Clarity Controls

Sykam S2100

LC **ENG**

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1 Sykam S2100 Control module

This manual describes the setting of the Sykam **S2100** pump, which is low-pressure gradient pump for 4 eluents. The control module enables direct control of the instrument over serial line.

Fig. 1. Sykam S2100 quaternary pump

Direct control means that the pump can be completely controlled from the **Clarity** environment. Instrument method controlling the analysis conditions will be saved in the measured chromatograms.

2 Requirements

- Clarity Installation CD ROM with LC Control module (p/n A24).
- Free serial port in the PC.

Note: *Modern computers usually have only 1 (if any) serial (COM) port installed. To use more devices requiring the port, the **MultiCOM** adapter (p/n MC01) is available.*

- Standard serial DB9F-DB9M cable (p/n SK02).

Note: *Cables are not part of **Clarity** Control Module. It is strongly recommended to order required cables together with the Control Module.*

3 Installation procedure

3.1 HW Setup – Sykam S2100 communication

The pump is controlled by serial (RS232) communication. In order to be controlled by computer, the pump has to be switched to *SERIAL CONTROL* mode. On S2100's front panel press **MENU** and repeatedly press **F4** until status line displpays *SERIAL CONTROL*.

Communication cable

The communication cable is standard (RS232 cpmpliant) straight communication cable DB9F-DB9M (computer side/ pump side); only three cords (2-2, 3-3, 5-5) are necessary.

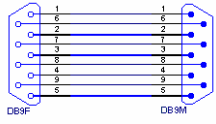

Fig. 2. Serial cable DB9F-DB9M

No additional wiring to PC besides the serial cable is required. In fact S2100 can not be started by bare wire while in serial control mode.

3.2 Configuration

In order to be able to control the pump, it must be connected to computer and be in **serial control** mode. Use buttons on pump's front panel to switch it to serial control mode.

- In the **System Configuration** dialog press the **Add** button (① in ***Fig. 5***, pg. ***7***) to invoke the **Available Control Modules** dialog.

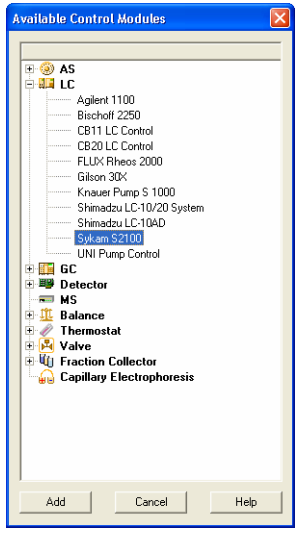

Fig. 3. Available Control Modules

- Go to the LC section, select the **Sykam S2100** and press the **Add** ② button.
- The **Sykam S2100 Setup** dialog will appear.

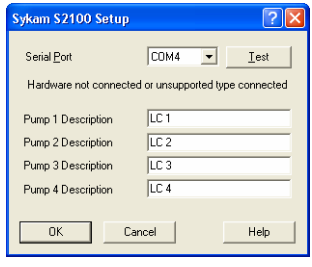

Fig. 4. Sykam S2100 Setup

- Select the **COM Port** and fill in the Pump Descriptions.
- Press **Test** button to verify that the pump is connected and set to *SERIAL CONTROL* mode.

Caution! *If the pump is in the HOLD or RUN mode, the test will fail.*

Note: *We recommend using onboard COM ports (usually COM1 or COM2). Certain USB-to-serial converters are known to cause errors in communication.*

The **Sykam S2100** item ③ will appear in the **Setup Control Modules** list of the **System Configuration** dialog.

- Drag the LC icon from the **Setup Control Modules** list on the left side to the desired **Instrument** tab ④ on the right side ⑤, or use the ⇢ button ⑥ to do so.

  A gradient is formed by low pressure mixing valves – all solvents must be used on the same instrument in the **System Configuration** dialog.

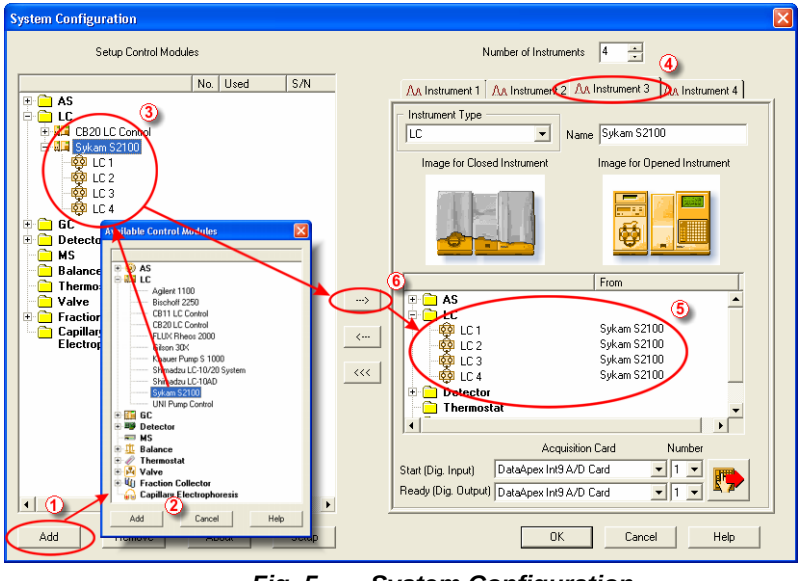

Fig. 5. System Configuration

Note: *If the pump is not in serial control mode, module will not be able to communicate with it. Use buttons on pump's front panel to switch it to this mode.*

Note: *The pump can not be started by wire while in serial control mode; electrical start signals would be ignored. The pump is started by computer over serial line.*

4 Using the control module

New **LC Gradient** and **LC** tabs appear in the **Method Setup** dialog, enabling the setting of the LC gradient program.

4.1 LC Gradient

The **Method Setup – LC Gradient** dialog serves for setting up the LC instrument method.

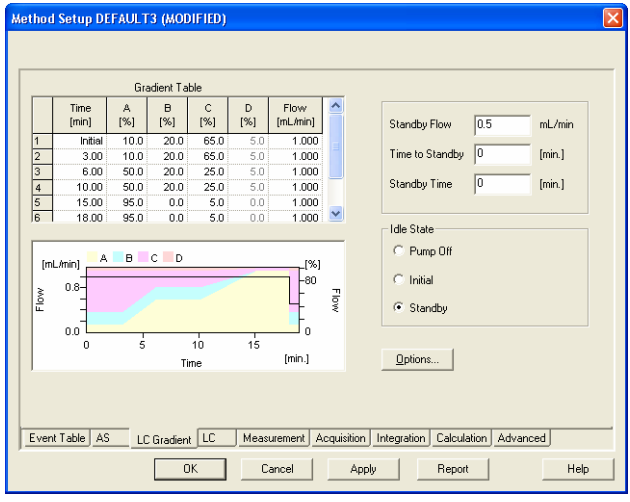

Fig. 6. Method Setup – LC Gradient

Gradient Table

A table for setting the composition of the mobile phase and the overall flow rate as a function of time. Operation is analogous to that of spreadsheets (Excel, Quatro Pro, etc.). Upon clicking a cell by the left mouse button that cell is highlighted by dots and ready to receive values. A cell that fails to highlight is not available for editing.

Time [min.]

The entered value represents the time at which the ratio of flow rates and the overall flow rate correspond to the values entered

in the corresponding row. (These values vary continuously from one time to the next in a manner ensuring that the conditions specified in the next row are satisfied).

XXX1 (..4) [%]
Represents the percentage of a component. The designation **XXX1-4** is in fact replaced by the name of the component (items **Solvent 1 - 4** in the **Gradient Options** Dialog box). Should you enter a component value such that the sum of all values exceeds 100 %, the percentage in the last column is automatically adjusted; if the percentage of the last compound is already zero, the value of the currently entered component is adjusted instead. The flow rate of a compound is calculated by multiplying the overall flow rate (indicated in the **Flow** column) by the corresponding percentage divided by 100.

Flow [ml/min]
Indicates the overall flow rate through the column. The entered value applies to the time specified in the corresponding row.

Note: *The values of the **Flow** for the **Sykam S2100** pump vary in ceratin range according to the type of the Pump Head attached. The possible values are as follows:*

Type of the Pump Head	Allowed flows
Micro	0.01-2 ml/min
Analytical	0.05-10 ml/min
Semi-Preparative	0.2-40 ml/min

Graph

The graph depicts the percentage of components as a function of time together with the overall flow rate. Data are taken over from the **Gradient Table**. Changes effected in this table are immediately reflected in the graph. Assignment of colours to individual components is shown in the header. The

assignment is fixed and individual components are displayed in the graph from bottom to top.

The flow rate is displayed in black.

The graph has two vertical axes: the axis on the left refers to the mixing ratio, and the one on the right to the overall flow rate.

Parameters

Standby Flow
Indicates the overall flow rate through the column in the *STANDBY* state reached after the last row of the table has been performed and the **Time to Standby** has passed. The time period during which the flow rate is so maintained is defined by item **Standby Time**. (The ratio of individual components in the respective *STANDBY* and *IDLE* states is given by the first row of the Table (the **Initial** row).

Time to Standby [min]
Indicates the time during which the flow rate varies continuously between the last values entered in the table and the value defined by *Standby Flow*.
This time is included in the analysis time (the *CONTROL* state). In case when *Time to Standby* is zero, there is step change from flow and components percentage specified on the last row of gradient table to that specified for *STANDBY* state.

Standby Time [min]
The time during which the flow rate is maintained at *Standby Flow*. This time is included in the analysis time (*CONTROL* state).

Idle State
An item specifying the overall flow rate through the column outside the instrument method. The following states are possible:

Pump Off
The flow rates of all components are zero.

Initial
The flow rate is defined by the first row of the gradient table (the **Initial** row).

Standby
The flow rate is the same as in the *STANDBY* mode and, accordingly, corresponds to the value entered in **Standby Flow**.

The *IDLE* state enters into effect each time an instrument is opened, at the end or after abortion of an analysis by the **Abort** command, and is maintained also when the **Clarity** program is shut down.

The mixing ratio of individual components in both the *IDLE* and *STANDBY* states is given by the first row of the gradient table (the **Initial** row).

Note: *There is step change from flow and components percentage specified for the STANDBY state to that specified for IDLE state.*

4.1.1 Options

Invoke the **Options** button in the **Method Setup – LC Control** dialog to open the **Gradient Options** dialog.

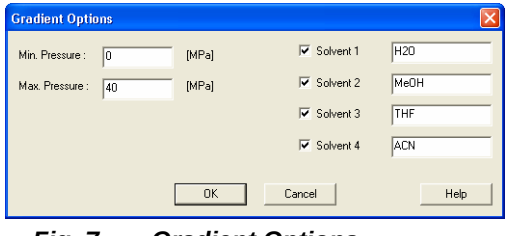

Fig. 7. Gradient Options

Min. Pressure

Sets the minimum pressure for the given auxiliary pump. When pressure reaches the set value, the pump will shut down. This prevents the solvent leakage.

Max. Pressure

Sets the maximum pressure for the given auxiliary pump. When pressure reaches the set value, the pump will shut down. This serves to prevent the damage to the pump when the column is blocked.

The maximum pressure that the **S2100** pump allows is *40* Mpa.

Solvent 1 (..4)

It is possible to enable/disable particular solvent, as well as to name it.

4.2 Method Setup - LC

Some of the general pump settings, as well as settings connected to the sending of signals to auxiliary devices, can be edited on the **Method Setup – LC** tab.

4.2.1 Method Setup – LC – Pump Settings

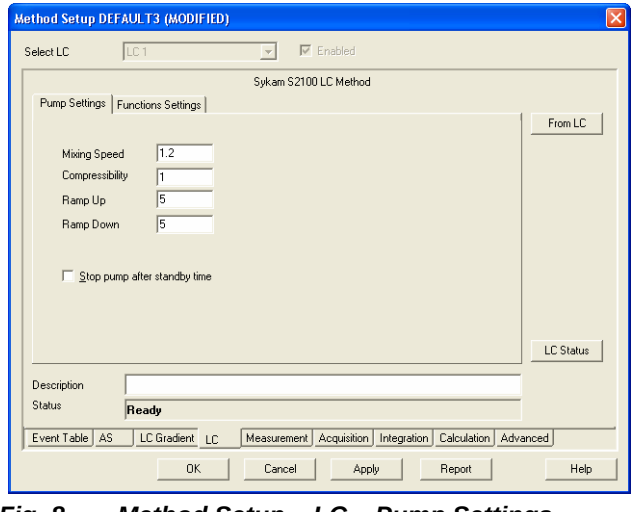

Fig. 8. Method Setup – LC – Pump Settings

Mixing speed

Sets the length of the mixing cycle. Values permited vary from *0,1* to *50* seconds.

Compressibility

Serves as a correction for volume contraction in the proces of mixing. This parameter can be set to values from *0* to *5*.

Ramp Up

Sets the flow rate increase before the start of the analysis. The higher the number entered (in (ml/min)/s), the steeper is the ramp. Possible values range is *0* – *10*.

Ramp Down

Sets the flow rate decrease after the end of the analysis. The higher the number entered (in (ml/min)/s), the steeper is the ramp. Possible values range is *0* – *10*.

Stop pump after standby time

This option decides what will happen after the end of the measurement. If checked, the pump will shut down, when not checked, it will switch to the state set in the **Idle State** section of the **Method Setup – LC Gradient** tab. It is thus possible to set the pump so it will be on after the method is sent, before the measurement, and off after the measurement is over.

4.2.2 Method Setup – LC – Function Settings

S2100 pump can control auxiliary equipment via TTL signals ("functions" in terminology of pump's manual) sent from contacts on the back panel of the **S2100** pump. These signals do not affect operation of pump itself.

The times when these signals will change have to be known before the analysis starts, so it is not possible to control these outputs from the **Event Table** window in dependence on the signal.

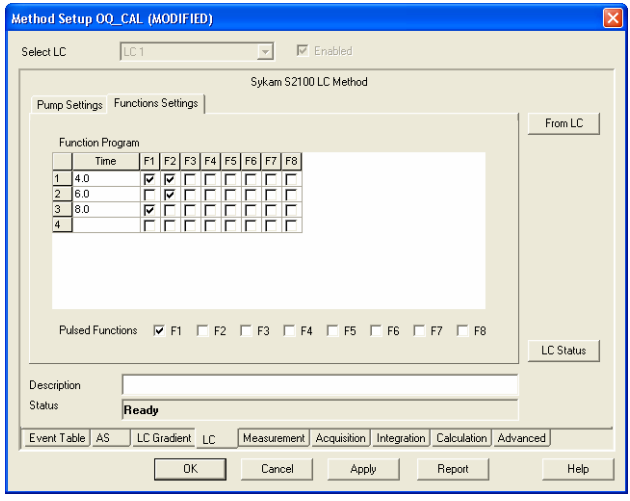

Fig. 9. Method Setup – LC – Function Settings

Time

Value entered in this field determines when the particular row will be executed. The value is in minutes (decimal value, 30 s is set as 0,5). Rows without time set will be cleared when leaving **Method Setup** dialog.

F1 – F8

In case of the checkbox checked, the particular signal will be sent in given time. In case of pulse signals, a pulse with the duration set in the **Sykam S2100** pump will be sent. If the type of the signal is not pulse, the checked output will change its state from *LOW* (default) to *HIGH*. On the next row of the **Function Program** table, every signal will be checked again and set to appropriate state (not checked to *LOW*, checked to *HIGH*).

Pulsed Functions F1 – F8

Determines the type of each output signal. If checked, the signal will be sent as pulse, not checked outputs will change the logical level between *LOW* and *HIGH*.

4.3 Device Monitor

The pump status dialog can be invoked by the **Monitor – LC Chromatograph** command from the **Instrument** window or using the **LC Monitor** icon. It displays the actual flows of particular solvents, as well as the total flow, the total pressure and the analysis time.

Note: ***Sykam S2100 LC Pump*** *as a possible part of* ***Sykam Amino Acid Analyzer*** *has its own device monitor section, differing from the usual graphic look. These two sections have the same functionallity and work interchangably (e.g. it is possible to* ***Stop flow*** *on LC Monitor and* ***Resume Idle*** *on the* ***Sykam S2100*** *monitor). In addition,* ***Sykam S2100*** *monitor has the Set Volumes button. Both monitors display the same values.*

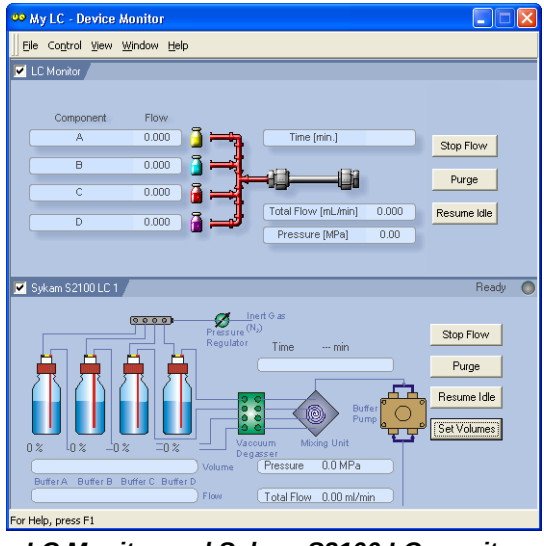

Fig. 10. LC Monitor and Sykam S2100 LC monitor

Stop Flow

The pumps can be stopped from this window by using the **Stop Flow** button. This action will stop the pump only, the analysis run will

continue and must be stopped or aborted from the **Data Acquisition** or **Single Analysis** dialogs.

Purge

The pumps may be purged by pressing this button. Set the desired total flow and solvent ratios in the separate dialog.

Resume Idle

Pressing this button will return the pumps to *IDLE* state as defined in the appropriate fiel in the **LC Gradient** tab of the **Method Setup** dialog.

Set Volume

S2100 control module can be used to keep track of the consumption of solvents. Pressing this button will invoke the **Set Remaining Solvents** dialog.

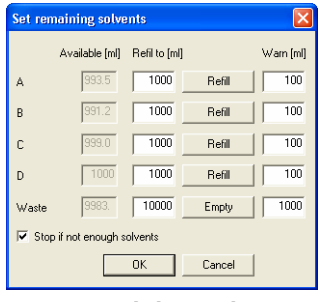

Fig. 11. Set remaining solvents

While the pump is operating, the module decreases the volumes of liquids which are available. The volume levels can be checked in the **Set Remaining Solvents** dialog. This dialog can also be used to set available volumes to given level by pressing **Refill** buttons.

Available [ml]

Displays currently available volume of particular solvents and free space in waste flask.

Refill to [ml]

Specifies the volume of the full flask of solvent and the volume of waste flask.

Refill

When invoked, sets the **Available** volume for corresponding solvent to the **Refill to** volume.

Warn [ml]

Specifies minimum amount of solvents to start the analysis.

Stop if not enough solvents

The control module will not start an analysis if this option is checked and the **Available** volume would drop below the **Warn** volume during the single run or sequence. Solvent consumption is counted from the time length of gradient table and the solvent flows of methods set in the sequence. If the method itself is longer than the length of the gradient table, this excess time is not used in the calculation, which can result in premature stop of the sequence.

4.4 Sykam S2100 Setup

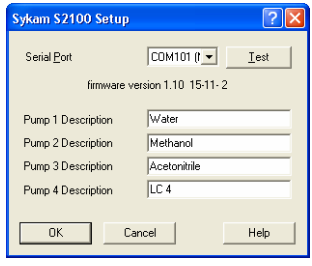

Fig. 12. Sykam S2100 Setup

Serial Port

Selects the serial port to which the Sykam S2100 pump is connected.

Test

By pressing this button, the firmware version of connected pump is read.

Pump 1-4 Description

Description of the pumps. No two devices on the same instrument can have the same name.

5 Report

The whole gradient table and other settings selected on the **Method Setup – LC Gradient** tab are reported as usual after the **Instrument control** option is checked on the **Report setup – Method** tab.

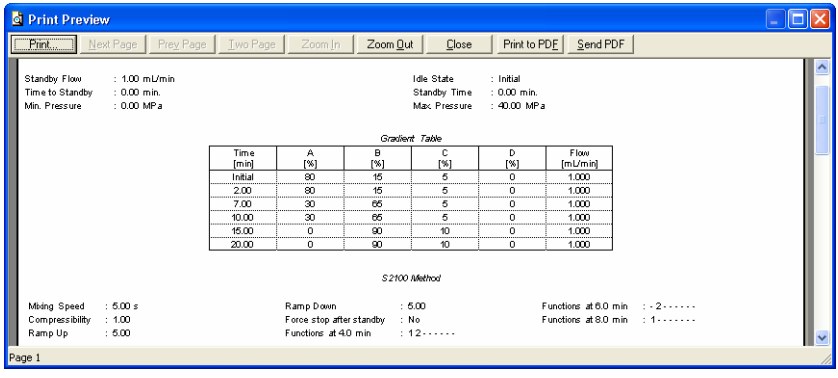

Fig. 13. Print preview

Values set on the **Method Setup – LC** tab are also reported in the section headed S2100 Method. Both the data from the **Pump Settings** and **Function Settings** tabs are shown.

6 Notes

The **Sykam S2100 pump** stops when Clarity method is sent to it. This is the limitation of pump's protocol.

The complete gradient is sent to the pump during initialization and at each change of the method. At this time, the pump is not ready for several seconds (the **Status Line** in the **Instrument** window displays "*Waiting, pump not ready*").