



BPC Core and BPC Core Light



Operation and Maintenance Manual

Release History

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1 GENERAL INFORMATION

The BPC Core (with 18 channels) and BPC Core Light (with 9 channels) have been developed by BPC for the on-line monitoring of gas flow rates. The gas flow rate measurements and data logging of the BPC Core and BPC Core Light are fully automated. The high precision of gas flow monitoring is based on a patented flow meter array using the principle of liquid displacement and buoyancy.

Before operating the BPC core (hereafter referred to as “the instrument”, “the system” or “the equipment” interchangeably) from BPC Instruments AB (hereafter referred to as “BPC Instruments”, “BPC”, “Bioprocess Control” or “BPC Instruments AB” interchangeably), carefully read this operator manual for the instrument, any separate instructions for other equipment used together or in conjunction with the instrument, as well as the safety instructions for any and all chemicals used in the process of utilising the instrument.

Safety Information

When performing experiments with the instrument, always use protective eyewear, gloves, and lab coat. Always make sure there is adequate ventilation and take proper precautions when handling electrical devices near water or explosive gases. Make sure to tie back any hanging objects, such as hair and clothing, when working near rotating or other moving parts.

Do not modify the instrument without the prior consent of the manufacturer. BPC Instruments AB do not assume responsibility for any errors due to equipment modification.

Do not clean or service the instrument while it is running.

Do not expose the instrument to mechanical vibrations or high frequency radio transmissions.

Never operate the instrument in a way it was not intended.

Never operate the instrument or let anyone else operate it without proper training.

Never use the instrument outside or in environments with parameters outside of the instruments recommended range.

Never connect additional electrical equipment not supplied by BPC Instruments AB for the express purpose of using with the instrument. This is true even if the connections can mate.

Always back-up important data to an external device.

Always keep the instrument level and on a flat and stable surface. Failing to do so can, among other things, generate an erroneous gas reading.

Always make sure all safety guards are in place and working before operating the instrument.

Always make sure that all parts are functioning properly immediately after start-up.

Always keep the instrument clean.

Always make sure to have access to relevant chemicals before starting an experiment.

Always dispose of parts and chemicals according to applicable rules in the country of usage.

Periodic maintenance of the instrument and its various accessories is essential. Always make sure they are in working condition. If service or spare parts are required, please visit <https://webshop.bpcinstruments.com> or contact BPC Instruments AB directly or one of its representatives.

Always make sure to connect the power supply so that it is easy to remove from the mains power outlet and so it doesn't risk becoming damaged.

Always make sure that the gas outlet of the Flow Cell Unit (FCU) can release pressure in the event of pressure build-up inside of the instrument. Do not obstruct or block it.

Always wait 60 seconds between powering the system on and off. This will allow for the operating system to shut down properly and for the capacitors to properly cycle.

Always use deionized water to minimize the risk of residue or rust forming on the inside of the FCU.

Electrical Safety

Compliance is required with respect to voltage, frequency and current requirements indicated on relevant parts. Improper operation, damage to the equipment, fire or otherwise undesired effects might be caused by connecting to a different power source. There are no user-serviceable parts in the equipment, unless otherwise agreed upon with BPC Instruments AB.

Limited Warranty

The product warranty provided with the instrument corresponds to the stipulations in Orgalime S 2012, unless otherwise agreed upon with BPC Instruments AB. BPC Instruments AB reserves the right to correct any possible errors, mistakes, changes, updates, technical data or otherwise relevant information in this manual or any other documents, where applicable by law.

Contact Information

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Swedish organisation number: 556687-2460

2 DELIVERY CHECKS

Upon delivery, unpack and check that the contents match with what is listed below in the Section “Box Content”.

If the packaging or equipment is broken or damaged at delivery, please:

- a. Document and take photos of the parts and packaging
- b. Inform the transport company at the time of delivery
- c. Make sure that the transport company documents the incident
- d. Inform the seller of the incident

Box Content



BPC Core

1 BPC Core	80 check valves	1 main unit power adapter
40 flow cell units (FCUs)	1 plastic syringe	1 ethernet cable
2 ml resolution (20 units)		
9 ml resolution (20 units)		



BPC Core Light

1 BPC Core Light	40 check valves	1 main unit power adapter
20 flow cell units (FCUs)	1 plastic syringe	1 ethernet cable
2 ml resolution (10 units)		
9 ml resolution (10 units)		

3 PRE-COMMISSIONING AND RECOMMENDATIONS

The following recommendations are essential for the safe and efficient operation of BPC Core instrument:

- The product guarantee provided corresponds to the guarantee stipulated on the confirmed product order form and shipping documentation.
- For a high accuracy analysis, the BPC Core should not be exposed to mechanical vibrations and/or high frequency radio transmissions and should be placed on a level and stable surface.
- To guarantee the quality and performance of the instrument, only the parts delivered with the instrument should be used.
- BPC reserves the right to correct any possible text and image errors as well as changes to technical data in this manual.

4 EQUIPMENT DESCRIPTION (DESIGN/FUNCTION/OPERATION)

The BPC Core (with 18 channels) and BPC Core Light (with 9 channels) have been developed by BPC for simultaneous gas volume detection from 18 or 9 independently operating reactors (**Figure 1**). The instrument comes with an OLED screen which will display various information, including IP address of the instrument, version of the software, current environmental parameters (temperature and pressure), and alignment indicator. The information can be accessed through two physical buttons located below the screen. The BPC Core (Light) Unit is equipped with a USB port for software upgrades and possible new applications and a power button.

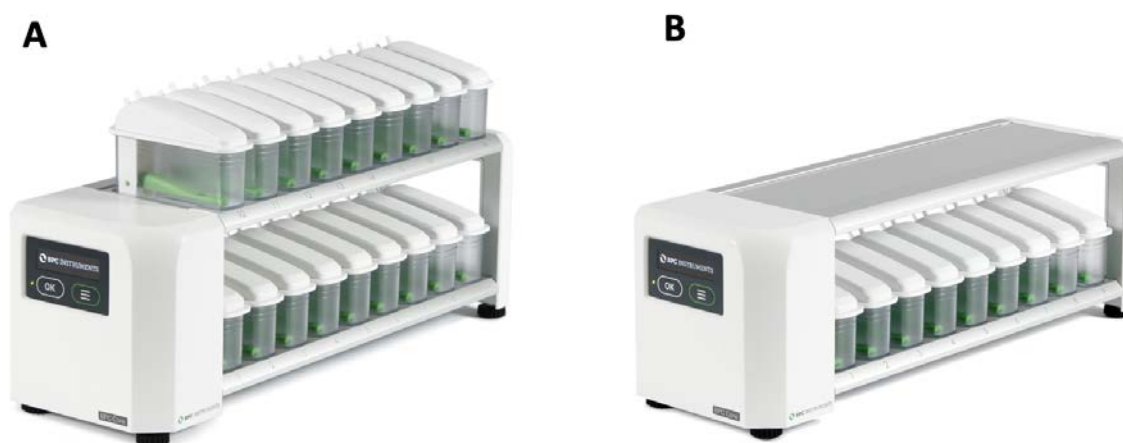


Figure 1. (A) Gas volume measuring device for BPC Core and (B) BPC Core Light.

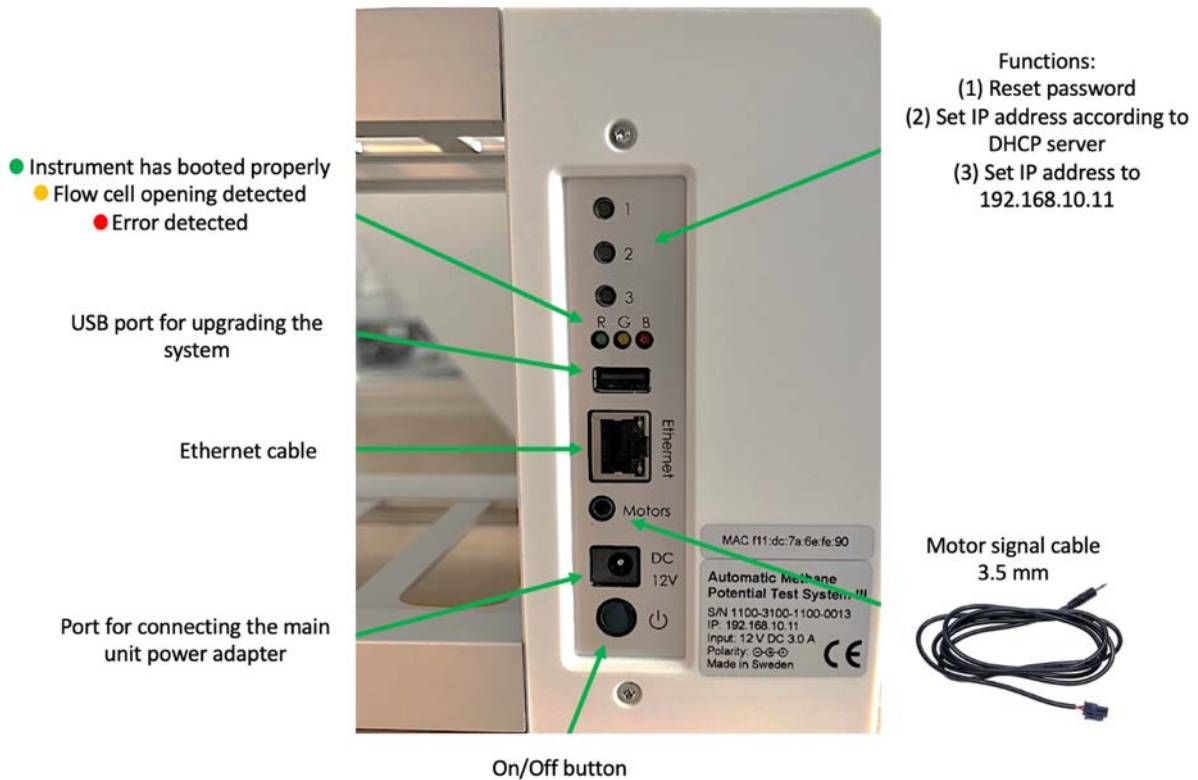


Figure 2. Back side of BPC Core (Light).

The operational principle is based on liquid displacement and buoyance. When a certain gas volume enters the flow cell unit, the force of buoyancy leads the flow cell to open and releases the entrapped gas (Figure 3). The system counts each flow cell opening and registers the temperature and pressure for automatic compensation to normalise the flow rate and volume to standard conditions.

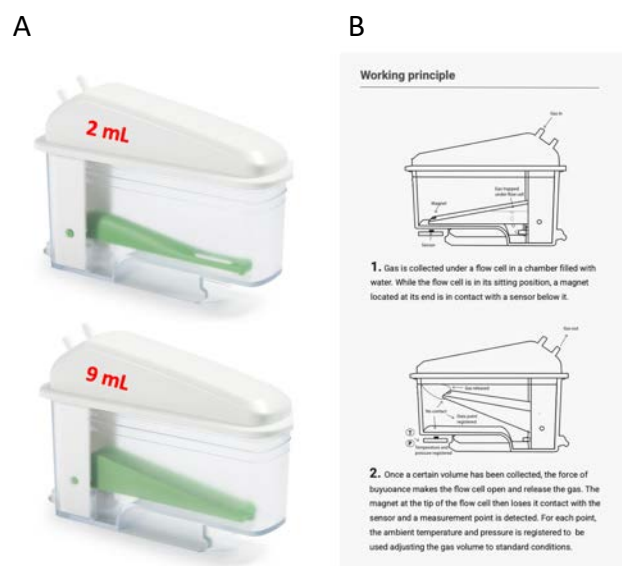


Figure 3. 2 ml and 9 ml FCU (A) and working principle (B).

Before starting the measurements, the FCUs should be filled with distilled water (Figure 4). Each FCU has an inlet and outlet for the gas. Use the syringe to introduce water through the inlet of the FCU. The water should be added until the recommended level.



Each FCU has an inlet and outlet for the gas. Use the syringe to introduce water through the inlet of the FCU



The water should be added until the recommended level

Figure 4. Filling FCU with water before starting the operation.

Make sure that each FCU is perfectly seated (horizontally levelled) on the BPC Core (Light). It can be easily observed by checking the **FCU level indicator** and the level control from the software or the OLED screen as shown below. **Adjustable feet** are used to level the instrument (Figure 5).

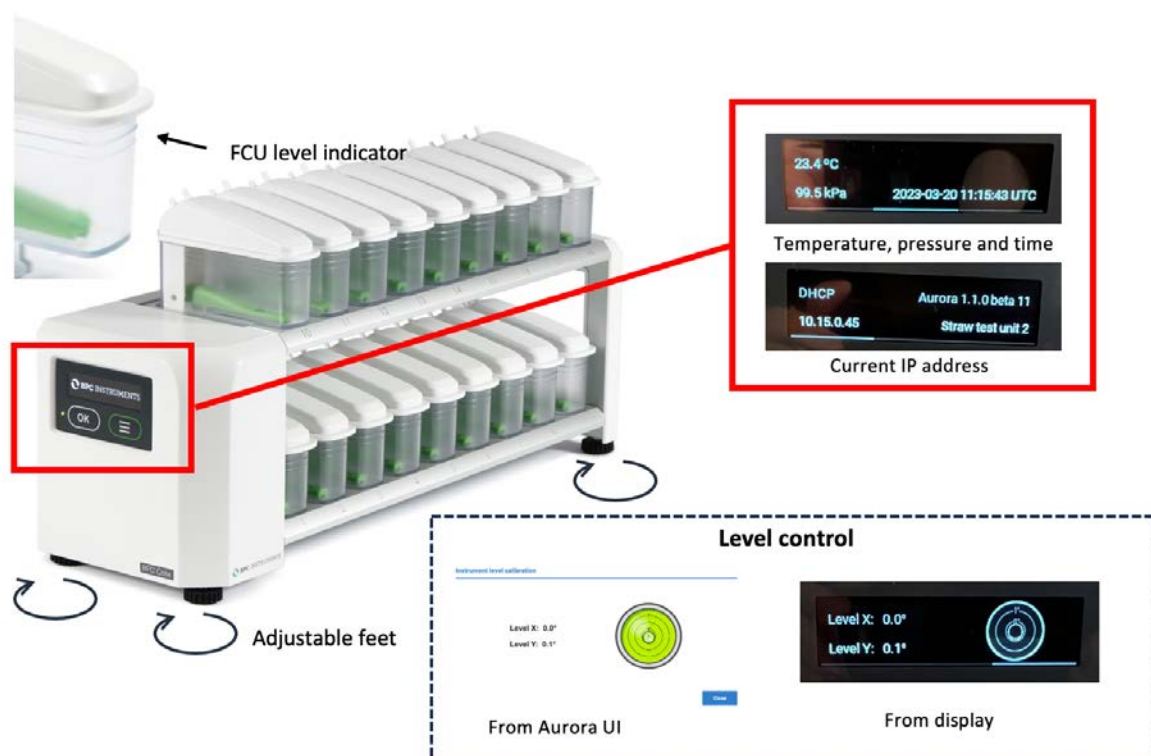


Figure 5. Levelling FCUs on the BPS Core (Light).

The BPC Core (Light) is equipped with an OLED screen that provides information regarding the status of the instrument (environmental conditions, time, current IP address used by the instrument and alignment indicator). This can be accessed through two physical buttons located below the screen.

5 BPC CORE (LIGHT) SOFTWARE

Computer Network Configuration

In order to have access to the web-based software, follow the steps outlined below (this procedure is described considering the most common operating system setups – **Windows 11** and **Mac Os 12.x**):

1

Connect the shielded Ethernet cable to the detection unit
Connect the shielded Ethernet cable to a computer.

2

Start → Settings → Network & Internet Ethernet (select the Ethernet network you are connected to) → Edit network IP settings → Manual → IPv4 → Insert IP address and Subnet mask

IP address: 192.168.10.10
Subnet mask: 255.255.255.0
Default gateway:



Windows 11

Press [Command] (in the top left corner) → System preferences → Network settings → Ethernet (select the Ethernet network you are connected to) → Configure IPv4: manually → Insert IP address and Subnet mask

Configure IPv4: Manually
IP address: 192.168.10.10
Subnet mask: 255.255.255.0
Router:



Mac OS 12.x

3

Open a web browser (preferably Google Chrome) and insert **192.168.10.11**

	Instrument	Computer
IP address	192.168.10.11	192.168.10.10
Subnet mask	255.255.255.0	255.255.255.0
Default gateway / Router	Leave empty	Leave empty

NOTE: 192.168.10.10 is the suggested IP to be assigned to the computer connected to the instrument in the network settings of the computer. IP address for the computer and the IP address for the BPC Core Unit are different. This is a design requirement of the IP protocol. Care needs to be taken so that the same address is not used in both locations, as it will render the system inaccessible from the designated computer. When using multiple BPC Core Units, make sure that each unit has its own IP address. This can be achieved by changing the last digit of the IP address.

The OLED screen in the detection unit will display whether the instrument uses a manually assigned IP or an automatic IP assigned by a DHCP server as well as what IP address is currently in use and the version of the instrument's software. In this way, it is simple and easy to connect the instrument to a computer or network.

Aurora™ Software Description

After inserting the default IP address of the instrument, users will have access to the **Log in** page (Figure 6). On the Log in page, the default password **bpc** needs to be added.

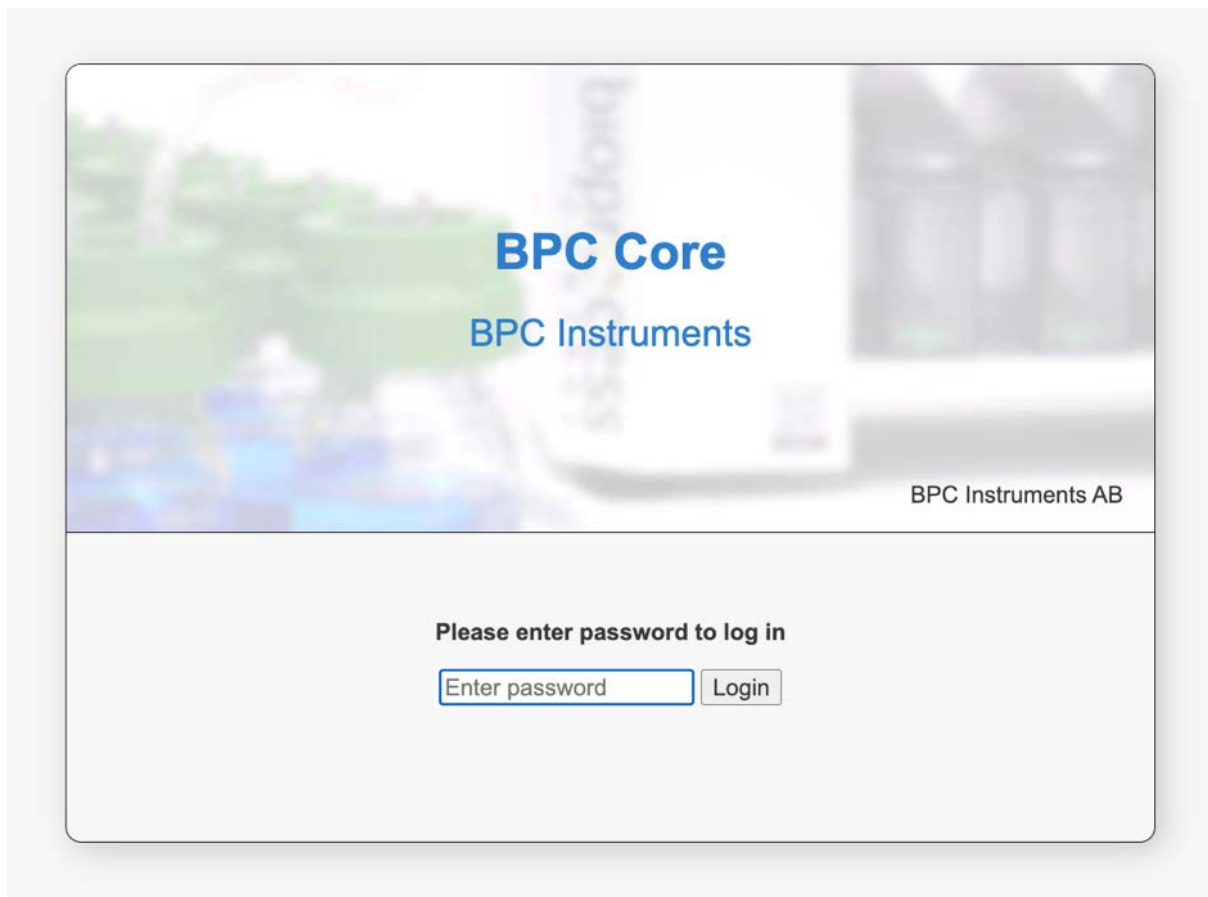


Figure 6. Log in page for BPC Core.

In the **Home** page, users get an overview of the features of the software, where the topics are ordered according to experimental setup, execution, monitoring and finally documented. In addition, three useful links are provided together with the Log out function (Figure 7).



Web links

[User manual](#)[BPC Instruments website](#)[Webshop](#)

Figure 7. Home page for BPC Core (Light).

BPC Core (light) can operate in two modes, batch and continuous. The switch between modes is possible at any time even during experiment running and it is done in the **System Settings** tab in the window **Experiment type** (Figure 8)

System settings

Instrument name

Instrument name
BPC Instruments

Restore
Save

Experiment type

Experiment type
Continuous

Restore
Save

Change system password

New password

Confirm password

Change password

System power

Restart the system

Restart

System reset

Reset to factory default

Reset

System software update

Choose file
No file chosen

Start update

Figure 8. Switching between Continuous and Batch modes in the **System Settings** tab.

5.3 Software Description Batch Mode

In the **Experiment** tab for BPC Core (the same description is valid for BPC Core Light only with 9 lines), 18 lines are related to the 18 reactors where each one of them should be properly labelled based on its content. In this page, using the function *Print Experiment Guidelines*, it is possible to directly print or save the page in pdf format which contains information regarding the parameters established for the test. The experiment setup can be arranged in two ways: *calculated* or *manual* (Figure 9).

A

BPC Core BPC Instruments (Batch mode)

Home Experiment Control Graph Report Settings

Experiment setup ☒ Calculated ☐ Manual

Line	Name	Total amount [g]	Inoculum conc. [%]	Substrate conc. [%]	Unit of conc. [%] vs. cco	ISR	Inoculum [g]	Substrate [g]	Organic inoculum [g]	Organic substrate [g]
1	Line 1	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
2	Line 2	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
3	Line 3	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
4	Line 4	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
5	Line 5	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
6	Line 6	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
7	Line 7	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
8	Line 8	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
9	Line 9	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
10	Line 10	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
11	Line 11	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
12	Line 12	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
13	Line 13	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
14	Line 14	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
15	Line 15	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
16	Line 16	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
17	Line 17	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00
18	Line 18	0.0	0.00	0.00	<input type="radio"/> <input checked="" type="radio"/>	1.00	0.00	0.00	0.00	0.00

Print experiment guidelines

B

BPC Core BPC Instruments (Batch mode)

Home Experiment Control Graph Report Settings

Experiment setup ☐ Calculated ☒ Manual

Line	Name	Unit of conc. [%] vs. cco	Organic inoculum [g]	Organic substrate [g]
1	Line 1	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
2	Line 2	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
3	Line 3	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
4	Line 4	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
5	Line 5	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
6	Line 6	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
7	Line 7	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
8	Line 8	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
9	Line 9	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
10	Line 10	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
11	Line 11	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
12	Line 12	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
13	Line 13	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
14	Line 14	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
15	Line 15	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
16	Line 16	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
17	Line 17	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00
18	Line 18	<input type="radio"/> <input checked="" type="radio"/>	0.00	0.00

Print experiment guidelines

Figure 9. Experiment setup (A) Calculated and (B) Manual for BPC core (Light)

If the *calculated function* is activated, the following parameters must be considered for each line:

Line	Name	Total amount [g]	Inoculum conc. [%]	Substrate conc. [%]	Unit of conc. [%] TS VS COD	ISR	Inoculum [g]	Substrate [g]	Organic inoculum [g]	Organic substrate [g]
1	Line 1	0,0	0,00	0,00	<input type="radio"/> TS <input checked="" type="radio"/> VS <input type="radio"/> COD	1,00	0.00	0.00	0.00	0.00

The *manual function* allows more set-up flexibility - information regarding the amount of organic matter in the inoculum and substrate is directly entered.

The **Control** tab is where direct interaction with the channels and motors are conducted (Figure 10). Using the Aurora™ software, it is possible to start and stop all or just selected channels.

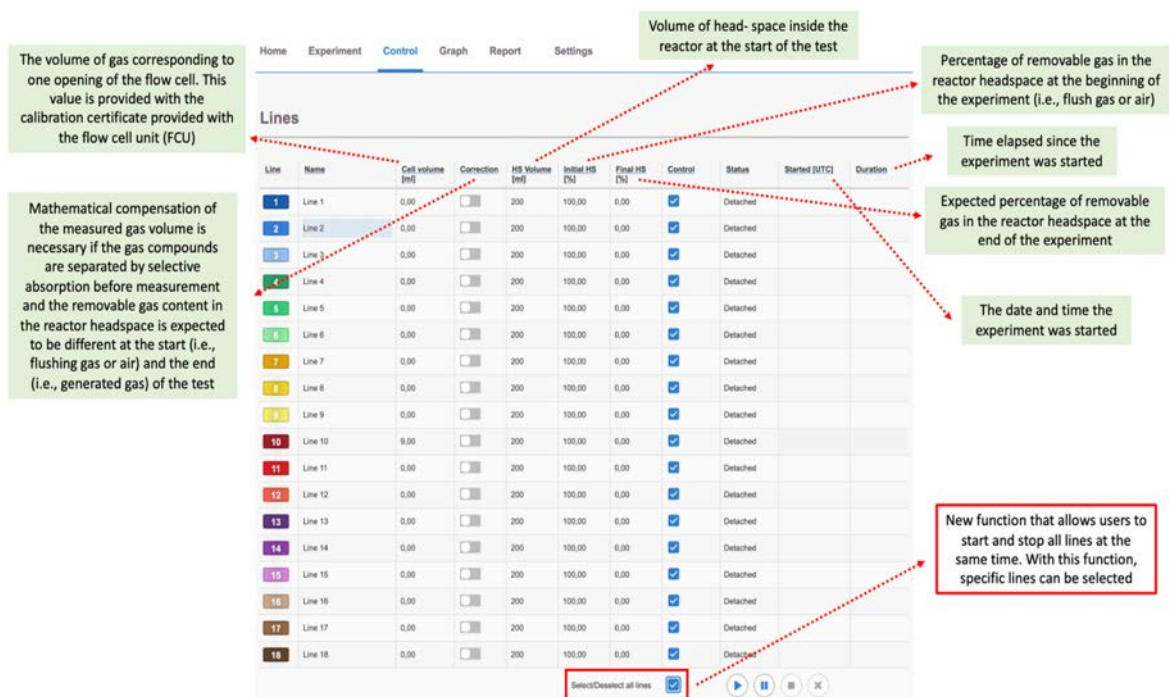


Figure 10. Control tab for Batch mode.

Located at the bottom right of the **lines section** is the control panel for the flow cell units. These work as follows:



Start data registration. In order to be able to press this button, the status needs to be **ready**



Pause data registration. In order to be able to press this button, the status needs to be **running**



Stop data registration. In order to be able to press this button, the status needs to be **paused**



Clear all data registrations. In order to be able to press this button, the status needs to be **stopped**

The motors of the agitation system can be controlled in *continuous (single)* or *two-phase (double)* modes. With the two-phase mode, the motors can run intermittently at two different speeds or as ON and OFF. (Figure 11). Please note, that the motors have to be purchased separately and are not part of BPC Core standard package.



The screenshot shows a software interface for controlling an agitation system. At the top, there is a title 'Agitation' and a 'Motor power' toggle switch. Below this, there are two radio buttons for 'Phases': 'Single' (selected) and 'Double'. Under the 'Single' phase, there is a 'Speed [%]' input field set to '100'. Under the 'Double' phase, there are two rows of input fields: 'Phase 1' with 'Speed [%]' (30) and 'Time [min]' (10), and 'Phase 2' with 'Speed [%]' (10) and 'Time [min]' (10).

Figure 11. Controlling the agitation system through the software.

The software provides two graphs, ***accumulated gas volume as a function of time*** and ***flow rate as function of time***. The gas volume can be presented in three different ways: without normalization, with normalization without considering the moisture content (dry), and with normalization considering the moisture content (wet). There are three possible units for the gas flow: Nml/min, Nml/h, and Nml/day.

Once the gas registration starts, the box/line changes color from grayish to the corresponding color of a specific line, see line 10 in Figure 12. In this part, it is also possible to select all lines at once.



The screenshot shows a 'Gas flow' segment in a software interface. It features a horizontal row of 18 numbered boxes (1 to 18) with different colors. Box 10 is highlighted in red. Below the row, there is a checkbox labeled 'Select/Deselect all lines'.

Figure 12. Gas flow segment in the **Graph** tab.

The user has an option to zoom in both graphs in order to get a better visualization of the real-time data.

NOTE: The graph requires at least two data points (i.e., flow cell openings) in order to display information. To simulate an opening during testing, briefly remove the FCU and place it right back; wait a few seconds and then repeat the action one more time. If everything is working properly, a line should appear in each graph.

The user can download and generate the report at any time from the **Report** tab. With Aurora Software, the raw data can be downloaded in a csv format either for each line separately or gathered in one file. Different settings can be applied to generate the report (Figure 13).

The figure displays three screenshots of the 'Report settings' interface. The top-left screenshot shows the 'Gas normalisation' set to 'Wet', 'Gas flow unit' as 'NmL/day', and 'Interpolation interval' as 'Day'. The top-right screenshot shows the 'Gas flow unit' dropdown menu open with options 'NmL/min', 'NmL/h', and 'NmL/day'. The bottom-left screenshot shows the 'Report file format' dropdown menu open with options 'Microsoft Excel (XLSX)' and 'Comma separated values (CSV)'.

Figure 13. Report settings available in the report page.

The **Settings** tab is home to a host of settings for the instrument. It is the same for both, batch and continuous mode, and will be described below in the section related to Software for Continuous mode of operation.

Software Description Continuous Mode

In the **Feeding** tab for BPC Core (Light) (Figure 14), 18 (9) lines are related to the 18 (9) lines where each one of them should be properly labelled. The page is divided into two sections: the upper one gives an overview of each line settings and the bottom one is a list of each individual feeding recorded. Please note that the feedings in the software are only for data recording functions so that it is possible in the software to follow the gas production together

with the operational data. In other words, the instrument is not able to control any actual feeding. That is up to the user to carry out either manually or with their own automatic setup.

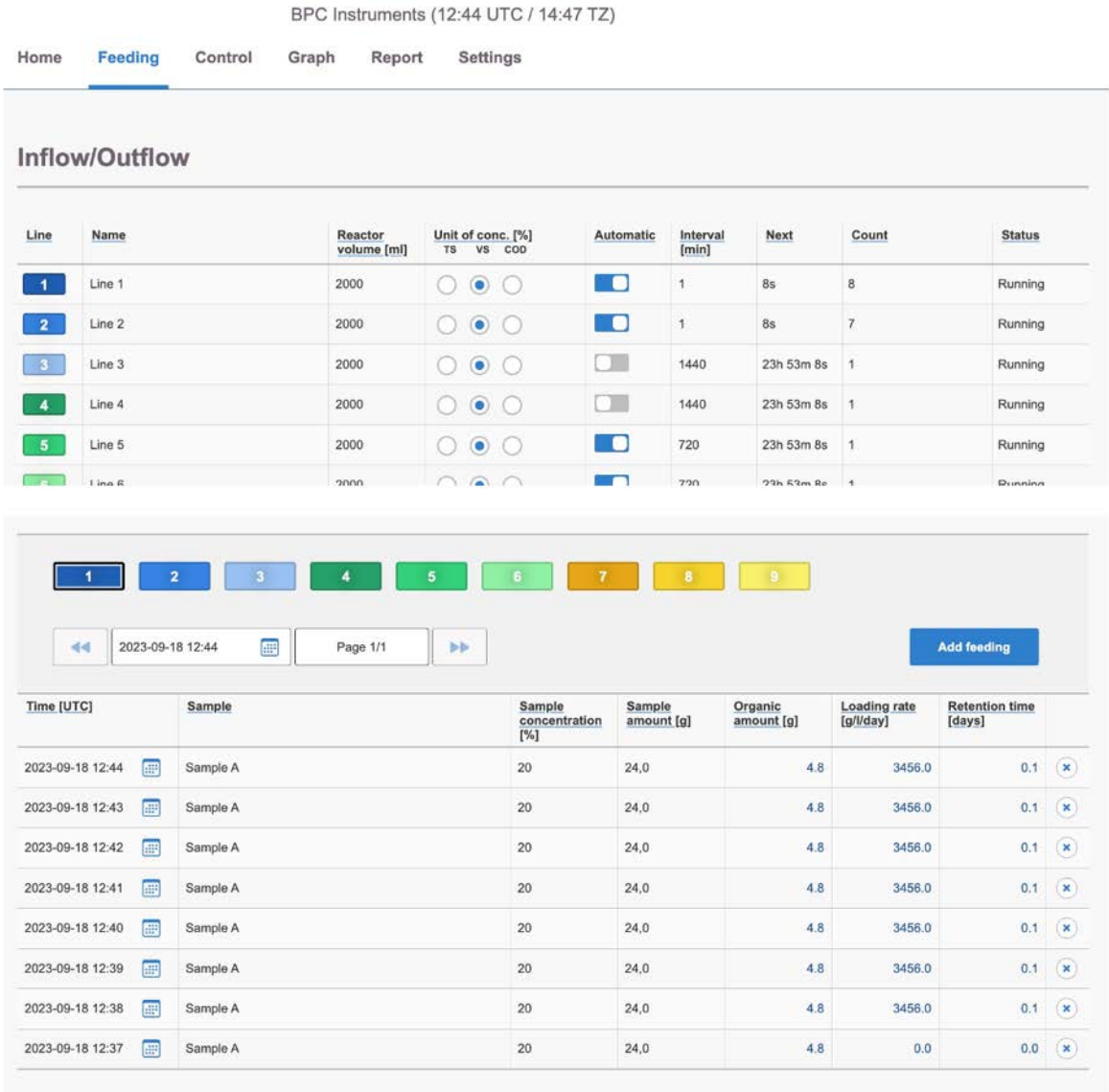


Figure 14. Feeding tab.

In Figure 15 the different parameters of the feeding settings are explained.

Description of each channel		The unit used to characterise the organic matter in the sample and the inoculum		At what interval the reactors are fed.		Number of recorded feedings		Status
Line	Name	Reactor volume [ml]	Unit of conc. [%] TS VS COD	Automatic	Interval [min]	Next	Count	
1	Line 1	2000	<input type="radio"/> TS <input checked="" type="radio"/> VS <input type="radio"/> COD	<input checked="" type="checkbox"/>	1	8s	8	Running

Indicates each channel of instrument

Volume of reactor (used for calculation of process parameters)

If feedings should be added automatically or not

Time to next feeding

Status of experiment

Figure 15. Description of **Feeding** settings

Each channel has a list of recorded feedings that can be accessed in the table at the bottom of the feeding page. Here it is possible to add, remove and change already recorded feedings (Figure 16).

Select channel to view

1

2

3

4

5

6

7

8

9

Amount of feedstock added

Add feeding

Select time period for feedings in table

◀

2023-09-18 12:44

📅

Page 1/1

▶

Time [UTC]	Sample	Sample concentration [%]	Sample amount [g]	Organic amount [g]	Loading rate [g/l/day]	Retention time [days]
2023-09-18 12:44	Sample A	20	24,0	4.8	3456.0	0.1

Time of feeding

Name/description of feedstock

Concentration of feedstock

Amount of feedstock added

Organic amount added (calculated)

Organic Loading rate of feeding (calculated).

Hydraulic retention time of feeding (calculated)

Figure 16. Description of **Feeding** log

The **Control** tab is where direct interaction with the channels and motors are conducted (Figure 16). Using the Aurora™ software, it is possible to start and stop all or just selected channels.

On the **Control** tab 18 (9) lines are related to the 18 (9) lines where each one of them should be properly labelled. This tab is where direct interaction with the channels and motors are conducted, where users can start and stop all or just selected channels (Figure 17). Note that before starting the experiment, it is required to input the FCU volume for each channel. The exact FCU volume is provided in the specification delivered with the FCUs.

BPC Core BPC Instruments (Batch mode)

Home Experiment **Control** Graph Report Settings

Lines

The volume of gas corresponding to one opening of the flow cell. This value is provided with the calibration certificate provided with the flow cell unit (FCU)

The date and time (UTC) the experiment was started

Line	Name	Cell volume [ml]	Correction	HS Volume [ml]	Initial HS [%]	Final HS [%]	Control	Status	Started [UTC]	Duration
1	Line 1	0,00	<input checked="" type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
2	Line 2	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
3	Line 3	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
4	Line 4	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
5	Line 5	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
6	Line 6	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
7	Line 7	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
8	Line 8	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
9	Line 9	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
10	Line 10	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
11	Line 11	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
12	Line 12	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
13	Line 13	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
14	Line 14	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
15	Line 15	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
16	Line 16	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
17	Line 17	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		
18	Line 18	0,00	<input type="checkbox"/>	200	100,00	0,00	<input type="checkbox"/>	Detached		





Select/Deselect all ☐

Time elapsed since the experiment was started

Function that allow to start and stop several or all lines at the same time

Figure 17. Control tab for continuous mode

Located at the bottom right of the lines section is the control panel for the flow cell units. These work as follows:

-  Start data registration. In order to be able to press this button, the status needs to be **ready**
-  Pause data registration. In order to be able to press this button, the status needs to be **running**
-  Stop data registration. In order to be able to press this button, the status needs to be **paused**
-  Clear all data registrations. In order to be able to press this button, the status needs to be **stopped**

Regarding the agitation system, the motors can be controlled in *continuous (single)* or *two-phase (double)* modes. With the two-phase mode, the motors can run intermittently at two different speeds or as ON and OFF. (Figure 18). Please note, that the motors have to be purchased separately and are not part of BPC Core standard package.

The screenshot shows a software interface for controlling an agitation system. At the top, there is a title 'Agitation' and a 'Motor power' toggle switch. Below this, there are two radio buttons for 'Phases': 'Single' (selected) and 'Double'. Under the 'Single' phase, there is a 'Speed [%]' input field with the value '100'. Under the 'Double' phase, there are two rows of input fields: 'Phase 1' with 'Speed [%]' (30) and 'Time [min]' (10), and 'Phase 2' with 'Speed [%]' (10) and 'Time [min]' (10).

Figure 18. Controlling the agitation system through the software.

The **Graph** tab (Figure 19) presents two graphs, gas flow rate as a function of time and gas flow loading rate (g/l/day) as well as Retention time (days) as a function of time. The gas volume can be presented in three different ways: without normalization, with normalization without considering the moisture content (dry), and with normalization considering the moisture content (wet). There are three possible units for the gas flow: Nml /min, NmL /h, and Nml/day.

Gas flow

▶ 1

▶ 2

▶ 3

▶ 4

▶ 5

▶ 6

▶ 7

▶ 8

▶ 9

▶ 10

▶ 11

▶ 12

▶ 13

▶ 14

▶ 15

▶ 16

▶ 17

▶ 18

☐ Select/Deselect all

Gas normalisation

Gas normalisation Wet ▼

Gas flow unit

Gas flow unit Nml/h ▼

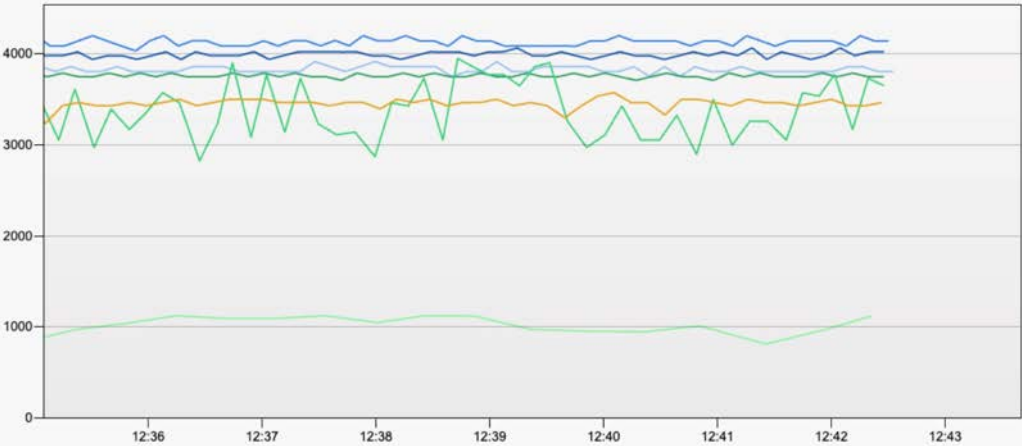
Time frame

Start date 2023-10-11 07:26

End date 2023-10-12 08:38

Gas flow rate [Nml/h]

1H 1D 1W 1M



Time [UTC]



Figure 19. Graph tab for Continuous mode

Upon initiation of gas registration, the line undergoes a colour transformation from a greyish hue to match the specific colour of the corresponding line. Users have an option to zoom the graphs in order to get a better visualization of the real-time data. Within the graph, users can select individual points along the curve, and for each selected point, details about the corresponding time and gas flow rate will be provided.

NOTE: The graph requires at least three data points (i.e., flow cell openings) in order to display information. To simulate an opening during testing, briefly remove the FCU and place it right back; wait a few seconds and then repeat the action one more time. If everything is working properly, a line should appear in each graph. The time axis presents absolute time rather than relative time of the experiment. It is important to set a proper time zone in Settings.

Users have the flexibility to download and generate reports at any time during the experiment from the **Report** tab (Figure 20). This page offers the option to download data from each channel and raw data can be obtained in a CSV format, allowing for individual line downloads or combining them into a single file.

Report settings

Start date: 2023-09-18 00:00

End date: 2023-09-18 12:42

Gas normalisation: Wet

Gas flow unit: Nm³/h

Interpolation interval: Day

Report file format: Microsoft Excel (XLSX)

Download reports

Figure 20. Report settings available

The **Settings** tab is the same for both Batch and Continuous mode (Figure 21) and contains valuable information regarding versions, licenses, a logfile and so forth. Sometimes, a blue triangle with a white exclamation mark will appear next to the settings tab in the Aurora™ software. This symbol indicates that there is information in the logfile that needs to be reviewed or that one of the settings needs to be adjusted. If it is a setting that is in question, that particular setting will also display the same symbol; if it is the logfile, pressing the clear log button (after reviewing and potentially saving the information) will remove the warning.

Two settings are generally described below:

1. **Network settings:** Displays IP and Mac address for the instrument. Also allows for configuring the built-in network adapter using either DHCP or manual configuration.
2. **System warning log:** Contains a list of events registered by the instrument which might be useful when trying to resolve an issue. Please have this information ready when contacting sup

System information

System information

Software version Aurora 1.2.3
 Hardware version 1083-5.3.1-210-r4
 Serial number 1100-3100-9100-1013

Software licenses

Copyright BPC Instruments AB

Show open source licenses

Calibration settings

Time settings

Instrument We, 2023-10-11 09:10:16 UTC
 Web browser We, 2023-10-11 09:10:25 UTC

Synchronize now

Instrument level calibration

Instrument level calibration

Reset accelerometer

Show level

Temperature calibration

Instrument temperature [°C] 24.1
 Actual temperature

Save

Pressure calibration

Instrument pressure [kPa] 98.6
 Actual pressure

Save

Figure 21. Settings tab.

6 MAINTENANCE

In order to ensure that the instrument and its constituent parts will operate properly for a long period of time, it is crucial to follow the instructions described on this manual. The lifespan of the instrument and its components will depend heavily on how the equipment is used and well maintained. Always make sure to use the instrument according to the following guidelines:

- The instrument must be kept in a dry and clean environment.
- Avoid applying tap water as bath liquid in the thermostatic water bath, since the minerals included in this type of water might negatively impact the material of the bath chamber (calcification or corrosion of stainless steel).
- The flow cell units cannot be opened and are considered consumables.
- Reactors and stirrers are consumables that can be autoclaved.
- To clean the detection unit, wipe it with a damp piece of cloth and, if required, a gentle form of detergent. Water must not get into the machine since it can harm electrical components.

All consumables are easily replaceable in the instrument. The spare parts can be ordered from BPC Instruments. For further information, please visit our webshop (link below):

<https://webshop.bpcinstruments.com>

BPC Instruments also provides a *Maintenance Package* where users can get all consumables that are recommended to be changed at regular intervals.