

SPARK SPH1299

Clarity Control Module

ENG

Code/Rev.: M221/90C Date: 2024-02-14

Phone: +420 251 013 400 clarity@dataapex.com www.dataapex.com DataApex Ltd. Petrzilkova 2583/13 158 00 Prague 5 Czech Republic

Clarity[®], DataApex[®] and $\blacktriangle^{\mathbb{R}}$ are trademarks of DataApex Ltd. Microsoft[®] and WindowsTM are trademarks of Microsoft Corporation.

DataApex reserves the right to make changes to manuals without prior notice. Updated manuals can be downloaded from www.dataapex.com.

Author: DR

Contents

1 Spark SPH1299 control module	1
2 Requirements	2
3 Installation Procedure	
3.1 Spark SPH1299 setup - communication	3
3.1.1 Digital Inputs and outputs	3
3.2 Clarity Configuration	4
4 Using the control module	6
4.1 Method Setup - LC	6
4.1.1 Time Table	6
4.1.2 SSV Method	7
4.1.3 Auxiliary Pump	8
4.2 Method Setup - LC Gradient	9
4.2.1 Gradient Options	12
4.3 Method Setup - Advanced	13
4.4 Method Setup - Event Table	14
4.5 Hardware Configuration	
4.6 Device Monitor	17
4.6.1 Device Monitor - LC Monitor	
4.6.2 Device Monitor - Auxiliary Pump	18
4.6.3 LC Control Manual Flow	
4.7 Spark SPH1299 Setup	21
4.7.1 Digital Outputs of SPH1299	23
5 Report Setup	24
6 Troubleshooting	
6.1 Specific Problems	25

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:

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)	

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

3.2 Clarity Configuration

							0
Setup Co	ontrol Modules			Number of Instrumen	ts: 1 🔹		
ne	Used	s/N		🕜 Instrument 1 🖨 Instrument 2	Instrume	ent 3 🔍 🖨 Instru	ment 4
AS				Name			
🖮 💼 SPH1299		DemoSN 4		Instrument 1			177
LC 1	Instrument 1			Instrument Type			
GC LC 2	Instrument 1			LC			
Detector	T.				-		
Thermostat					From		
Valve						6	
Capillary Electrophoresis			\sim		SPH129 SPH129	9	
Auxiliary				Detector	5111225	,	
			<	Thermostat			
			<<<	Fraction Collector			
				Auxiliary			
				Data Inputs & Outputs	Dev	ice	Number
				Ext. Start Dig. Input:		~	×
				Ready Dig. Output:		~	×
				Miscellaneous Settings			
				Units Setup		Method Optic	ons
Add Remove	About	Setup			ОК	Cancel	Help
Auritatia Cantant Markelan							~
Available Control Modules						- U	~
		Installed Only	Filter: All	✓ sph1299 ②			0
Name 🔺	Status	Vendor	Co	mment	Mo	dule Info	
_ 🔮 🐴							
	installe	ed Spark Holland			Te	esting.	
SPH1299			De	art of MassChrom 1299 HPLC System.	Te	esting.	
SPH1299	installe	ed Esensing					
GC Detector	installu	ed Esensing					
GC Detector Balance Themesetet	installi	ed Esensing					
GC GC C Detector Balance Thermostat Valve	installi	ed Esensing					
GC SPH1299 GC Detector Detector Detector Thermostat Valve	instali	ed Esensing					
SPH1299 SPH1299 GC Detector Detector Detector Thermostat Yalve Fraction Collector Gapillary Electrop Gapillary Electrop	instali , horesis	ed Esensing					
Control C	nstali , horesis	ed Esensing					
Contrast Contr	nstali horesis	ed Esensing				Hela	

Fig. 2: System Configuration

- Start the **Clarity** station by clicking on the **L**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.

Communication	O RS232		OUSB		
Cardel Dark	•	0	0		
Senarport	COM1			~	
IP Address	192 . 168 . 1	. 209			
USB Port	DEMO Mode			\sim	
			AutoDetect		
ID: 72	2				
Name: LC	2.1				
	Auxiliary Pump(s)				
	Pump B (2nd solvent)	: LC 2			
				_	
Status: Unk	nown				
	LC box 1				
	·/				
Don't stop LC	C pump when closing I	instrument win	dow		

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 <u>Spark SPH1299 Setup</u> 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 <u>Method Setup - LC Gradient</u> 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

New Open Save Save as Report setup Audt trall Seried method by email	
Select LC SPH1299 LC 1 🗸 🖉 Enabled	
SPH1299 LC Method LC Sta	us
Time Table SSV Method	
Time Relay Relay TTL TTL [min] Output 1 Output 2 Output 1 Output 2	
1 Initial - Open	
LC Status Demo Mode: Not Ready (Method has not been sent) From	LC
Event Table LC Gradient LC Measurement Integration Calculation Advanced	
G OK Cancel	Send Method

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).

Method Setup Default2 (MODIFIED)			×
New Open Save Save as Report setup Audit trail Send method by e-mail			
Select LC SPH1299 LC 1			
SPH1299 LC Method LC Status			
Auxiliary Pump SSV Method			
SSV A SSV B			
Initial Position Keep Current 🗸 Initial Position Keep Current 🧹			
Set Init Position on Close Instrument			
LC Status Demo Hode: Not Ready (Hethod has not been sent) From LC			
Event Table LC Measurement Integration Calculation Advanced			
G OK Cancel	D s	end Metho	d

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

Method Setup Default2 (MODIFIED)			×
New Open Save Save as Report setup Audit trail Send method by Help			
Select LC SPH1299 LC 1 V Enabled			
SPH1299 LC Method LC Status Auxiliary Pump SSV Method			
Auxiliary Pump Method			
Idie Flow: 1 mL/min Low Pressure Limit: 0 MPa			
High Pressure Limit: 124,1 MPa			
LC Status Demo Hode: Hot Ready (Hethod has not been sent) From LC			
Event Table LC Measurement Integration Calculation Advanced			
R OK Cancel	21	Send Meth	d.

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.

Gradient Table Time Acetonitrie Methanol Flow [min] Standby Flow 1 m./min 1 Acetonitrie Methanol [min] Time Standby Flow 1 m./min 2 3,00 60,0 20,00 2,500 Time to Standby 0 min 5 15,00 20,0 2,500 5 Standby Time 0 min 7 Acetonitrie Methanol 2,500 1 Standby Time 0 min 80,0 20,0 80,0 2,500 1 Standby Time 0 min 9 Acetonitrie Methanol 1 Standby Time 0 min	lew	Open	Save	Save as	Report	t setup	Audit trail.	Send method by e-mail	? Help			
Time Acetonitrie Methanol Flyw 1 Initial 80,0 20,0 2,500 2 3,00 80,0 20,0 2,500 3 6,00 60,0 40,0 2,500 5 15,00 20,0 2,500 7			Gr	adient Tabl	e							
1 Initial 80,0 20,0 2,500 2 3,00 80,0 20,0 2,500 3 6,00 40,0 2,500 4 10,00 60,0 40,0 2,500 5 15,00 20,0 80,0 2,500 7 Acetonitrie Methanol 960 98 1 1,100 60,0 40,0 2,500 7 Acetonitrie Methanol 96 98 1 1,100 60,0 40,0 2,500 100 100 7 Acetonitrie Methanol 96 98 90 97		Time [min]	Acetonitrile [%]	Methanol [%]	Flow [mL/min]		1	Standby Flow		1	ml /min	
2 3.00 80,0 20,0 2,500 3 6,00 40,0 2,500 4 10,00 60,0 40,0 2,500 5 15,00 20,0 80,0 2,500 6 18,00 20,0 80,0 2,500 7 Acetonitrile Methanol 9 min 2,3 4 10,00 60,0 40,0 2,500 7 Acetonitrile Methanol 9 min 9 2,3 4 10,00 50,0 2,500 10 10 11 2,3 4 10,00 20,00 20,00 10 10 10 4 10,00 50,00 2,500 10 10 10 10 3 4 10,00 50,00 2,500 10 10 10 4 10 50 9 9 10 10 10 3 4 4	1	Initial	80.0	20.0	2,500			Standoy How		·	magnini	
3 6.00 60.0 40.0 2.500 4 10.0.0 60.0 40.0 2.500 5 15.00 20.0 80.0 2.500 7 20.0 80.0 2.500	2	3,00	80,0	20,0	2,500			Time to Standby		0	min	
4 10,00 60,0 40,0 2,500 5 15,00 20,0 90,0 2,500 6 18,00 20,0 90,0 2,500 7 Acetonitrile Methanol [%] G 2,5 0 0 0 0 8 0 0 0 0 0 0 0 0 0	3	6,00	60,0	40,0	2,500			Time to Standby		<u> </u>		
5 15,00 20,0 80,0 2,500 7 Acetonitrile Methanol [%] 8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4	10,00	60,0	40,0	2,500			Standby Time		0	min	
6 18,00 20,0 80,0 2,500 7 Ldle State (mi,/min) 2,5 2,5 2,5 2,5 2,5 2,5 2,5 2,5	5	15,00	20,0	80,0	2,500			stanuby nine		<u> </u>		
7 Idle State [mt,min] 2,5 4 5 5 5 5 5 5 5 5 5 5 5 5 5	6	18,00	20,0	80,0	2,500							
0,0 () () () () () () () () () (./min] 4	kcetonitrile	Methanol		[%] -80 -60	Composi	Idle State Pump Off Initial Standby				

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 <u>Gradient Options</u> 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 the <u>Method Setup - LC Gradient</u> 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.

Gradient Options				×
Min. Pressure:	이	[MPa]	Solvent 1	Acetonitrile
Max. Pressure:	40	[MPa]	Solvent 2	Methanol
Max. Pressure for Set Flow:	1	[MPa]	Solvent 3	Ethanol
			Solvent 4	D
	(OK	Cancel	Help

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 <u>Device Monitor</u>. 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

Method Setup Default2 (MODIFIED)		— 🗆 X
New Open Save Save as Report setup Audit trail	Send method by e-mail	
Common for all detectors		
Subtraction Chromatogram [None]	User Variables	
Matching No Change Set None	Name	MethodUserVar1
Column Calculations	Value	<u> </u>
Unretained Time 0 [min] Column Length 50 [mm]	Variable 2 Name	MethodUserVar2
Statistical Moments	Value	0
	Variable 3	
Auxiliary Signal Store	Name	MethodUserVar3
1 LC Flow LC 1 V 2 LC Pressure LC 1 V 3 LC Flow LC 2 V	Value	0
Event Table LC Gradient LC Measurement Integration Calculation	Advanced	Send Method

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

WIC C	hod Setup Def	auitz (MODIFIE	:D)									×
N	lew Open	Save Sav	re as •	Report setup	. Audit	D trail	Send method by e-mail	y Help	I			
Con	mon for all dete	ectors										
	Alere a		I	nput				OL	tput			
	Name	Type	Source	Input	Value	Units	Output Type	Out	out	Parameter	Store	
1	Purge	Run Time >			0,100	min	SPH1299 LC 1			0,500	\checkmark	
2	Stop	Run Time >			0,500	min	SPH1299 LC 1			0,050		
3												
E	ent Table LC	2 Measureme	nt Integratio	n Calculatio	n Advan	ced						

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

Hardware Configuratio	on	×
Type of Machine: S Connection: D	PH 1299 emo	
Firmware Revision:	1.00	
Pump A:	Available	\sim
Pump B:	Available	~
SSV A:	Available	~
SSV B:	Available	\sim
External I/O:	Available	\sim
Degasser:	Available	~
Backwash:	Available	\sim
Purge Valve:	Available	~
Leak Sensor:	Available	\sim
I I Dox	1/	
OK	Cancel	

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.

@ Instrument 1	- Device Mon	tor			— C	
<u>F</u> ile Co <u>n</u> trol <u>V</u>	iew <u>W</u> indow	Help	M 🕨 🕨 🕅 🔞		II 💿 📬	
LC Monitor					Ready	y 📀 📊
Compone	nt Flow				Stop Flow	
A		- -	Time [min]		Set Flow	
в -			-0-0		Resume Idle	
		.	Total Flow [mL/min]	0,000		
-	-		Pressure [MPa]		Hold	
F	igures in italics re	present expec	ted and not actual values		Modify Gradient	
For help press F1.	-					

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.

Set Flow			×
Total Flow		5	[mL/min]
А		이	[%]
в		100	[%]
Max. Pressure:	▲	35	[MPa]
Apply			Cancel

Fig. 13: Set Flow

Resume Idle

Returns the pumps to *IDLE* state as defined in the appropriate field on the <u>LC</u> 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 the<u>LC Control Manual Flow</u> 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:

Prime & Purge		×
	Prime Seal Wash	Start
1	Prime Mobile Phase	Start
Purge	A & B ~	Start
	Close	

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.

@ Instrume	nt 1 - Device Mon	itor						×
<u>F</u> ile Co <u>n</u> trol	<u>V</u> iew <u>W</u> indow	Help 🚺 🌠	▶ >> I> 🙆 😣	681	0			
SPH1299	LC 1		Demo Mo	de: Not Ready	(Method has	s not be	en sent)	0
Flow A	0,000 mL/min	Flow B		Stop	Set Flow	Resu	ume Idle	
Pressure	0,000 MPa					Prime 8	k Purge	
SSV A	~	SSV B	~			LC S	status	
For help press	F1.							

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.

Set Manual Flow	N		×
Flow	1	mL/min	
	ок	Cancel	

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 from<u>Device Monitor</u> window allows the user to set a custom mobile phase composition and flow while the analysis is running. It resembles the <u>Method Setup</u> - <u>LC Gradient</u> tab in functionality.

Time Acctanitrile Methanol Ethanol Flow Initial 80,0 20,0 0,0 2,500 3,00 80,0 20,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 15,00 20,0 0,0 2,500 18,00 20,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500	Time Acctonitrie Methanol Flow 1 mL/min Tintei 80,0 20,0 0,0 2,500 1 min min 5,00 60,0 60,0 0,0 2,500 min Time to Standby 0 min 15,00 20,0 80,0 0,0 2,500 Standby Time 0 min 4Acctonitrie Methanol Ethanol 1% 1 mL/min 2,500 136,00 20,0 80,0 0,0 2,500 Standby Time 0 min 4Acctonitrie Methanol Ethanol 1% 1 mL/min Standby Time 0 min 2,500 10 1,5 10 1,5 Time 0 min Standby Time 0 min	Time Acetonitrie Methanol Ethanol Flow 1 Initial 60,0 20,0 0,0 2,500 1 5,00 60,0 20,0 0,0 2,500 1 15,00 60,0 40,0 0,0 2,500 1 15,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 2 0 5 10 15 15 10 15 2 0 5 10 15 15 10 15 3 10 15 10 15 15 10 15 3 10 15 10 15 11 11 11 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Time [min]	Acetonitrile						
Initial 00,0 20,0 0,0 2,500 3,00 80,0 20,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 Itile Standby Time 0 min 11,00 20,0 80,0 1,0 2,500 Itile Standby Time 0 min 11,00 5 10 15 10 15 10 10 10 10 10 10 10 10 10 10 11 11 10 10 10 11 11 11 11 11 11	Initial 89,0 20,0 0,0 2,500 3,00 80,0 20,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 115,00 20,0 80,0 0,0 2,500 128,00 20,0 80,0 0,0 2,500 115,00 20,0 80,0 0,0 2,500 116 20,0 80,0 0,0 2,500 117 18,00 20,0 80,0 0,0 2,500 118,00 20,0 80,0 0,0 2,500 10 11 2,5 10 15 10 15 10 15 10 100 5 10 15 10 15 10 15 100 5 10 15 10 15 11 11 11 11	Initial 80,0 20,0 0,0 2,500 3,00 80,0 20,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 2 4 10,00 5 0 15 2 4 4 4 4 4 6 2 4 4 5 6 7 10 15		[%]	Methanol [%]	Ethanol [%]	Flow [mL/min]	Standby Flow	1	ml /min
3.00 80.0 20.0 0.0 2.500 5.00 60.0 40.0 0.0 2.500 15.00 20.0 80.0 0.2 2.500 15.00 20.0 80.0 0.0 2.500 18.00 20.0 80.0 0.0 2.500 18.00 20.0 80.0 0.0 2.500 18.00 20.0 80.0 0.0 2.500 10.00 5 10 15 0 min 18.00 20.0 80.0 0.0 2.500 10 min 0.00 5 10 15 0 10 min 0.00 5 10 15 0 10 10 0.00 5 10 15 15 10 10 0.00 5 10 15 15 10 10 0.00 5 10 15 15 15 10 10	3,00 80,0 20,0 0,0 2,500 6,00 60,0 0,0 0,2 500 10,00 60,0 40,0 0,0 2,500 15,00 20,0 80,0 0,0 2,500 16,00 20,0 80,0 0,0 2,500 10,00 50,0 0,0 2,500 Standby Time 0 min Acctonitrile Methanol Ethanol 1% 0 2 500 Time 1% Acctonitrile Methanol Ethanol 1% 0 0 min 100 5 100 16 Time 100 110 15 Time 100 100 100	1 3,00 80,0 20,0 0,0 2,500 1 6,00 60,0 90,0 0,0 2,500 1 10,00 60,0 40,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 18,00 50,0 1,0 2,500 1 2	Initial	80,0	20,0	0,0	2,500	Standby How	-	
6,00 60,0 40,0 0,0 2,500 10,00 60,0 40,0 0,2 500 15,00 20,0 80,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 11,00 20,0 80,0 0,0 2,500 10,00 5 10 15	6,00 60,0 40,0 0,0 2,500 10,00 60,0 40,0 0,0 2,500 15,00 20,0 80,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500 10,00 5 10 15 10 15 0,0 2,500 10 15 10 15 11 5 10 15 10 15 12 10 5 10 15 10 15 10 5 10 15 10 15 10 15 10 5 10 15 10 15 10 15 10 15 10 5 10 15 10 15 10 15 10 15 10 5 10 15 10 15 10 15 10 15 10 15 11 13 14 5 5 10 15 10 15 10 15 10	i 0,00 60,0 40,0 0,0 2,500 i 10,00 60,0 40,0 0,0 2,500 i 15,00 20,0 80,0 0,0 2,500 i 18,00 20,0 80,0 0,0 2,500 fmL/min Acetonitrile Methanol Ethanol [%] 20,0 50,0 10 15 0 Initial 0 5 10 15 0 Standby Initial 0 Standby Initial O Standby Initial	3,00	80,0	20,0	0,0	2,500	Time to Standby	0	min
10,00 60,0 40,0 0,0 2,500 15,00 20,0 80,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500 Acctonitrile Methanol Ethanol 1%0 1 0,0 5 10 15 1 0,0 5 10 15 1	10,00 60,0 40,0 0,0 2,500 15,00 20,0 80,0 0,0 2,500 18,00 20,0 80,0 0,0 2,500 Acetonitrie Methanol Ethanol [%] 0 0 5 10 15 10 15 0 5 10 15 15 1 Time	i 10,00 60,0 40,0 0,0 2,500 i 15,00 20,0 80,0 0,0 2,500 i 18,00 20,0 80,0 0,0 2,500 Acetonitrile Methanol Ethanol [%] 0 1 15 0 1 0 0 5 10 15 0 0 15 10 15 0 0 0 1 15 0 0 0 0 1 15 0 0 0	6,00	60,0	40,0	0,0	2,500	Time to buildby		
15.00 20.0 80.0 0.0 2,500 1 18.00 20.0 80.0 0.0 2,500 1 4/mining Acetonitrile Methanol Ethanol 1%0 0.0 5 10 15	115,00 20,0 80,0 0,0 2,500 1 18,00 20,0 80,0 0,0 2,500 1 (mt/min) Acctonitrile Methanol Ethanol [%] 0,0 5 10 15 0,0 5 10 15 Time [min] Time	i 15,00 20,0 80,0 0,0 2,500 init i 15,00 20,0 80,0 0,0 2,500 init (mL/min) Acctonitrile Methanol Ethanol [%] 0,0 0,0 5 10 15 0,0 0 5 10 15 Time [min] Initial	10,00	60,0	40,0	0,0	2,500	Standby Time	0	min
18,00 20,0 80,0 0,0 2,500 u_(min) Acctonitrile Methanol Ethanol [%] -0 -0 -0 -0 0,0 -0 -0 -0 0,0 -0 -0 -0 0,0 -0 -0 -0 0,0 -0 -0 -0 0,0 -0 -0 -0 0,0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0 0 -0 -0 -0	18,00 20,0 80,0 0,0 2,500 [mi,/min] Acetonitrile Methanol Ethanol 60 60 60 74 1tile Standby 10,00 5 10 15 Time [min] Initial Standby	i 18,00 20,0 80,0 0,0 2,500 int_min_ Acetonitrile Methanol Ethanol 60 90 int_min_ 60 90 90 0 15 intial 0 5 10 15 intial 0 Standby Initial intial 0 Standby initial Standby Initial	15,00	20,0	80,0	0,0	2,500	Standby finite		
Acetonitrile Methanol Ethanol [96] a. (min) 2.5 10 15 0.0 5 10 15 (Methanol Ethanol [96] 40 8 5 10 15 (Methanol Ethanol [96] 5 10 15 (Methanol Ethanol [96] 5 10 15 (Methanol Ethanol [96] 5 10 15 (Methanol Ethanol [96] 5 10 15 (Methanol [96] 5 10 15 (Meth	Intial Acetonitrile Methanol Ethanol (mL/min) 2,5 0,0 0,0 0,0 0,0 0,0 0,0 0,0 0	Initial - Standby	18,00	20,0	80,0	0,0	2,500			
	line	line · ·	0,0	5	10	15	-80 -60 -40 -20 0 [min]	 Initial Standby Initial - Standby 		
						Time	Time	Time [min]	Time [min]	Time [min]

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.

Communicatio	n ORS232		USB	
Serial Por	rt COM1			~
IP Addres	S 192 . 168 . 1	1 . 209		
USB Por	rt DEMO Mode			~
			AutoDetect	
ID:	72			
Name:	LC 1			
(Auxiliary Pump(s)			
	Pump B (2nd solvent	t): LC 2		
Status: (Jnknown			
	I Choy 1			
Don't stop	LC pump when dosing	Instrument wind	low	

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** <u>Event</u> <u>Table</u> 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.

Digital Output Na	imes	×
Output no.	Descriptions:	
1	LC 1 - Auxiliary Output 1	
2	LC 1 - Auxiliary Output 2	
3	LC 1 - Auxiliary Output 3	
4	LC 1 - Auxiliary Output 4	
ОК	Cancel Help]

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 the Digital 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

C Print Preview			×
🖶 Print 🔡 Print to PDF 🖓 Send PDF 🚽	▶ III ⊕ Q Close		
06.04.2023 14:30	Method d:\darity90\DataFiles\WORK2\Default2.met	Page 1 of 1	
Standby Flow : 1,00 mL/min	Idle State : Standby		
Time to Standby : 0,00 min	Standby Time : 0,00 min		
Min. Pressure : 0,00 MPa	Max. Pressure : 40,00 MPa		
	Gradent Table		
	Time Acetonitrile Methanol Flow [min] [%] [%] [mL/min]		
	Initial 80 20 2,500		
	6,00 60 40 2,500		
	10,00 60 40 2,500		
	15,00 20 80 2,500 18.00 20 80 2,500		
	Audiary Signals		
	Signal Name Stored		
	LC Pressure LC1		
	LC Flow LC 2		
	GDU1700 Mathed / C 1		
Time	elay Relay TTL	TTL	
[min] O	put 1 Output 2 Output 1	Output 2	
211001	open		
SSV B : available	Init Position : Keep Ourrent Set of	n Clase : ON	
	SPH1299 Method LC2		
<u> </u>	Time Table		
Time [min] O	elay Relay TTL put 1 Output 2 Output 1	TTL Output 2	
Initia	har - Andre - Andre -		
SSV B : available	Init Position : Keep Current Set o	n Clase : ON	
Page 1			

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 <u>Method Setup - LC Gradient</u> 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 <u>Spark SPH1299 Setup</u> 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.