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Instruction Manual

BactoSense Multi

Rapid bacterial monitoring system

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Table of Contents

1 Glossary

This glossary contains terms which might be unknown to the reader, but are widely used within the document. The terms used in this document can be found with in-depth explanations in the Reference Handbook.

TERM	EXPLANATION
Autosampler	Automated sampling device, part of the BactoSense Multi instrument.
Cartridge	Cartridge with fluorescent dyes, bleach, rinse and waste compartments.
FL1/FL2	Fluorescence signal 1 (535 nm) and fluorescence signal 2 (715 nm).
Gate	Gates are tools for data analysis of a subset of data points in flow cytometry.
HNAC	High Nucleic Acid Count. The number of HNA bacteria inside the TCC or ICC gate, and above the HNA / LNA limit.
HNAP [%]	High Nucleic Acid Percentage. The percentage of HNA bacteria relative to the cell count.
ICC	Intact Cell Count. Total number of intact bacteria inside of the ICC gate.
LNAC	Low Nucleic Acid Count. The number of LNA bacteria inside the TCC or ICC gate, and below the HNA / LNA limit.
Online Sampling Device	Connection module to a water line, allowing online sampling with the BactoSense Online.
Manual Sampling Device	Connection module, allowing manual sampling with the BactoSense Online.
SSC	Side scatter signal. Scattered light increases with the internal complexity (granularity) of the detected object.
TCC	Total Cell Count. Total number of bacteria detected inside the TCC gate.

2 General user information

2.1 Intended use of the BactoSense Multi

This instruction manual provides the user with helpful information about the entire life cycle of the BactoSense and its peripheral devices. Before commissioning the instrument, you should be completely familiar with the Instruction Manual.

The instruction manual is intended for all persons who are responsible for the operation and maintenance of the instrument. This document is part of the product. It should be stored in a safe place and always be close at hand for the user.

The intended use of the BactoSense and peripheral equipment is the measurement of the concentration of microbial cells in drinking water. The instrument must be operated by trained technical personnel who have read and understood the content of the instruction manual.

The most recent version of this document can be ordered from the bNovate representative in your country. A list of bNovate representatives can be found on our website: www.bnovate.com/distribution-partners.

Additional important documentation can be found in the table below.

Table 2-1 Additional documentation

40201	Quick Start Guide	Basic information needed to quickly operate the BactoSense Multi.
40203	Reference Handbook	Sophisticated menu functions, connectivity solutions and work steps for advanced users.
40205	Cleaning Kit BSM	Usage of the Cleaning Kit for the BactoSense Multi
30201	Data Sheet	Descriptions and technical data about the instrument.
MN-002873	Guide Scanner	Quick start guide for use of barcode scanner. ©ZIH Corp.
41221	Declaration of conformity	Compliance with the underlying directives and standards.
41421	CB Test report	UL/CSA/FCC compliance report, also under CH-11152 on https://certificates.iecee.org

2.2 Declaration of conformity, norms and classifications

Current technological principles were followed in designing and manufacturing the instrument. They comply with the applicable guidelines concerning safety and the duty to take due care.

CE

The measuring instrument meets all applicable requirements within the European Union (EU) for carrying the CE mark.

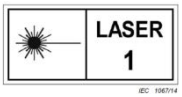
The unit is UL/CSA/FCC compliant.

COMPLIANCY AND CERTIFICATION	
Regulatory compliance	CE RoHS FCC compliant
Applied EMC standards	IEC 61326-1:2012 CFR 47 §15.107/109 ICES-003
Applied safety standards	IEC 61010-1:2010/Amd1:2016 IEC 61010-2-010:2019 IEC 60825-1:2014 CSA C22.2No. 61010-1-12 UL 61010-1:2012 EN ISO 12100:2010
National differences	EN 61326-1:2013 EN 61000-3-2:2019 EN 61000-3-3:2014+A1:2019

For more details on the CE mark, please refer to the separate declaration of conformity (141221 Declaration of Conformity).

For UL/CSA/FCC compliance, please refer to the CB test report.

(https://certificates.iecee.org: CH-11152).



The BactoSense is classified as a Class 1 Laser product according to the standard IEC 60825-1:2014.

2.3 Safety symbols

All **safety symbols** used in this document are explained below:

DANGER!

Electric shock that may result in serious injury or death.

Ignoring this notice may lead to electrical shocks and death.

EXPLOSION HAZARD!

Explosion that may result in serious injury or death.

Ignoring this notice may cause explosions resulting in serious property damage and death.

WARNING!

Injury or hazards to health with long-term effects.

Ignoring this warning may lead to injuries with possible long-term effects.

CAUTION!

Material damage.

Ignoring this notice may cause material damage to the instrument and its peripherals.

2.4 Meaning of the pictograms

All **pictograms** used in this document are explained below:

Additional information about the current topic.

Practical procedures when working with the BactoSense.

The screenshot is an example and may differ from the current device.

2.5 Use restrictions

EXPLOSION HAZARD!

Inappropriate environment.

Operation in explosive areas can cause explosions, which can lead to the death of persons in the vicinity.

- It is not permitted to operate the instrument in explosion hazardous areas or rooms.
- It is not permitted to use the instrument with explosive sample substances.

2.6 Improper use

DANGER!

Improper use.

Improper use of the instrument can cause injuries to persons, process-related consequential damage and damage to the instrument and its peripherals.

In the following cases the manufacturer cannot guarantee the protection of persons and the instrument and therefore assumes no legal responsibility:

- The instrument is not used in the described area of application.
- The instrument is not mounted correctly, set up or transported.
- The instrument is not installed and operated in accordance with the Instruction Manual.
- The instrument is operated with accessory parts and consumables which bNovate Technologies SA has not recommended.
- Improper changes to the instrument
- The instrument is operated within the specifications, in particular pressure and temperature limits.
- The instrument is exposed to vibrations, shocks, or other mechanical forces.

3 Instrument Overview

3.1 BactoSense Multi overview

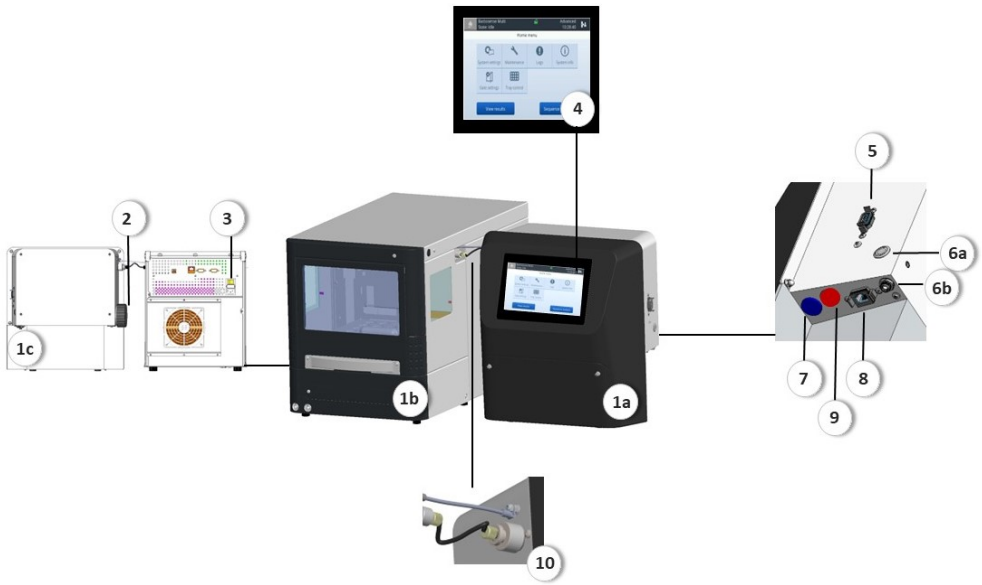


Figure 3-1 BactoSense Multi Overview

①	BactoSense Multi 1a: BactoSense 1b: Autosampler 1c: Back view	②	Desiccant bag access
③	Power button autosampler and power connection	④	Touchscreen
⑤	USB connection BactoSense	⑥	Power button 6a: Power button BactoSense 6b: Input power jack
⑦	USB connection for optional barcode scanner (blue)	⑧	RJ45 interface
⑨	M16 3-pin connector to establish communication between BactoSense and autosampler (red)	⑩	Microfluidic connection between BactoSense and autosampler

3.1.1 Type plate of the BactoSense

The instrument has the following type plate:

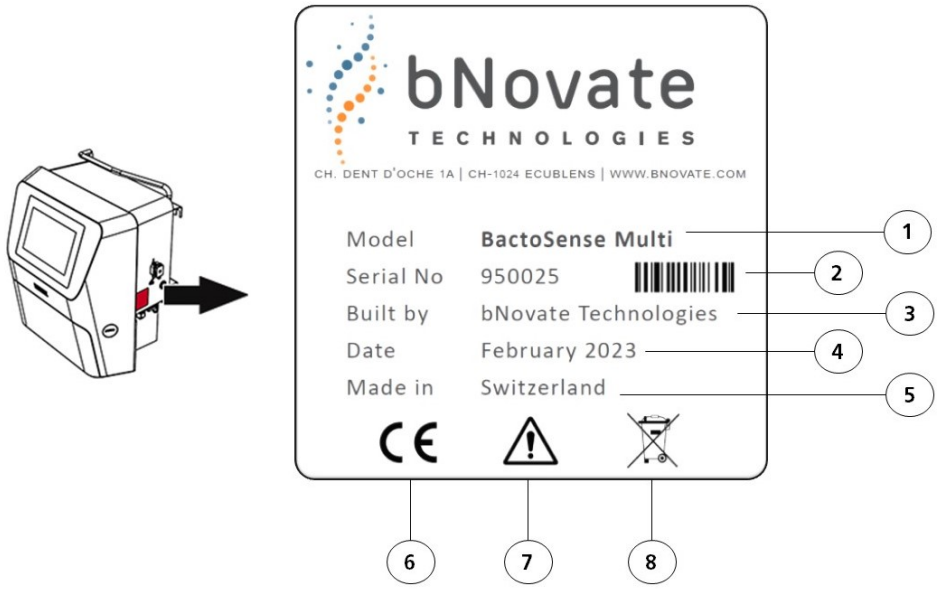


Figure 3-2 Type plate BactoSense

①	Product name	②	Serial number and barcode of serial number
③	Manufacturer	④	Manufacturing Date
⑤	Country of origin	⑥	CE Symbol
⑦	Observe the Instruction Manual	⑧	Disposal information

3.1.2 Type plate of the BactoSense power supply

The power supply has the following type plate

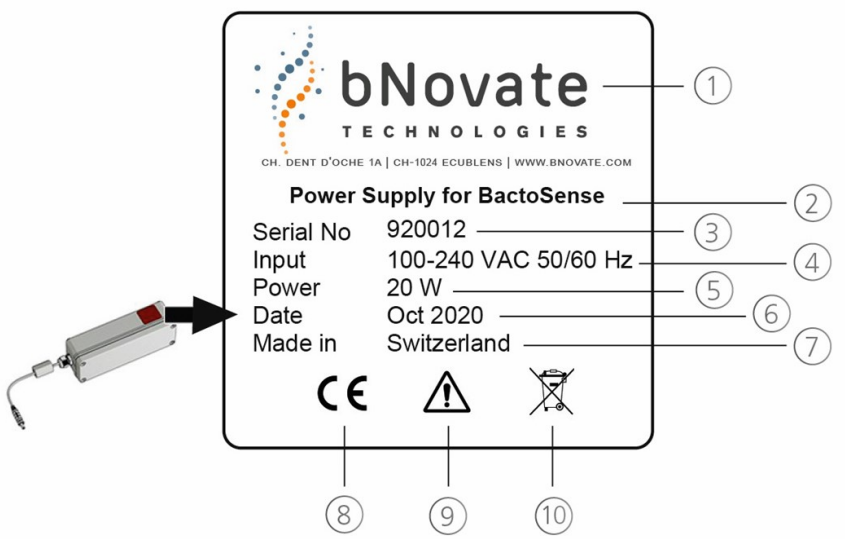


Figure 3-3 Type plate power supply

①	Manufacturer	②	Product name
③	Serial number	④	Service voltage and frequency
⑤	Power consumption	⑥	Manufacturing Date
⑦	Country of origin	⑧	CE Symbol
⑨	Observe the Instruction Manual	⑩	Disposal information

3.1.3 Type Plate of the autosampler

The autosampler has the following type plate

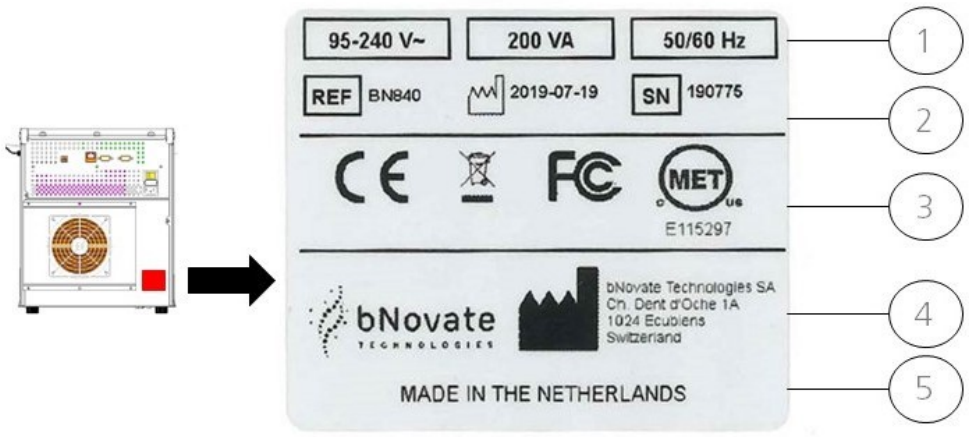


Figure 3-4 Type plate autosampler

①	Voltage, power consumption and frequency	②	Production data, from left to right: Reference number Manufacturing Date Serial number
③	Certification mark and disposal symbols, from left to right: CE (conformité européenne) WEE (Waste of electrical and electronic equipment) FCC (Federal Communications) MET (Eurofins)	④	Manufacturer and manufacturers address
⑤	Country of origin		

3.2 Technical data

Table 3-1 Technical data of the BactoSense Multi

DATA	VALUES
GENERAL	
Operating environment	Indoor use
Operating altitude	Maximum 2000 m (6600 feet above sea level)
Operating temperature	+10°C – +30°C
Operating humidity	20% – 80% RH
Transport and storage temperature	+5°C – +30°C
Transport and storage humidity	10- 85% RH
Dimension (W x D x H)	700 × 757 × 373 mm

Table 3-2 Technical data of the BactoSense.

DATA	VALUES
GENERAL	
Operating environment	Indoor use
Operating altitude	Maximum 2000 m (6600 feet above sea level)
Operating and storage temperature	+5°C – +30°C
Operating and storage humidity	10% – 90% RH
Ventilation requirements	None
Sound pressure level	< 64 dBA
Protection class	Enclosure: IP65, Power Supply: IP67

PHYSICAL	
Enclosure dimension (W x D x H)	350 x 240 x 373 mm
Enclosure weight	14.5 kg with cartridge 11.3 kg without cartridge
Power supply dimension (W x D x H)	230 x 80 x 65 mm
Power supply weight	0.9 kg

ELECTRICAL	
Installation category	II
Pollution degree	2

Supply voltage	100 – 240 VAC +/-10%, 50 – 60 Hz, 1.4 A
Power consumption	20 W

INTERFACES	
Connectors	USB 2.0, Ethernet
Display	WVGA, 7.0“capacitive touchscreen
Storage capacity	32 GB

SPECIFICATIONS	
Measuring principle	Flow cytometry
Measurement range	0 – 5´000´000 cells/ml
Laser type and wavelength	Laser diode 488 nm
Fluorescence	• 535/43 FL1 • 715LP FL2
Side scatter	488 nm SSC
Detection limit	TCC: 1000 - 2‘000‘000 cells/ml ICC: 100 - 2‘000‘000 cells/ml
Microbial parameters	TCC/ml, ICC/ml, DCC/ml, ICP (%), LNA/ml, HNA/ml, HNAP (%)
Cartridge capacity	Maximum 500 measurements 9 months validity
Measurement interval	Measurement 25 min Cleaning 14 min Full sequence for one sample 40 min

SAMPLING	
Sampling type	Autosampler
Sample volume	Sampling volume 1200 µl (containing a prime) Minimum sample volume 3.4 ml Maximum sample volume 10 ml
Sample conditions	Chlorine: max. 3 mg/l pH-value: 5 - 12 Temperature: +5°C - +40°C Conductivity: 0 - 100'000 µS/cm at 20°C Turbidity: 1 - 10 FTU
COMPLIANCY AND CERTIFICATION	
Please refer to section 2.2 for the list of compliance and certification	

Table 3-3 Technical Data of the autosampler

DATA	**VALUES**
GENERAL	
Operating environment	Indoor use
Operating altitude	Maximum 2000 m (6600 feet above sea level)
Operating temperature	+10°C – +40°C
Transport and storage temperature	-29°C – +60°C
Operating humidity	20% – 80% RH
Transport and storage humidity	max. 85% RH
Sound pressure level	LAeq< 64 dB

PHYSICAL	
Enclosure dimension (W x D x H)	300 mm x 575 mm x 360 mm
Enclosure weight	18.7 kg
Stackable Weight	65 kg

ELECTRICAL	
Installation category	II
Pollution degree	2
Supply voltage	100 – 240 VAC +/-10%, 50 – 60 Hz
Power consumption	200 W
Fuses	2 x 2.5AT, 250V, 1500A breaking capacity IEC60127-2, UL recognized

INTERFACES	
Connectors	RS232
Max Length	for RS232 is 3m

COMPLIANCY AND CERTIFICATION	
Regulatory Compliance	CE RoHS FCC ICES-01

Applied safety standards	IEC61010-1 IEC61010-2-081
Applied EMC standards	IEC61326-1 EN5011/CISPR11
Certification	UL and CSA approved

4 Safety

4.1 Dangers

DANGER!

Damaged instrument or cabling

Touching damaged cables may lead to electrical shocks or death.

- The instrument may be operated only when the cables are intact.
- The instrument may be operated only if it has been properly installed or repaired.

DANGER!

Dangerous voltage inside the supplied mains device

Touching a wet or damaged mains device may lead to electrical shocks or death.

- Do not position the mains device in moist locations.
- Do not operate the mains device if its housing is damaged.

DANGER!

Damage due to incorrect service voltage

If the instrument is connected to an incorrect service voltage, the instrument can be damaged.

- The instrument must only be connected to voltage sources as specified on the type plate.

WARNING!

Missing instruction manual

Operating the instrument without following the procedures indicated in the Instruction Manual may lead to injuries to persons and damage to the instrument.

- If the instrument changes hands, always include the Instruction Manual.
- If the Instruction Manual is lost, you can contact bNovate to request a replacement at www.bnovate.com/contact.

CAUTION!

Moisture or condensation on the electrical components

If moisture enters the instrument, the BactoSense can be damaged.

- The covers and lids must always be attached during operation.
- Service inside the instrument must only be performed by trained personnel in a dry room and at room temperature. The instrument should be at operating or room temperature (avoid condensation on optical and electrical surfaces).

Use of aggressive chemicals

Use of aggressive chemicals can cause damage to instrument components.

- Do not use aggressive chemicals or cleaning agents.
- Should the instrument come in contact with aggressive chemicals, clean it thoroughly with a neutral cleaning agent.
- Use a damp cloth (water only) to clean the exterior of the device.

4.2 Safe handling of chemicals

Improper handling of chemicals

Please observe the following instructions for safe handling of chemicals:

- Wear the recommended personal protection (safety goggles, protective gloves, protective clothing).
- Wash your hands thoroughly after working with chemicals.
- Study the MSDS (Material Safety Data Sheet) before working with chemicals. If an accidental release happens, please follow the instructions of the MSDS.
- Never smoke or store food or beverages in the working environment.

4.3 Residual risk

Residual risk

According to the risk assessment of the applied safety directive DIN EN 61010-1, there remains the risk of the displayed measurement values being incorrect. This risk can be reduced with the following measures:

- Use an access code to prevent unauthorised persons from changing parameters.
- Perform the specified servicing duties.

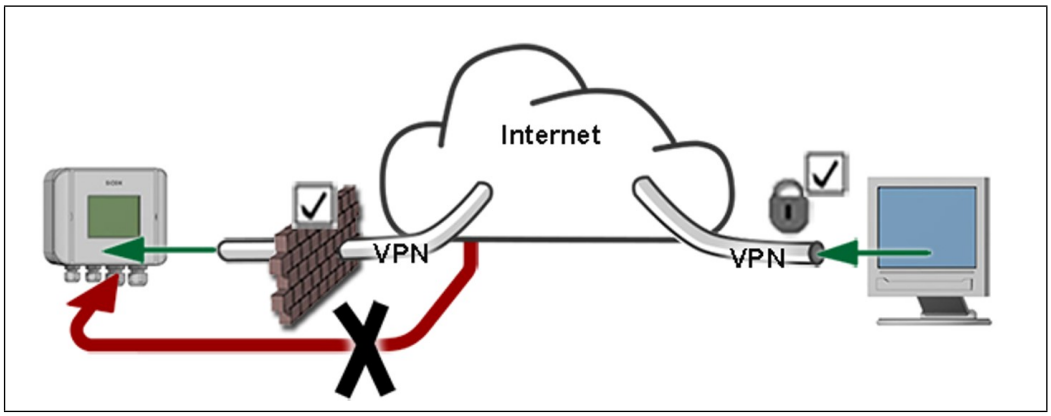
4.4 Warning and danger symbols on the instrument

No warning or danger symbols on the instrument

Users must ensure that they observe the safety measures as specified in the Instruction Manual at all times when working with the instrument and its peripheral equipment, even if no warning or danger symbols are attached to the instrument.

- Observe safety points when performing the described procedures.
- Observe local safety regulations.

4.5 Preventing unauthorized online access



CAUTION!

bNovate instruments are equipped with an integrated web user interface. Any malintentionate internet user can access your instrument when you expose the instrument directly to the internet.

Please note the following points to prevent this:

- Never expose the instrument's network ports to the open internet.
- Operate it behind a firewall and block access to the instrument.
- Only connect to branch offices via VPN.
- Change the standard password on commissioning.
- Always keep up-to-date with the latest changes regarding internet security so that you can react promptly in the event of alterations.
- Install the latest updates immediately (also for the router and firewall).

5 Installation

CAUTION!

Observe the safety points

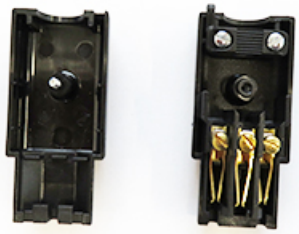
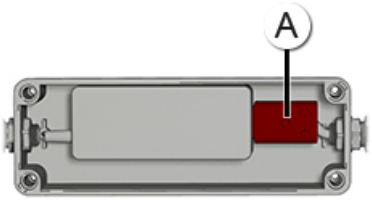
Before working on the instrument, ensure you have carefully read the safety points in the instruction manual.

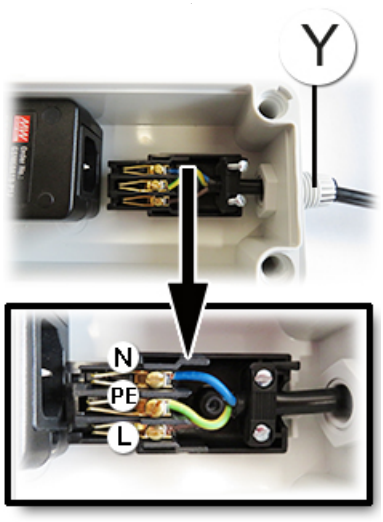
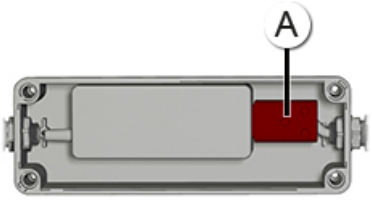
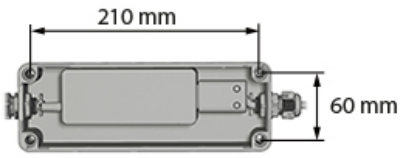
You should also follow these regulations:

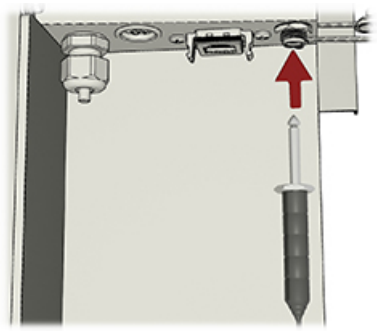
- Only professional electricians are authorised to do the electrical changes to the power supply unit.
- It is forbidden to modify or repair the actual device.
- Perform the work steps in the exact order instructed.
- When replacing parts, use only genuine original parts listed in the consumables and spare parts list.
- When returning components use the original packaging of the BactoSense
- Be sure to use a plug with Protective Earth (PE) and that the device is correctly connected to it.

5.1 Connection of the power supply of the BactoSense

The power supply comes in an IP67 enclosure and a cable with a plug type J, type E or type G. Depending on the country, the relevant plug is delivered. For the connection of a different plug, e.g. for direct installation in a network, use the following procedure:

	WORK STEP	ADDITIONAL INFO / IMAGES
1.	Remove the cover of the enclosure by unscrewing the four screws (circles). ⚠ Ensure that the power supply is not connected to power.	
2.	Remove the C13 connector (A) and unscrew it to open. 	

	WORK STEP	ADDITIONAL INFO / IMAGES
3.	Open the cable connector (Y) and insert the cable. Wires cross sections and cable length: • 0 .. 9 m: 1 mm^2 • 9 .. 21 m: 1.5 mm^2 (maximal) ⚠ The cable connector is dimensioned for a cable diameter of 3 .. 10 mm.	
4.	Tighten the 3 wires (N, PE, L) in the electrical terminal and block the cable isolation. ⚠ Ensure, that a plug with Protective Earth (PE) is used and the device is correctly connected to it.	
5.	Close the C13 connector (A) using the screw and plug it in the power supply. Tighten the cable connector. Try to pull the cable to see if the cable connector is tight enough.	
6.	Optional: the power supply can be mounted on a wall. M4 screws should be used with a minimum length of 20 mm. With the cover still removed, place the 4 screws and fix the enclosure to the wall.	

	WORK STEP	ADDITIONAL INFO / IMAGES
7.	Put the cover of the enclosure back and tighten the four screws to seal it.	
8.	Remove the socket cover and then insert the power plug.	
9.	Fasten the power connector lock ring (X).	

- If the cable is longer than 2 m, label it near the plug with the name of the device.
- If the cable is longer than 20 m, the impedance of PE needs to be smaller than 0.2 Ω.
- The electrical plug should always be accessible, or a circuit breaker should exist to disconnect the main supply.
- The circuit breaker should respect the standards IEC60947-1 and IEC60947-3 and should protect a current of 10 A to 16 A.

5.2 Connection of the autosampler

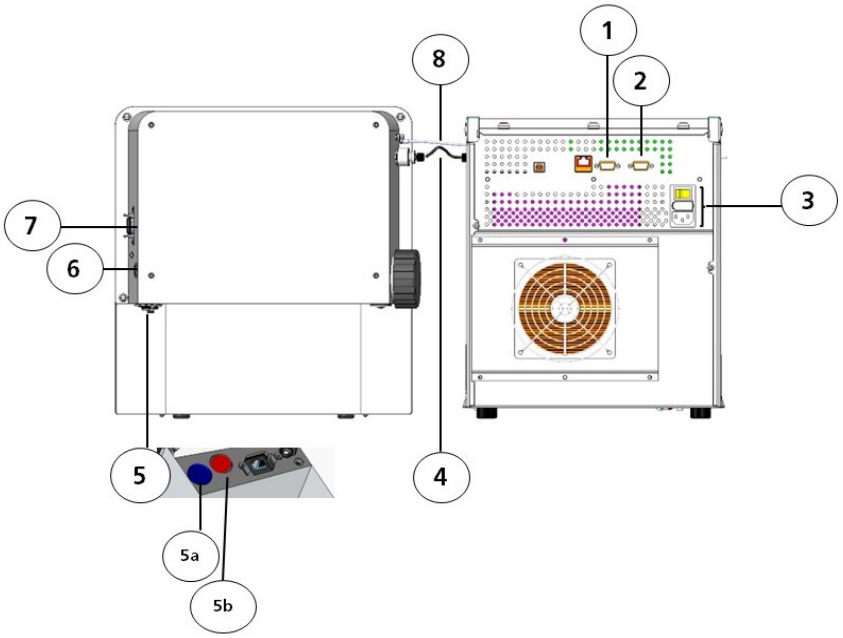


Figure 5-1 Back view of BactoSense Multi

①	D-sub 9: I/O port of autosampler	②	D-sub 9: Communication port of autosampler
③	Integrated power supply of the autosampler: power button autosampler and power connection	④	Microfluidic tubing between autosampler and BactoSense
⑤	Connection panel of the BactoSense: 5a USB port (blue) 5b M16 3-pin connector (red)	⑥	Power button BactoSense
⑦	USB connector (additional)	⑧	Spacer cable between BactoSense and autosampler

The connections will be established upon installation. Only perform these actions when necessary and refer to section 9.3:

- Connection of tubing ④ and spacer cable ⑧between autosampler and BactoSense are established (section 9.3).
- Connect the D-sub 9 from the communication port ② of the autosampler to the M16 3-pin connector of the BactoSense ⑤ (5b-red) with the delivered connection cable.
- If desired, connect the barcode scanner to the USB port ⑤ of the instrument according to section 5.4.
- Connect the power supply of the BactoSense according to section 5.1.
- The power supply of the autosampler is integrated into the device. Connect the autosampler with the delivered C13-cable.
- Turn on the power of the BactoSense ⑥and autosampler ③.

5.3 Connection to the liquid waste container

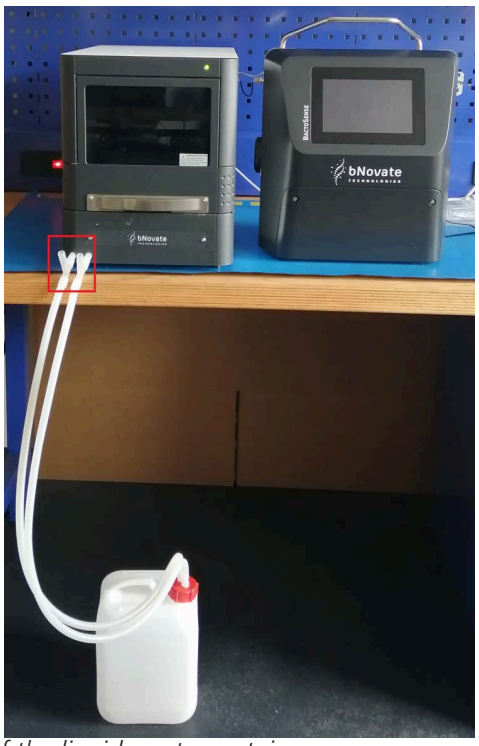


Figure 5-2 Connection of the liquid waste container

To connect the liquid waste container to the autosampler of the BactoSense Multi, connect the two tubes to the t-connection and lead them into the container. Ensure that the empty ends of the t-connection are facing upwards (red box in Figure 5-2)

WARNING!

Avoid exposure of skin and eyes to chemicals.

The liquids contained in the liquid waste container are chemicals (see safety data sheets of decontamination solution and rinsing solution). Chemicals can cause skin irritation, eye damage and other health damage and need to be properly disposed of. Please contact your local waste disposal company for more information on chemical waste disposal.

5.4 Connection of the handheld 1D/2D barcode scanner

Turn the instrument off and connect the handheld barcode scanner to the USB connector of the BactoSense with the delivered ethernet (Barcode Scanner) to USB (BactoSense) cable (see connector 5a in figure 5-1). Turn the instrument on again. The USB scanner works on 1D and 2D Barcodes with its auto settings. If you run into problems, refer to the quick start manual (©ZIH Corp., MN-002873-01), which was delivered with the barcode scanner.

The barcode scanner is an optional accessory and not part of the standard delivery (see section 13).

5.5 Connection of the web user interface

To establish a connection to the web user interface, insert the plug into the RJ45 connector (section 3.1) and enter the IP address of the BactoSense. For detailed information refer to the reference handbook.

6 Operation

6.1 Home menu

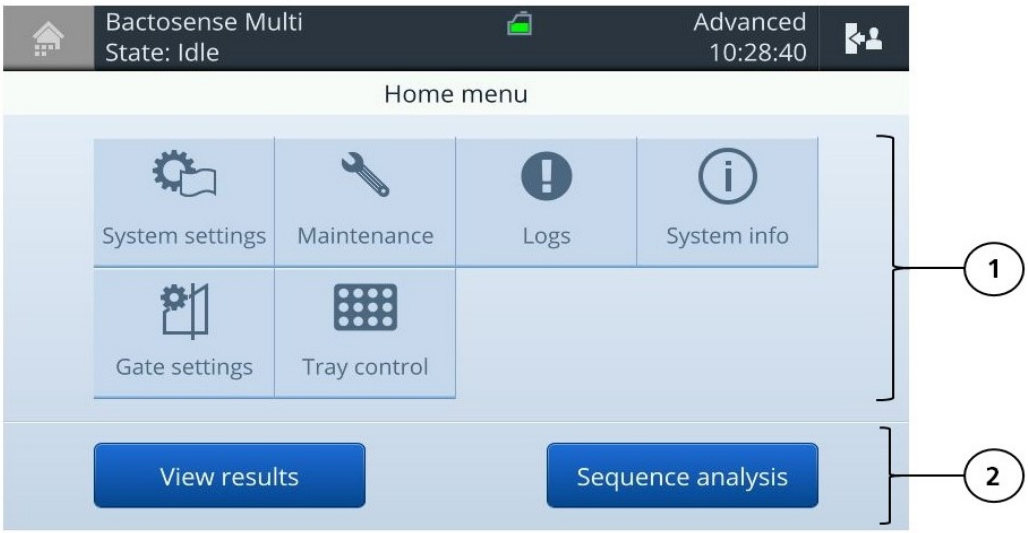


Figure 6-1 Main elements of the home menu

①	The following sub-menus are accessed from the Home menu screen: • System settings • Maintenance (highlighted if the cartridge is empty or if a service is required) • Logs (highlighted if an error needs to be corrected) • System info • Gate settings • Tray control (temperature control of tray) Some menus might be disabled (Section 6.7).
②	Mode selection: switch between view results and sequence analysis. • The **view results** function allows to browse the measured batches. • The **sequence analysis** function allows to perform the measurements.

6.2 User interface: Sequence analysis

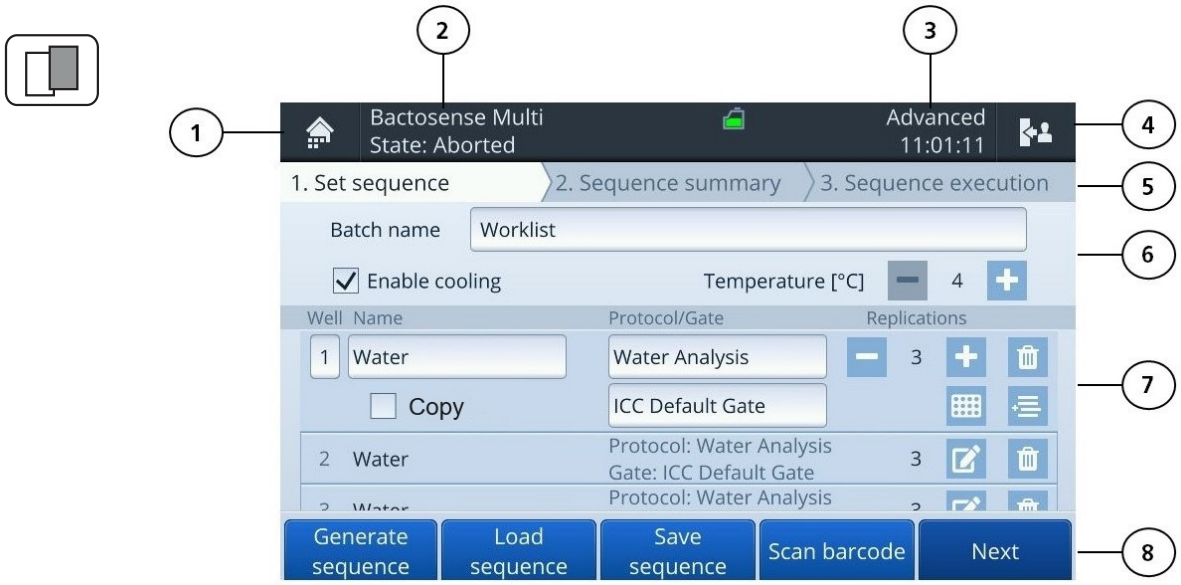
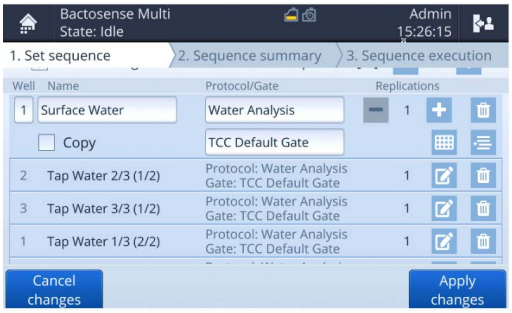
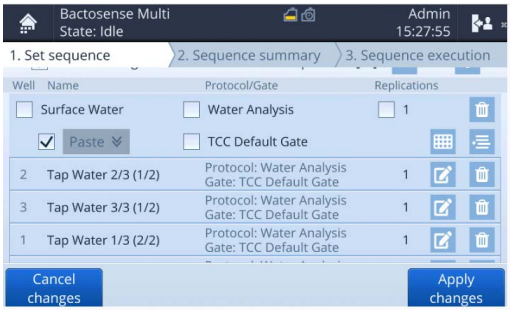
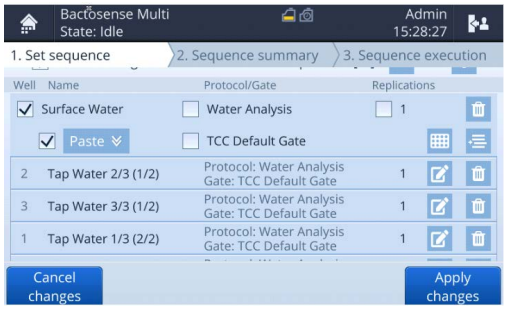
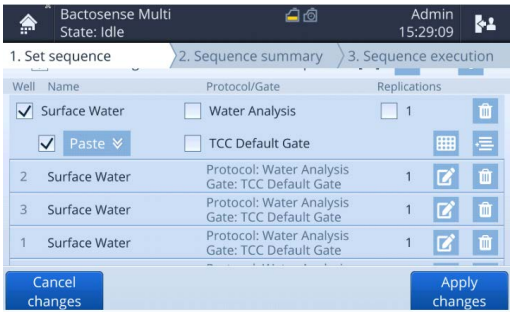


Figure 6-2 Main elements of the user interface

①	**Home** button
②	Top bar left: instrument configuration and state of the device.
③	Top bar right: user mode and time.
④	**Logout** button, used to lock the screen, choose a user, or power off the instrument.
⑤	Wizard header: Shows the current step of the process.
⑥	Batch name, tray cooling option activation and temperature setting [°C]
⑦	Batch listing. Fields for well number, sample name, protocol and gate can be modified. The sequence can be duplicated. Number of replications can be set. These buttons can be accessed:  Tray view (Figure 6-4)  Add sample below line  Discard entry
⑧	Buttons on the **Action Bar**: Generate sequence, Load sequence, Save sequence, Scan barcode, Next.

6.2.1 Copy-Paste of a sample

Copy-Paste actions change the well properties of the sequence. Only the items below the line you are working on are affected. The paste function will work on all lines below the sample, except for Primes and Pauses.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Choose the sample you want to copy from the sequence. In this example sample one was chosen.	
2.	Change one or more of the sample properties: sample name, protocol, gate or replications. In this example, the sample name was changed to **Surface Water.** Check the **Copy** box and see how it turns to **Paste**. Check boxes appear at sample name, protocol and gate.	
3.	The chosen check boxes will be duplicated in the following samples: Click on the **Paste** box.	
4.	Sample one and the following samples are now carrying the same sample name **Surface Water**.	

6.3 User interface: Sequence validation

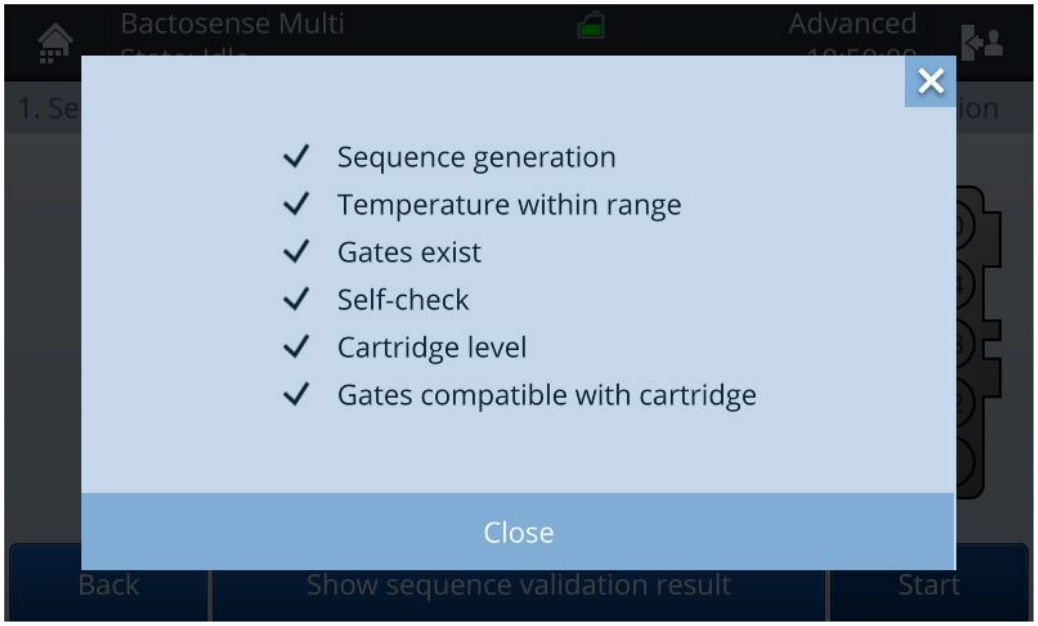


Figure 6-3 Passed sequence validation

The sequence validation is a number of tests which need to be passed to proceed to the measurement. Contact your local service organisation (Section 9.1), if a problem persists or if you need a new cartridge.

Table 6-1 Sequence validation descriptions and errors

STEP	DESCRIPTION	ACTIONS IF TEST FAILS
Sequence generation	Checks the validity of the commands and sequence	Check the commands in the sequence.
Temperature within range	Checks whether the temperature in the BactoSense is within range	Wait or relocate instrument (environment or instrument is too warm or too cold)
Gates exists	Checks whether gates exist. (e.g. deleted gates or typos in the gate naming)	Change naming of gates in the sequence or recreate gates.
Self-check	Checks the communication with the autosampler and within the BactoSense	Check whether the autosampler is turned on and cartridge is correctly installed. Refer to section 10.6.
Cartridge level	Checks whether the cartridge is sufficiently filled to perform all tests in the sequence.	Try to run fewer samples or install a new cartridge.
Gates compatible with cartridge	Checks whether the gating is compatible with the cartridge in the instrument.	Change cartridge or change gates in the sequence.

6.4 Tray view

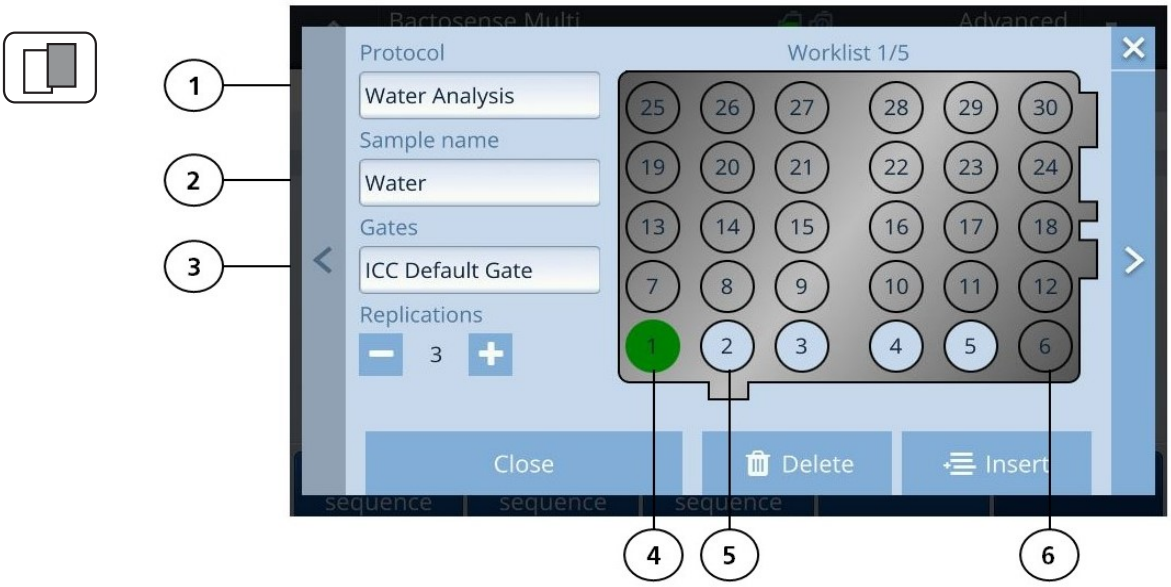


Figure 6-4 Vial tray as it is displayed in the software.

The tray view is a view in the software on how the samples need to be placed in the tray, how many samples there are in the sequence and which sample is under review. This view can be accessed by clicking on the little tray when in sequence view. Displayed in this view are the latches of the tray, number of replications and the numbering of the samples (1-30).

①	Protocol
②	Sample name
③	Gate
④	Green: Sample under review
⑤	Light blue: Samples included in sequence
⑥	Grey: Empty sample positions

6.5 Top bar icons

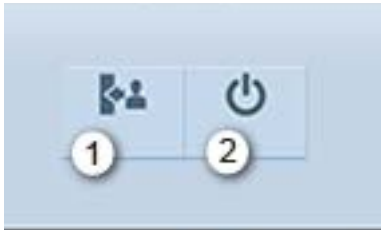
Top bar icons are displayed in the bar at the top of the display. They are a fast method to get initial information about the status of the instrument.

Table 6-2 Top bar icons

ICON	DESCRIPTION	ICON	DESCRIPTION
	Process running		Demo mode activated
	Stand-by heating activated (Reference Handbook)		Service required (Reference Handbook)
	Cartridge almost empty		Cartridge level indication
	Cartridge almost expired		Cartridge empty (Section 9.5.3)
	Cartridge not correctly initialised (Section 9.5)		Cartridge expired (Section 9.5.3)
	Critical errors (Section 10.3)		Non-critical errors (Section 10.2)

6.6 User logout and power off

These steps need to be performed to power the instrument off and lock the screen.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Logout** button.	
2.	Choose one of the following options: 1: **User logout** (locks the screen or change user) 2: **Power off** the device	

6.7 User roles and permissions

By default, the passwords for Basic, Advanced, and Admin users are empty. Users will be prompted to set a password at first login. The service login is only accessible for service personnel.

Table 6-3 User roles and permissions

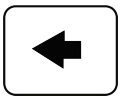
RIGHT	BASIC	ADVANCED	ADMIN
View last result	✓	✓	✓
View all results and export	✓	✓	✓
Start, stop, and schedule measurement	✓	✓	✓
View error and warning log	✓	✓	✓
Rename results	✓	✓	✓
Validate device	✓	✓	✓
Change their own passcode	✓	✓	✓
View system info	✓	✓	✓
See network settings	✓	✓	✓
View last self-check	✓	✓	✓
Change cartridge	✓	✓	✓
Clear errors	✓	✓	✓
See intervention log	✓	✓	✓
See validation results	✓	✓	✓
Delete results		✓	✓
Re-gate results		✓	✓
Adjust gates		✓	✓
Reboot		✓	✓
Run a self-check		✓	✓
Delete old measurements		✓	✓
Export all		✓	✓
See intervention info		✓	✓
Export diagnostics		✓	✓
Change other USERS' passcode			✓
Create other users			✓
Change authentication settings			✓
Set device name			✓
Set date and time			✓

RIGHT	BASIC	ADVANCED	ADMIN
Change network settings			✓
Change services settings			✓
Change language			✓
Switch to demo mode			✓
Reset settings			✓
Full factory reset (excepted interv. log)			✓
Import settings			✓

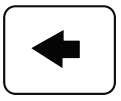
7 Settings

7.1 Change the system language

The device name can only be changed by the admin.

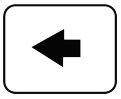
	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **System settings** button, then **Language**.	 
3.	Choose the language and press the **OK** button.	
4.	The following message appears: "In order to change the language, the interface must reload". Therefore, press the **Reload interface** button.	

7.2 Password change

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **System settings** button.	
3.	Press the **Users** button.	
4.	Choose one of the existing users and press **Edit**	**Basic, Advanced** can only change their own password. **Admin** can change his own password and the other passwords.
5.	To change the password, press the **Change PIN** button. Complete the fields on the display and press **Save**.	

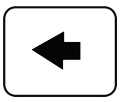
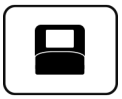
7.3 Date and time

If time synchronization is enabled, either with NTP servers, your manual date and time settings will be overridden during the next synchronization. Press **Time synchronization settings** in the Action bar for settings.
→ For setting up NTP sever, please refer to the reference handbook.

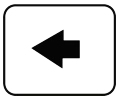
	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **System settings** button.	
3.	Press the **Date & Time** button.	
4.	Enter the date and time.	
5.	Select the **Time zone.**	
6.	Press the **Set** button.	⚠ The **Reset** button undoes the changes.

7.4 Change the device name

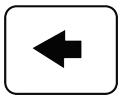
The device name can only be changed by the admin.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **System settings** button.	
3.	Press the **Device name** button.	
4.	Enter your individual device name in the input field.	
5.	Press the **Save** button.	

7.5 Filling level of cartridge

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **System info** button.	
3.	The filling level of the cartridge is displayed among other system information. A value of 70% means that 70% of the reagents are still available.	

7.6 Clear disk space

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **Maintenance** button.	
3.	Press the **Delete old measurements** button.	⚠ Only for admin roles available.
4.	If available, choose one of the following measuring modes: **Auto** / **Manual**	
5.	Choose the time interval for the measurements to keep.	⚠ Measurements older than this will be deleted.
6.	Press **Delete measurements** to delete the data.	

8 Measurements

8.1 Measurement scope of the BactoSense Multi

The BactoSense Multi was developed to measure the concentration of microbial cells in water. The BactoSense Multi is able to perform measurements of up to 30 samples automatically. The following requirements must be fulfilled to use the instrument:

- Raw waters, especially surface waters, must be filtered with a 20 µm filter. Bigger objects in the water can block the sampling device's filters and damage the instrument. Clear water that is expected to be potable, usually does not need filtering.
- Sparkling water and soft drinks cannot be measured by the instrument.
- Water with a high concentration of chlorine can affect the results of the measurement.
- The sample and operating conditions of Section 3.2 must be fulfilled.

8.2 Preparation of the autosampler

The autosampler reproducibly delivers up to 30 samples to the BactoSense. Minimal sample volume is 3.4 ml and maximal sample volume is 10 ml. Measurement of up to five replicates from one sample vial is possible. Ensure the vial is filled with enough liquid or the run will be aborted (Table 8-1). Consider for the fill volume of the vials all replicates of the measured sample and additional primings of the instrument.

Table 8-1 Minimum volumes for different numbers of replicates

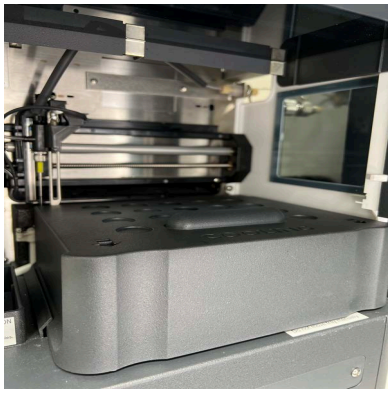
REPLICATES	VOLUME
1	min. 3.4 ml
2	min. 3.7ml
3	min 4.0 ml
4	min. 4.2 ml
5	min. 4.4 ml
Additional prime	+0.8 ml

Avoid contamination of the sample and instrument

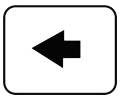
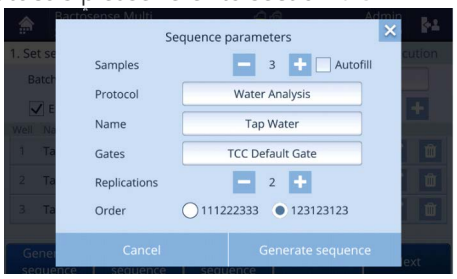
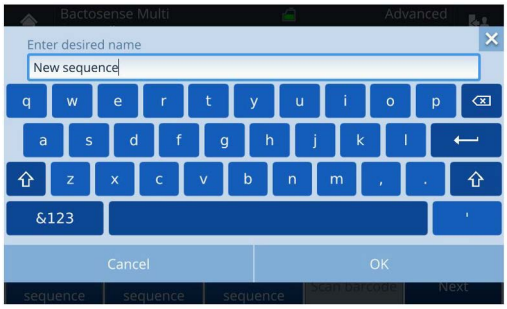
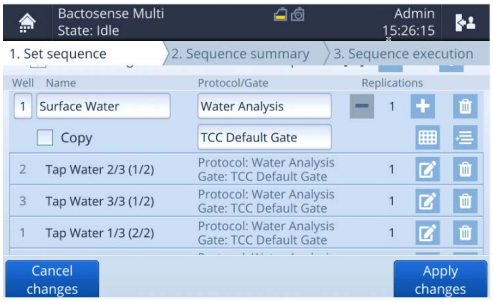
Operators may be a potential source of microbial contamination:

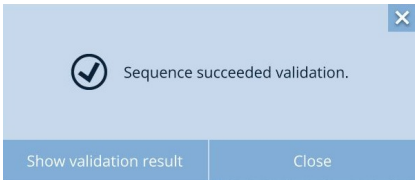
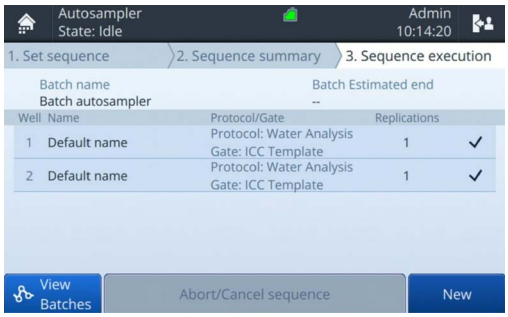
- Wear fresh, non-powdered nitrile gloves when handling the samples, sampling device, or any components which come in contact with them.

The following steps are necessary to prepare the autosampler for measurement:

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Make sure that the BactoSense and the autosampler are powered.	⚠ A green light at the upper right corner of the instrument indicates the autosampler status.
2.	Check the fill level of the waste container.	
3.	Fill the tray with samples and put it into the instrument. Secure the tray until the latch is fitting. When filling the tray pay attention to the sequence and position of the vials. The positions of the vials are indicated with numbers (section 6.4).	 ⚠ Intended Fit: The latch is inserted into the space below the vials.Improper fit disturbs the workflow because the needle cannot enter the vials and could be potentially damaged.
4.	Close the vial cover. Make sure it is guided through the guide rails on both sides and pushed as far as possible to the back.	
5.	Proceed to section 8.3: **Start a sequence analysis**.	

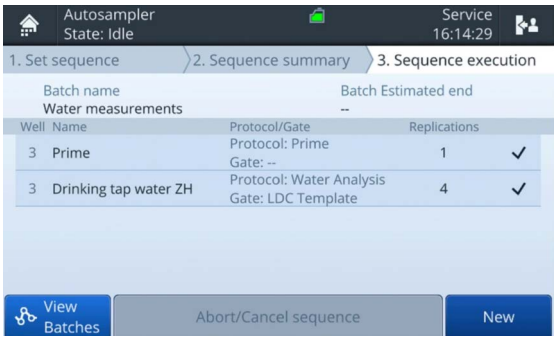
8.3 Start a sequence analysis

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu (Section 6.1) and press "Sequence analysis"	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **Generate sequence** button when you want to setup a new sequence of measurements. Choose the number of samples, the measurement protocol and number of replicates.You have the option to choose **Autofill** which will increment your sample number (and the replicate number, if necessary). Otherwise press **Load sequence.**	⚠ A default TCC or ICC Template is available. Adjusting the gate settings is described in the Reference Handbook. For an exhaustive list of all the available protocols please refer to section 8.5 . 
3.	Optional: Press on the batch name field to pop up an on-screen keyboard, enter the desired name and press **OK**.	
4.	Optional: press on a line item and change the name of the sample, well position, protocol or replication number or a sample can be duplicated. (Section 6.2). Do this until the samples are correctly displayed like they are physically in the tray (Figure 6-4). Use the barcode scanner, if available, to enter the sample name.	
5.	Enable or disable cooling and set the desired temperature.	
6.	If you generated a sequence: Press **Save sequence** and enter a new name for the sequence.	⚠ The sequence must be saved when finished or it will be overwritten.
7.	Press **Next.** The sequence is validated.	

	WORK STEP	ADDITIONAL INFO / IMAGE
8.	If the sequence is validated, press **Close** or take a look at the validation data by pressing **Show validation results.**	⚠ If there was an error in the validation, correct the issues before proceeding (Section 6.2.1) 
9.	Press **Start.** The sequence starts.	
10.	After each performed measurement a check mark appears next to the samples. Already collected results can be accessed during runtime through **View Batches.**	

8.4 View measurement results

Once a sequence analysis has been performed, the batch results can be listed

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **View Batches** button. A **View results** button is also accessible through the **Home menu.** (Section 6.1)	
2.	Select the batch you want to view.	
3.	Select the sample you want to analyze and go to Sample View (section 8.4.1).	

8.4.1 Measurement result

This page shows a measurement result. From here, the user can delete a measurement, look up older results or export results. Expert users can repeat the cell counting with new gates. Some actions are bound to specific accounts (Basic, Advanced or Admin).

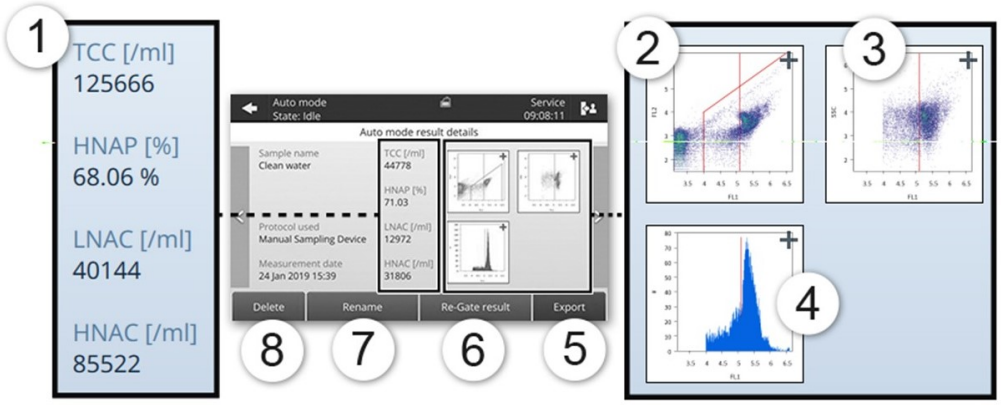


Figure 8-1 Display of a single measurement result, using a TCC cartridge

①	Measured parameters are displayed. For details refer to the Reference Handbook.
②	The FL2 vs FL1 dotplot shows all detected events according to the amplitude of their fluorescence signals FL1 (535 nm, X-axis) and FL2 (715 nm, Y-axis). The red polygon defines the gate. For details refer to the Reference Handbook.
③	The SSC vs FL1 dotplot shows only cells inside the gates, according to their fluorescence signal FL1 (535 nm) and scattered light signal SSC (488 nm).
④	The FL1 histogram shows all cells inside the gates, binned according to their fluorescence in FL1.
⑤	**Export** saves this result to a USB stick. To export multiple results, refer to the Reference Handbook.
⑥	**Re-Gate result** allows you to move the gates and recalculate cell counts. You can optionally save the new gates for future measurements. For details refer to the Reference Handbook.
⑦	**Rename:** ability to rename the result. (section 8.6)
⑧	**Delete:** the result is deleted permanently (requires confirmation).

Multiple selection & batch operations: long-press to select multiple measurements, then **Delete** / **Re-gate** / **Export** selection.

8.5 Protocols

Operators can choose between several analysis protocols. All protocols, except fill tubing, can be replicated 1 to 5 times. Each replication encompasses sampling, mixing and incubation (if applicable), and analysis. There is no cleaning step between each replication, and only one prime is done before the measurement of replicates of one sample..

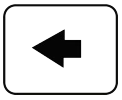
PROTOCOL NAME	PROTOCOL DESCRIPTION
Water Analysis	Analyses the water sample and finishes with a cleaning cycle. If several replications are executed, the cleaning step is executed only once, at the end.
Beads Analysis	Analyses calibration beads and finishes with a cleaning cycle. If several replications are executed, the cleaning step is executed only once, at the end. Only to be performed with the validation kit.

Additionally, the following maintenance protocols are available. These can be run before or between analysis protocols to prepare, flush, or clean the system. When multiple replications are selected, the entire protocol is repeated the desired number of times.

PROTOCOL NAME	PROTOCOL DESCRIPTION
Clean Optics	Launches a cleaning step that washes all components in contact with the sample inside the BactoSense, except the sampling device.
Clean Sampling Device	Cleans the sampling device so that the external filter and the needle's interior can be washed after an extremely loaded sample or in case of filter blockage.
Fill Tubing	Fills all tubing carrying reagents from the cartridge to remove bubbles in the tubing. Cleans optics at the end of the process.
Prime and Clean Optics	Fills the tubing with liquid from the sample. Helps to dilute any residues after a clean sampling device, for instance. Is finished by the cleaning step.
Prime	Fills the tubing with liquid from the sample. Use this protocol to prime the tubing before a measurement.

8.6 Rename results

Measurements can be renamed from their result details view.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu (Section 6.2), press **View results** and select the batch.	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Find the sample that should be renamed and press it, leading to the results details view.	
3.	Press the **Rename** button (Section 8.4.1).	
4.	A keyboard and text field with the current sample name will appear. Use the keyboard to change the sample name and press **OK**.	
5.	After a few seconds, the new name is applied.	

8.7 Cleaning levels

BactoSense offers different ways of cleaning a contamination (biological or non-biological), depending on the strength of the contamination. A new level in the cleaning procedure needs to be accessed whenever there is a persistent contamination. The best way to test for contamination is to run a sample with sterile water.

LEVEL	CLEANING PROCEDURE
0	**Default cleaning**. Cleaning is automatically performed after each measurement. The cleaning agents are provided by the cartridge. No action needed.
1	**Basic cleaning**. The cleaning agents are provided by the cartridge. Follow section 8.11 of the Instruction Manual
2	**Cleaning kit**. The cleaning agents are provided in the cleaning kit. See section 5.1 of the reference Handbook

9 Service

CAUTION!

Observe the safety points.

Before working on the instrument, ensure you have carefully read the safety points in the Instruction Manual.

You should also follow these regulations:

- Only professional electricians are authorised to do the electrical installation of the power plug.
- It is forbidden to modify or repair the actual device.
- Perform the work steps in the instructed order.
- When replacing parts, use only genuine original parts listed in the consumables and spare parts list.
- When returning components, use the original packaging of the BactoSense
- Be sure to use a plug with Protective Earth (PE) and that the device is correctly connected to it.

CAUTION!

Service not carried out.

Service duties have to be carried out according to the maintenance schedule and original bNovate spare parts have to be used, otherwise this can lead to damage to the instrument or measurement errors.

In this case, bNovate Technologies accepts no warranty claims made by the customer and is not responsible for any subsequent costs.

Only service-trained and authorised personnel are allowed to carry out BactoSense Multi service operations:

- Carry out servicing duties according to the servicing schedule (Section 9.1).
- When carrying out servicing duties, use original bNovate spare parts according to the spare parts list (Section 13). The use of third-party spare parts requires the written approval of bNovate Technologies.
- If the instruments are subjected to heavy use or exposed to severe environmental conditions, service duties must be carried out more often as required, and wear parts have to be replaced more often.

9.1 Customer service information

Should you have any questions, please contact the responsible service centre in your country or region. A current list of all bNovate country representatives is available online at www.bnovate.com/distribution-partners.

Please have the following information ready when you contact a bNovate service point or customer service:

- Serial number of the BactoSense.
- Description of instrument behaviour and the work steps when the problem occurred.
- Description of what you did when trying to solve the problem yourself.
- Documentation of the third-party products you use in conjunction with the BactoSense.
- Description of operation conditions (place, power supply, measured medium, temperature etc.).
- Instruction Manual and Reference Handbook.
- Export of the last measurements when the error occurred.

In case you cannot find the correct representative, bNovate Technologies customer service in Switzerland (support@bnovate.com) can provide you with a contact address.

9.2 Maintenance schedule

CAUTION!

Obligatory measures for maintaining measuring accuracy and functional efficiency.

Table 9-1 Maintenance schedule

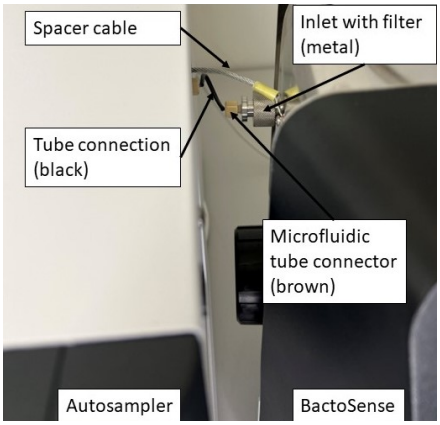
WHEN	WHO	WHAT	PURPOSE
• As needed • Annually	User, Technician during preventive maintenance	Replace: • Filter of the sampling device	Section 9.4
• As needed • Annually	User, Technician during preventive maintenance	Replace: • Teflon plug of the sampling device	Section 9.4
• As needed • Annually	User, Technician during preventive maintenance	Replace: • Desiccant bag	Section 9.6
• Date expired • Cartridge is empty	User	Replace: • Cartridge	⚠ Schedule cartridge change early enough (Section 9.5.3).
• After the use of 3 cartridges • At least annually	Technician	Replace: • Syringe • Valve • Filter module • Drain Channel	
• Every five years	Technician	Replace: • Internal tubing	

9.3 Relocation

The following procedure describes how to move the BactoSense Multi. The first installation will be performed by trained personnel from bNovate or a distributor

Avoid contamination of the sample and instrument

Operators may be a potential source of microbial contamination:
Wear fresh, non-powdered nitrile gloves when handling the samples, sampling device, or any components which come in contact with them.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Power off the BactoSense and autosampler.	
2.	Remove the power cables from the autosampler and the BactoSense	
3.	Remove the RS232 to output pins cable between the autosampler and BactoSense	
4.	Remove the drain tubes from the autosampler and dispose of the contents of the liquid waste container (section 5-2). Optional: Remove the barcode scanner.	
5.	Pay attention to the connection between the autosampler and the BactoSense measurement device, when the BactoSense Multi needs be moved after the installation: The cable between the devices serves as spacer between the BactoSense and the autosampler. For moving the instrument the following steps need to be performed: 1. Microfluidic tube connector (brown) needs to be unscrewed and put into a plastic bag. 2. The spacer cable needs to be removed. 3. Close the inlet with filter with a stopper. 4. Pay attention to the connective tube (Section 9.4).	
6.	Once both instruments are completely disconnected lift the autosampler to the new location keeping both hands under the instrument. Keep the instrument upright.	

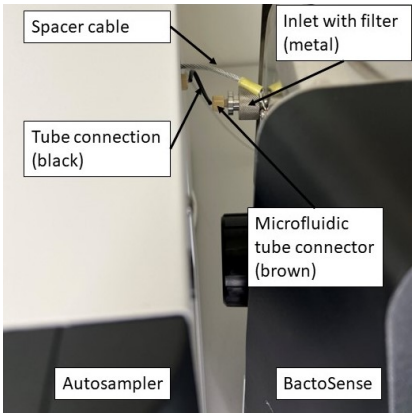
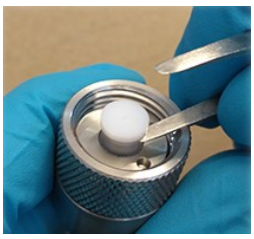
	WORK STEP	ADDITIONAL INFO / IMAGE
7.	Lift the BactoSense at its handle to the new location. Keep the instrument upright.	
8.	Connect both instruments in the following order (also refer to section 5.2): 1. Move the instruments closely together. 2. Reconnect the spacer cable. 3. Remove the stopper, store it in a plastic zip-lock bag and reconnect the microfluidic tube inlet (brown). 4. Restore the D-sub 9 cable (autosampler) to the M16 3-pin (BactoSense) connection. 5. Attach the drain tubes, the liquid waste container and optionally the barcode scanner 6. Reconnect the power supply of BactoSense and the power cable of the autosampler.	
9.	⚠ Power on the instrument and perform a *Fill tubing* protocol (described in section 8.3 & 8.5)	

9.4 Filter replacement in sampling device

The sampling device of the BactoSense contains a 25 µm filter, which can be replaced by the users. bNovate SA recommends performing a filter exchange during the yearly maintenance by a bNovate employee or distributor.

Avoid contamination of the sample and instrument

Operators may be a potential source of microbial contamination:
Wear fresh, non-powdered nitrile gloves when handling the samples, sampling device, or any components which come in contact with them.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Unscrew the microfluidic tube connector (brown) from the inlet screw with filter (metal) at the left side of to the BactoSense and store the microfluidic tube connector in a zip lock bag. Unscrew the remaining inlet screw with filter (metal) from the BactoSense. Pay attention to the connective tube (black). Make small movements.	
2.	Place flat tweezers under the white Teflon plug.	
3.	Remove the Teflon plug and mind the filter. The filter sometimes stays inside the cavity and other times remains attached to the Teflon plug.	

	WORK STEP	ADDITIONAL INFO / IMAGE
4.	Remove the filter and place a new one. Do not use force; let the filter sink with gravity. Do not push the filter inside with tweezers.	
5.	Re-insert the Teflon plug. Be sure to press it until it reaches the bottom. The force of the Teflon plug will press the filter in the right position.	
6.	Re-install the sampling device inlet and subsequently screw in the microfluidic tubing.	

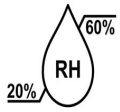
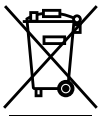
9.5 Cartridge handling

9.5.1 Auto-detection of the cartridge type

Several cartridge types can be ordered with the BactoSense. The BactoSense detects automatically which type is used and adapts its interface accordingly. Each cartridge type contains its own chemistry and produces specific results.

9.5.2 Safety instructions for cartridge handling

When handling the cartridge, the following safety instructions must be followed:

	**Consult the manual.**		**Storage temperature.** Store and ship between 5 °C and 25 °C. The optimal temperature is 15 °C.
	**Wear protective gloves.** Nitrile recommended.		**Storage humidity**. Store and ship between 20 and 60 % RH.
	**Wear protective glasses.**		**To recycle.** Object to recycle.
	**Ship, install and store this way up.**		**No trash.** Don't throw in the trash.

9.5.3 Cartridge exchange

CAUTION!

Avoid exposure of skin and eyes to chemicals.

Leaking chemicals can cause skin irritation, eye damage and other health damage.

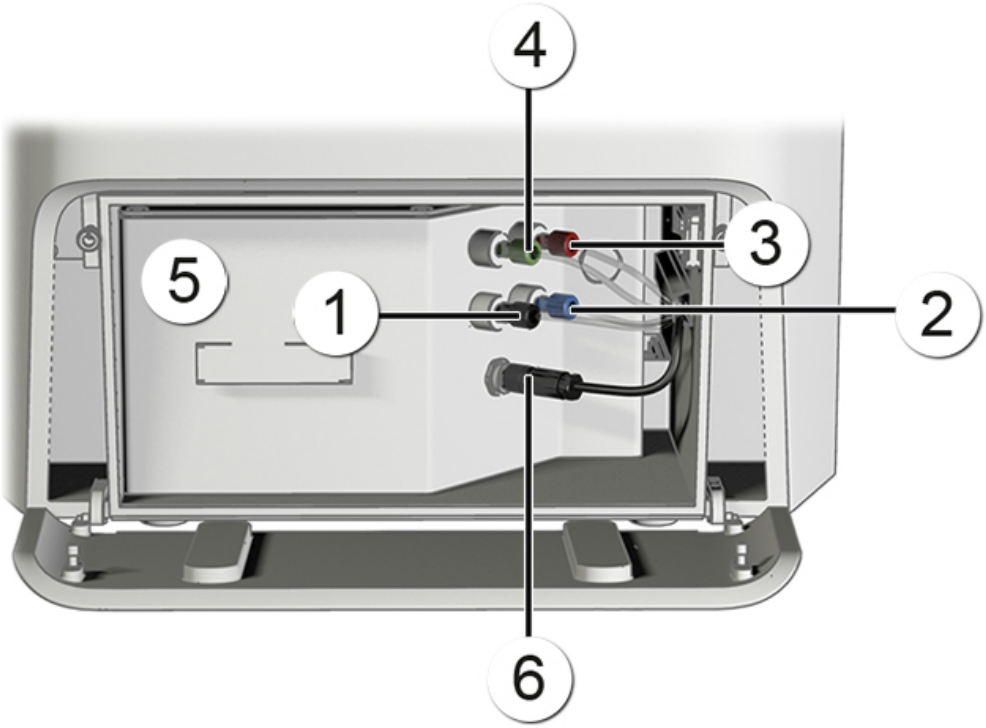
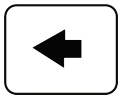
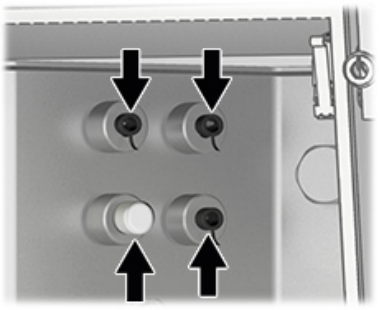


Table 9-2 Cartridge overview

①	Waste fluids connector (black)	②	Rinse fluid connector (blue)
③	Bleach connector (red)	④	Dye connector (green)
⑤	Cartridge	⑥	Electrical connection

The following procedure describes the cartridge change:

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Press the **Home button** to get to the Home menu (Section 6.1).	  ⚠ Press the **Back** button as many times as needed for the **Home** button to appear.
2.	Press the **Maintenance** button.	
3.	Press the **Cartridge change** button. Follow through the first step "Close the door from the cartridge".	
4.	Only when the software instructs you to remove the cartridge, open the screws (circles).	
5.	Open the cartridge cover.	
6.	Follow the instructions on the display. Be sure to seal each connector with a plug in the empty cartridge.	
7.	Close the cartridge cover and fix the screws.	

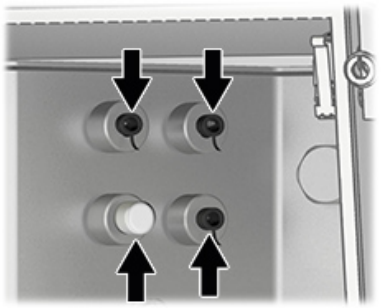
9.5.4 Return the cartridge

Once the cartridge is empty and changed, it should be returned to bNovate Technologies representatives. Follow the procedure described below for the return. Use the original packaging for the BactoSense and Cartridge. If you need new packaging, please contact the bNovate Service Organisation (support@bnovate.com).

CAUTION!

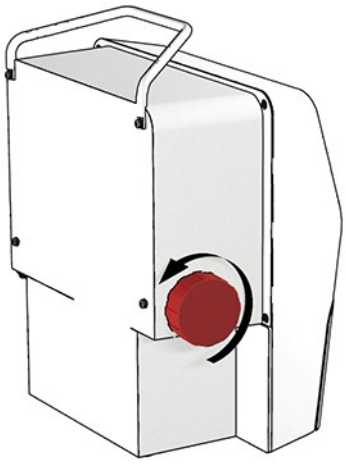
Avoid exposure of skin and eyes to chemicals.

Leaking chemicals can cause skin irritation, eye damage and other health damage.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Execute the cartridge change procedure according to Section 9.5.3.	
2.	Ensure that each connector is sealed with a plug.	
3.	Insert the cartridge in its original cardboard box, held in place using the bottom and top foams.	
4.	Seal the cardboard box and send it to bNovate Technologies representatives.	

9.6 Replace the desiccant bag

The following procedure describes how to replace the desiccant bag:

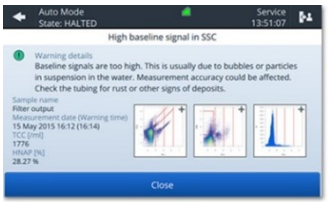
	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Open the desiccant bag access by unscrewing the large cap on the left-hand side of the instrument.	
2.	Replace the used desiccant bag by a new one.	
3.	Close the desiccant bag access by screwing back the large cap.	

10 Error and Warning Messages

If the instrument encounters a problem, it enters a different state, depending on the severity of the issue. There are warnings, noncritical errors and critical errors, each having different implications and requiring different actions.

10.1 Warnings

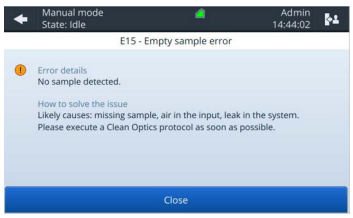
Warnings appear when unusual behaviour is detected during an otherwise successful measurement. They can indicate reduced accuracy of the measurement results or indicate impending errors. Unlike errors, warnings do not prevent the instrument from functioning, but users should pay attention to them as they can indicate sources of inaccuracies.

WARNING	IMAGE
When unusual behavior is detected, a warning is shown next to the measurement results.	

The warning messages are described in detail in the Reference Handbook.

10.2 Non-critical errors

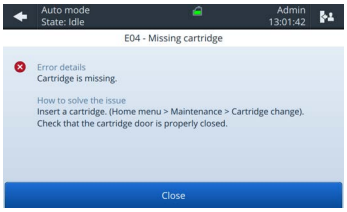
Non-critical errors prevent a measurement from terminating successfully but do not prevent the instrument from running another measurement afterwards. These errors do not require human intervention. Some non-critical errors are promoted to critical errors if they are repeated multiple times.

NON-CRITICAL ERRORS	IMAGE
The protocol stops. The cause of the error is usually fixed by repeating the analysis or waiting. • Another measurement can immediately be started. If it completes successfully, the error state is cleared. • More information on the error can be found in the error log. See section 10.4.	

Non-critical error messages are described in detail in the Reference Handbook.

10.3 Critical errors

Critical errors interrupt the workflows of the instrument and require human intervention. The error source needs to be eliminated and the instrument set to running conditions again. Critical errors need to be cleared.

CRITICAL ERRORS	IMAGE
If a critical error occurs during operation, it has the following effects: • The measurement is cancelled. • The instrument goes into a critical error state, and manual intervention is needed before any new protocol can be launched. • The cause of the error must be solved by an operator. The errors can then be manually cleared from the Error log, as described in sections 10.4 and 10.5.	

Critical error messages are described in detail in the Reference Handbook.

10.4 Error and warning logs

The error and warning log views can be accessed separately through the user interface **Home menu** when pressing the **Logs** button.

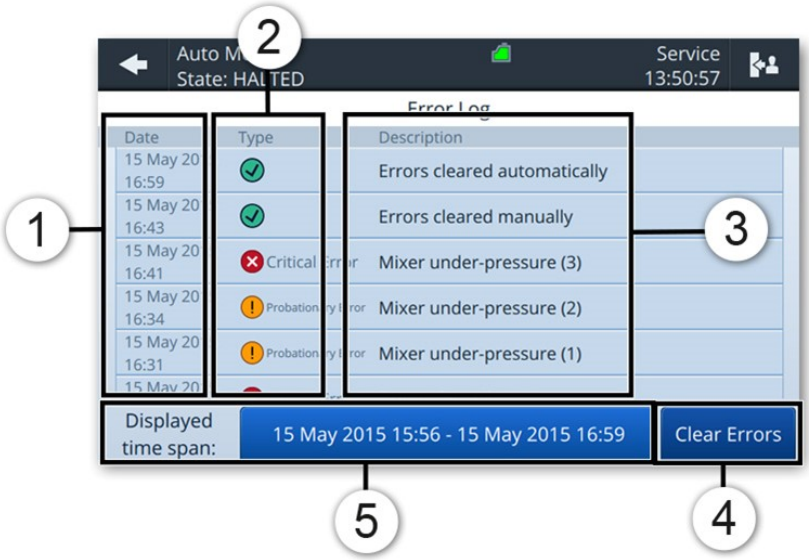


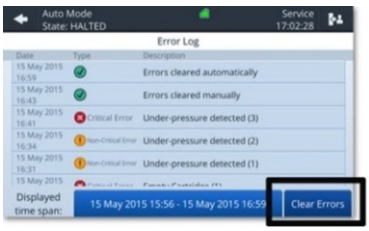
Figure 10-1 : Error logs

①	Date and time of the event	②	Type of the event
			Critical error
			Non-critical error
			Errors cleared
③	Short description of the error or event	④	Button to manually clear errors (only available for **Admin** and **Service** users)
⑤	Date range of displayed events. Click to change the range.		

Selecting any event on the list leads to a page with more information on the cause of the error and recommended resolution steps.

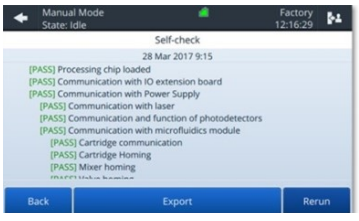
10.5 Clear errors

Critical errors must be cleared manually. Make sure to first solve the origin of the problem, then manually clear the error with the steps below. Please note that the procedure below does not automatically solve the root cause of the error.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Navigate to the **Home menu** of the BactoSense user interface.	
2.	Press the **Logs** button, and then the **Error log** button	
3.	Make sure you have resolved the problem leading to the displayed error(s). Then press the **Clear Errors** button.	
4.	Cleared errors appear with grey error symbols and an “Errors cleared” event is added to the log. The instrument is ready to analyze again.	

10.6 Automatic self-check

The **automatic self-check** tool checks that each component of the BactoSense is functioning correctly and identifies those that are not. It can be used to identify problems with the instrument.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Navigate to the **home menu** of the BactoSense user interface.	
2.	Press the **Maintenance** button.	
3.	Press the **Self-check** button.	
4.	Press the **Run** or **Rerun** button to start the self-check. ⓘ Once execution has terminated, the instrument shows a list of all tests, with a green PASS or red FAIL indicator. Some tests may be skipped: if the system cannot communicate with the cartridge, all the tests that require cartridge communication are skipped.	

11 Troubleshooting

Table 11-1 Troubleshooting actions

DETECTABLE MALFUNCTION	IDENTIFICATION OF MALFUNCTION
Nothing on display	• Check whether the main device is plugged in. • Check whether the supply voltage is present. • Check whether the instrument is switched on.
Error message on the display	• Analyze the error message in accordance with section 10 and the reference handbook.
The measurements appear to be wrong	• Ensure that the sample and operating conditions described in section 3.2 are met. • Check whether the instrument is correctly mounted (section 5, section 9) • Ensure that the servicing duties have been performed according to the servicing schedule (Section 9) • Perform cleaning measures according to cleaning kit instructions and the reference handbook.
Measurement does not start	• Check the green light on the top right corner of the autosampler. If it is off, turn the autosampler on.

If the resolution measures listed here do not provide satisfying results, please consult customer service (section 9).

12 Packaging, transport and disposal

WARNING!

Hazardous media in the returned instrument can harm humans

Instruments that have come into contact with hazardous media (may not be sent without certificate of decontamination (contact support@bnovate.com for more information).

- Precise information on the media must be received by bNovate Technologies in advance in order to take necessary precautions when unpacking the instrument.

Use the original packaging materials for packing the BactoSense products. This includes sending the packed BactoSense on a wooden palette. bNovate Technologies does not take responsibility for deliveries sent differently and will fully charge any resulting repairs. Please contact bNovate Technologies (support@bnovate.com) if the original packaging is no longer available or you need help with repackaging the instrument.

In addition, please note the following:

- Make sure that the cartridge has been removed from the BactoSense and is packaged separately.
- The BactoSense Online must be sent with its manual sampler attached.
- All peripheral devices and accessory parts must be packaged separately and marked with the serial number of the instrument.

12.1 General storage information

Please consider the following storage requirements:

- The system contains electronic, optical and fluidic components. Storage for such components must fulfil the operating and storage conditions. It is important to note that the storage temperature must be between +5 and +40 °C.
- All components that come into contact with the sample during operation have to be cleaned and dried before being stored. A cleaning step with the reagents that are stored within the cartridge is sufficient.
- The measurement equipment with all of the accessory parts must be protected against weather factors, condensing humidity and aggressive gases during storage.

12.2 Cartridge storage

CAUTION!

Avoid exposure of skin and eyes to chemicals.

Leaking chemicals can cause skin irritation, eye damage and other health damages.

CAUTION!

Ensure that all connectors are sealed.

The cartridge has special storage requirements as it contains several critical reagents. Please respect the following points for optimal storage conditions:

- The storage temperature should be between +15 and +25 °C. The optimal temperature is +15 °C.
- The storage relative humidity should be between 20 % and 60 %.
- The cartridge is to be protected from the light
- Guidelines on the cartridge are to be followed.

Pay attention to the expiration date of the cartridge. The expiration date is printed on the handle of the cartridge in the format Day/Month/Year or can be found on the **System info** page of the software (Home/ System info/ Cartridge expiration date).

12.3 Recycling and disposal

Disposal of the BactoSense and its peripheral devices is to be carried out in compliance with regional statutory regulations.

The BactoSense contains no environmentally damaging sources of radiation. The materials listed below should be disposed of or recycled as described in the following table:

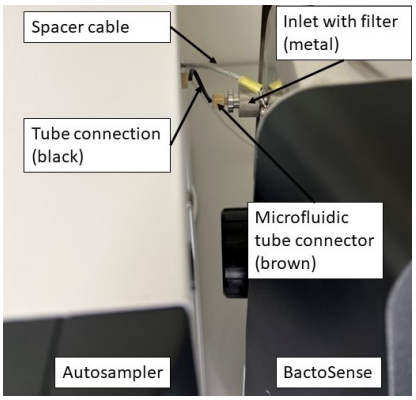
Table 12-1 Materials and their recycling or disposal

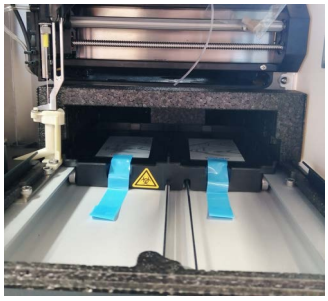
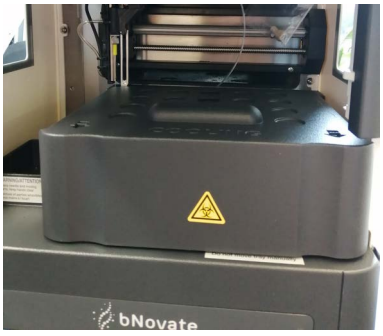
CATEGORY	MATERIALS	DISPOSAL POSSIBILITIES
Packaging	Cardboard, wood, paper	Reuse as packaging material, local disposal points, incineration plants.
	Protective foils, polystyrene shells	Reuse as packaging material, recycling
Electronics	Printed circuit boards, electromechanical components	To be disposed of as electronic waste. Follow the local legislation.
Optics	Glass, aluminum	Recycling via centers for recycling glass and waste metal
Housing	Styrene butadiene painted, stainless steel, polystyrene painted, Silica beads (Desiccant bag), filters	Local disposal centre
Cartridge	⚠ Do not disassemble the cartridge.	Prepare the cartridge according to section 9.5 and return the cartridge with a declaration to bNovate Technologies according to section 12.

12.4 Decommissioning of the BactoSense Multi

The aim of decommissioning is to prepare the instrument properly for storage. It is recommended to follow the following procedures before shipment and transport of the device or before an extended period of non-use.

For disassembly, decommissioning and packing the BactoSense Multi follow these steps:.

	WORK STEP	ADDITIONAL INFO / IMAGE
1.	Perform a combined cleaning step with the cleaning kit solutions (Cleaning Kit Full Sequence; 40208 Cleaning Kit BactoSense Multi)	
2.	Remove the cartridge according to section 9.5 and package the cartridge in the original packaging material.	
3.	Power off the BactoSense with the logout button and the autosampler with the switch at the back of the autosampler. Remove the power supply from the BactoSense and power cable from the autosampler.	
4.	Remove the drain tubes from the autosampler and dispose of the contents of the liquid waste container (section 5-2). Optional: Remove the barcode scanner.	
5.	Unscrew the tube connection (black) with its microfluidic connectors (brown) fully and put it in a clean zip lock bag. Remove the spacer cable from the BactoSense.	
6.	Tape the spacer cable to the side of the autosampler and close the microfluidic connection with a stopper.	

	WORK STEP	ADDITIONAL INFO / IMAGE
7.	Close the microfluidic connection of the BactoSense with a stopper. If you lost the stoppers contact your local service team.	
8.	Exchange the desiccant bag according to section 9.6.	
9.	Open the door of the autosampler. Remove the cooling cover and tape the moving tray down.	
10.	Put the cooling cover back in position and close the door again.	
11.	Tape the door and waste drains.	 
12.	Make sure that the electronic port covers are mounted.Package in the original packaging materials.	

13 Supply scope, accessories and consumables

13.1 Supply scope of the BactoSense Multi

The supply scope of the BactoSense contains everything you need for a smooth operation after unpacking.

Table 13-1 Supply scope for the BactoSense Multi

ART. NO.	NAME	VIEW	VARIANT
200113 200114	**BactoSense Multi System** Includes: Cytometer with 110-240 V, 50/ 60 Hz Power Supply, Autosampler with Tray, Waste Container, Communication Cable BactoSense - Autosampler and Power Cable, Cartridge (TCC or ICC), Cleaning Kit, Tube Adapters 7 mm hex nut Screwdriver, 10 ml sterile vials for autosampler (set of 100), Operator Manual (EN), Packaging		2001113 with TCC Cartridge 200114 with ICC Cartridge

13.2 Optional accessories

These accessories can be ordered upon need, for example if you need spare parts. bNovate Technologies recommends to order a second cartridge with your instrument in order to have a replacement cartridge when required.

Table 13-2 Optional accessories for the BactoSense Multi

ART. NO.	NAME	VIEW	VARIANT
200048 200049 200050	Power supply BactoSense		200048 CH plug 200049 EU plug 200050 UK plug
200017	Cartridge TCC		
200053	Cartridge ICC		
200129	Instruction Manual BactoSense Multi		English
200121	Tray Autosampler Tray for 30 vials		
200124	Barcode reader USB barcode and QR code reader		
200123	Waste Container Collects waste and condensed water from the autosampler		Waste Container only
200130	Tubing autosampler to waste container		2x 1m tubing + 2x union T
200061	Packaging BactoSense		
200128	Packaging Autosampler		

13.3 Consumables

Available consumables are listed below. They can be ordered through your local sales team.

Table 13-3 Consumables of the BactoSense Multi

ART. NO.	NAME	VIEW	VARIANT
200068	Screw Cap Vials 10 ml sterile vials for Autosampler (100 Pcs)		
200023	Desiccant bag		
200025	Set of 5 filters 316L – 25 µm		
200083	Cleaning kit		
200019	Refill TCC cartridge		
200054	Refill ICC cartridge		
200122	Validation kit		

14 Index

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