the detector cells to the switching valve (Delay) and then switches back to mobile phase reservoir (green position).

To ensure reliable operation in automated systems a start signal of autosampler may be connected to the input ZERO *SPR-200*.

To ensure a fail-safe design of *SPR-200*, the mobile phase is recycled only when the device is turned on and monitors the input signal. The default position of the three-way valve is to waste. In case of power failure the valve thus remains in the waste position and the mobile phase in the reservoir remains uncontaminated.

Rear panel components



The rear panel of SPR-200 Solvent Recycler contains the detachable switching valve in the holder and connectors subpanel.

They are following connections (from the left):

- Analog input (yellow)
- TTL Zero input (white)
- Valve connector (blue)
- μ B USB connector (black)
- Power switch (green)

Specification

Feature/Parameter	
Recycling efficiency	Up to 90%
System compatibility	Any HPLC detector with analog output
Analog input range	$\pm 1V, \pm 100 \text{ mV}$
A/D converter resolution	22 bit
Calibration of analog input	Possible, two independent calibrations each range separately
User interface	6 button membrane keypad 8 character LCD display
Computer connection	USB
Stand alone operation	Typical
Fraction collector mode	Implemented
Manual WASTE/RECYCLE	Available
Threshold/Delay parameters	Implemented
Configurable TTL/contact input	Zero, Waste/Recycle, FC start
Power supply	5V, USB from PC or wall mount adapter
Valve body material	PEEK or PTFE
Maximum pressure	0.21 MPa/30 p.s.i.
Liquid connection	¼" - 28 flat bottom
Drivers	Standard part of MS Windows And available for download
Communication protocol	Simple text protocol, available on request

Installation

Scope of delivery

After unpacking *SPR-200* check the completeness. The box contains:

- SPR-200 Solvent Recycler
- Fittings (3)
- PTFE capillaries (3) (green, natural, 1 meter each)
- Universal analog cable (1)
- Agilent analog cable (1)
- USB cable
- AC adapter, 5V USB-A connector

Fluid connection

SPR-200 is connected to the HPLC system using 1/16 "PTFE capillaries and flange-free fittings (1/4" - 28). Ferrule fittings to be oriented correctly (see figure).



Connecting capillary

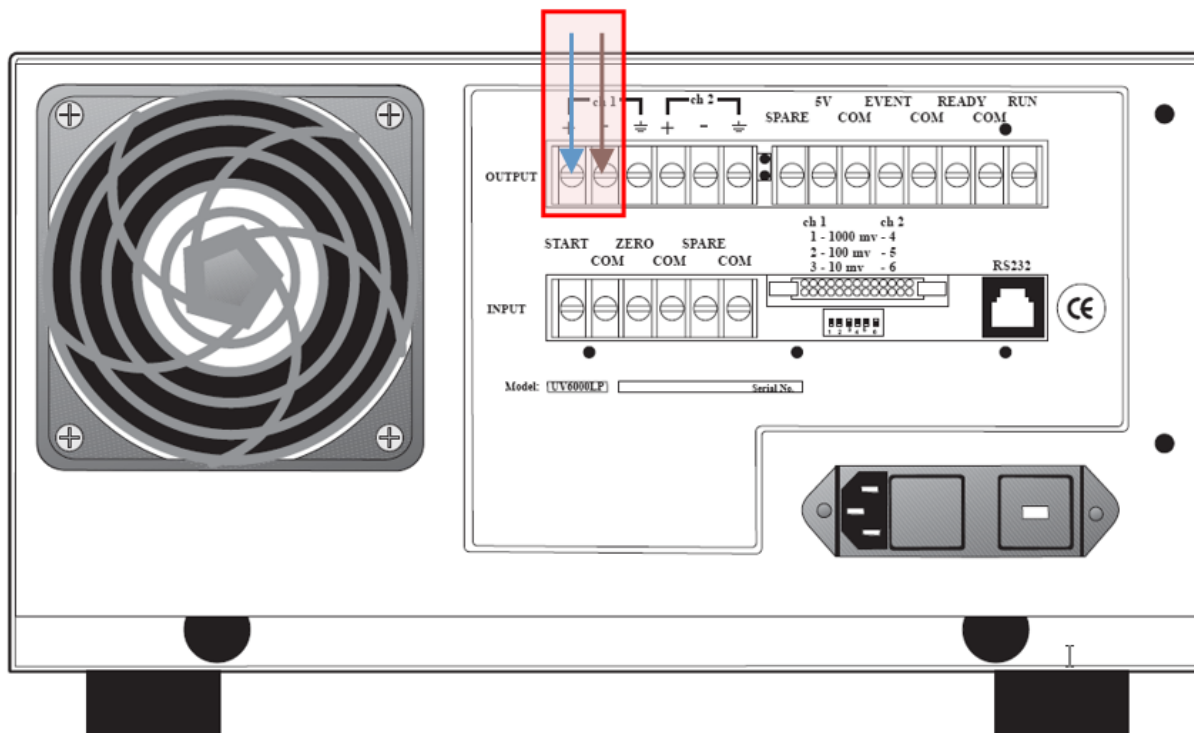
Mobile phase detector outlet should be connected to a common port (labeled D or COM) of switching three-way valve. Connect the valve port marked R (or NC) with the reservoir of mobile phase using green PTFE capillary. The valve port marked W (or NO) should be connected to the waste bottle.

Electrical connections

Signal connection

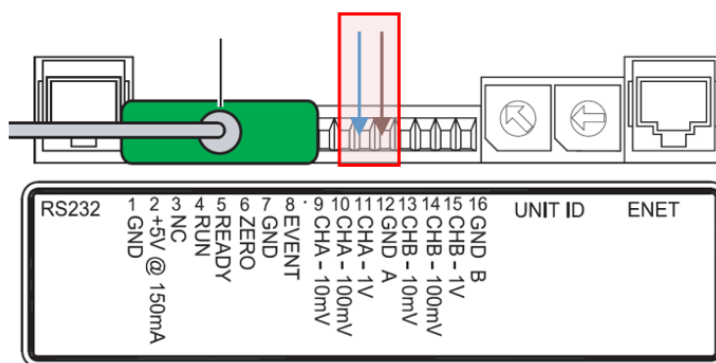
Contact SPR-200 signal cable to integrator (1 volt full scale) output of the HPLC detector. According to the type of output terminals select a suitable cable from an installation set (see following three figures).

If you are using a UV 6000 detector, locate the terminal on the rear panel labeled "OUTPUT". Connect the white (blue) wire of the universal analog cable to the position of CH1+, the brown (black) wire to the position of CH1-. Alternatively, a second analog output may be used. Before using SPR-200 it is necessary to set the analog output in the chromatographic software of the HPLC instrument.



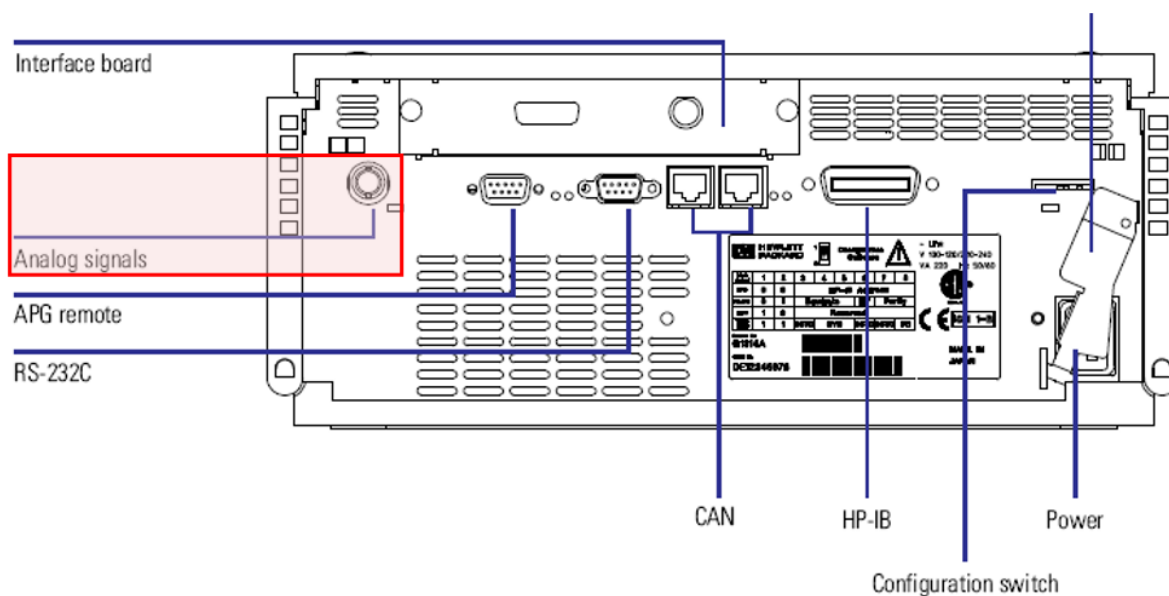
Connecting an analog cable to Thermo Scientific UV6000 detector

When using detectors Surveyor or Accela connect the SPR-200 again with universal analog cable. White (blue) wire to the terminal CHA - 1V, brown (black) wire to the GND position. Alternatively, channel B can. Before using SPR-200 it is necessary to set the analog output in the chromatographic software.



Connecting to the detectors Thermo Scientific Surveyor or Accela

When using an Agilent detector, connect the analog input of SPR-200 with analog output on the detector rear panel. Use an analog cable with a BNC connector. Set analog output of the detector in HPLC software to 1V FS.



Connecting an analog cable to the Agilent detector

If it is necessary for the proper function to zero the input of SPR-200, connect the ZERO on the panel with the contact closure (relay or transistor switch with open collector). Contact must be activated at the moment of injection. In case the polarized autosampler output observe connection polarity - brown (black) wire to the ground terminal. The white (blue) input wire is maintained at the potential of 5V.

If you want to use the computer control of SPR-200, connect the solvent recycler using a USB cable.

SPR-200 Power Supply

SPR-200 utilizes the 5V DC power supply. It may be obtained from the wall mount power unit (part of delivery), or from the USB port of the computer. The connection is realized by USB-A to USB- μ B cable.

Operating the SPR-200

LCD display and LEDs

A four-digit LCD display shows the voltage level of the analog input. MODE button switches the display mode data SIGNAL-SET THRESHOLD - SET DELAY. The current display mode is indicated by the LED to the right of the display.

Modes of operation

SIGNAL mode

LCD display shows the signal of the connected detector (in mV). Depending on set analog input range, the full scale display is +/-1000 mV, or +/-100.0 mV.

THRESHOLD mode

LED display shows the set limit for switching the valve to the RECYCLE/WASTE positions. The threshold value is in mV or in 0.1 mV.

DELAY mode

LED display shows the transport delay value in seconds.

Keyboard

Membrane keyboard has six keys, their function is described below.

MODE button

Switches the display mode between Signal - Threshold - Delay. Pressing the setting modes (Threshold, Delay) ensures storing of the values to the non-volatile memory. When the valve is in forced position (RECYCLE or WASTE button was pressed), pressing MODE puts the unit into monitoring input signal.

ZERO button

Enable Auto-Zero, an analog signal at the input of the device is considered to be zero. You can repeat indefinitely, disabling this feature is disabled.

UP / DOWN buttons ▲ ▼

Have a function in the setting modes and allow the increase and decrease of the displayed value.

WASTE button

The valve is in WASTE position, input signal is ignored. Function is canceled by pressing MODE.

RECYCLE button

The valve is in the RECYCLE position, input signal is ignored. Function is canceled by pressing MODE.

Changing the analog input range

SPR-200 Solvent Recycler is a dual analog input range device. The input range is +/- 1000 mV or +/-100.0 mV alternatively. When 100 mV range is set, the analog value is displayed with 0.1 mV resolution. It is strongly recommended to use 100 mV range when low Threshold values are planned to be used.



The input range may be switched by holding the MODE button for approx. 1 second while power on the instrument. The analog input range is changed to another one every time you use this procedure. The last setting is stored in the nonvolatile instrument memory.



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