

BISCHOFF 2250

Clarity Control Module

ENG

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To facilitate the orientation in the **Bischoff 2250** 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 Bischoff 2250 Control module

This manual describes the setting of the **Bischoff 2250** pump, which is high-pressure gradient or auxiliary pump for 1 eluent. The control module enables direct control of the instrument over serial line.



Fig. 1: Bischoff 2250

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 with LC Control module (p/n A24).
- 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 cross DB9F-DB25F cable (p/n SK04).

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 Bischoff 2250 communication

The **Bischoff 2250** pump is controlled by serial (RS232) communication. The communication cable is Standard cross DB9F-DB25F cable (computer side/pump side, p/n SK04); only three cords (2-2, 3-3, 5-7) are necessary. Typical serial cable wiring is described in the picture.

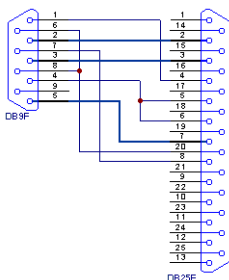


Fig. 2: Serial cross DB9F - DB25F cable

Note: As the serial cross DB9F-DB25F cable is not widely available, it is possible to use serial cross DB9F-DB9M cable with the DB9F-DB25F reduction.

The communication parameters are:

Baud rate 9600, parity *N*, bits 8, stop bit 1.

In order for the pump to communicate, **Ext.** button should be pressed on pump front panel (it's appropriate diode should be shining).

3.2 Clarity Configuration

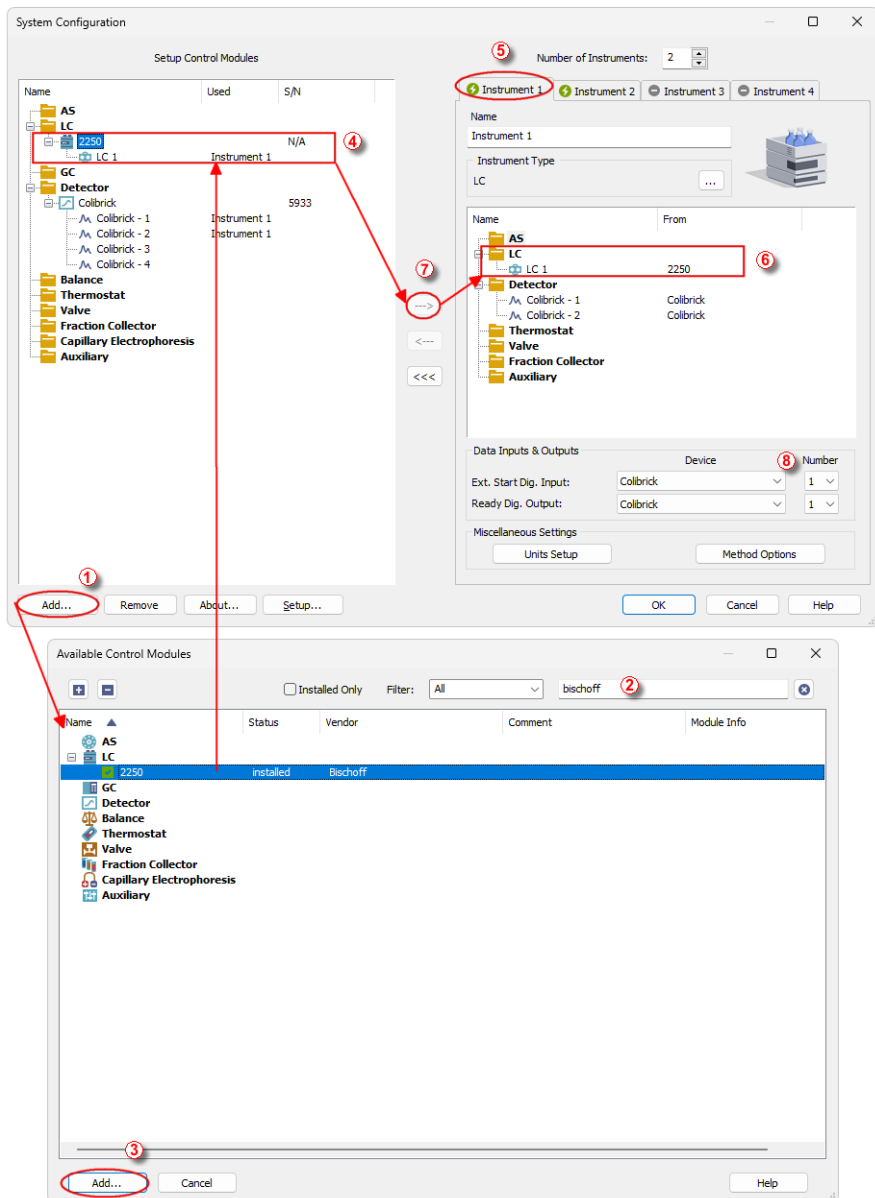



Fig. 3: How to add Bischoff 2250

- 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. 3** 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 **2250**pump and press the *Add* ③ button.

The [Bischoff 2250 Setup](#) dialog will appear.

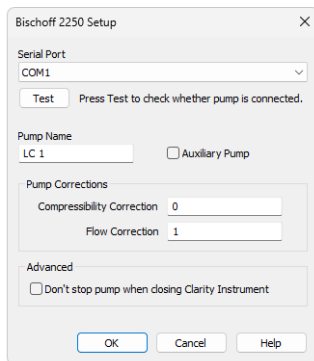



Fig. 4: Bischoff 2250 Setup

- Select the correct *Serial Port* and fill in the *Pump Name*. Use the *Test* button to check whether the **Bischoff 2250** pump is connected to the selected RS232 port.

Note: The [Bischoff 2250 Setup](#) dialog is more closely described in the chapter "**Bischoff 2250 Setup**" on pg. 16.

The **Bischoff 2250** pump item will appear in the *Setup Control Modules* list of the *System Configuration* dialog.

- Drag and drop the **Bischoff 2250** 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).
- Set the *Ext. Start Dig. Input* and *Ready Dig. Output* numbers ⑧ for your acquisition card according to the wires being used for synchronization.

4 Using the control module

If the **Bischoff 2250** pump is set as a part of the gradient in the *System Configuration* window, a new **LC Gradient** tab appears in the *Method Setup* dialog, enabling the setting of the LC gradient program.

If the pump was set as an auxiliary pump, the **LC** tab appears instead.

4.1 Method Setup - LC Gradient

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

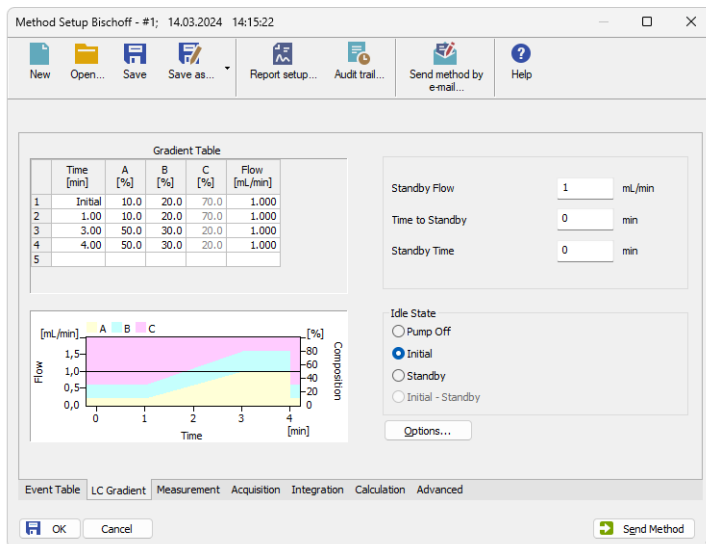


Fig. 5: Method Setup - LC Gradient

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 **Bischoff 2250** pump vary in certain range according to the type of the Pump Head attached. These are as follows:

Type of the Pump Head	Allowed flows
M	0.001-0.999 ml/min
A	0.01-4.99 ml/min
P	0.1-19.9 ml/min

Tab. 1: Flow Rate limitations

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*.

Options...

Opens the [Gradient Options](#) dialog that allows the setting of minimum and maximum pressure limits and solvent names.

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.

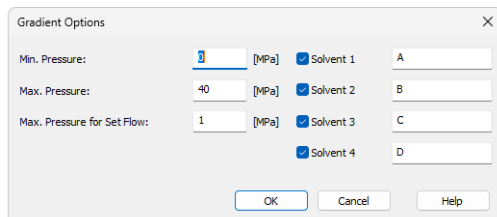


Fig. 6: Gradient Options

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.

Min. Pressure and *Max. Pressure* for the **Bischoff 2250** pump depends on the type of the Pump Head attached. The possible values are as follows:

Type of the Pump Head	Allowed pressures
M	0-60 MPa
A	0-50 MPa
P	0-15 MPa

Tab. 2: Pressure limitations

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.

4.2 Method Setup - LC

If the *Auxiliary Pump* checkbox in the [Bischoff 2250 Setup](#) dialog was checked, the *LC* tab will appear instead of the [LC Gradient](#) tab in the *Method Setup* dialog.

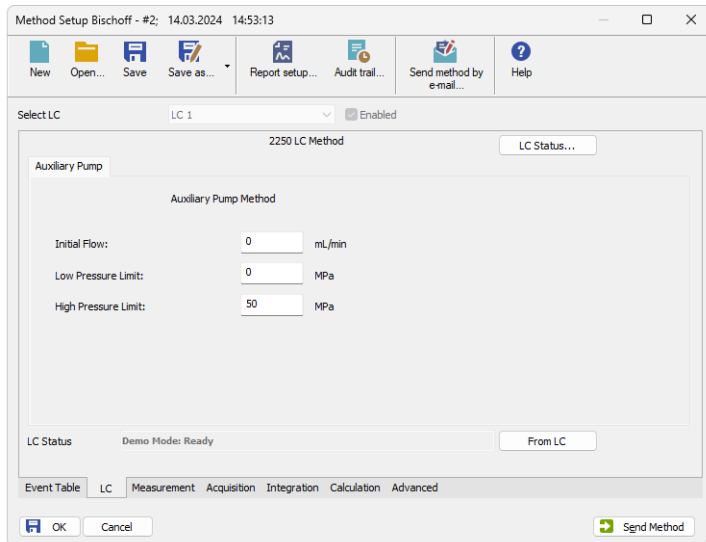


Fig. 7: Method Setup - LC

In case several auxiliary pumps are configured on the same **Clarity** Instrument, is possible to switch between them using the *Select LC* menu on the top of the *LC* tab.

Initial Flow

Sets the initial flow of the auxiliary pump.

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.

From LC

Acquires the status of the auxiliary pump from the device.

LC Status

Opens the [Hardware Configuration](#) dialog.

4.2.1 Hardware Configuration

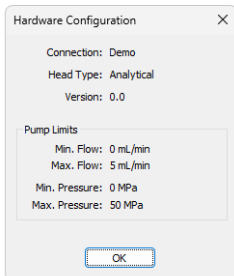


Fig. 8: Hardware Configuration

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 **Bischoff 2250** pump is connected, the type of the Pump Head installed, the pump firmware version and also reads all **Flow** and **Pressure** limits set by the given Pump Head from the device.

4.3 Method Setup - Advanced

Method Setup Bischoff (MODIFIED)

Common for all detectors

Subtraction

Chromatogram: [None]

Matching: No Change

Column Calculations

Unretained Time: 0.0000 [min]

Column Length: 50.0000 [mm]

Statistical Moments

From Width at 50%

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

User Variables

Variable 1

Name: MethodUserVar1

Value: 0

Variable 2

Name: MethodUserVar2

Value: 0

Variable 3

Name: MethodUserVar3

Value: 0


Event Table | LC | Measurement | Acquisition | Integration | Calculation | **Advanced**

OK Cancel Send Method

Fig. 9: Method Setup - Advanced

Bischoff 2250 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.

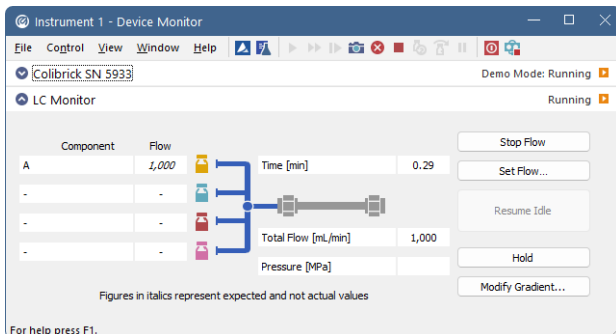


Fig. 10: LC monitor

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.

Set Flow

Sets the desired total flow and solvent ratios in the opened *Set Flow* dialog. *Max. Pressure* sets the maximum pressure to be used. Initial value is 1 MPa.

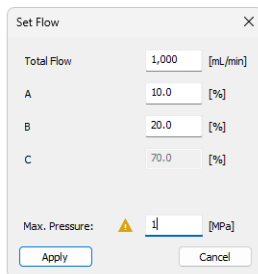


Fig. 11: Set Flow

The number of solvents and their names displayed in the *Set Flow* dialog correspond to the solvent number and names set in the [Gradient Options](#) dialog. The last available solvent field is always grayed and is automatically counted as a rest of the percentage of the other solvents.

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

Pauses / resumes the execution of the **Gradient Table** at the actual flow and mobile phase composition. The same flow and composition will be maintained until the *Resume* button is pressed, which returns the method to the original **Gradient Table** again. The command is only available during the analysis run.

Modify Gradient

Opens the [LC 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.

4.4.1 Device Monitor - Auxiliary pump

Each auxiliary pump has its own **Device Monitor** window displaying the actual flow and pressure of the device. The buttons that are present on these sections has the same functionality as in the **Device Monitor** window of the pumps present in the gradient, but target the given pump only.

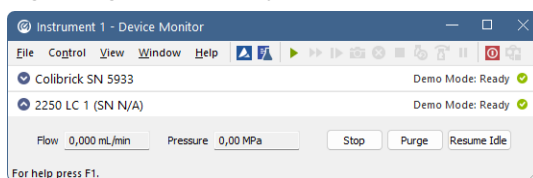


Fig. 12: Device Monitor - Auxiliary pump

That said, the *Purge* button is only working for one particular solvent, so there is only one field in the invoked *Purge* dialog, allowing to set the flow during the Purge operation. No solution composition fields are necessary.

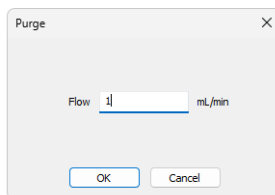


Fig. 13: Purge

Note: If the control module does not obtain the necessary figures from all connected pumps, the missing values will be displayed in italics in the form of data sent to the instrument (expected values). Warning message will also be displayed in the bottom of the **Device Monitor** window.

4.4.2 LC Control Manual Flow

The *LC Control Manual Flow* dialog accessible through using the *Modify Gradient ...* button from [Device 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.

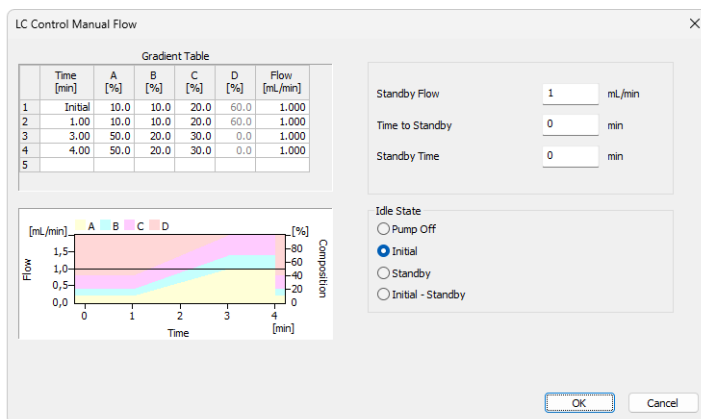


Fig. 14: LC Control Manual Flow dialog

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.

4.5 Bischoff 2250 Setup

Bischoff 2250 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.

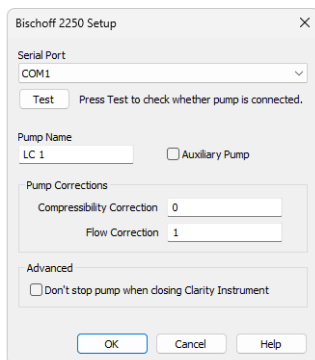


Fig. 15: *Bischoff 2250 Setup*

Serial Port

Serves for the selection of the communication port.

Test

Tries to connect with the pump and shows results in text status line. Displays the kind of Head Type on the pump.

Pump Name

Sets the pump name.

Auxiliary Pump

Sets the pump to auxiliary state, thus excluding it from the **Gradient Table**. This serves for the possibility to add more than four pumps to single Instrument.

Pump Corrections

Compressibility Correction

Sets the correction for the compressibility of solvents at high pressures. For more details, see **Bischoff 2250** manufacturers manual.

Flow Correction

Sets the correction for the flow. This number can be set in the range (0.9 - 1.1) in 0.01 increments, allowing for the correction of the flow inaccuracy caused by the manufacturing of the pump.

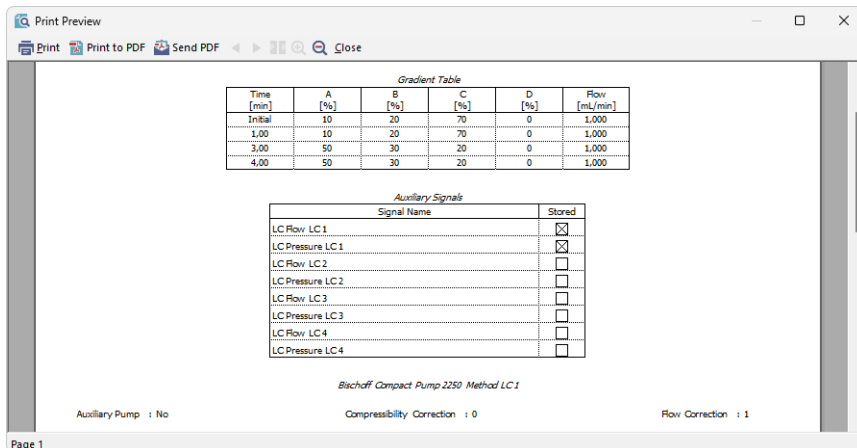
Advanced

Don't stop pump when closing Clarity Instrument

When checked, the pump will not stop after the **Clarity Instrument** window has been closed.

5 Report Setup

Only the pump specific settings (e.g. *Flow* and *Compressibility* corrections) are reported in the pump-specific section of the report if the pump participates in the **Gradient Table**. Other settings of the method are reported as a part of the LC Gradient method. These settings, as well as settings of auxiliary pumps, are displayed in the report after the *Instrument Control* checkbox of the **Report Setup - Method** dialog is used.



The screenshot shows a 'Print Preview' window for 'Bischoff Compact Pump 2250 Method LC 1'. It contains two tables and some status information.

Gradient Table

Time [min]	A [%]	B [%]	C [%]	D [%]	Flow [mL/min]
Initial	10	20	70	0	1,000
1,00	10	20	70	0	1,000
3,00	50	30	20	0	1,000
4,00	50	30	20	0	1,000

Auxiliary Signals

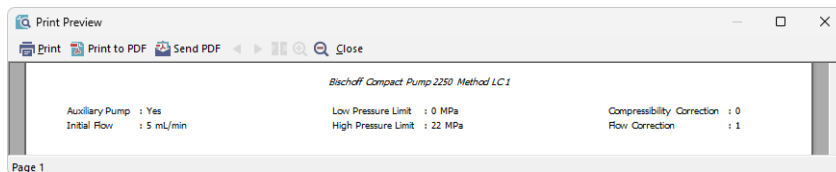
Signal Name	Stored
LC Flow LC 1	<input checked="" type="checkbox"/>
LC Pressure LC 1	<input checked="" type="checkbox"/>
LC Flow LC 2	<input type="checkbox"/>
LC Pressure LC 2	<input type="checkbox"/>
LC Flow LC 3	<input type="checkbox"/>
LC Pressure LC 3	<input type="checkbox"/>
LC Flow LC 4	<input type="checkbox"/>
LC Pressure LC 4	<input type="checkbox"/>

At the bottom of the report, the following settings are listed:

- Auxiliary Pump : No
- Compressibility Correction : 0
- Flow Correction : 1

Fig. 16: Report - Gradient pump

If the pump is set as an Auxiliary pump, thus excluded of the **Gradient Table**, the values set on the of the [Method Setup - LC](#) tab are reported as well.



The screenshot shows a 'Print Preview' window for 'Bischoff Compact Pump 2250 Method LC 1'. It displays the following settings:

- Auxiliary Pump : Yes
- Initial Flow : 5 mL/min
- Low Pressure Limit : 0 MPa
- High Pressure Limit : 22 MPa
- Compressibility Correction : 0
- Flow Correction : 1

Fig. 17: Report - Auxiliary pump

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=Bischoff2250_%D.txt
reset=off
```

Note: Instead of COM1 type the correct serial port used to communicate with the **Bischoff 2250** pump. This port number is displayed when the *LC Status* button in the [Method Setup - LC](#) dialog is invoked or in the [Bischoff 2250 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.