

SYKAM S2100

Clarity Control Module

ENG

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To facilitate the orientation in the **Sykam S2100** manual and **Clarity** chromatography station, different fonts are used throughout the manual. Meanings of these fonts are:

Open File (italics) describes the commands and names of fields in **Clarity**, parameters that can be entered into them or a window or dialog name.

WORK1 (capitals) indicates the name of the file and/or directory.

ACTIVE (capital italics) marks the state of the station or its part.

Chromatogram (blue underlined) marks clickable links referring to related chapters.

The bold text is sometimes also used for important parts of the text and the name of the **Clarity** station. Moreover, some sections are written in format other than normal text. These sections are formatted as follows:

Note: Notifies the reader of relevant information.

Caution: Warns the user of possibly dangerous or very important information.

I Marks the problem statement or trouble question.

Description: Presents more detailed information on the problem, describes its causes, etc.

Solution: Marks the response to the question, presents a procedure how to remove it.

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.

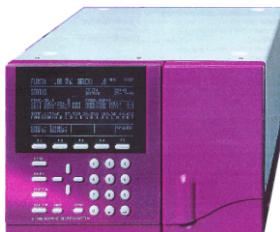


Fig. 1: Sykam S2100

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 USB with LC Control module (p/n A24).

Caution: Minimal firmware version required is **1.1**.

- Free serial COM port in the PC.

Note: Modern computers usually have only 1 (if any) serial (COM) port installed. To use more devices requiring the RS232 port, the **MultiCOM** adapter (p/n MC01) is available.

- Serial straight 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 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 displays *SERIAL CONTROL*.

The firmware of the **Sykam S2100** pump has to be 1.10 or higher.

Communication cable

The communication cable is Standard straight DB9F- DB9M cable (computer side/pump side, DataApex p/n SK02); only three cords (2-2, 3-3, 5-5) are necessary. Typical serial cable wiring is described in the picture.

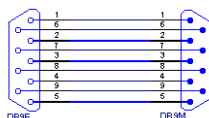


Fig. 2: Serial straight DB9F - DB9M cable

No additional wiring to PC besides the serial cable is required. In fact **S2100** cannot be started by external start contact while in serial control mode.

3.2 Clarity 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.

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

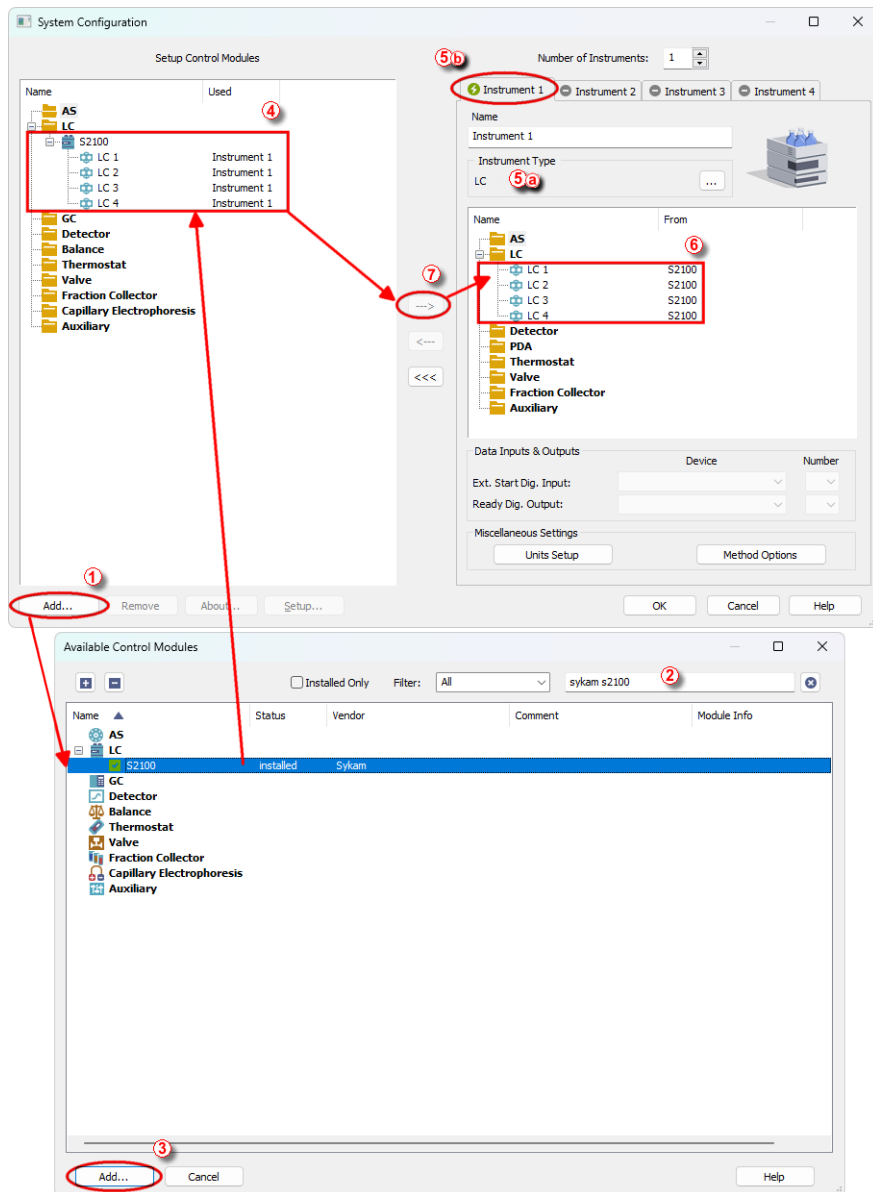


Fig. 3: System Configuration

- In the *System Configuration* dialog press the *Add* button ① to invoke the *Available Control Modules* dialog.

- Select the **Sykam S2100** in the **LC** section or you can use the filter ② to simplify the searching of the control module and press the **Add** ③ button.
- The [Sykam S2100 Setup](#) dialog will appear.

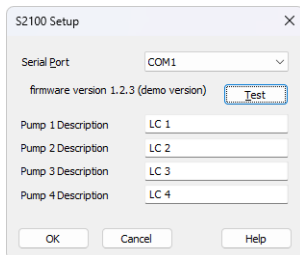



Fig. 4: Sykam S2100 Setup

- Select the correct *Serial Port* and fill in the *Pump Descriptions*. Use the **Test** button to check whether the **Sykam S2100** pump is connected and in the **SERIAL CONTROL** mode. 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 third-party USB-to-serial converters are known to cause errors in communication.

- The **Sykam S2100** item ④ with 4 solvents will appear in the *Setup Control Modules* list of the **System Configuration** dialog.
- Change the *Instrument Type* ⑤ ① on the desired *Instrument* tab ⑤ ② to LC.
- Drag the LC item(s) from the *Setup Control Modules* list on the left ④ to the *Instrument* tab on the right ⑥, or use the  button ⑦.

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 Method Setup - LC Gradient

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

Method Setup Default1 - #18; 25/10/2023 16:22:11

New Open... Save Save as... Report setup... Audit trail... Send method by e-mail... Help

Gradient Table						
	Time [min]	A [%]	B [%]	C [%]	D [%]	Flow [mL/min]
2	3.00	10.0	20.0	65.0	5.0	1.000
3	6.00	50.0	20.0	25.0	5.0	1.000
4	10.00	50.0	20.0	25.0	5.0	1.000
5	15.00	95.0	0.0	0.0	5.0	1.000
6	18.00	95.0	0.0	2.0	3.0	1.000
7		0.0	0.0	0.0	100.0	

Standby Flow: 1 mL/min
Time to Standby: 0 min
Standby Time: 0 min

Idle State:
☐ Pump Off
☒ Initial
☐ Standby
☐ Initial - Standby
Options...

Event Table LC Gradient LC Measurement Integration PDA Method Calculation Advanced

OK Cancel Send Method

Fig. 5: 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.). To prepare the cell to receive values, click it by the left mouse button; the cell will highlight by dots. A cell that fails to highlight is not available for editing.

Time [min.]

Sets 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). 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.

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

Tab. 1: Flow Rate limitations:

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. Legend in the header of the graph indicates the assignment of colors to individual components. The assignment is fixed and individual components are displayed in the graph from bottom to top. The flow rate is displayed as a black line.

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

Parameters

Standby Flow

Sets 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 period defined in the *Time to Standby* field has passed. The duration of this state is defined by the *Standby Time* item. The ratio of individual components in the respective *STANDBY* and *IDLE* states is given by the first row of the **Gradient Table** (the *Initial* row).

Time to Standby [min]

Indicates the time during which the flow rate and mobile phase composition changes continuously between the last values entered in the table and the values defined by *Standby Flow* field and the *Initial* row mobile phase composition.

This time is included in the analysis time (the Instrument is in the *CONTROL* state). In case when the *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 (the Instrument is in the *CONTROL* state).

Idle State

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

Pump Off

The flow rates of all components are zero.

Caution: Be careful as this setting may damage the column in some cases.

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* field.

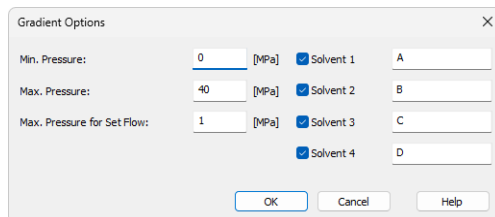
The *IDLE* state comes into effect each time an Instrument is opened, at the end or after abortion of an analysis by the *Abort* command, and is also maintained after the **Clarity** program is shut down.

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 a step change in the flow and components percentage from the values specified for the *STANDBY* state to those specified for the *IDLE* state if the *Idle State* field is not set to *Standby*.

4.1.1 Gradient Options

Invoke the *Options...* button in the [Method Setup - LC Gradient](#) dialog to open the *Gradient Options* dialog. This dialog allows to set the custom name for particular solvents, to switch whether they are used or not in the gradient and to set the warning levels for pressure to prevent the damage to hardware.



Parameter	Value	Unit	Solvent 1	Solvent 2	Solvent 3	Solvent 4	Custom Name
Min. Pressure:	0	[MPa]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	A
Max. Pressure:	40	[MPa]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	B
Max. Pressure for Set Flow:	1	[MPa]	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	C

Fig. 6: Gradient Options

Min. Pressure

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

Max. Pressure

Sets the maximum pressure for the given 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 **Sykam S2100** pump allows is 40 MPa.

Max. Pressure for Set Flow

Sets the maximum pressure to be used in the *Set Flow* dialog in the [Device Monitor](#). Initial value is 1 MPa.

Solvent 1 (...4)

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

4.2 Method Setup - LC

Some of the general pump settings, as well as settings related to the sending of signals to auxiliary devices, can be edited on the *Method Setup - LC* tab. This method page has two sub-tabs labeled [Pump Settings](#) and [Function Settings](#).

4.2.1 Method Setup - LC - Pump Settings

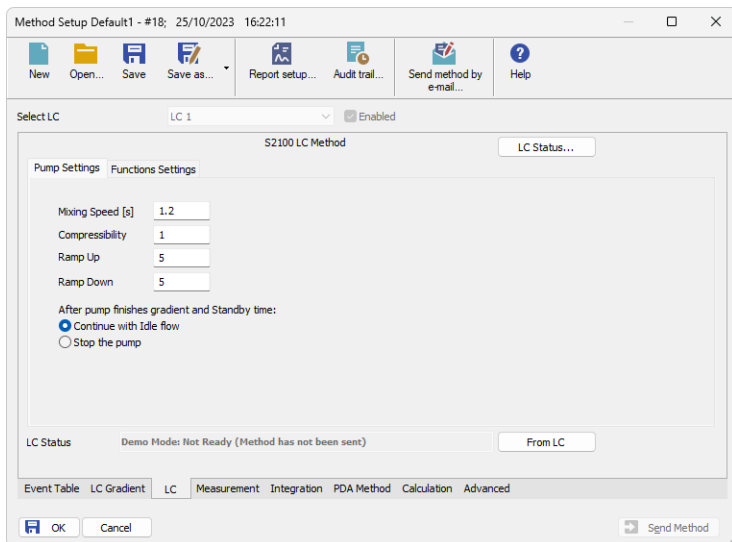


Fig. 7: Method Setup - LC - Pump Settings

Mixing speed

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

Compressibility

Serves as a correction for volume contraction in the process 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.

After pump finishes gradient and Standby time:

This option decides what will happen after the end of the measurement. 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.

Continue with Idle flow

The pump will switch to the state set in the *Idle State* section of the [Method Setup - LC Gradient](#) tab.

Stop the pump

The pump will shut down.

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 using the contacts on the back panel of the **Sykam S2100** pump. These signals do not affect operation of the 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 *Method Setup - Event Table* dialog in dependence on any input (e.g. signal value).

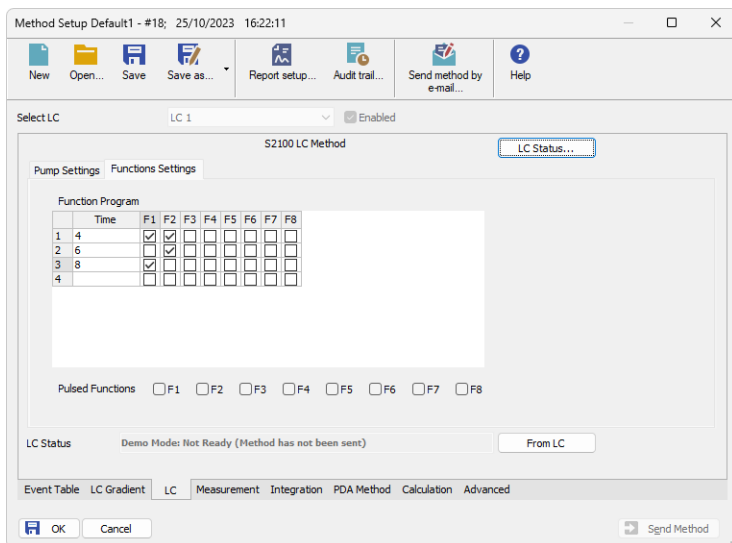


Fig. 8: Method Setup - LC - Functions Settings

Time

Value entered in this field determines when the particular row will be executed. The value is set in minutes (decimal value, 30 s is set as 0,5). Rows with empty *Time* field 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.

If the signal type is set as pulsed, a pulse with the duration set in the **Sykam S2100** pump's hardware 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*.

4.2.3 Hardware Configuration

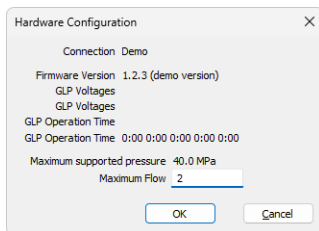


Fig. 9: Hardware Configuration

This dialog is invoked by using the *LC Status* button in the [Method Setup - LC](#) dialog. The *Hardware Configuration* dialog displays the COM port to which the **Sykam S2100** pump is connected, its firmware version and all pump-specific GLP (Good Laboratory Practice) parameters of the pump. These parameters are usually displayed separately for each individual pump, the values separated by spaces. Moreover, this action also detects the type of the Pump Head installed and displays the maximum pressure and flow for the **Sykam S2100** pump under these conditions.

4.3 Method Setup - Advanced

Method Setup Default1 (MODIFIED)

NewOpen...SaveSave as...Report setup...Audit trail...Send method by e-mail...Help

Common for all detectors

Subtraction

Chromatogram[None]

MatchingNo Change

Set...None

Column Calculations

Unretained Time1 [min]

Column Length50 [mm]

Statistical Moments

From Width at 50%

	Auxiliary Signal	Store
1	LC Pressure LC 1	<input checked="" type="checkbox"/>
2	LC Flow LC 1	<input checked="" type="checkbox"/>
3	LC Flow LC 2	<input type="checkbox"/>
4	LC Flow LC 3	<input type="checkbox"/>
5	LC Flow LC 4	<input type="checkbox"/>

User Variables

Variable 1

NameMethodUserVar1

Value0

Variable 2

NameMethodUserVar2

Value0

Variable 3

NameMethodUserVar3

Value0


Event TableLC GradientLCMeasurementIntegrationPDA MethodCalculationAdvanced

OKCancelSend Method

Fig. 10: Method Setup - Advanced

Sykam S2100 provides the pump flow and pressure auxiliary signals for use in Clarity. To save the auxiliary signals into each chromatogram measured according to the given method, check the particular checkbox in the lower section of the Method Setup - Advanced dialog.

4.4 Device Monitor

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

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 of the LC monitor. These two sections have the same functionality and work interchangeably (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.

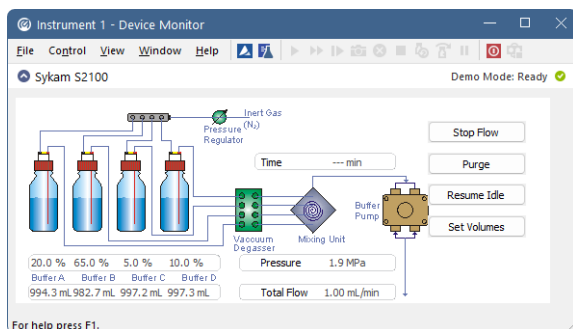


Fig. 11: LC monitor and Sykam S2100 Monitor

Stop Flow

The pumps can be stopped from this window 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* window or *Single Analysis* dialog.

Purge

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

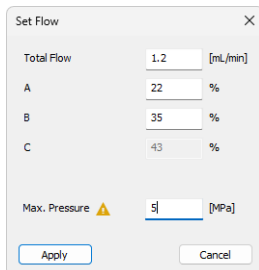


Fig. 12: Set Flow

Resume Idle

Returns the pumps to *IDLE* state as defined in the appropriate field on 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 invokes the *Set Remaining Solvents* dialog.

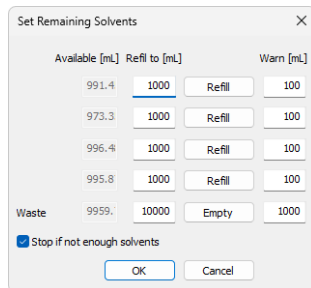


Fig. 13: Set Remaining Solvents

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.

4.5 Sykam S2100 Setup

Sykam S2100 Setup dialog (accessible through the *System Configuration* dialog) is used to set the connection to the pump and to name each of its pumps used in the gradient.

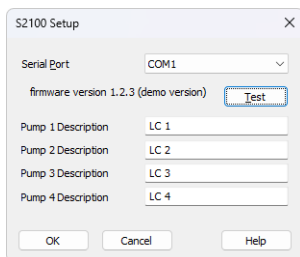


Fig. 14: Sykam S2100 Setup

Serial Port

Sets the COM port to which the **Sykam S2100** pump is connected.

Test

Checks whether the **Sykam S2100** pump is connected to the selected *Serial Port* and, if the connection is successful, displays the firmware version below the *Serial Port* field.

Pump 1 [..4] Description

Sets the name (description) for each pump in the gradient. This name is later used in the *System Configuration* dialog.

Caution: The pump's *Time Base* parameter must be set to *0.1 min* (default value). Otherwise the gradient program will run for shorter or longer time. To check the value, press the *Menu* button on the pump, choose *5 Instrument Setup* and locate the *Time Base* item.

Note: The solvent names in the graph on the [Method Setup - LC Gradient](#) tab are set in the [Gradient Options](#) dialog (for more details see also chapter **Gradient Options** on pg. 10).

5 Report Setup

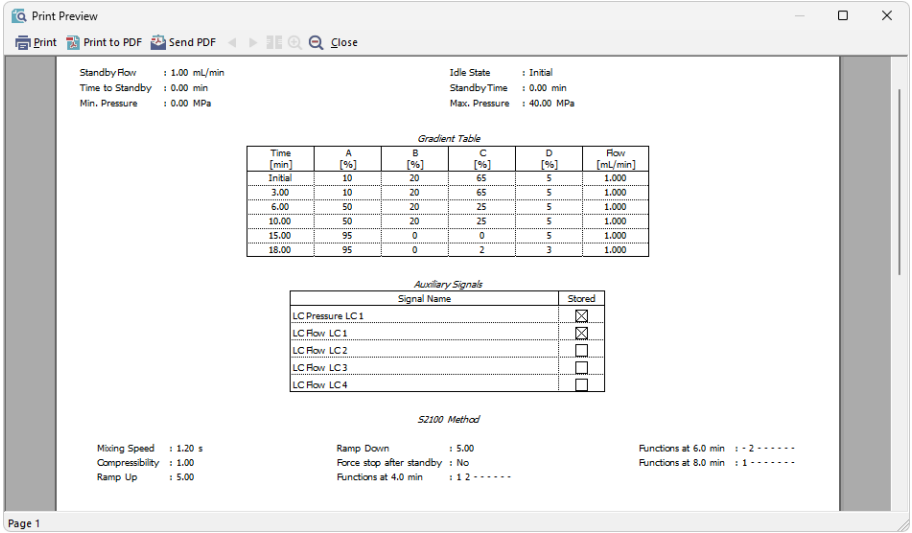


Fig. 15: Sykam S2100 report preview

All pump-specific settings (e.g. the settings from the **Method Setup - LC** tab) plus the general LC settings (such as the **Gradient Table** from the **Method Setup - LC Gradient** tab) are reported as a part of the data displayed by the use of *Instrument Control* checkbox of the **Report Setup - Method** dialog.

6 Troubleshooting

When the remedy for some problem cannot be discovered easily, the recording of communication between **Clarity** and the pump can significantly help the DataApex support to discover the cause of the problem.

The recording can be enabled by adding or amending the COMMDRV.INI file in the **Clarity** installation directory (C:\CLARITY\CFG by default). The file can be edited in any text editor (e.g. Notepad). Following section should be edited or added:

```
[COM1]
echo=on
textmode=on
filename=SykamS2100_%D.txt
reset=off
```

Note: Instead of COM1 type the correct serial port used to communicate with the **Sykam S2100** pump. This port number is displayed when the *LC Status* button in the [Method Setup - LC](#) dialog is invoked or in the [Sykam S2100 Setup](#) dialog.

Note: %D (or %d) in the filename parameter means that the log will be created separately for each day. The *reset=off* parameter disables deleting the content of the log each time the station is started during the same day.

The created *.TXT files will greatly help in diagnosis of unrecognized errors and problems in communication.

6.1 Specific Problems

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

Description: 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* inscription).

Solution: The **Sykam S2100** pump will stop and switch the valves every time the method is sent to it. This is a firmware limitation.