DataApex
Clarity™
CHROMATOGRAPHY SOFTWARE

SPARK SPH1299

Clarity Control Module ENG

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Contents

To facilitate the orientation in the **Spark SPH1299** 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.

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 Spark SPH1299 control module

This manual describes the setting of the **Spark SPH1299** pump. The control module enables direct control of the instrument over serial line.

Fig. 1: Spark SPH1299

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

Note: It is recommended to check the user manual of the pump for its operating principles and restrictions.

2 Requirements

- **Clarity** Installation with LC Control module (p/n A24).
- Communication cable according to the type of communication used - serial straight DB9F-DB9M cable (p/n SK02) in case of serial communication, LAN cross cable (p/n SK08) in case of LAN communication or USB A-B cable (p/n SK06) in case of USB communication.

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

- Possible additional communication cable for interconnecting more than one pump.
- Free communication port in the PC, based on the type of communication used - free serial COM port in case of serial communication, free ethernet port in case of LAN communication or free USB port in case of the USB communication.

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.

3 Installation Procedure

3.1 Spark SPH1299 setup - communication

The **Spark SPH1299** pump can be controlled from **Clarity** via three different communication ways - serial, LAN or USB. For serial communication straight DB9F-DB9M cable is used, which can be ordered as p/n SK02. Maximum length for USB, serial or input/output cable is 3 m.

3.1.1 Digital Inputs and outputs

The **Spark SPH1299** pump has one I/O connector on the back panel of the instrument and such connector can be used for both TTL input/output and Relay output synchronization. The pump has 2 TTL conections that can be configured to act as an input or output and 2 Relay output connections. The pin mapping is as follows:

Tab. 1: External I/O connector - pins mapping

Pin	Function	Comment
1	TTL 1 (input/output)	
2	GND	
3	TTL 2 (input/output)	
4	GND	
5	Relay output 1 (normally open)	When defined action is triggered, the Relay output is closed provided that the Relay output 1 (common) is connected together with Relay output 1 (normally open)
6	Relay output 1 (common)	
7	Relay output 2 (normally closed)	When defined action is triggered, the Relay output is opened provided that the Relay output 2 (common) is connected together with Relay output 2 (normally open)
8	Relay output 2 (common)	

3.2 Clarity Configuration

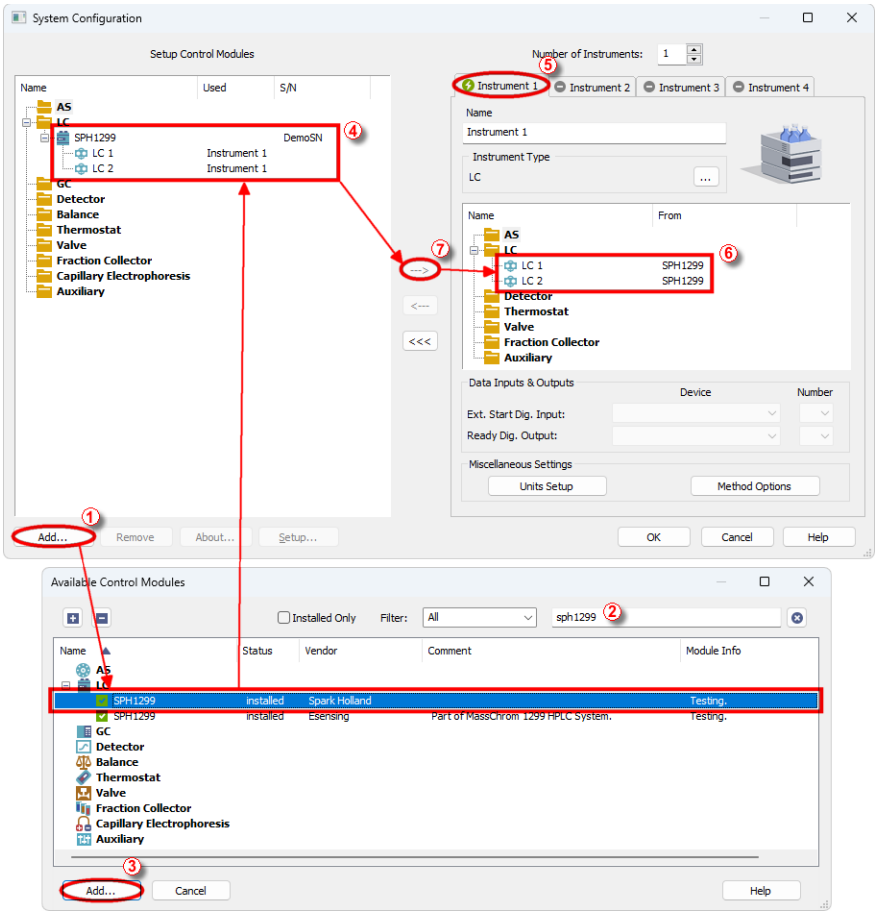

Fig. 2: System Configuration

- Start the **Clarity** station by clicking on the icon on the desktop.
- Invoke the *System Configuration* dialog accessible from the *Clarity* window using the *System - Configuration…* command.
- Press the *Add* button ① (see **Fig. 2** on pg. **4**.) to invoke the *Available Control Modules* dialog.
- You can specify the searching filter ② to simplify the finding of the driver.
- Select the **SPH1299** pump and press the *Add* ③ button.

The Spark SPH1299 Setup dialog will appear.

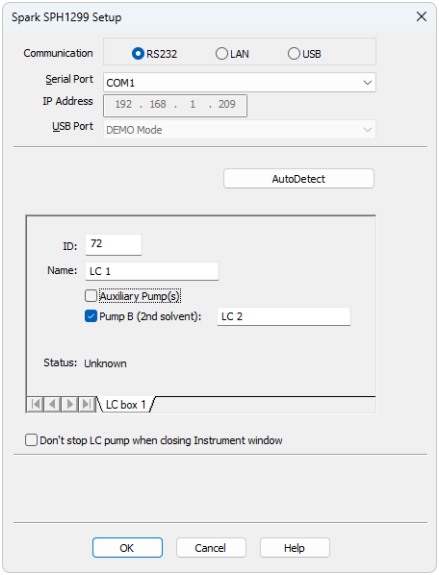

Fig. 3: Spark SPH1299 Setup

- Select the type of the communication to be used.
- Fill in the appropriate communication parameters for the selected type of communication and fill in the correct *ID*, then press the *AutoDetect* button. If the communication is correct, the *Connected* inscription along with the firmware version and serial number of the **SPH1299** pump will be shown in the *Status* row. The *ID* must match the device identifier set on the back of the pump, as described in the chapter "Installation Procedure". If you have more than one pump chain-connected via the same communication port, it is advisable to try to autodetect one pump at a time.

Note: The Spark SPH1299 Setup dialog is more closely described in the chapter **"Spark SPH1299 Setup"** on pg. **21**.

The **Spark SPH1299** pump item will appear in the *Setup Control Modules* list of the *System Configuration* dialog.

- Drag and drop the **SPH1299** icon from the *Setup Control Modules* ④ list on the left side of the *System Configuration* dialog to the desired *Instrument* ⑤ tab on the right side ⑥ (or use the ---> button ⑦ to do so).

4 Using the control module

New Method Setup - LC and possibly a Method Setup - LC Gradient tabs appear in the *Method Setup* dialog, enabling the setting of the **Spark SPH1299** pump control method.

4.1 Method Setup - LC

4.1.1 Time Table

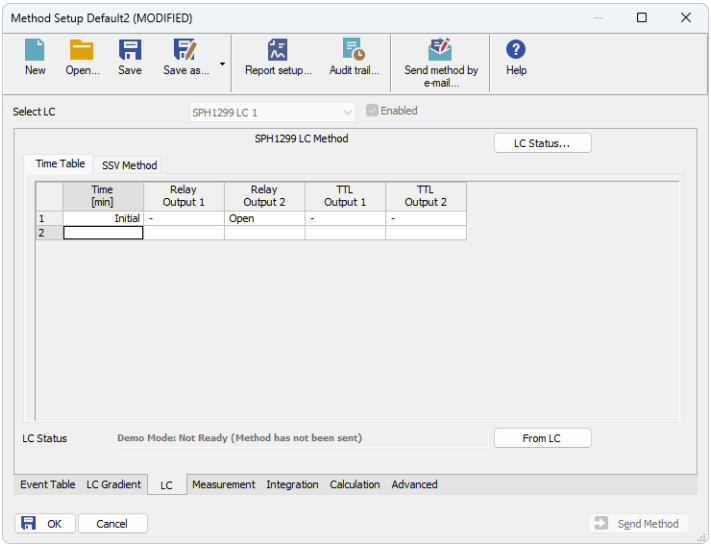

Fig. 4: Method Setup - LC - Time Table

This tab defines the behavior of the physical digital output placed on the pump set as a part of the gradient. For such pump, the output may only be switched during a run based on the pre-set time table, unlike the Auxiliary pump, whose auxiliary output can only be switched by the means of the Event Table.

4.1.2 SSV Method

Spark SPH1299 is equipped with two solvent selection valves (SSV).

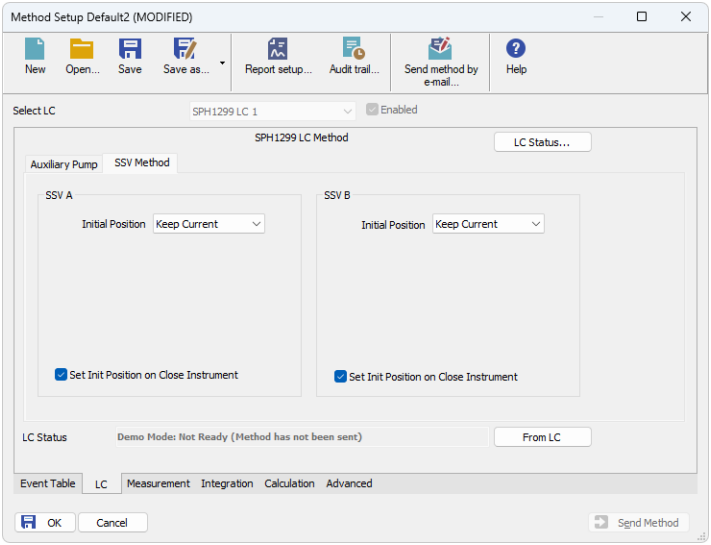

Fig. 5: Method Setup - LC - SSV Method

Initial Position

Specifies the initial position to which the valve is switched at the sending of the method. Possible values for the valve are: *Keep Current*, *Position 1* and *Position 2*. *Keep Current* option does not change the valve position at the moment of sending the method.

Set Init Position on Close Instrument

This checkbox specifies what will happen after the Instrument is closed. When checked, the valve will return to the state specified in the *Initial Position* field. When unchecked, the valve will stay in current position or move to position set in the Event Table. Default state is "checked".

4.1.3 Auxiliary Pump

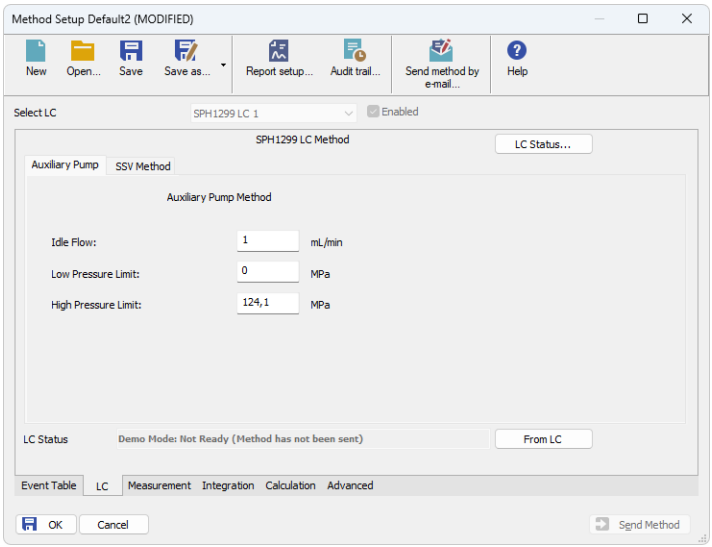

Fig. 6: Method Setup - LC - Auxiliary Pump

This tab defines the properties of **Spark SPH1299** pump set as auxiliary.

Idle Flow

Sets the flow of the pump used outside of the run. The flow of the pump that should be used during the run can be defined in the Event Table.

Low Pressure Limit

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.

High Pressure Limit

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.

4.2 Method Setup - LC Gradient

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

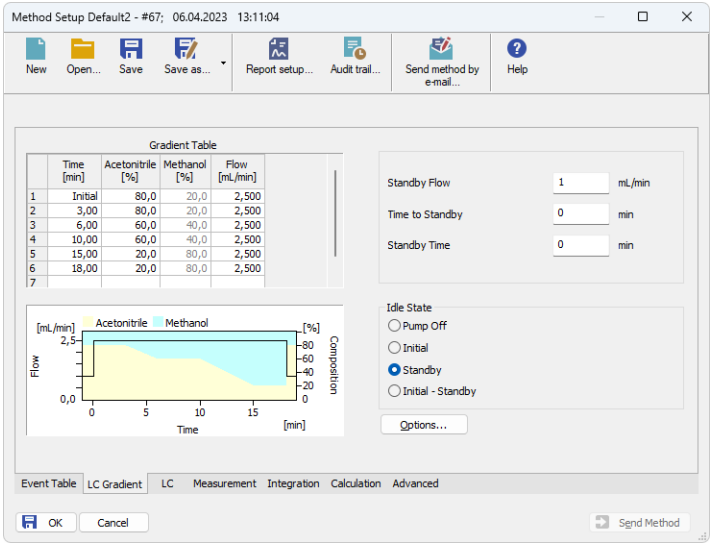

Fig. 7: Method Setup - LC Gradient

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 range for *Flow* values is *0 - 2* 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 overall flow rate, the one on the right to the mixing ratio.

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.

Initial - Standby

The flow is defined by the first row of the gradient table (the *Initial* row) after the method is sent, or by the value entered in the *Standby Flow* field after the method finishes.

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*.

4.2.1 Gradient Options

Invoke the *Options…* button in theMethod 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.

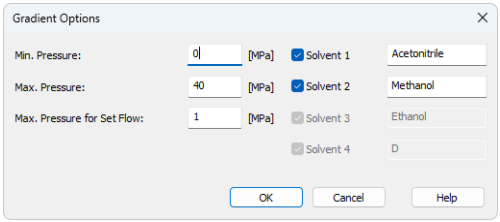

Fig. 8: Gradient Options

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. The range for *Min. Pressure* values is *0 - 129* MPa.

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 range for *Max. Pressure* values is *1 - 130* MPa, where the *Max. Pressure* must also be at least *1* MPa higher than the *Min. Pressure*.

Note: Pressure limits are checked in the pump hardware. Pressure checking doesn't start immediately after the pump is started, but with a few minutes delay. During this delay the pressure in chromatographic system can stabilize.

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.

4.3 Method Setup - Advanced

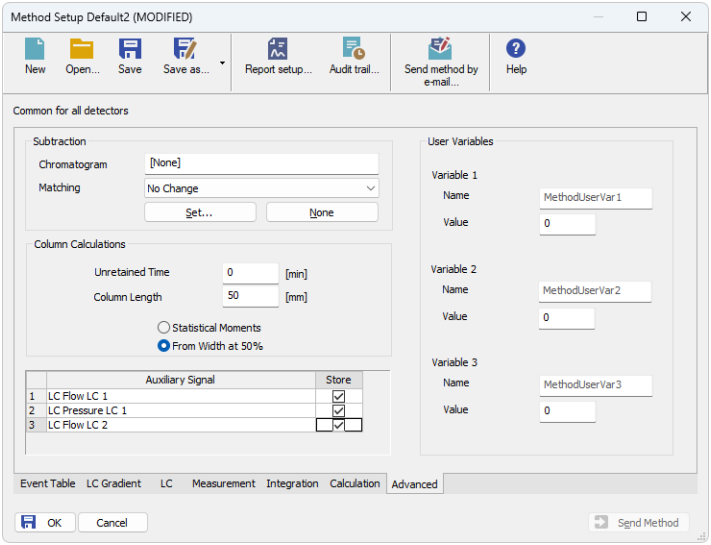

Fig. 9: Method Setup - Advanced

Spark SPH1299 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 Method Setup - Event Table

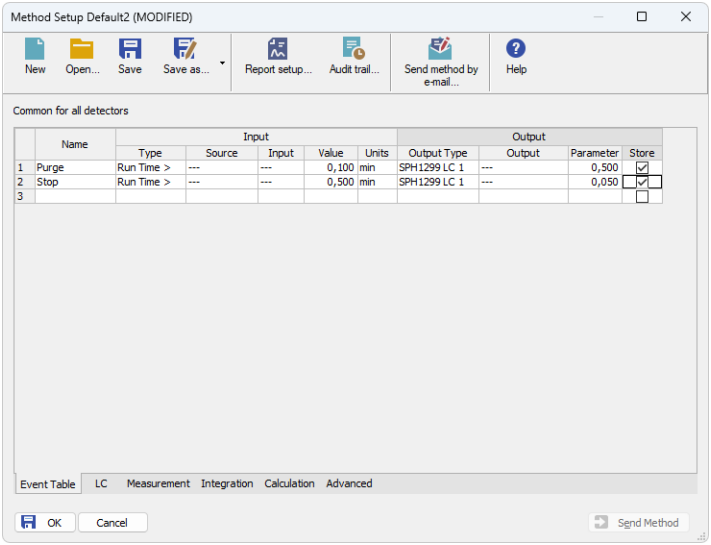

Fig. 10: Method Setup - Event Table

The *Method Setup - Event Table* tab can be, outside of other things, also used for switching the flow of the **Spark SPH1299** auxiliary pump and switching the auxiliary output on the auxiliary pump.

Note: It is not possible to switch auxiliary output or change flow on a pump that is part of the gradient from the **Event Table**.

4.5 Hardware Configuration

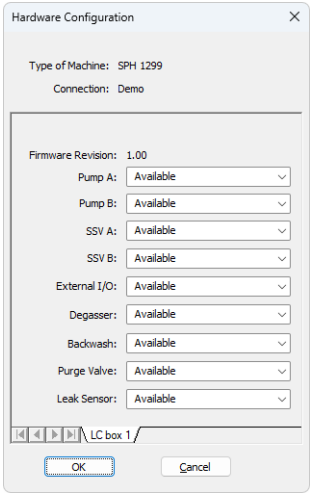

Fig. 11: Hardware Configuration

The *LC Status* button in the Method Setup - LC dialog displays the *Hardware Configuration* dialog. The dialog is consisted of tabs that display the settings of pumps chained on the same communication port.

In the full version, this dialog displays pump model, data on the communication used, firmware revision and the presence of optional parts of the **Spark SPH1299** pump.

In the demo version the presence of the particular options can be set to demonstrate the possibilities of the pump with selected configuration.

Type of Machine

Shows the **Spark SPH1299** pump type as automatically detected by the control module.

Connection

Shows the communication port as detected from the pump.

Firmware Revision

Shows the firmware revision loaded into the **Spark SPH1299** pump.

Pump

Shows if the Pump A or Pump B is available.

SSV

Shows whether the **Spark SPH1299** pump is equipped with the solvent selection valve option.

External I/O
Shows whether the **Spark SPH1299** pump is equipped with the I/O connector for hardware synchronization.

Degasser
Shows whether the **Spark SPH1299** pump is equipped with the degasser option.

Backwash
Shows whether the **Spark SPH1299** pump is equipped with the backwash option.

Purge Valve
Shows whether the **Spark SPH1299** pump is equipped with the Purge Valve.

Leak Sensor
Shows whether the **Spark SPH1299** pump is equipped with the Leak Sensor.

4.6 Device Monitor

The pump status dialog can be invoked by the *Monitor - Device Monitor* command from the *Instrument* window or using the LC Monitor icon.

4.6.1 Device Monitor - LC Monitor

For gradient pumps, the monitor consists of the section common to all pumps present in the gradient (this section displays the actual flows of particular solvents, as well as the total flow, the total pressure and the analysis time), and of parts belonging to particular pumps.

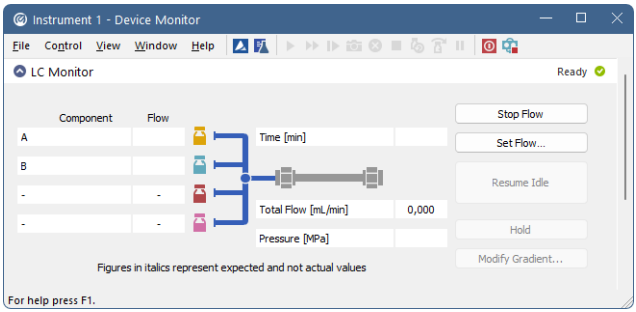

Fig. 12: Spark SPH1299 Device Monitor

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 separately by the *Stop*/*Abort* button in the toolbar.

Set Flow...

Sets the desired total flow and solvent ratios in the opened *Set Flow* dialog. *Max. Pressure* allows to set a different pressure than set in the "Gradient Options" on page 12 of a given method.

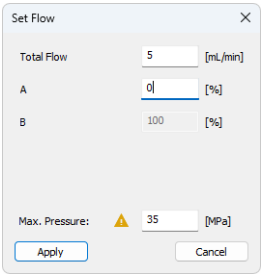

Fig. 13: Set Flow

Resume Idle
Returns the pumps to *IDLE* state as defined in the appropriate field on the LC Gradient tab of the *Method Setup* dialog.

Hold/Resume
Clicking on the *Hold* button will keep the current gradient conditions until *Resume* is clicked.

Modify Gradient...
Opens theLC Control Manual Flow dialog allowing to set custom flow and mobile phase composition, disregarding the **Gradient Table** set in the method. The command is only available during the analysis run.

Flow A; Flow B
Displays the flow on pump solvents. The values are read out from the pump over communication line.

Pressure
Displays the pressure on the pump pressure reader.

SSV A; SSV B
Allows to switch the *SSV* valve *A* or *B* in the pump (if present) to the desired position. This action can only be performed outside of the analysis run.

Prime & Purge
Opens the *Prime & Purge* dialog serving to operate the pump outside of the run:

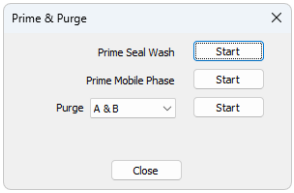

Fig. 14: Prime & Purge

The dialog allows to perform *Prime Seal Wash*, *Prime Mobile Phase* and *Purge* operations. The operations are started by pressing the appropriate *Start* button and will end up automatically after set amount of time (*25s* for *Prime Seal Wash*, *95s* for *Prime Mobile Phase* and *120s* for *Purge*) or can be stopped manually earlier using the *Stop* button. *Purge* command allows to set he solvents to be purged using the drop-down menu prior to purging, *A*, *B* and *A & B* variants are possible..

LC Status
Displays the Hardware Configuration dialog for the **Spark SPH1299** pump.

4.6.2 Device Monitor - Auxiliary Pump

Each Auxiliary pump has its own device monitor displaying the actual flow and pressure on the device. This separate monitor mimics the operations of *Stop Flow*, *Set Flow*, *Resume Idle*, *SSV A* (or *B*), *Prime & Purge* and *LC Status* from the gradient *Device Monitor*, but can also be used during the analysis run.

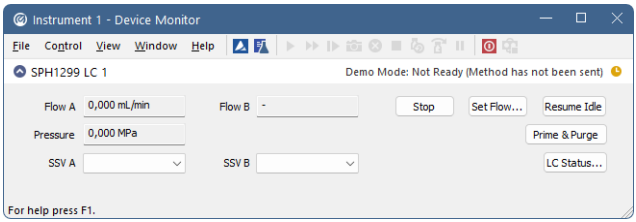

Fig. 15: Device Monitor - Auxiliary pump

Note: Please note that the separate *Set Manual Flow* dialog is present for each auxiliary pump. Auxiliary pumps must thus be purged manually one at a time.

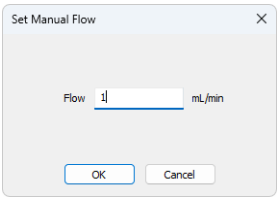

Fig. 16: Set Manual Flow - SPH1299 Auxiliary pump

4.6.3 LC Control Manual Flow

The *LC Control Manual Flow* dialog accessible through using the *Modify Gradient …* button fromDevice Monitor window allows the user to set a custom mobile phase composition and flow while the analysis is running. It resembles the Method Setup - LC Gradient tab in functionality.

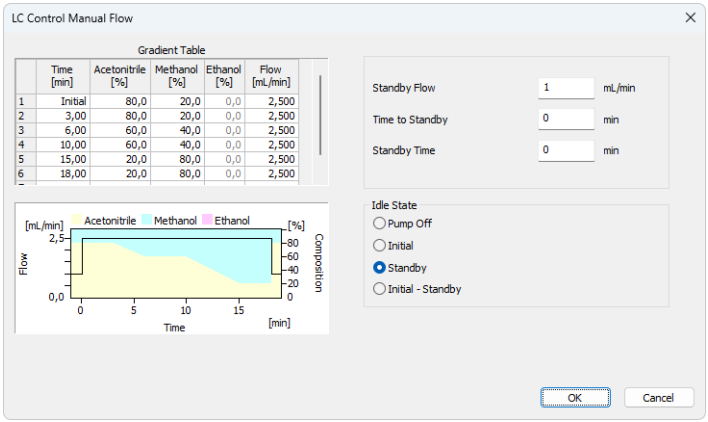

Fig. 17: LC Control Manual Flow dialog

The *LC Control Manual Flow* dialog is only available during the analysis run. When it is invoked and the *OK* button is pressed, the original **Gradient Table** from the acquisition method is discarded and replaced by the **Gradient Table** from the *LC Control Manual Flow* dialog. Any such operation is recorded in the audit trail of the measured chromatogram.

Caution: After the analysis run which used manual flow changes ends, the original method is automatically sent to all controlled devices to make sure **Clarity** station returns to the original method.

4.7 Spark SPH1299 Setup

Spark SPH1299 Setup dialog (accessible through the ***System Configuration*** dialog) allows to manually set the parameters needed for the communication with the **Spark SPH1299** pump.

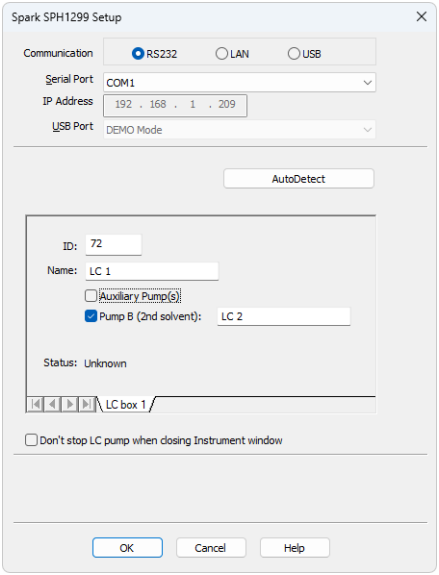

Fig. 18: Spark SPH1299 Setup

Communication

Sets the type of the communication for the **Spark SPH1299** pump. The possible options are *RS232*, *LAN* or *USB*. The selection influences the fields available in the *Spark SPH1299 Setup* dialog.

Serial Port

In case of serial (RS232) communication sets the COM Port used for the communication between the **Spark SPH1299** pump and **Clarity**.

IP Address

In case of LAN communication sets the IP address of the **Spark SPH1299** pump connected to the computer via network.

USB Port

In case of the USB communication sets the particular USB port used to communicate with the **Spark SPH1299** pump.

Autodetect

When pressed, checks whether there is the **Spark SPH1299** pump present using the selected *Communication* option, with the given *Serial Port*, *IP Address* or *USB*

Port. The *ID* is also checked for the successful communication attempt. The result of the autodetection is then displayed in the *Status* row.

ID

Sets the device identifier of the **Spark SPH1299** pump. By default the *ID* is set to *72*.

Name

Sets the name of the **Spark SPH1299** pump.

Auxiliary Pump(s)

Denotes the pump as an auxiliary one, which means the fact whether the pump is a part of the gradient or not. Maximum of four solvents may be used in the same gradient table, other solvents may be further used via the auxiliary pumps. Pump that is set as auxiliary will have it's auxiliary digital output available for operation in the **Clarity** Event Table and usable as a *Ready Digital Output* in the *System Configuration* dialog.

Pump B (2nd solvent)

This checkbox enables the use of the second pump (solvent). If checked the name can be input in the *Name* field. This option is enabled only when the *Auxiliary Pump (s)* checkbox is unchecked.

Status

Shows the status of the communication with the **Spark SPH1299** pump after the *AutoDetect* button has been used. The displayed information, in case of the successful communication attempt, includes the version of the firmware in the pump and the pump's serial number.

Don't stop LC pump when closing Instrument window

When checked, causes the pump not being stopped when the *Instrument* window is closed. Default behavior in **Clarity** causes all devices to be stopped when the *Instrument* window is closed.

Digital Output Names

Pressing the *Change* button will open the *Digital Output Names* dialog used for setting the custom names of the auxiliary digital output of the **Spark SPH1299** pump.

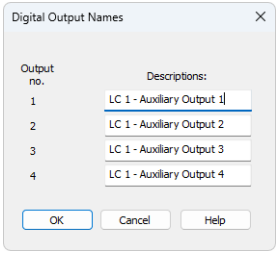

Fig. 19: Digital Output Names

Note: The option to change the digital output name is only displayed when at least one pump is set as Auxiliary pump. The initial state of the output may then be changed in theDigital Outputs of SPH1299 dialog accessible from the main **Clarity** window via the *System - Digital Outputs…* menu command.

4.7.1 Digital Outputs of SPH1299

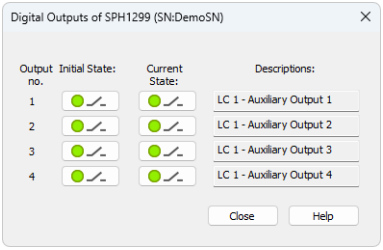

Fig. 20: Digital Outputs of SPH1299

Serves for setting the initial and actual state of the **Spark SPH1299** pump's auxiliary output. The output is only available when the pump is set to the *Auxiliary* mode.

5 Report Setup

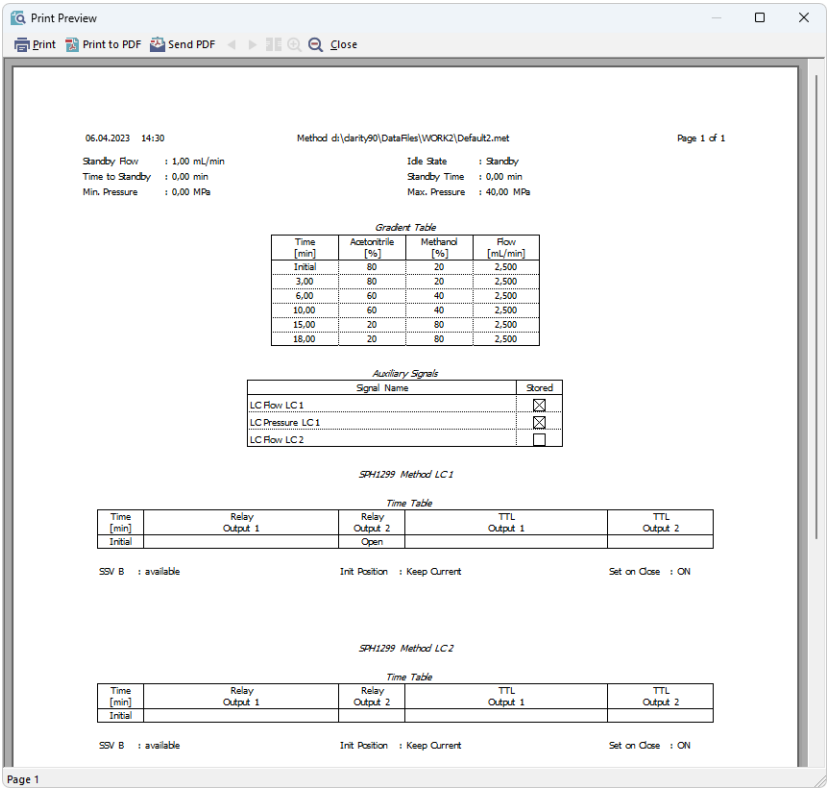

Fig. 21: Spark SPH1299 report preview

All pump-specific settings (that means the data from both sub-tabs of the Method Setup - LC tab) and gradient-specific settings (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=Spark_SPH1299_%D.txt
reset=off
```

Note: Instead of COM1 type the correct port used to communicate with the **Spark SPH1299** pump. This information is displayed when the *LC Status* button in the Method Setup - LC dialog is invoked or in the Spark SPH1299 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. Note that the file size may be quite significant, so in case the error occurs on a regular basis, it might be better to set the Reset=on, start **Clarity**, invoke the error, close **Clarity** and send the diagnostics file (the file will be once more reset during the next start of **Clarity**).

6.1 Specific Problems

An error message "Cannot establish communication with …" appears when opening Clarity Instrument.

Solution: Check the power cable (**Spark SPH1299** pump must be switched on), communication cable and communication settings in the Spark SPH1299 Setup dialog.