MINIFOR 2 BIO

Compact laboratory fermenter

USER MANUAL

Revision 1/2023

1 TECHNICAL DESCRIPTION

1.1 TECHNICAL PARAMETERS

POWER SUPPLY	Universal power supply for mains 100-240 V AC/50-60Hz, 400W, CE conform Fused 5 x 20 F2A
DIMENSIONS	220 x 444 x 350-550 cm (W x D x H)
ARCHITECTURE	Dual microprocessor technology MIPS 120 MHz ARM 1 GHz Dual-Core
OPERATING MEMORY (RAM)	2 GB
INTERNAL MEMORY (NON-VOLATILE)	8 GB, (4GB available for process or user data saving)
DISPLAY	7“ TFT IPS with resolution 1024x600 and capacitive touch panel
FERMENTOR VESSEL	Pyrex glass with 6 to 8 side necks; 0.3, 0.4, 1, 3, 7 liter vessels
TEMPERATURE CONTROL	High efficiency 150 W infrared (IR) radiation heat source with gilded parabolic reflector
Regulation	from 5°C to 60°C
Measurement	from 0 to 99.9°C in 0.1°C steps
Sensor	Pt 100 incorporated in the glass electrode of the pH probe (analog combined pH probes or digital probes)
Control type	Fixed value, profile or cascade control

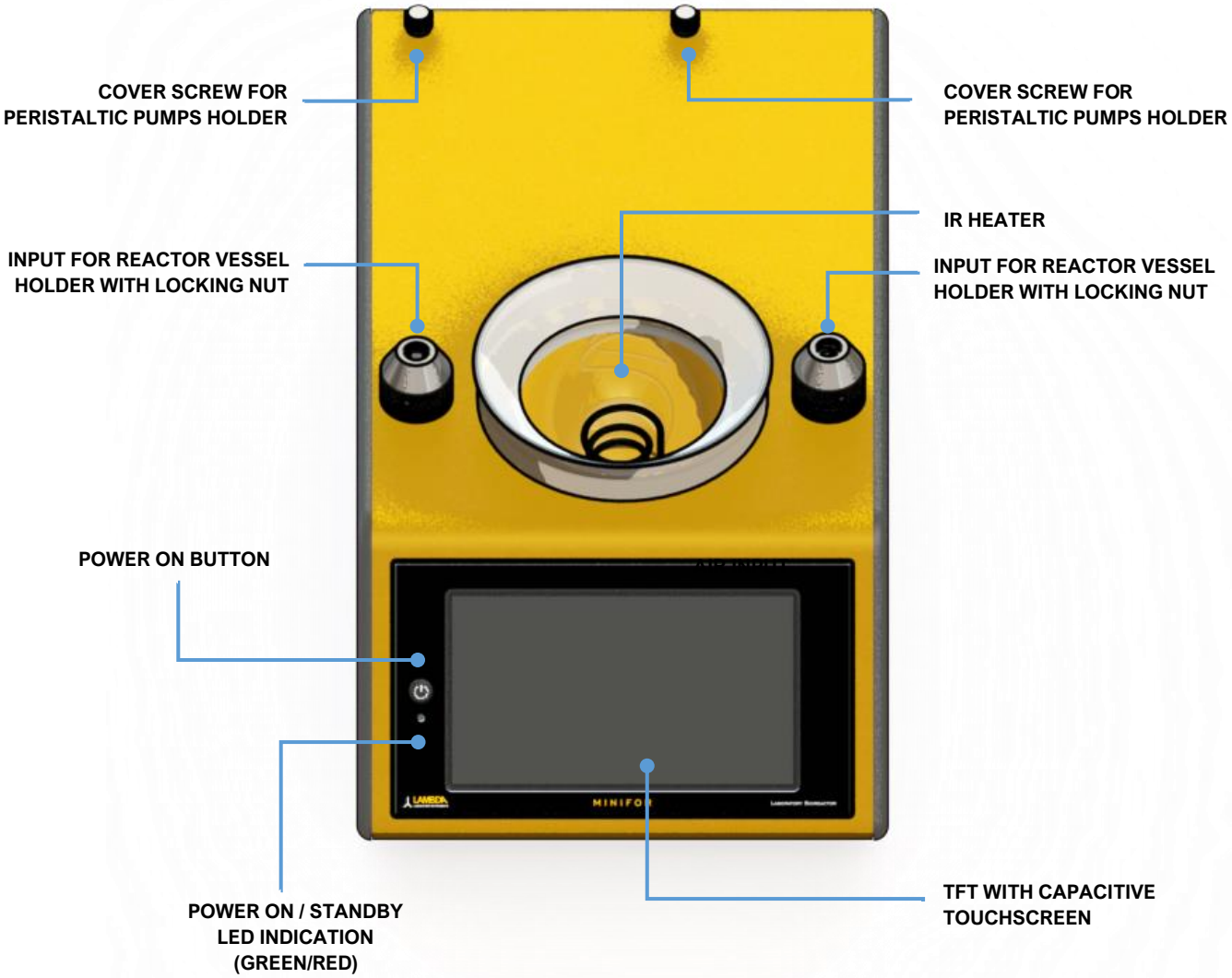
PH CONTROL	sterilisable pH electrode pH 0-14 with automatic temperature correction, two-point calibration and Variopin connector or digital probe ARC
Range	0.00 to 14.00 pH unit
Resolution	0.1, 0.01 or 0.001 pH unit (adjustable)
Analog probe types	Analog sterilisable Mettler Toledo/Hamilton Bonaduz AG with Pt 100 temperature sensor or similiar with Variopin 8 connector
Digital probe types	Bonaduz AG ARC technology with Varionpin 8 connector
Calibration	two-points with automatic temperature compensation (with analog combined probe connector data stored inside – moveable to other MINIFOR 2 BIO unit)
Precision	+/- 0.02 pH unit
Offset	up to 0.5 pH unit (adjustable)
Regulation	Needs two peristaltic pump for ACID and BASE type PRECIFLOW
Regulation dead zone	from ± 0.05 to ± 0.2 pH unit (adjustable)
Control type	Fixed value, profile or cascade control
PO2 CONTROL	sterilisable Clark type oxygen sensor with fast response, automatic temperature correction, two-point calibration, dissolved oxygen (DO) control through regulation of the airflow rate or cascade controller
Range	0 to 25 mg oxygen/ l, in 0.1 mg/l steps 0 – 100% saturation (adjustable units)
Resolution	0.1, 0.01 or 0.001 (adjustable)

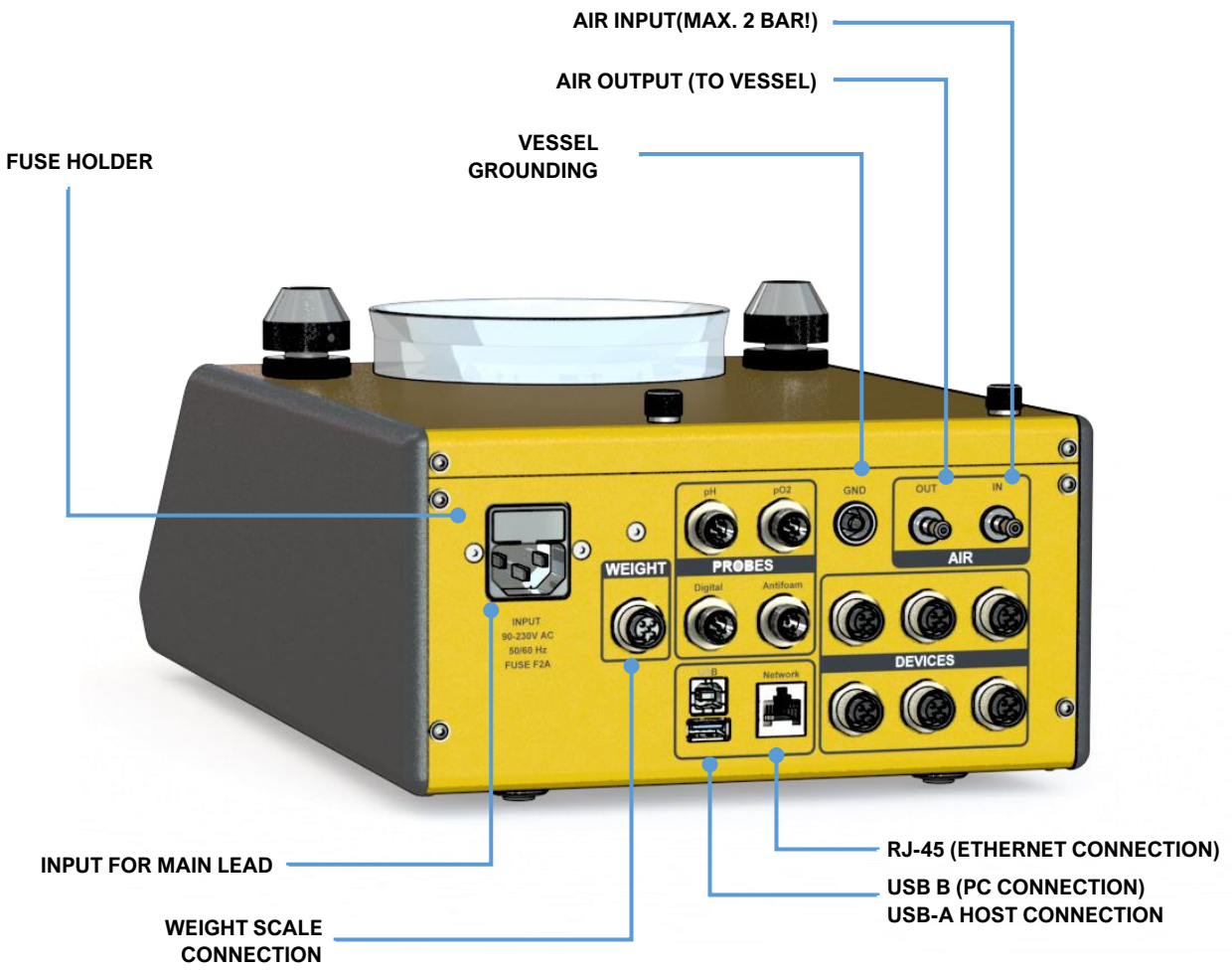
Analog probe type	LAMBDA sterilisable Clark type oxygen sensor with fast response
Digital probe type	Bonaduz AG ARC technology (clark type or optical)
Calibration	two-points (automatic parameters calculation inside)
Control type	fixed value, profile, cascade or direct pO2 regulator
Regulation	Air flow regulator only or cascade control (air flow, agitation and optionally O_2 MASSFLOW
AIR FLOW CONTROL	Internal proportional special needle valve
Range	from 0 to 5.00 L/min with 0.01 steps
Linearity	0.0025 L/s minimal step change for stable linear ramps or gradients
Measure precision	± 0,125 L/min
Pressure	from 0.5 to 2 Bar
Control type	fixed value, profile, cascade or direct pO2 regulator
AGITATION CONTROL	Up-and-down agitation unit
Range	from 0.0 to 20.0 Hz in 0.1 steps
Control type	fixed value, profile or cascade control
Motor	50W BLDC type sensored
Connection	Magnetic coupling with moving axis
Mixing	one or more special fish-tail discs
PORTS / SIDE NECKS	One large quadruple sampling or additions port with four needles with LAMBDA PEEK double-seal connections, used for sampling, inoculation, antifoam, feeds, harvest, addition of correction solutions etc., additional double ports are available.

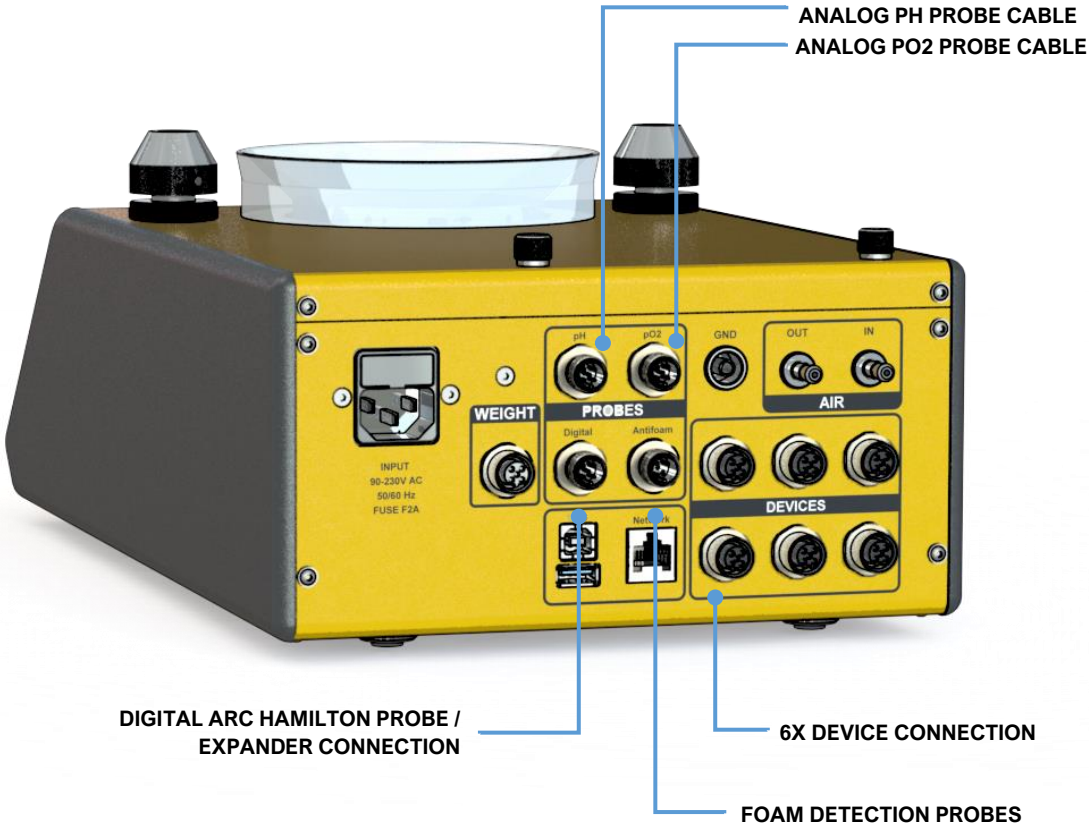
ACTIVE PERIPHERALS (DEVICES)	Device managed by internal software manager
Pumps	PRECIFLOW, HIFLOW, MAXIFLOW, MEGAFLOW
Gas flow regulators	MASSFLOW 500, MASSFLOW 5000
Gas flow meters	OXYMETER, CARBOMETER, METHANMETER
Compressors	AEROSILENTO
Balance	BALANCE 20
OPERATING ENVIRONMENT	
Temperature	0 – 40 °C
Humidity	0 – 90%, without condensation
Weight	6 kg
INTERFACE	USB 1.1/2.0 type B (PC control) USB 1.1/2.0 type A (Host) for data export or software updates LAN Optionally WiFi
COMMUNICATION PROTOCOL	All data transfer in realised in JSON text format (commands, data in/out)
PC SOFTWARE	Software application MIRETO for online monitoring, manage and data download
OPERATING SYSTEM	Embedded linux Buildroot
SOFTWARE LICENSE	Graphic user interface and application server is developer under LGPLv3 license of Qt Library 5.13.1. The library source code and access to systém will be provide on request with additional information.
CONFIRMITY	DIRECTIVE 2014/30/EU

TECHNICAL STANDARDS	DIRECTIVE 2014/35/EU
	EN 61326-1:2013
	EN 61010-1:2010/A1:2019/AC:2019-04

1.2 DEVICE DESCRIPTION




AIR INPUT(MAX. 2 BAR!)
AIR OUTPUT (TO VESSEL)
VESSEL GROUNDING
FUSE HOLDER
INPUT FOR MAIN LEAD
WEIGHT SCALE CONNECTION
RJ-45 (ETHERNET CONNECTION)
USB B (PC CONNECTION)
USB-A HOST CONNECTION
pH
pO2
GND
OUT
IN
AIR
WEIGHT
PROBES
Digital
Antifoam
DEVICES
Network
INPUT
90-230V AC
50/60 Hz
FUSE F2A


ANALOG PH PROBE CABLE
ANALOG PO2 PROBE CABLE
DIGITAL ARC HAMILTON PROBE / EXPANDER CONNECTION
6X DEVICE CONNECTION
FOAM DETECTION PROBES
pH
pO2
GND
OUT
IN
AIR
WEIGHT
PROBES
Digital
Antifoam
DEVICES
INPUT
90-230V AC
50/60 Hz
FUSE F2A

2 Safety for installation, operating, cleaning, maintenance and storage

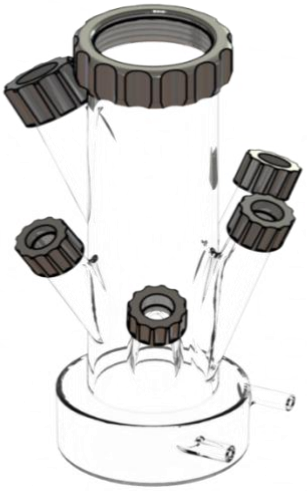
3 USABLE REACTOR VESSELS

Minifor2Bio works with original glass bottles (reactors) with a volume from 350 ml to 7 liters. The glass bottles of the reactor bring the possibility of visual inspection of the medium inside and all other components used.

3.1 VESSEL SIZES

VESSEL VOLUME	up to 350 ml
PORTS	5x Pyrex 22 1x Pyrex 30
NOTE	needs additional liquid volume present in separated section

350 ml



VESSEL VOLUME	up to 400 ml
PORTS	7x Pyrex 22 1x Pyrex 300
NOTE	

400 ml

VESSEL VOLUME	up to 1000 ml
PORTS	7x Pyrex 22 1x Pyrex 300
NOTE	

1000 ml

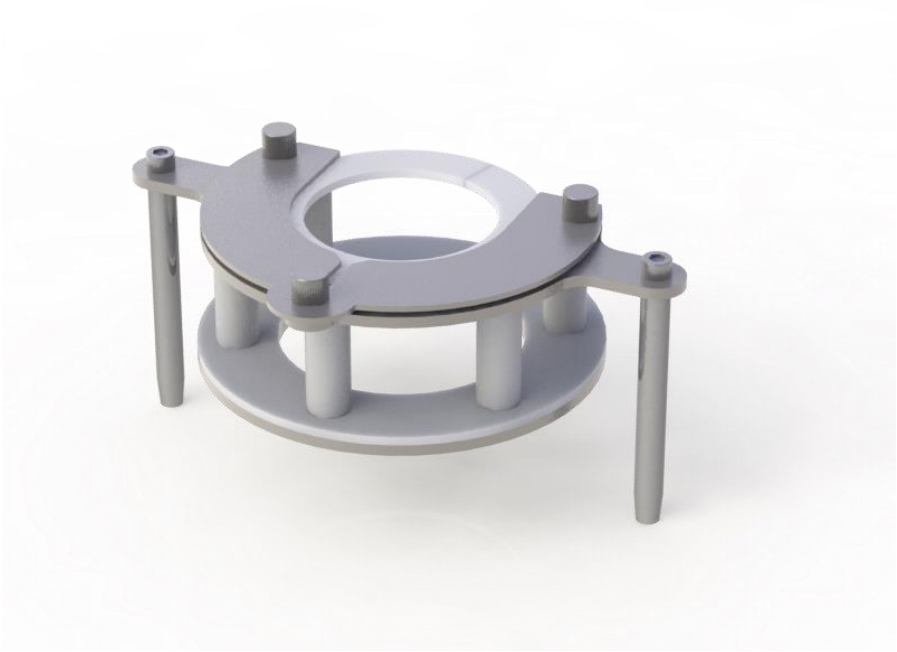
VESSEL VOLUME	up to 3000 ml
PORTS	7x Pyrex 22 1x Pyrex 300
NOTE	

3000 ml

VESSEL VOLUME	up to 7000 ml
PORTS	7x Pyrex 22 1x Pyrex 300
NOTE	

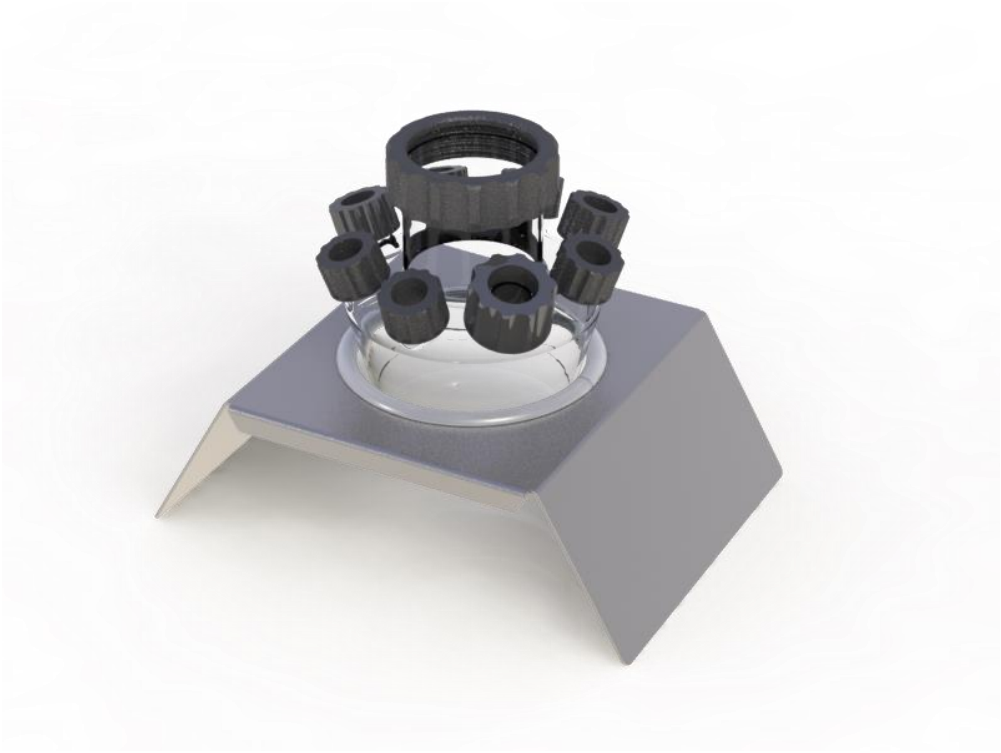
7000 ml

3.2 VESSEL HOLDERS AND STANDS

VESSEL	350 ml
HOLDER	

VESSEL	**400 ml**
HOLDER	

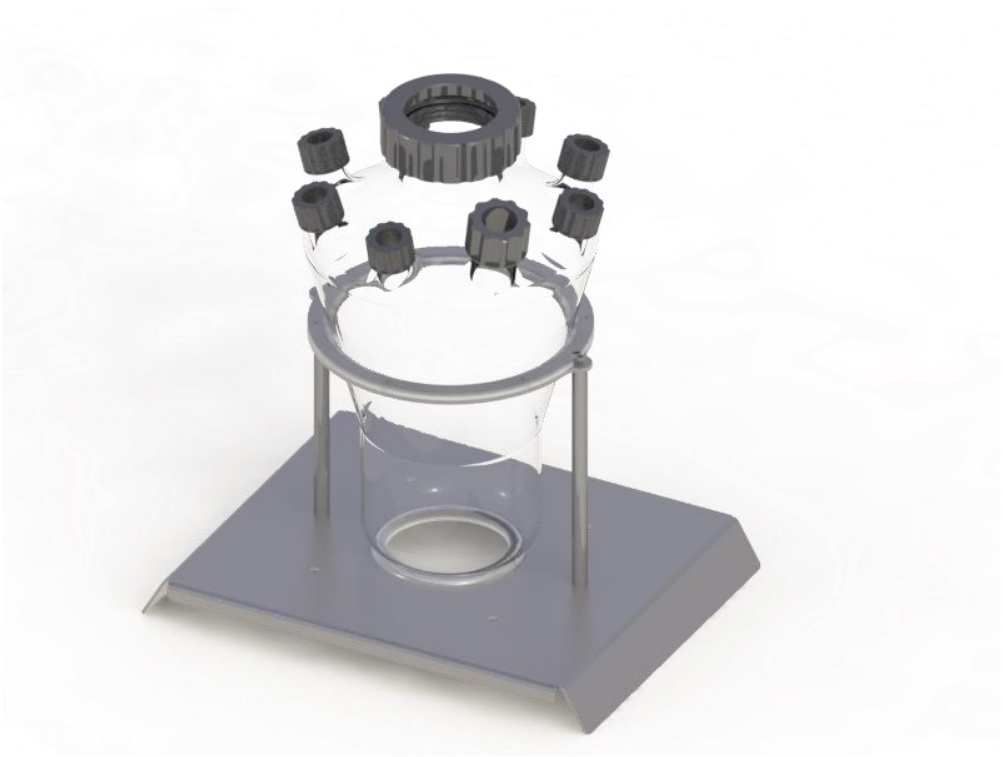
STAND



VESSEL

1000 / 3000 ml

HOLDER

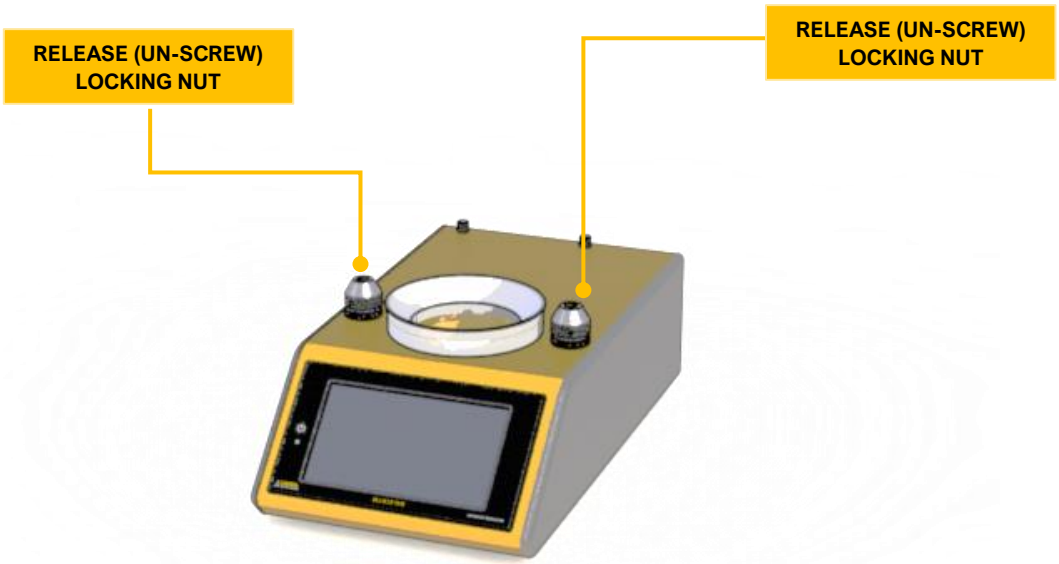
STAND	
VESSEL	**7000 ml**

HOLDER

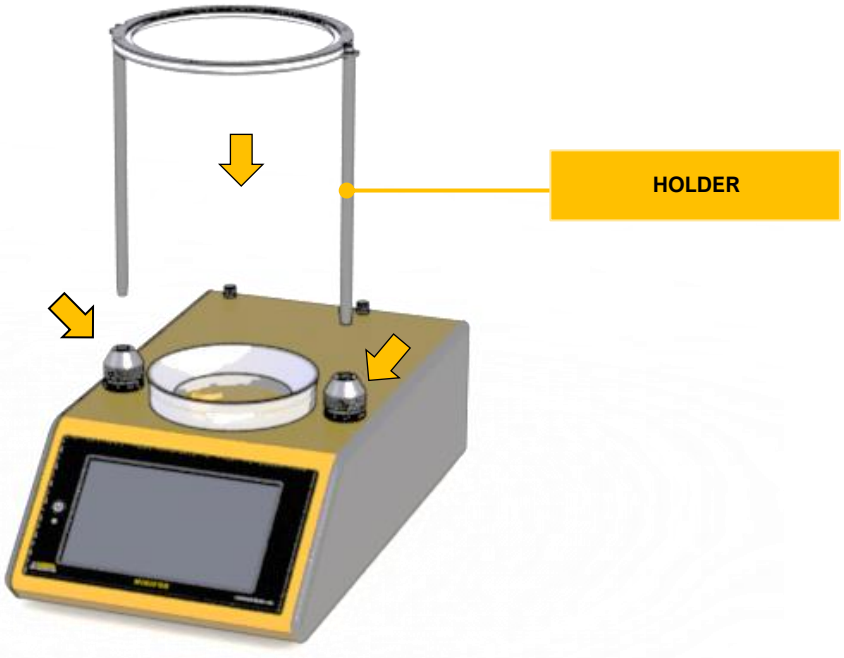
STAND

3.3 VESSEL INSTALLATION

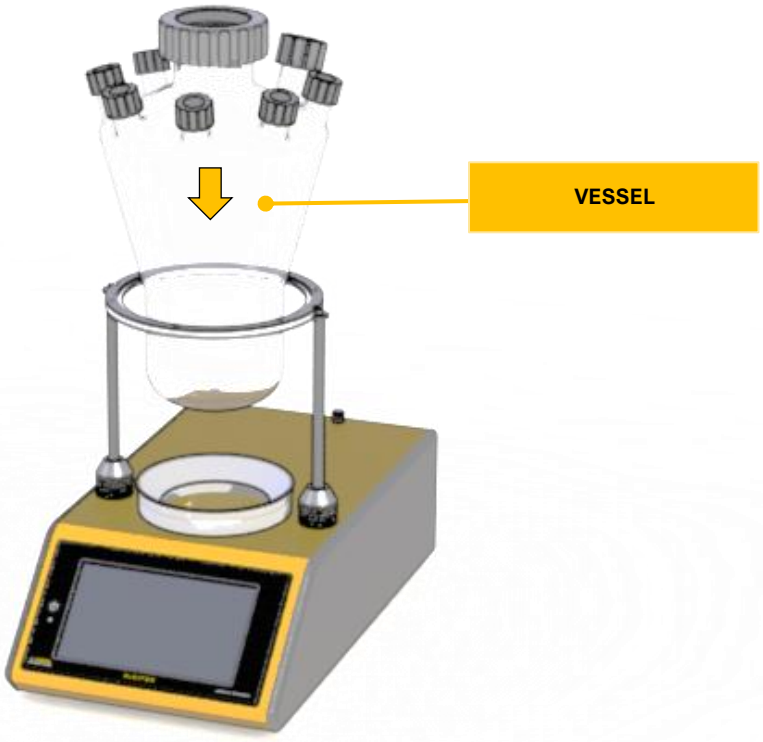
STEP 1	Release (unscrew) holder fixation nuts. Do it by hand, alternative use tool.



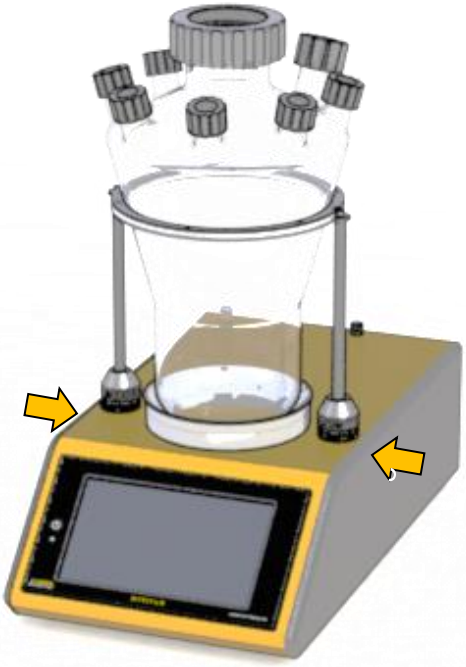
STEP 2	Use the **appropriate** holder for the installed vessel size. Insert the holder bars into the released locking nut. Before installation do not tighten the locking nuts.



STEP 3	Insert the vessel into the holder. Place the lower part of the vessel on the silicone ring of the IR emitter. While inserting the bottle, adjust the position of the holder so that it sufficiently fixes the vessel.



STEP 4	Tighten the locking nut. Use special tool.



4 ANALOG PROBES

Minifor2Bio allows you to use analog probes from Mettler Toledo or Hamilton AG to measure pH, temperature, ORP and pO2. For connection, use the adapter for analog probes included in the package. The adapter stores the calibration data and therefore it is possible to exchange this adapter including the probe between individual devices.

4.1 PROBE SUPPORT LIST

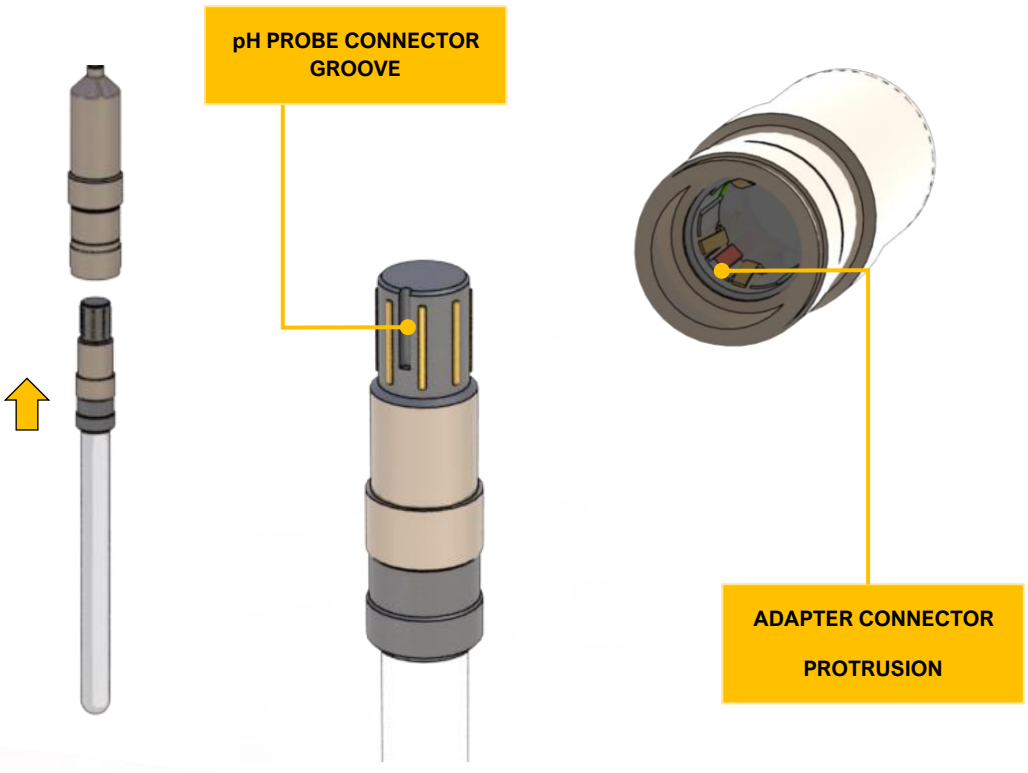
MEASURE TYPE	CONNECTOR	VENDOR	VENDOR ID
pH, temperature (combined)	VP8	Metler Toledo	Mettler InPro 3253SG/.../Pt100
pH, temperature, ORP (combined)	VP8	Metler Toledo	Fill concrete model description!!!
pH, temperature (combined)	VP8	Hamilton AG	Fill concrete model description!!!

4.2 PROBE INSTALLATION

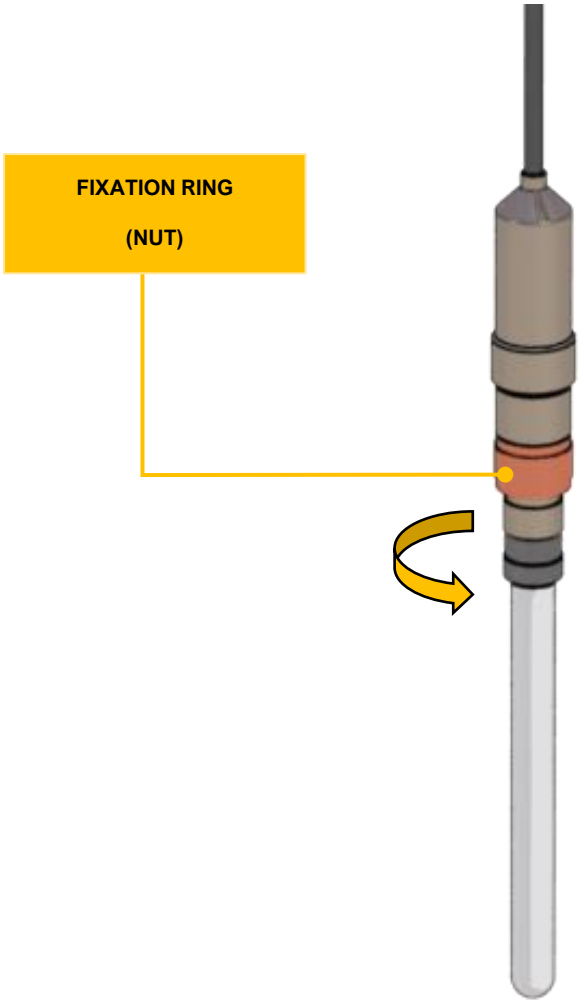
The Minifor2Bio package includes a connection adapter for measuring pH analog probes. This adapter connects to the corresponding connector on the back of the device.

STEP 1	Connect the adapter to the connector in section “**Probes**” on the back of the device marked "**pH**".

STEP 2	Connect an analog probe equipped with a VP8 connector, model from the "**Probe support list**". Rotate the probe so that the groove of the VP8 connector on the probe is in the correct position with the protrusion inside the connector.



STEP 3	Secure the probe by tightening the nut. **Attention!** Turn only the ring marked in the picture and at the same time insert the probe into the connector (clockwise)



5 DIGITAL PROBES

The device is equipped with an interface for connecting and measuring various parameters using digital probes from Hamilton AG, ARC technology.

ARC technology is built on the RS 485 interface with the MODBUS RT protocol. To use digital probes, it is necessary to set the parameters of the RS 485 communication channel.

5.1 RS 485 PARAMETERS

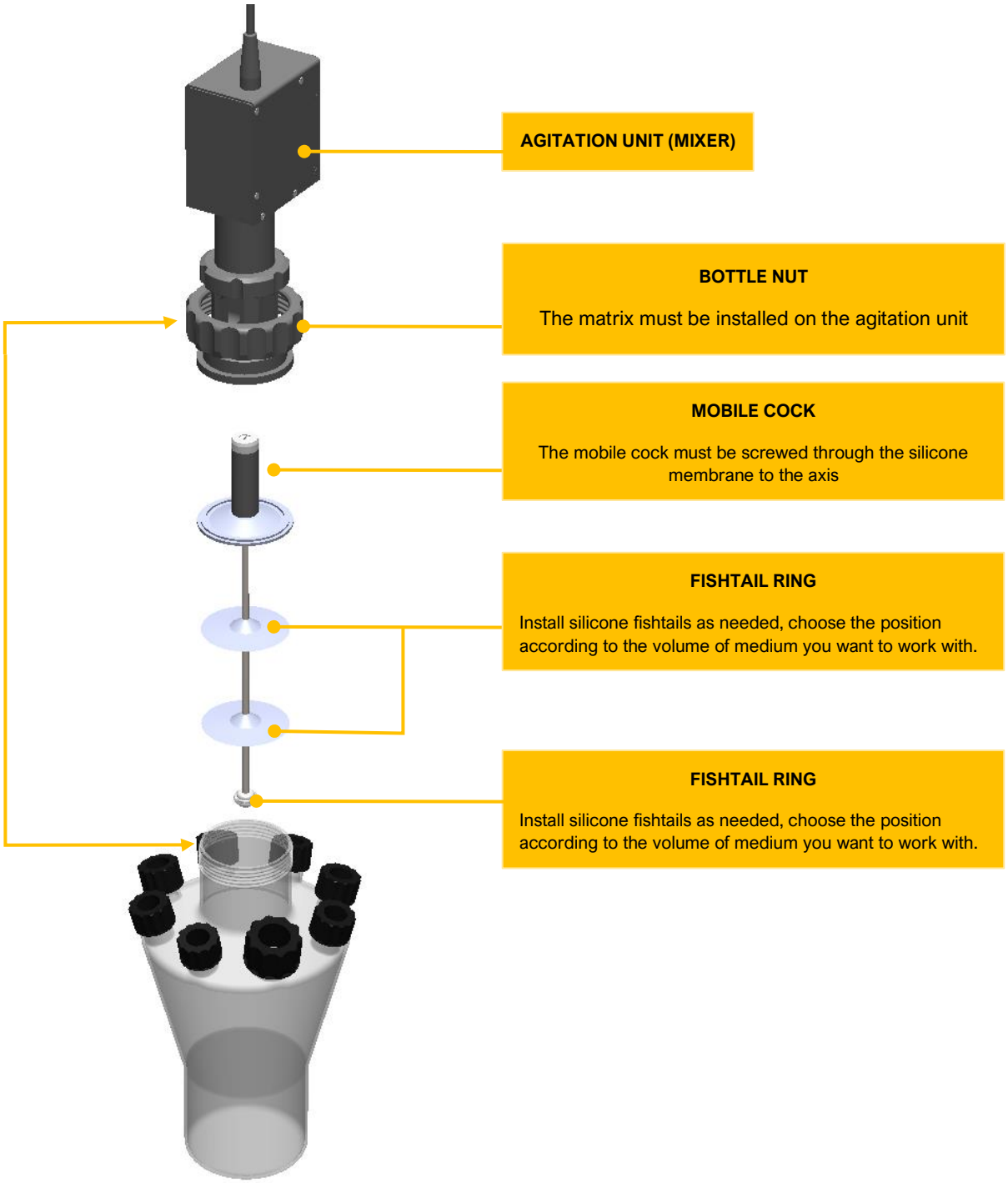
PARAMETER	DEFAULT	AVAILABLE
Baudrate	19200	19200 38400 57600 115200
Parity	None	None Odd Even
Stop bits	2	0 1 2

5.2 PROBE INSTALLATION

For connection, use the cable intended for this purpose and connect it to the "Digital" connector on the back panel of the device.

6 AGITATION

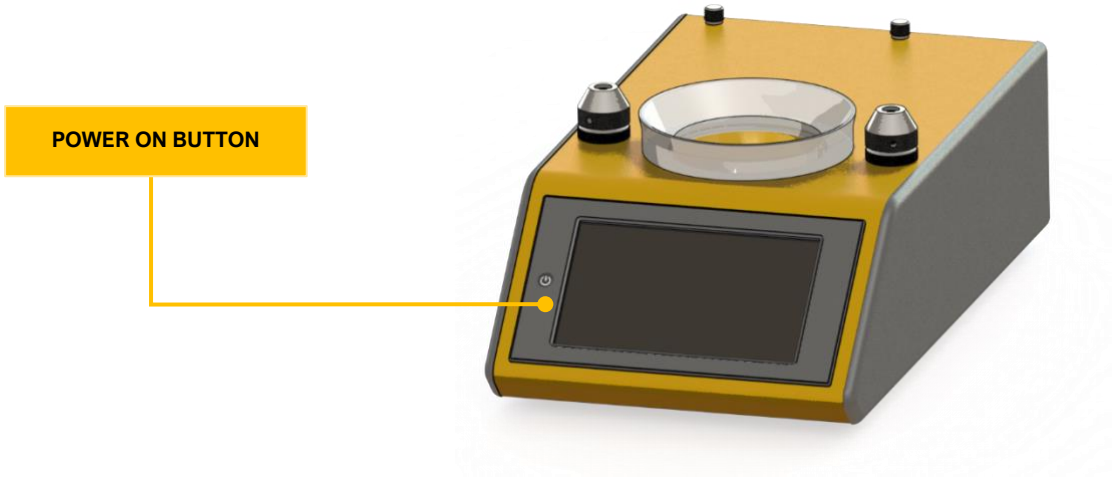
6.1 MIXER UNIT INSTALATION



7 SWITCHING THE DEVICE ON AND OFF

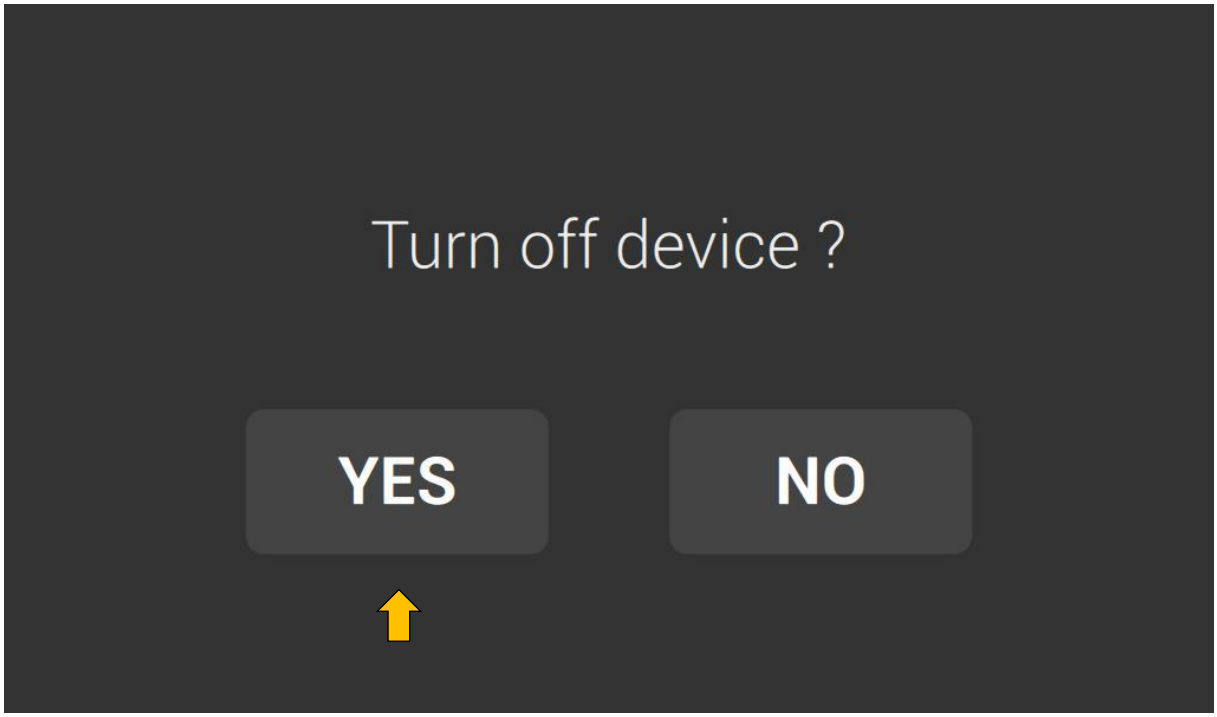
7.1 POWER ON

Connect the device by main lead to electrical network. The red LED indicator next to the display lights up red and the device is in standby mode. Press and hold power button for 1 second and release. Minifor2bio will start and the indicator light will light up green.



7.2 POWER OFF

To turn off the device, first make sure that the minifor2bio is in the STOP operating mode (the fermentation process is not in progress). If minifor2bio is in STOP operating mode, press and hold the power button. The screen will ask you to confirm the shutdown. If you confirm by tapping the "YES" button, minifor2bio will exit and turn off. After successful shutdown, the red indicator LED lights up (standby mode).



8 OPERATING MODES

Minifor2Bio is equipped with two operating modes **STOP** and **RUN**. In the **STOP** operating mode, all regulators, profiles, cascades, peristaltic pump controllers and the like are stopped. This state serves to prepare the device for the fermentation process, or to interrupt the fermentation process. In the **RUN** operating mode, minifor2bio processes all preset requests.

The current operating mode is indicated by the color of the **HOME** button at the bottom of the screen.

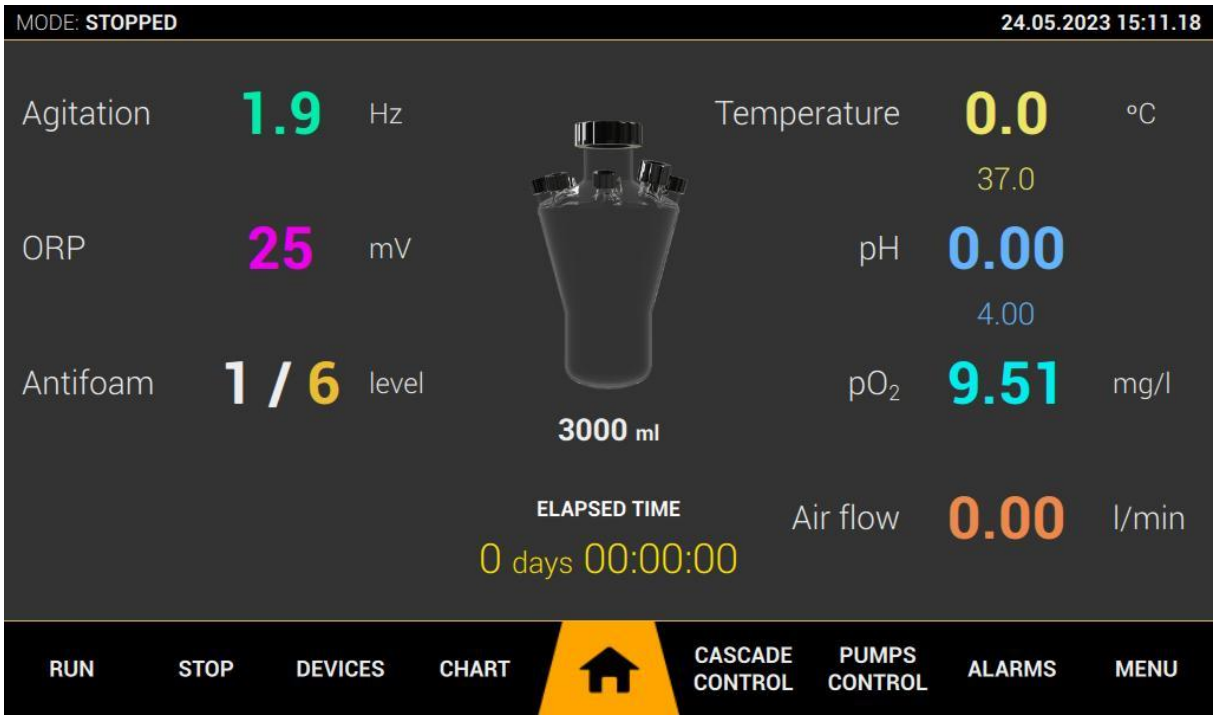
STOP

RUN

Some settings can only be made in the STOP operating state. Current operating mode is indicated on left top corner of display too.

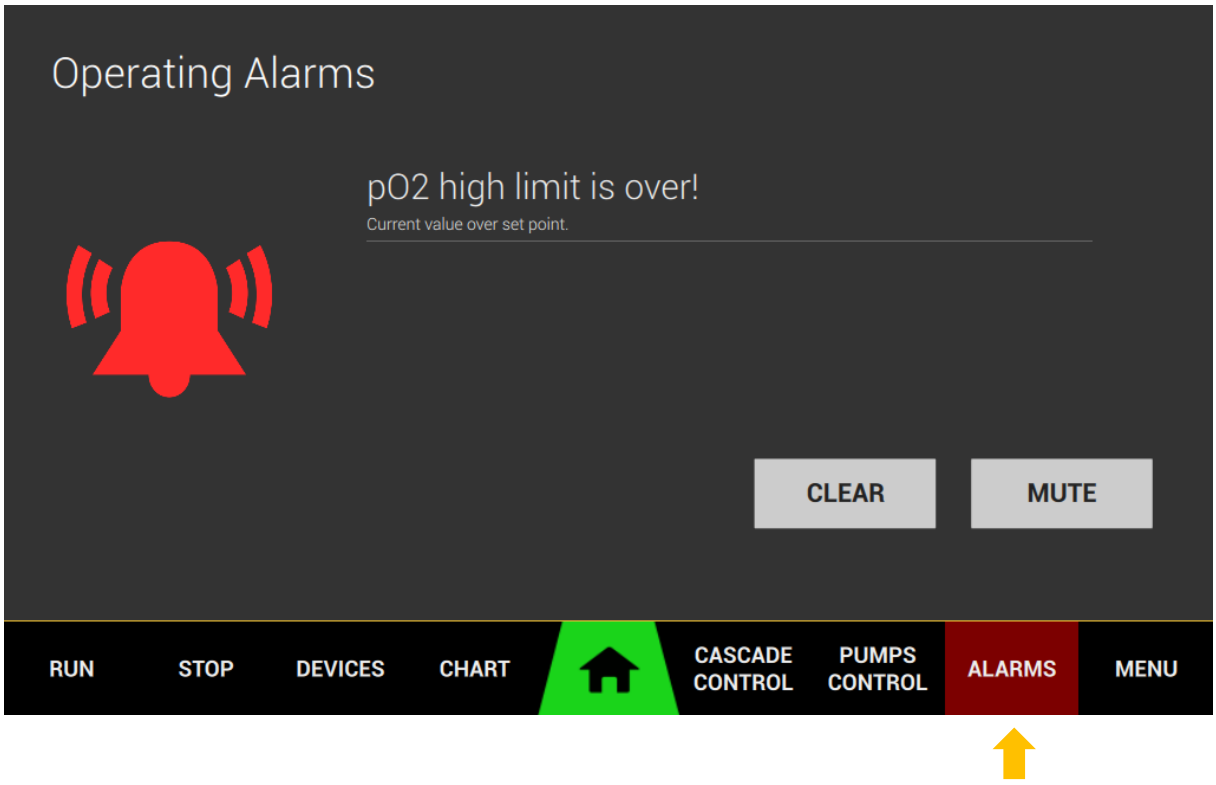
8.1 CHANGE OPERATING MODE

The Minifor2Bio operating mode can be changed by tapping the **RUN** or **STOP** button on the main screen.



9 ALARMS

The alarm screen contains a list of active alarms. The system monitors the status of user-defined and system alarms. To display the alarms screen, tap the **HOME** button and the main menu item **ALARMS**. Active alarms is indicate by flashing item **ALARMS** in main menu.



Alarms are issued only in the RUN operating state.

9.1 DISCARD ALARM

Alarms announced during an active fermentation process (in RUN mode) can only be canceled after the problem has been eliminated. Alarms can be canceled by tapping the **CLEAR** button.

9.2 MUTE ALARM

Active alarms can be set to mute mode by tapping the **MUTE** button. Acoustic alarm signaling will be suppressed for 120 seconds. This time can be used, for example, to correct the set values of user alarms.

9.3 USER ADJUSTABLE ALARMS

ALARM NAME	ALARM DESCRIPTION
pO2 high limit is over!	The preset high alarm limit value for pO2 has been exceeded. The limit value can be set in the pO2 concentration control settings.
pO2 low limit is over!	The preset low alarm limit value for pO2 has been exceeded. The limit value can be set in the pO2 concentration control settings.
PH high limit is over!	The preset high alarm limit value for pH has been exceeded. The limit value can be set in the pH control settings.
PH low limit is over!	The preset low alarm limit value for pH has been exceeded. The limit value can be set in the pH control settings.
Temperature high limit is over!	The preset high alarm limit value for pH has been exceeded. The limit value can be set in the temperature control settings.
Temperature low limit is over!	The preset low alarm limit value for pH has been exceeded. The limit value can be set in the temperature control settings.
Air flow high limit is over!	The preset high alarm limit value for pH has been exceeded. The limit value can be set in the air flow settings.
Air flow low limit is over!	The preset low alarm limit value for pH has been exceeded. The limit value can be set in the air flow settings.
ORP high limit is over!	The preset high alarm limit value for pH has been exceeded. The limit value can be set in the ORP settings.
ORP low limit is over!	The preset low alarm limit value for pH has been exceeded. The limit value can be set in the ORP settings.

Weight scale high limit is over!	The preset high alarm limit value for pH has been exceeded. The limit value can be set in the weight settings on basic screen.
Weight scale low limit is over!	The preset low alarm limit value for pH has been exceeded. The limit value can be set in the weight settings on basic screen.

9.4 OPERATING ALARMS

ALARM NAME	ALARM DESCRIPTION
Gas flow error!	No gas flowing from beginning attempt. Check gas connection on rear panel.
Gas flow error!	Target set point cannot be reached. Check tubing and input gas pressure.
Heating area is flooded!	Area of IR heater with heating coil contains liquid! Clear this area. **Attention! Be careful if the situation occurred during fermentation, the heating coil can be up to 300°C.**

9.5 PERIPHERALS (DEVICES) ALARMS

ALARM NAME	ALARM DESCRIPTION
Mixer unknown error!	Mixer has not identified error. Try disconnect and newly connect mixer to Minifor2Bio. If problem remains, contact service centre.
Mixer absolute maximum current over (1)!	The absolute maximum permissible motor current has been exceeded. Check the connection of the mixer to the reactor vessel and the associated agitation accessories.
Mixer motor pwm maximum over! (2)	Motor regulator reached maximal allowed pwm value.
Mixer motor maximum current over (3)!	The maximum permissible motor current has been exceeded. Check the connection of the

	mixer to the reactor vessel and the associated agitation accessories.
Mixer motor maximum current over (4)!	The maximum permissible motor current has been exceeded. Check the connection of the mixer to the reactor vessel and the associated agitation accessories.
Pump unknown error!	Pump has not identified error. Try disconnect and newly connect mixer to Minifor2Bio. If problem remains, contact service centre.
Pump absolute maximum current over (1)!	The absolute maximum permissible motor current has been exceeded. Check the connection of the mixer to the reactor vessel and the associated agitation accessories.
Pump motor pwm maximum over! (2)	Motor regulator reached maximal allowed pwm value.
Pump motor maximum current over (3)!	The maximum permissible motor current has been exceeded. Check the connection of the mixer to the reactor vessel and the associated agitation accessories.
Pump motor maximum current over (4)!	The maximum permissible motor current has been exceeded. Check the connection of the mixer to the reactor vessel and the associated agitation accessories.
Dozito unknown error!	Dozito has not identified error. Try disconnect and newly connect mixer to Minifor2Bio. If problem remains, contact service centre.
Dozito safety timer left!	Dozito not reached dose end point to absolute time limit. The timer protects the dozito from damage. Check dozito setup end points by mechanical screw, or check syringe load.
Dozito maximal force limit over!	Dozito has reached the maximum force that can be applied to the syringe plunger or the syringe is empty. Check syringe state.
Massflow unknown error!	Pump has not identified error. Try disconnect and newly connect mixer to Minifor2Bio. If problem remains, contact service centre.

Massflow fuse time over!	No gas flowing from beginning attempt. Check gas connection on rear panel.
Massflow cannot reach setpoint!	Target set point cannot be reached. Check tubing and input gas pressure.
Massflow sensor error!	Mass flow sensor not responding. Try power off and power of the Massflow. If problem remains, contact service centre.

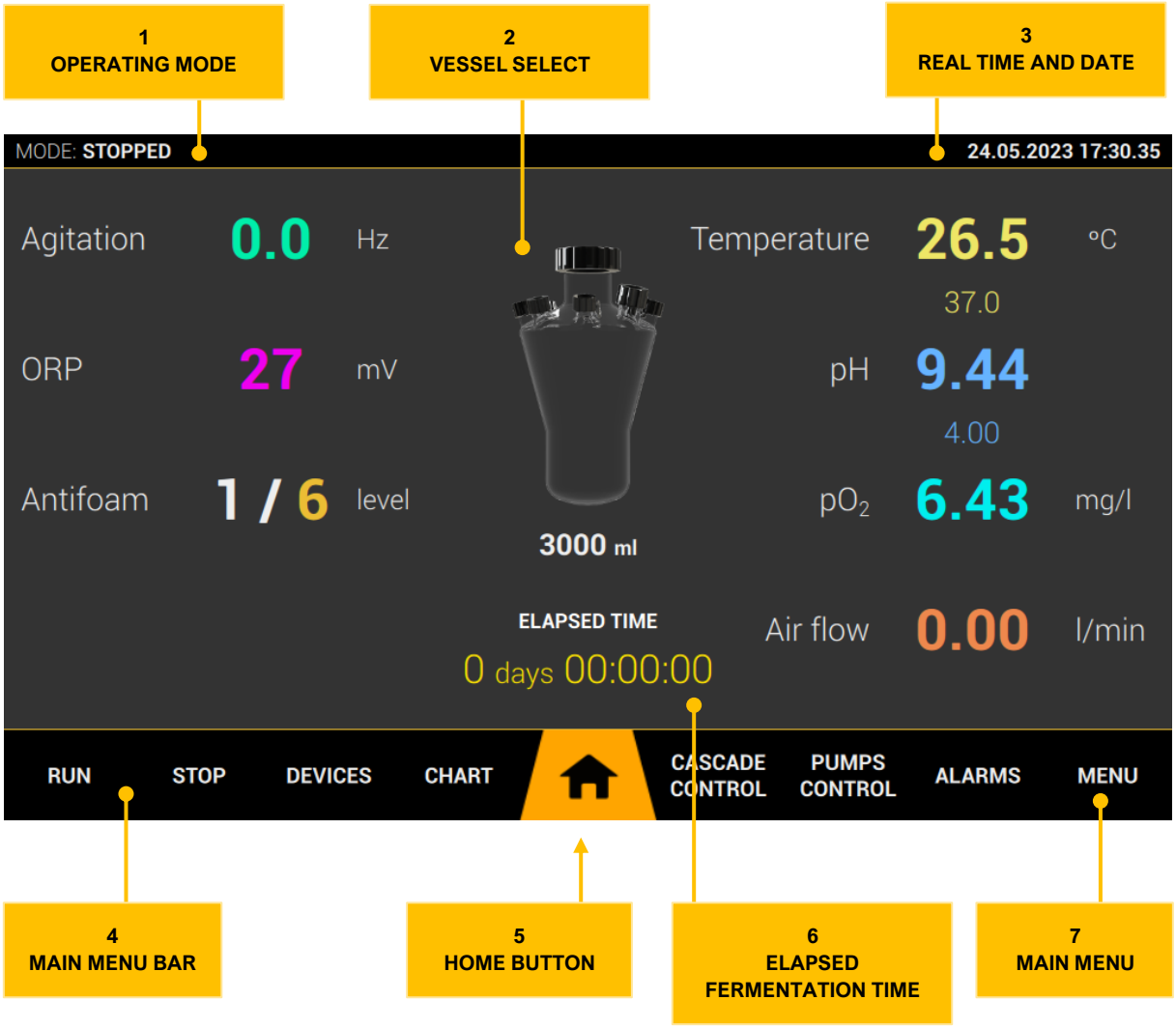
9.6 SYSTEM ALARMS

ALARM NAME	ALARM DESCRIPTION
Mainboard connection failed!	Internal system connection between mainboard and system board lost. Try to disconnect the unit from main power lead and newly power on Minifor2Bio. If the problem remains, contact service centre.
Internal connection failed!	Connection between graphic application and application server lost. Power off and power on device. If problem remains, contact service centre.
Mass flow sensor error!	Internal mass flow sensor is not responding. Try power off and power on device. If problem remains, contact service centre.

10 DEVICE OPERATION

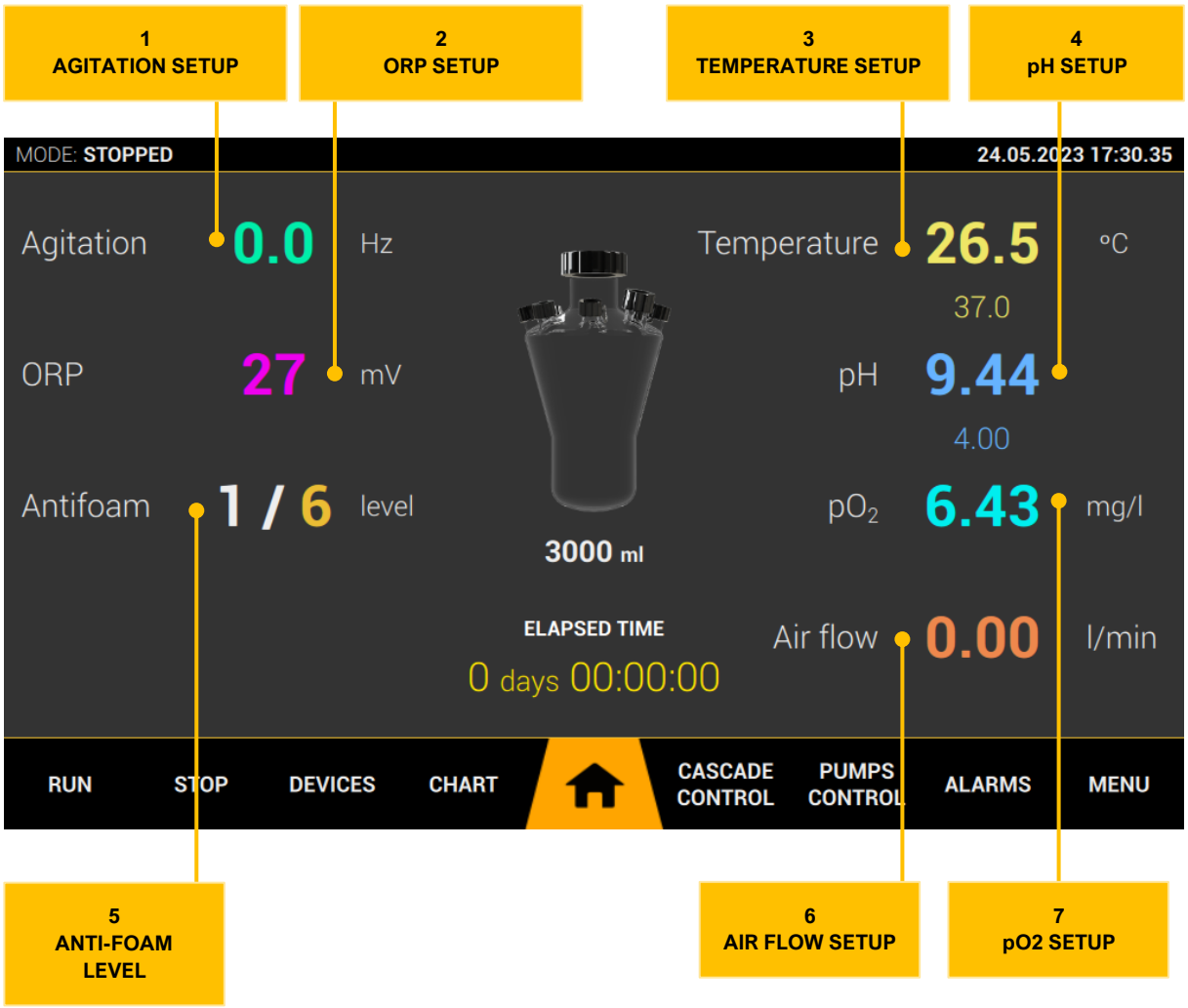
10.1 BASIC SCREEN

10.1.1 BASIC INDICATORS AND ELEMENTS



1. Operating mode indicator (chapter 8)
2. Tap on the vessel image to go to the vessel settings (chapter 10.1.3)
3. Current real time and date (chapter
4. Main menu bar
5. Home button (tapping the button will always display this basic screen)
6. Elapsed fermentation time management (chapter 10.1.4)
7. Access to the main menu of the device (chapter 10.1.6

10.1.2 **FERMENTATION PARAMETERS**

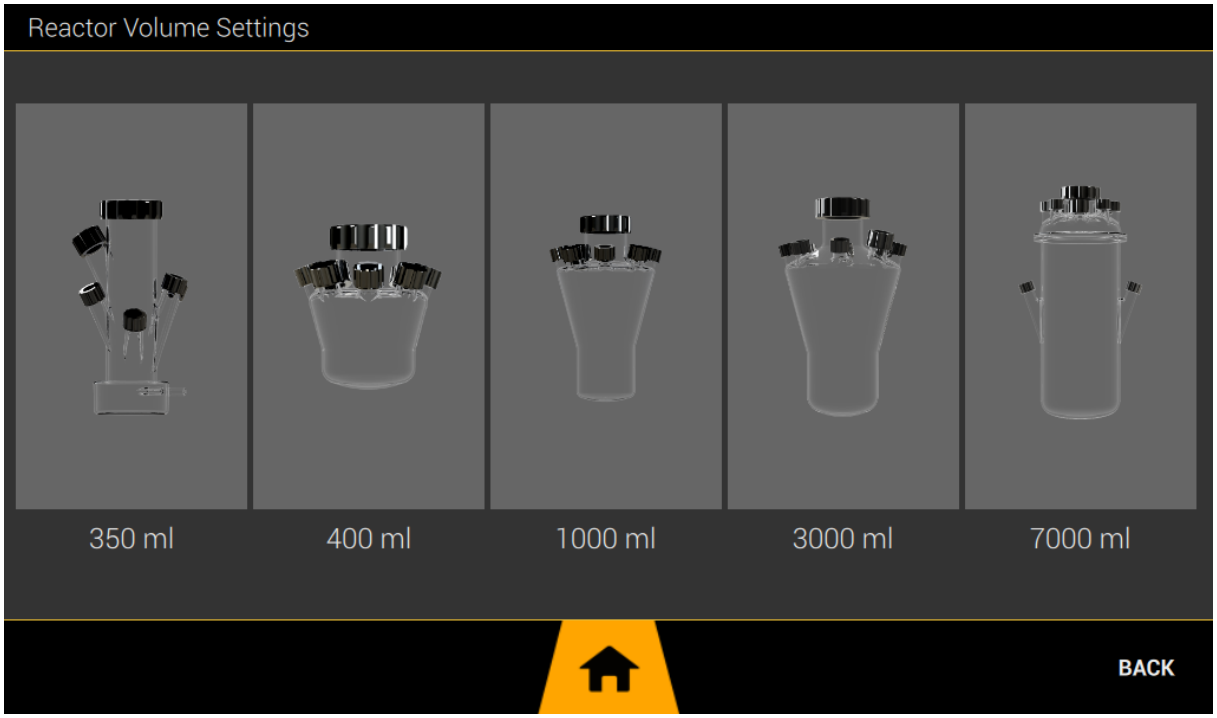


1. Agitation controller, tap to go to settings (fixed value, profile, …) – chapter
2. ORP measurement setup, tap to go to settings (high/low alarms, …) - chapter 10.7
3. Temperature controller, tap to go to settings (high/low alarms, profile, …) - chapter 10.4
4. pH Controller, tap to go to settings (high/low alarms, profile, …) - chapter 10.3
5. Anti-foam controller, tap to go to settings (chapter 10.6)
6. Air flow controller, tap to go to settings (high/low alarms, profile, …) (chapter 10.8)
7. pO2 controller, tap to go to settings (chapter 10.5)

10.1.3 **VESSEL SETUP**

For the proper functioning of the individual regulators, especially the temperature regulator, it is necessary to choose the type of bottle that you will use for the fermentation process.

1. To set the bottle, move to the main screen by tapping the **HOME** button and then tap the **vessel** image.
2. Tap on the image of the used bottle to confirm your selection.

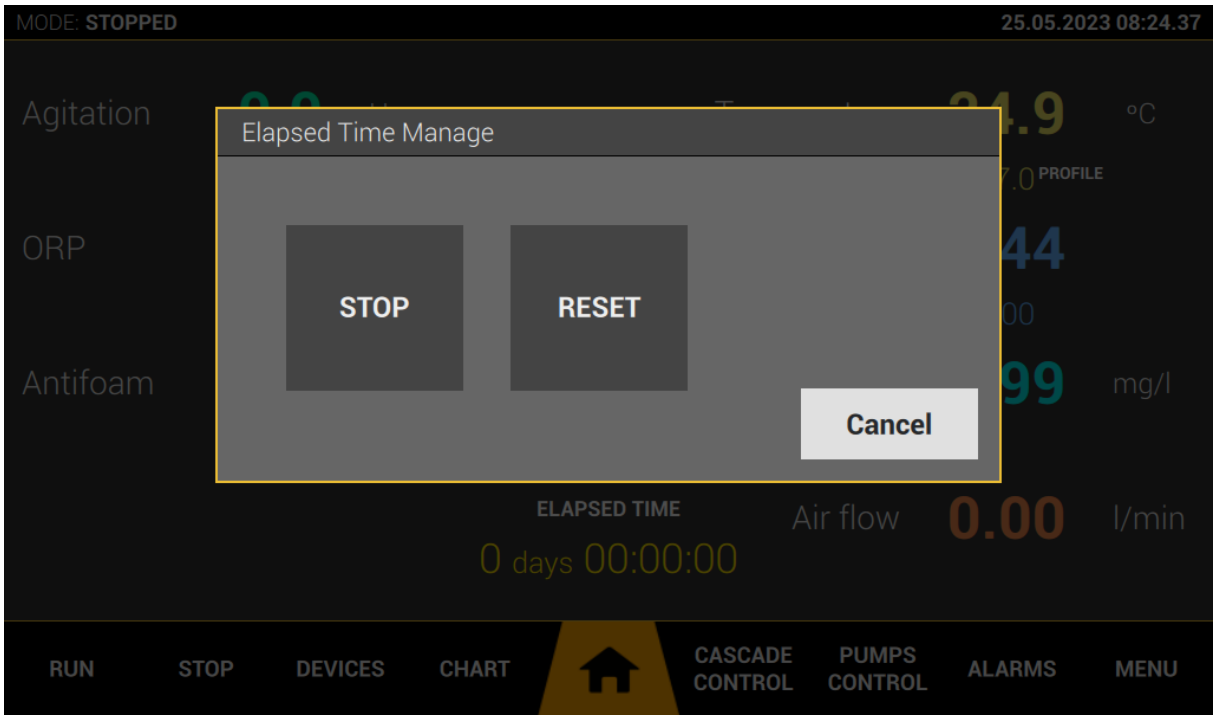


10.1.4 **ELAPSED FERMENTATION TIME**

Elapsed fermentation time (hereinafter EFT) serves as a time source for managing user profiles of user parameters. In the profile settings of user parameters (pH, temperature, pump control, etc.) it is necessary to select "ELAPSED TIME" as the time base item. In this case, the profile is controlled using EFT.

EFT is started manually at the moment the fermentation process is ready. EFT only runs in "RUN" operating mode. At the moment of transition to the "STOP" operating mode, EFT is suspended. In the "RUN" operating mode, EFT can be stopped manually.

1. Go to EFT management, tap the **HOME** button to go to the home screen if you are not in it.
2. Tap the EFT time **ELAPSED TIME** on the main screen to display the EFT management.



10.1.4.1 **STOP ELAPSED FERMENTATION TIME**

1. Go to EFT management, tap the **HOME** button to go to the home screen if you are not in it.
2. Tap the **STOP** button on the EFT management modal window.

10.1.4.2 **RESET ELAPSED FERMENTATION TIME**

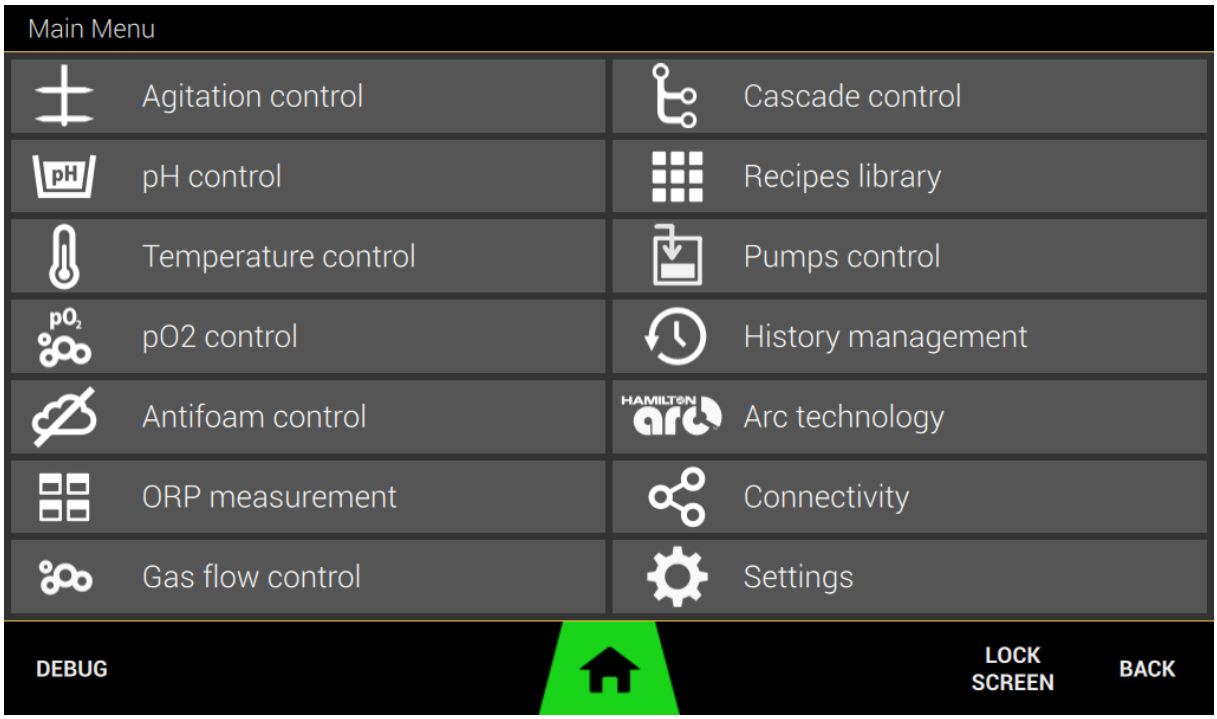
1. Go to EFT management, tap the **HOME** button to go to the home screen if you are not in it.
2. Tap the **RESET** button on the EFT management modal window.

10.1.5 **REAL TIME AND DATE**

The current real time and date can be set manually or synchronized with the Internet. Time is backed up by an independent power source. This power source (for real time) is not replaceable and will keep time for 60 days without being turned on.

You can find more about setting the real time and date in the chapter 10.14.3.

10.1.6 **MAIN MENU**

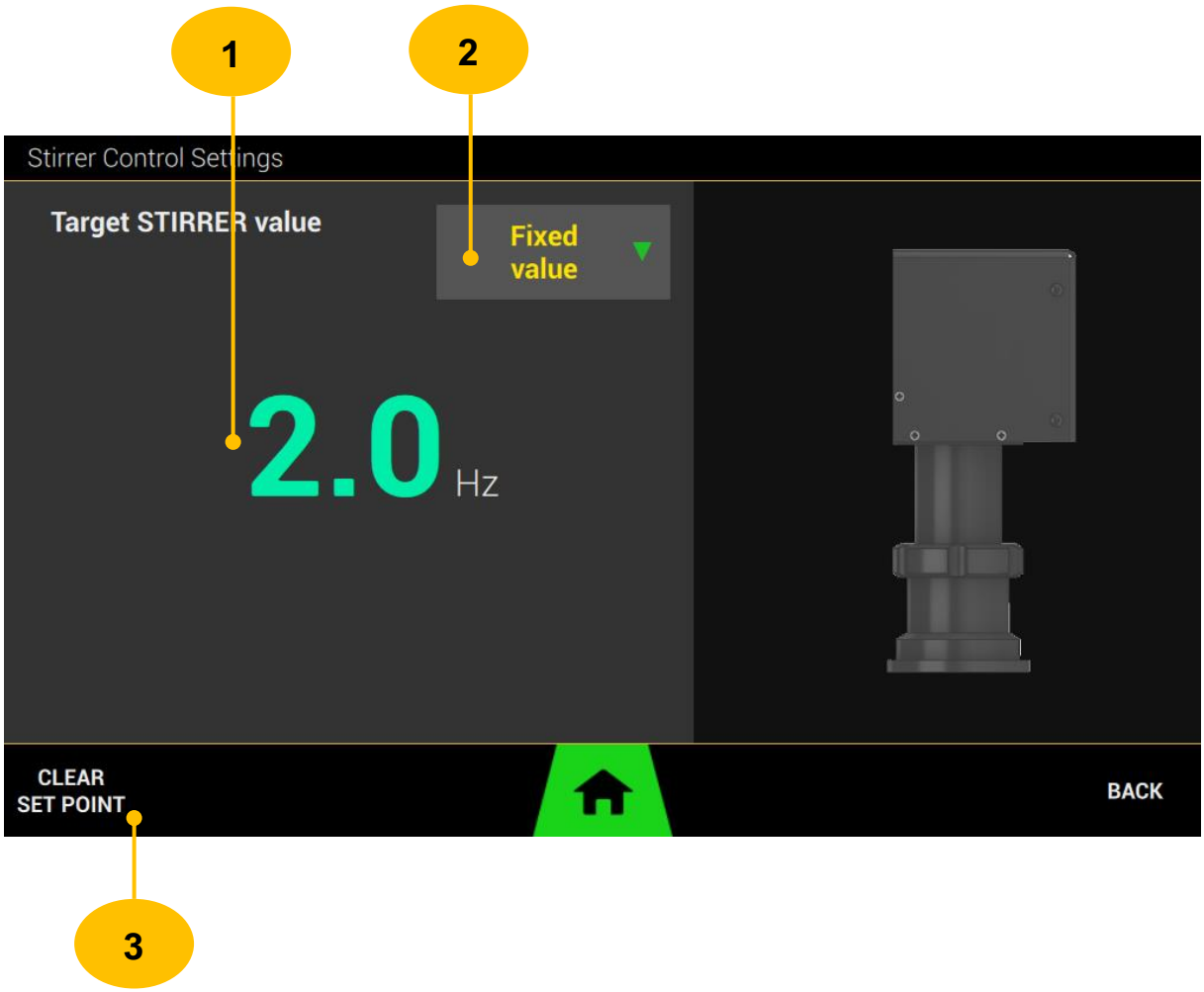


Menu items:

1. Agitation control – agitation unit (mixer) parameter settings (chapter 10.2
2. pH control - pH regulator parameter settings, measurements and more (chapter 10.3).
3. Temperature control - temperature regulator parameter settings, measurements and more (chapter 10.4).
4. pO2 control – pO2 parameter settings, measurements and more (chapter 10.5).
5. Antifoam control - parameter settings (chapter 10.6).
6. ORP measurement - parameter settings (chapter 10.7).
7. Gas flow control – gas flow control regulator parameter settings, measurements and more (chapter 10.8).
8. Cascade control – manage of proportional cascade of parameters (chapter 10.16).
9. Recipes library – management of saved fermentation recipes (chapter 10.9).
10. Pumps control - external peristaltic pump settings manager (chapter 10.10).
11. History management - logs of events, changes and their management (chapter 10.11).
12. Arc technology - settings management of Hamilton AG digital probes equipped with ARC technology (chapter 10.12).
13. Connectivity - management of external communication settings (chapter 10.13).
14. Settings - General device settings (chapter 10.14).

10.2 AGITATION CONTROL

Agitation settings can be accessed by tapping the **AGITATION** item on the home screen.



1. **SET POINT** - desired agitation frequency value.
   Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

2. **CONTROL MODE** - setting the type of agitation regulation. It can choose regulation to a fixed value, a profile or it can be a set point agitation using cascade control (dependency on another measured value).

   FIXED VALUE - agitation to a fixed value. The agitation will run with the set point value.

   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter 10.15.

CASCADE - By setting control mode to that state, agitation is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

3. **CLEAR SET POINT** - tapping the button resets the set point value.

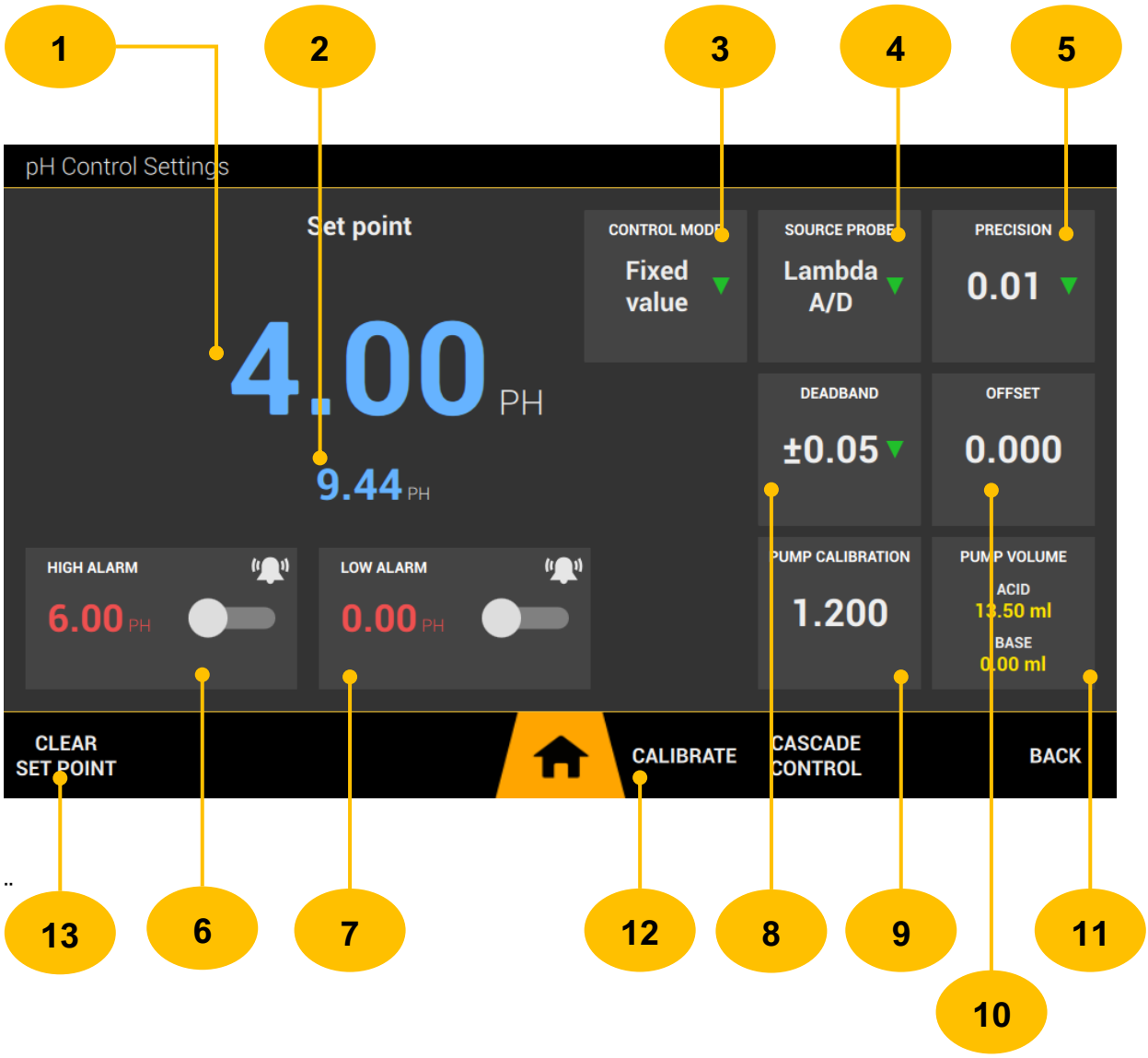
10.3 PH CONTROL

The controller serves to regulate the pH in the reactor with the help of ACID and BASE liquids dosed via external peristaltic pumps. The current pH value is measured by a probe placed in the vessel.

Supported probe types are listed in chapter (4, 5).

Selects the signal source (probe type) for measurement. Several control modes are available for regulation (fixed value, profile, and cascade).

The desired range of the measured pH value can be monitored using user alarms defined in the HIGH-LOW range.



1. **SET POINT** - desired pH value in the vessel for the regulator.
   Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

2. **CURRENT VALUE** - process (measured) pH value

3. **CONTROL MODE** - setting the type of pH regulation. It can choose regulation to a fixed value, a profile or it can be a set point pH control using cascade control (dependency on another measured value).

   FIXED VALUE - regulation to a fixed value. The regulator will regulate to the set point value.

   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter 10.15.

   CASCADE - By setting control mode to that state, pH is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

4. **SOURCE PROBE** - setting the signal source (value) for pH measurement. Select Lambda Digital / ARC technology probe depending on which probe you connected to Minifor2Bio and have installed in the vessel.

5. **PRECISION** - setting the fineness of displaying pH values (decimal places)

6. **HIGH ALARM** - user-adjustable alarm for the upper limit of the measured value. If the measured value exceeds the high alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

7. **LOW ALARM** - user-adjustable alarm for the lower limit of the measured value. If the measured value is smaller than the low alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

8. **DEADBAND** - setting the degree of insensitivity of the regulator. It expresses the deviation between the set point and the measured value, which is permissible. The smaller this deviation will be, the greater will be the consumption of ACID and BASE control fluids.

9. **PUMP CALIBRATION** - calibration constant for calculating the dispensed volume of BASE and ACID liquids. You can get the calibration value directly on the pump or in the pump control calibration tab. You can find more about pump calibration in the chapter 10.10.3.1.

10. **OFFSET** - user-adjustable offset of the measured value. Can be used in a situation where the fermentation process is long and measurement deviation occurs due to contamination of the probe in the vessel by medium. **Maximal value is ± 0.5 pH.**

11. **PUMP VOLUME** - statistics of dispensed volume of ACID and BASE liquids. Tap the box to reset the stats.

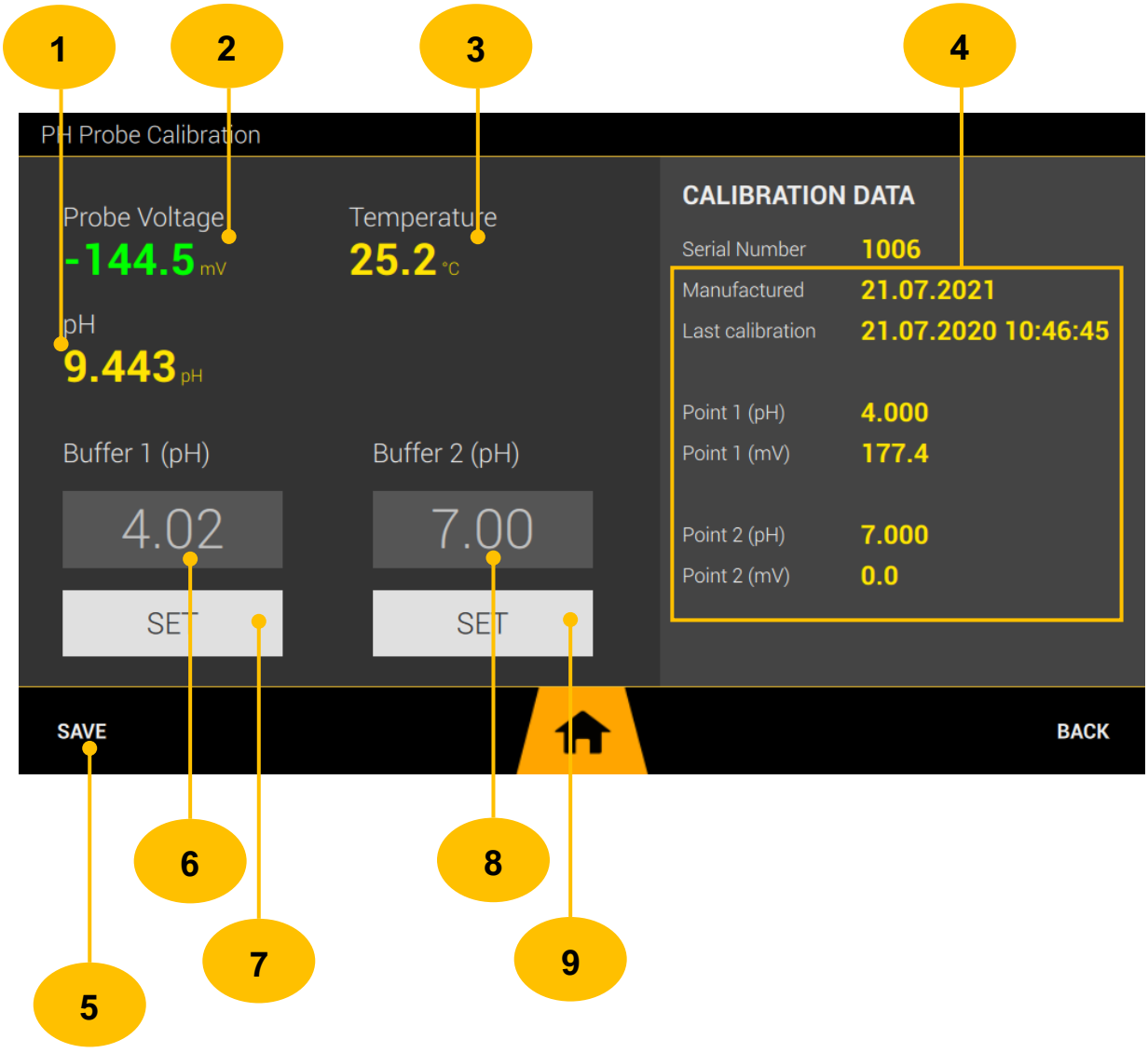
12. **CALIBRATE** - transition to pH calibration - applies to Lambda Digital probes. You can find more about calibration in the chapter 10.3.1.

13. **CLEAR SET POINT** - tapping the button resets the set point value.

10.3.1 CALIBRATION PH PROBE

The pH calibration (two-point calibration) is intended for Lambda Digital probe types. Perform calibration only in STOP operating mode.

You can go to calibration by tapping on the pH value on the main screen and then by tapping on the **CALIBRATE** button on the bottom menu bar.



1. **pH** – current measured pH value using existing calibration data.

2. **PROBE VOLTAGE** – current measured voltage value generated by the pH probe.

3. **TEMPERATURE** – current measured temperature for compensation. The temperature of the calibration medium should be taken into account when entering the buffer value!

4. **CALIBRATION DATA** – the calibration values are stored internally in the Lambda Digital adapter. They are transferable between other Minifor2Bio.

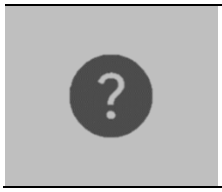
5. **SAVE** – save by tapping the button, the new values will be saved and used for measurement.

6. **BUFFER 1** – Value of calibration buffer 1 in pH units. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

7. **SET** – by tapping the button, the value of buffer 1 is applied to the calibration data.

8. **BUFFER 2** – Value of calibration buffer 2 in pH units. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

9. **SET** – by tapping the button, the value of buffer 2 is applied to the calibration data.



- **Perform the pH calibration in the STOP operating state.**
- **For the values of the calibration buffers, take into account the temperature dependence.**

10.3.2 **CALIBRATION PROCEDURE**

STEP 1	Go to pH calibration. (chapter 10.3)
STEP 2	Insert the pH probe into the container with **calibration buffer 1** and set the value of the calibration buffer in the "BUFFER 1" box.
STEP 3	Wait for the voltage value on the probe to stabilize. The value **must** be green. Tap on **SET"!** button to use value.
STEP 4	Rinse the probe from the calibration solution and continue to next step.
STEP 5	Insert the pH probe into the container with **calibration buffer 2** and set the value of the calibration buffer in the "BUFFER 1" box.
STEP 6	Wait for the voltage value on the probe to stabilize. The value **must** be green. Tap on **SET** button to use value.
STEP 7	Tap the **SAVE** button to complete and save the calibration.

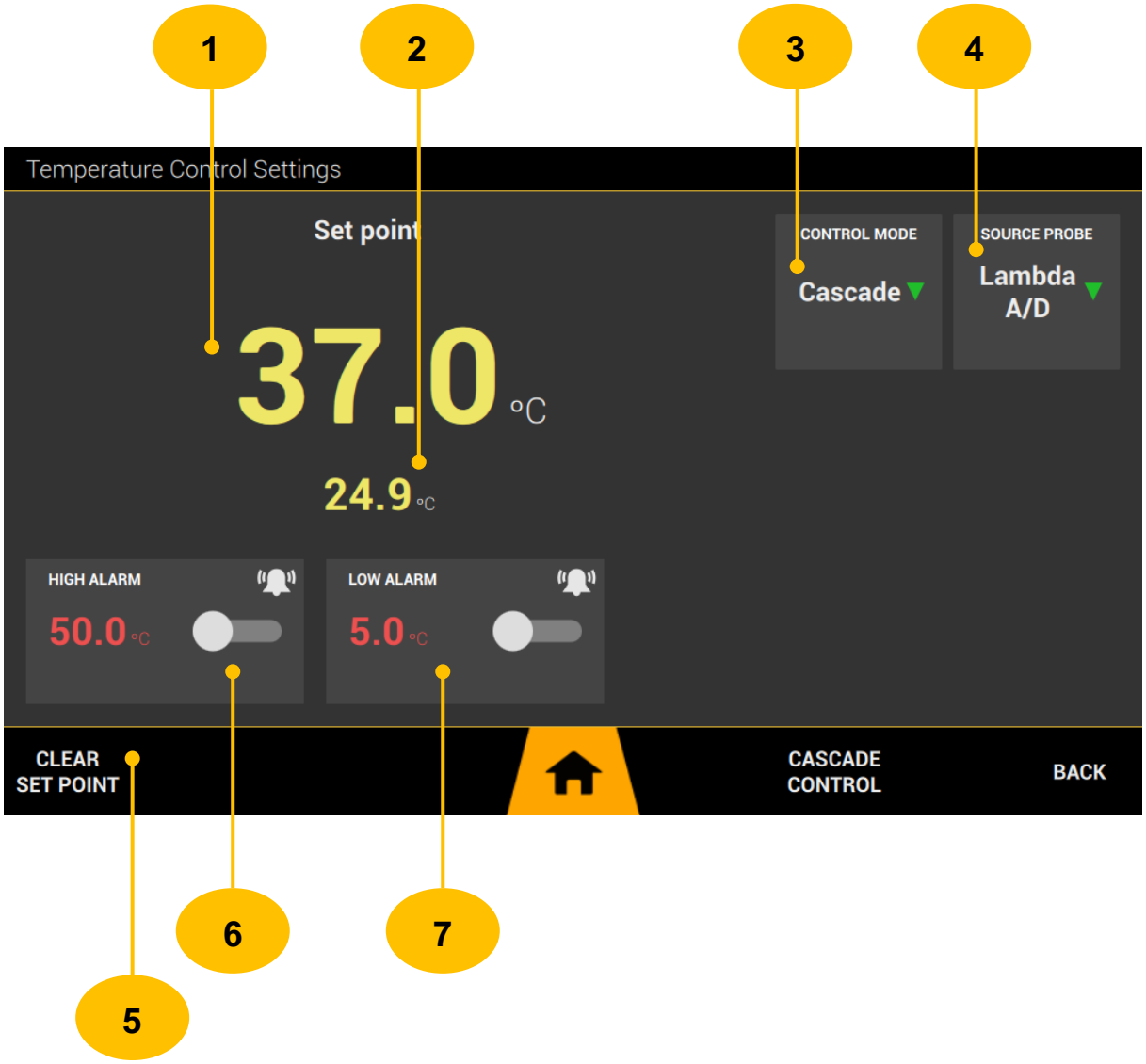
10.4 TEMPERATURE CONTROL

The controller serves to regulate the temperature in the vessel. The current temperature value is measured by a probe placed in the vessel.

Supported probe types are listed in chapter (4, 5).

Selects the signal source (probe type) for measurement. Several control modes are available for regulation (fixed value, profile, and cascade).

The desired range of the measured temperature value can be monitored using user alarms defined in the HIGH-LOW range.



1. **SET POINT** - desired temperature value in the vessel for the regulator.
   Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

2. **CURRENT VALUE** - process (measured) temperature value

3. **CONTROL MODE** - setting the type of temperature regulation. It can choose regulation to a fixed value, a profile or it can be a set point pH control using cascade control (dependency on another measured value).

   FIXED VALUE - regulation to a fixed value. The regulator will regulate to the set point value.

   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter 10.15.

   CASCADE - By setting control mode to that state, temperature is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

4. **SOURCE PROBE** - setting the signal source (value) for temperature measurement. Select Lambda Digital / ARC technology probe depending on which probe you connected to Minifor2Bio and have installed in the vessel.

5. **CLEAR SET POINT** - tapping the button resets the set point value.

6. **HIGH ALARM** - user-adjustable alarm for the upper limit of the measured value. If the measured value exceeds the high alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

7. **LOW ALARM** - user-adjustable alarm for the lower limit of the measured value. If the measured value is smaller than the low alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

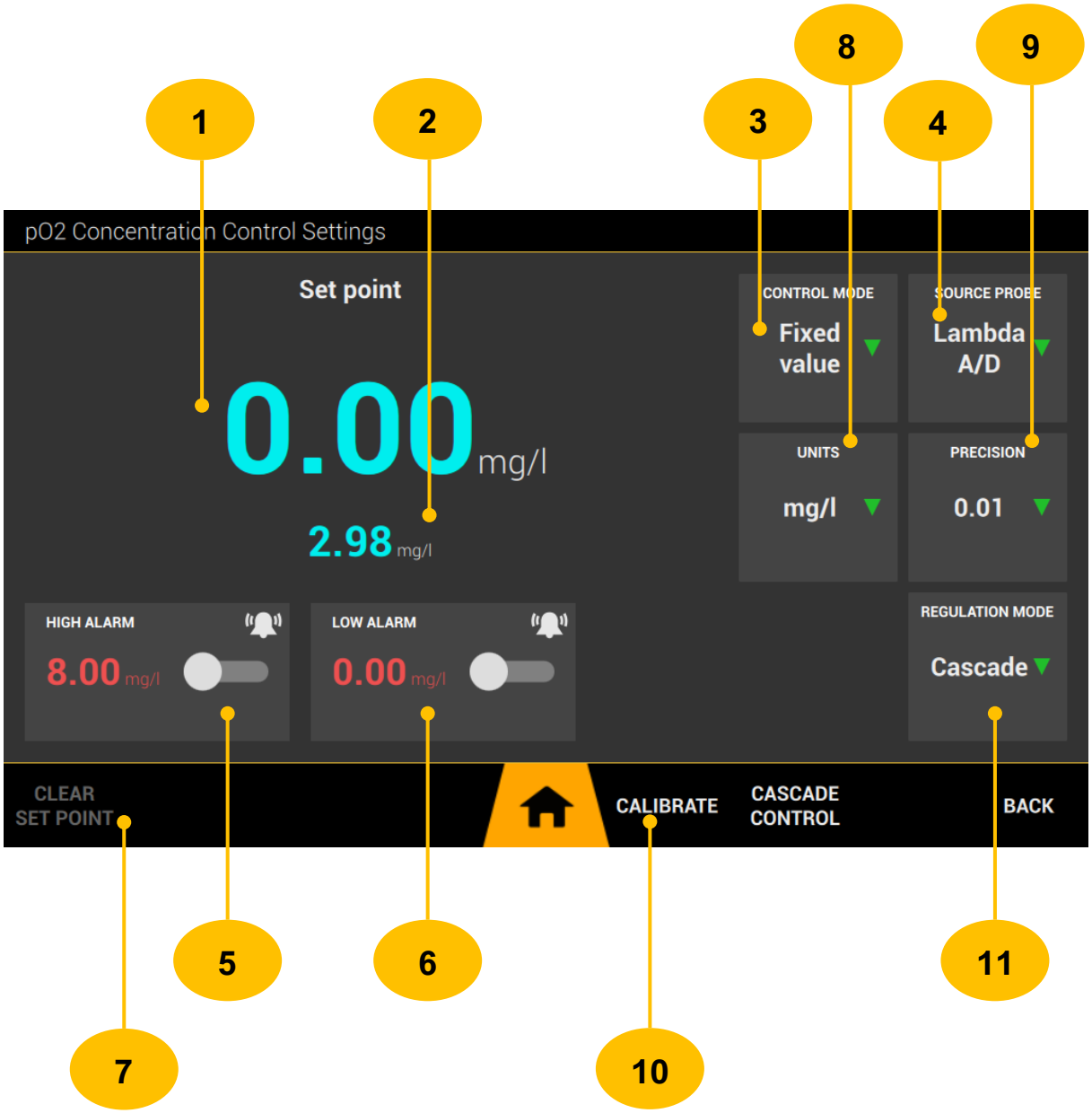
10.5 PO2 CONTROL

The controller serves to regulate the pO2 in the vessel. The current pO2 value is measured by a probe placed in the vessel.

Supported probe types are listed in chapter (4, 5).

Selects the signal source (probe type) for measurement. Several control modes are available for regulation (fixed value, profile, and cascade).

The desired range of the measured pO2value can be monitored using user alarms defined in the HIGH-LOW range.



1. **SET POINT** - desired pO2 value in the vessel for the regulator.
   Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

2. **CURRENT VALUE** - process (measured) pO2 value

3. **CONTROL MODE** - setting the type of temperature regulation. It can choose regulation to a fixed value, a profile or it can be a set point pH control using cascade control (dependency on another measured value).

   FIXED VALUE - regulation to a fixed value. The regulator will regulate to the set point value.

   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter 10.15.

   CASCADE - By setting control mode to that state, temperature is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

4. **SOURCE PROBE** - setting the signal source (value) for temperature measurement. Select Lambda Digital / ARC technology probe depending on which probe you connected to Minifor2Bio and have installed in the vessel.

5. **HIGH ALARM** - user-adjustable alarm for the upper limit of the measured value. If the measured value exceeds the high alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

6. **LOW ALARM** - user-adjustable alarm for the lower limit of the measured value. If the measured value is smaller than the low alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

7. **CLEAR SET POINT** - tapping the button resets the set point value.

8. **UNITS** - unit setting, mg/l or % sat (percent of saturation) units can be selected.

9. **PRECISION** - setting the fineness of displaying pH values (decimal places).

10. **CALIBRATE** - transition to pO2 calibration - applies to Lambda Digital probes. You can find more about calibration in the chapter 10.5.1.

11. **REGULATION MODE** - regulation type setting. The regulator can work in two modes "AIR" or "CASCADE".

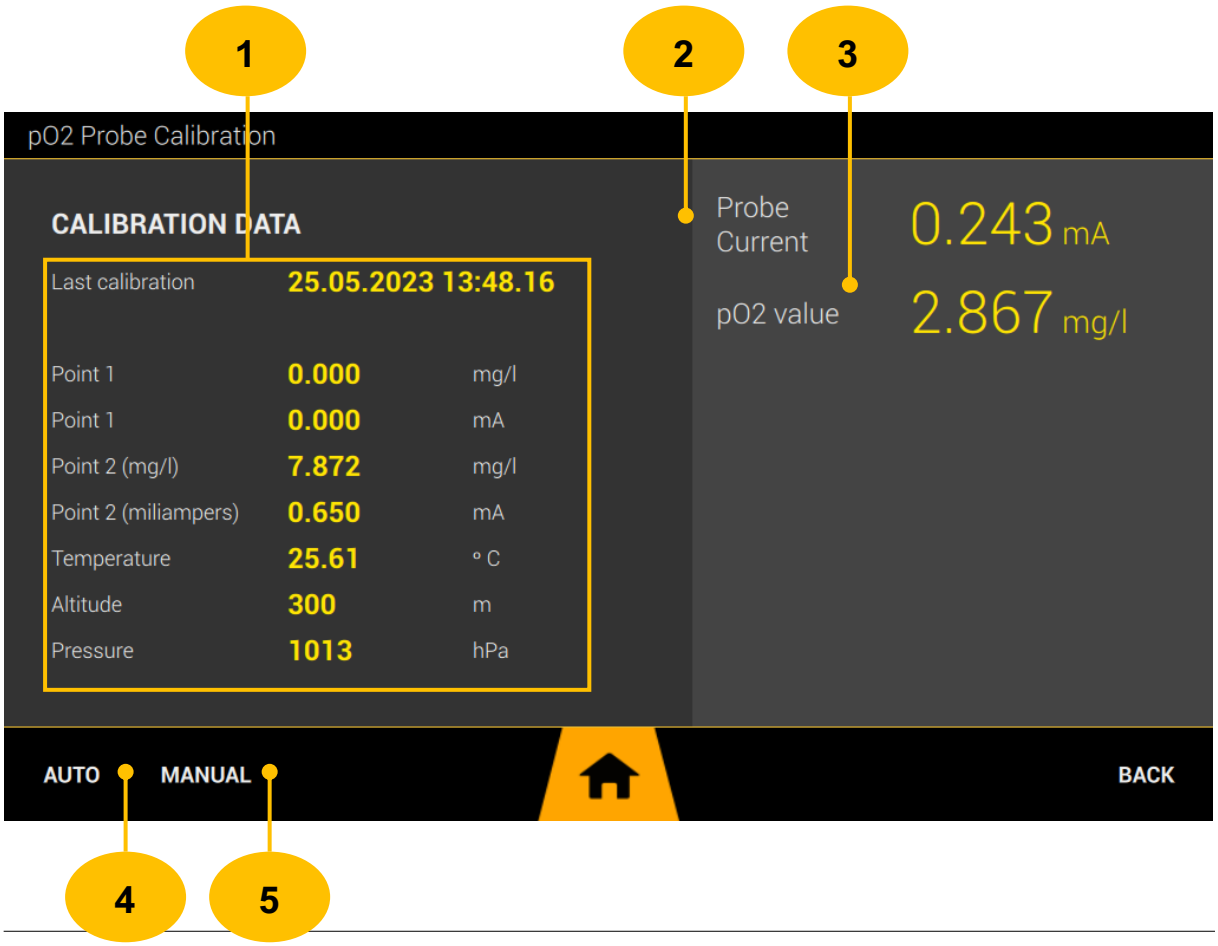
    AIR - the regulator uses gas flow control to achieve the desired pO2 value. In this mode, it is not possible to manually set the value for air flow, because it is dynamically set by the pO2 controller.
    CASCADE - the set point is controlled depending on the user assigned values of other measured variables.

10.5.1 **CALIBRATION**

pO2 calibration is two-point.

In most cases, the first calibration point is 0 micro-ampere. The second calibration point is obtained by creating the maximum oxygen saturation of the media in the vessel, which is subsequently used for calibration. The maximum saturation of the medium in the vessel is determined by temperature, altitude, and atmospheric pressure. After entering the specified parameters, the maximum amount of oxygen saturation is automatically calculated. For calibration, it is necessary to use a minimum air flow of 3 l/min and agitation with a frequency of min. 10 Hz.

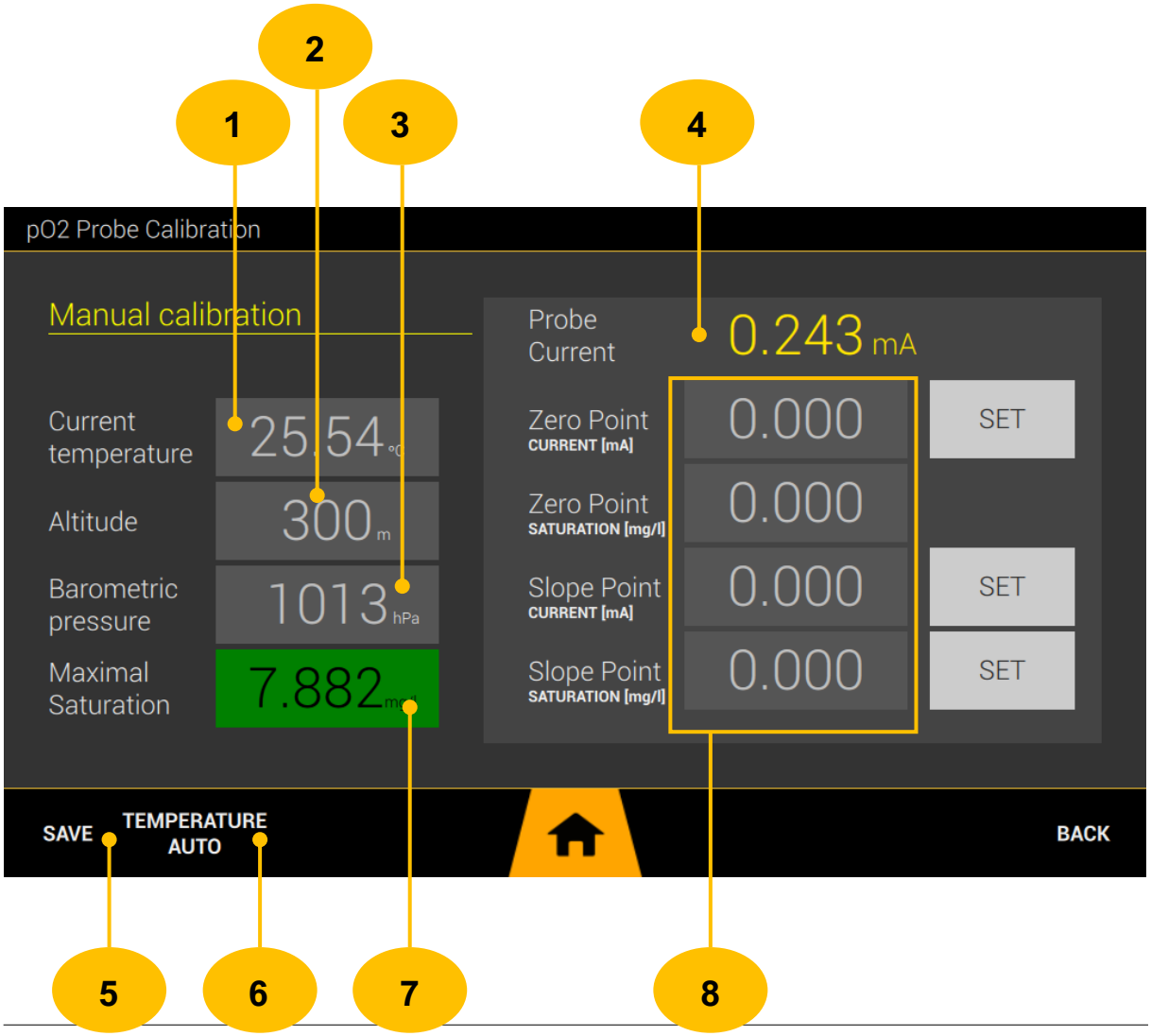
- **Manual calibration pO2 perform in the RUN operating state**
- **Automatic calibration pO2 is available only in the STOP operating state (needs control gas flow, agitation unit, etc.)**
- **Check connection of Lambda pO2 probe**
- **Install agitation unit before calibration**
- **Install air flow input before calibration**
- **Calibration is stored inside Minifor2Bio unit**



1. **CALIBRATION DATA** – the calibration values are stored internally Minifor2Bio memory.
2. **PROBE CURRENT** – measured current value generated by the pO2 probe.
3. **pO2 VALUE** – the current measured value according to the current calibration.
4. **AUTO** – tap to "**AUTO**" to invoke automatic pO2 calibration.
5. **MANUAL** – tap to "**MANUAL**" to invoke manual pO2 calibration.

10.5.1.1 MANUAL CALIBRATION

Manual calibration pO2 perform in the RUN operating state!



1. **CURRENT TEMPERATURE** – current media temperature. Enter manually by tapping the value, or if you have another temperature probe used in the medium, tap "TEMPERATURE AUTO" to use that temperature.

2. **ALTITUDE**– enter your altitude value. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

3. **BAROMETRIC PRESSURE** – enter the value of the current atmospheric pressure. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

4. **PROBE CURRENT** – measured current value generated by the pO2 probe.

5. **SAVE** – save calibration data to internal memory of Minifor2Bio.

6. **TEMPERATURE AUTO** – use current measure temperature measured by different probe (i.e. pH probe).

7. **MAXIMAL SATURATION** – automatically calculated value of maximal saturation for entered temperature, altitude and atmospheric pressure.

8. **CALIBRATION DATA** – Two-point calibration needs an origin value and a value to calculate the slope of the curve. The data always contains two pairs of values (the probe current at zero and the probe current at maximum saturation. The "SET" buttons are used to retrieve the current value of the probe current or, in the case of saturation, to retrieve the value of the calculated value of the maximum saturation. The values can be entered manually by tapping on the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

10.5.1.2 MANUAL CALIBRATION PROCEDURE

STEP 1	Prepare Minifor2Bio for calibration: - Install vessel (chapter 3.3) and fill with medium - Connect the pO2 adapter including the probe to the back panel of the device, do not install the probe into the vessel yet. - Set **SOURCE PROBE** to **LAMBDA A/D** (chapter 10.5 - Connect the source of clean air to the **AIR** section (**IN** input) on the back panel of the device (chapter 1.1)

- Install the agitation unit (chapter 6.1).
- Set the set point 3 l/min on the basic screen (chapter 10.8)
- Set the set point agitation to 10Hz (10.2)
- Put Minifor2Bio into **RUN** operating mode (chapter 8.1)

STEP 2

Go to pO2 control -> **CALIBRATE** -> **MANUAL**
(chapter 10.5)

STEP 3

Enter the value of temperature, altitude, atmospheric pressure. If you have a temperature source (another probe that provides temperature and is placed in the vessel) you can use "TEMPERATURE AUTO" to take the value. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

After entering the values, the maximum oxygen saturation of the medium will be automatically calculated (**MAXIMAL SATURATION**).

STEP 4

Enter the **PROBE CURRENT** value (in milliamps units) for **ZERO POINT** (0 mg/l). In most cases, the values are both zero. Alternatively, submerge the probe in a sodium sulfite (Na_2SO_3) solution to ensure 0% oxygen saturation (if the current value is not 0 mA, enter the value in the **ZERO POINT [CURRENT]** box).

STEP 5

Insert the probe into the vessel and wait until the **PROBE CURRENT** value stabilizes. When inserted, the current value will increase. During the entire process, Minifor2Bio must be in RUN mode with agitation at least 10 Hz and gas flow at least 3 l/min.

STEP 6

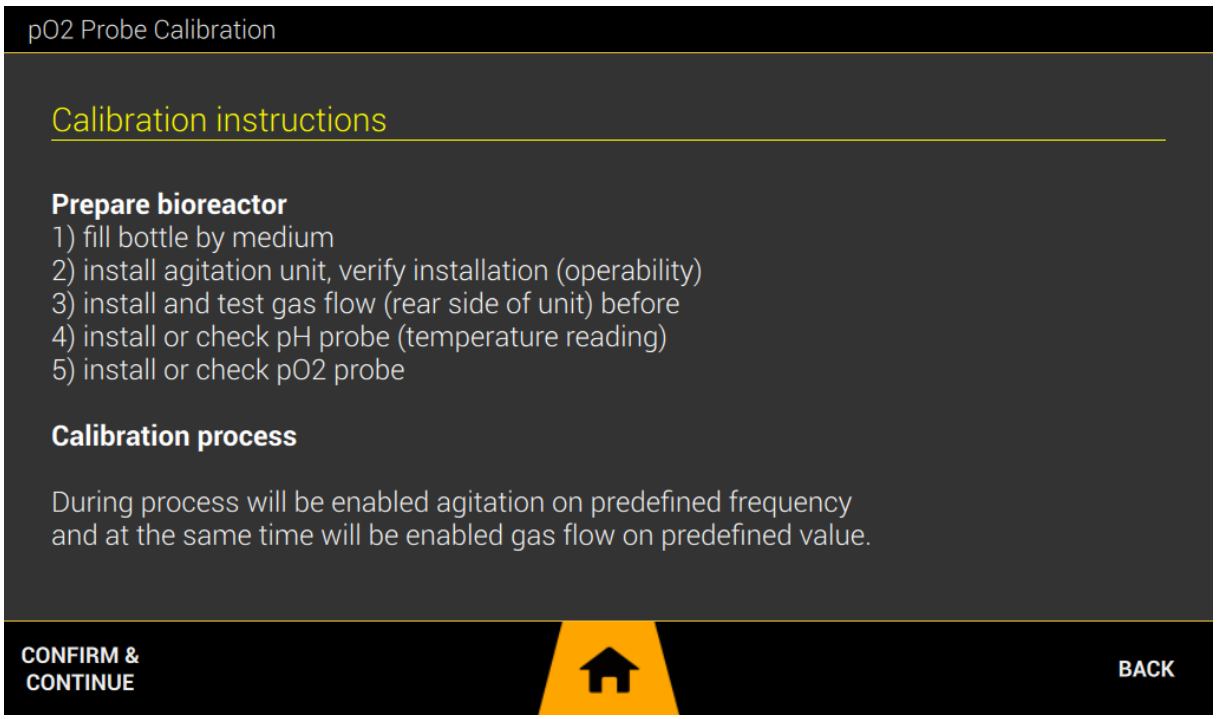
If the current value is stable, tap the **SET** button next to the **SLOPE POINT [CURRENT]** value. The value of the probe current is added. Continue by tapping the **SET** button next to the **SLOPE POINT [SATURATION]** value. The value of the calculated maximum saturation is added.

STEP 7	Save the calibration by tapping the **SAVE** button.

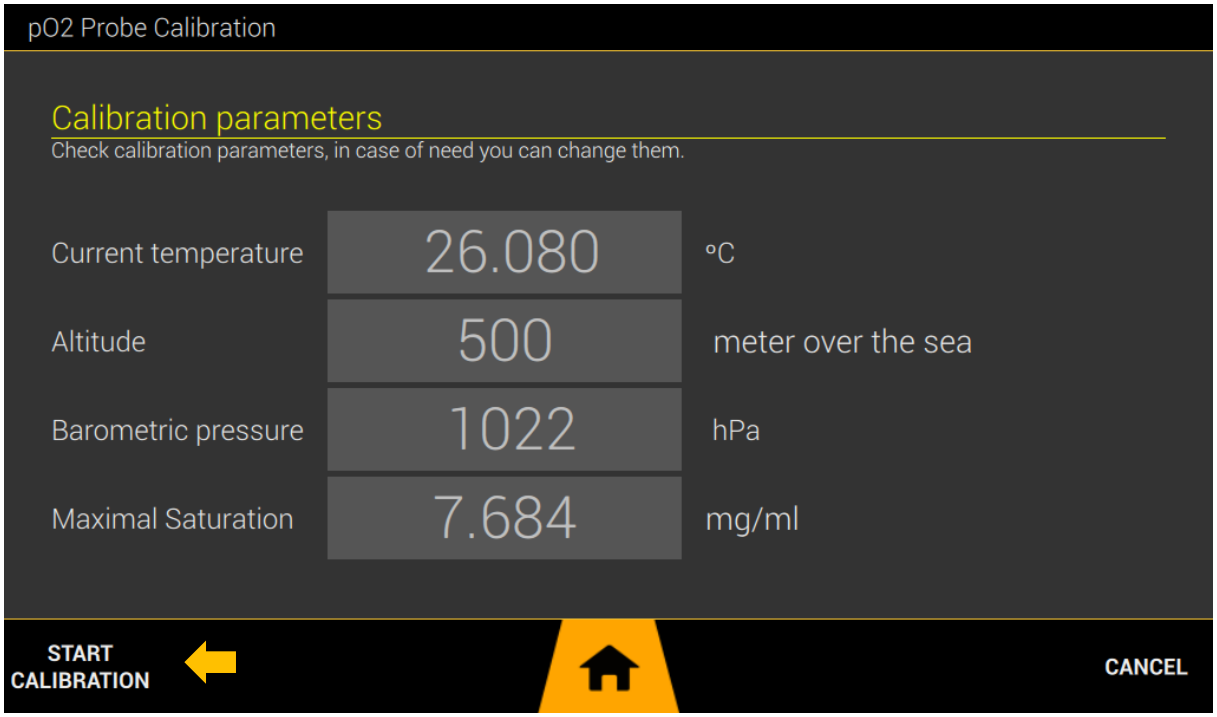
10.5.1.3 **AUTOMATIC CALIBRATION**

- **Manual calibration pO2 perform in the STOP operating state!**
- **Automatic calibration automatically sets gas flow, and agitation unit frequency. For automatic calibration, it is necessary to have a probe installed providing the Minifor2Bio temperature measurement source with a medium in which the pO2 probe is placed!**

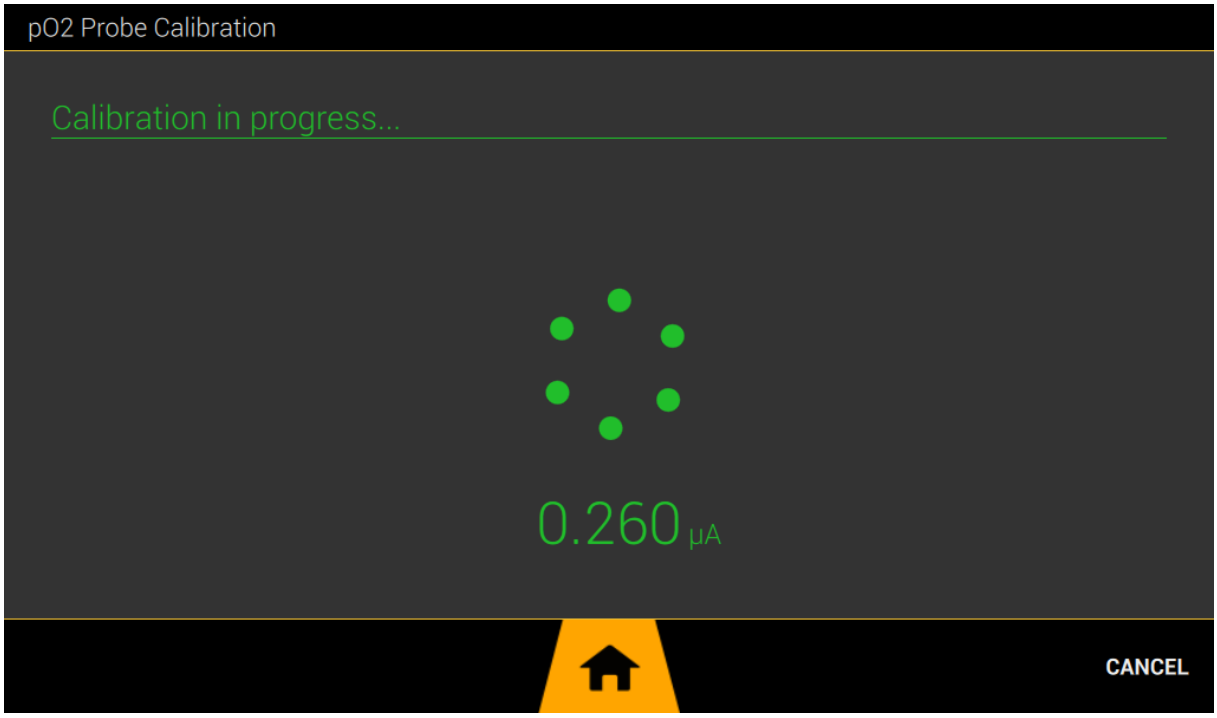
STEP 1	Go to pO2 control -> **CALIBRATE** -> **AUTO** (chapter 10.5) Follow the calibration instructions !!! If you have Minifor2Bio ready for automatic calibration according to the instructions on the display, continue by tapping the **CONFIRM & CONTINUE** button.



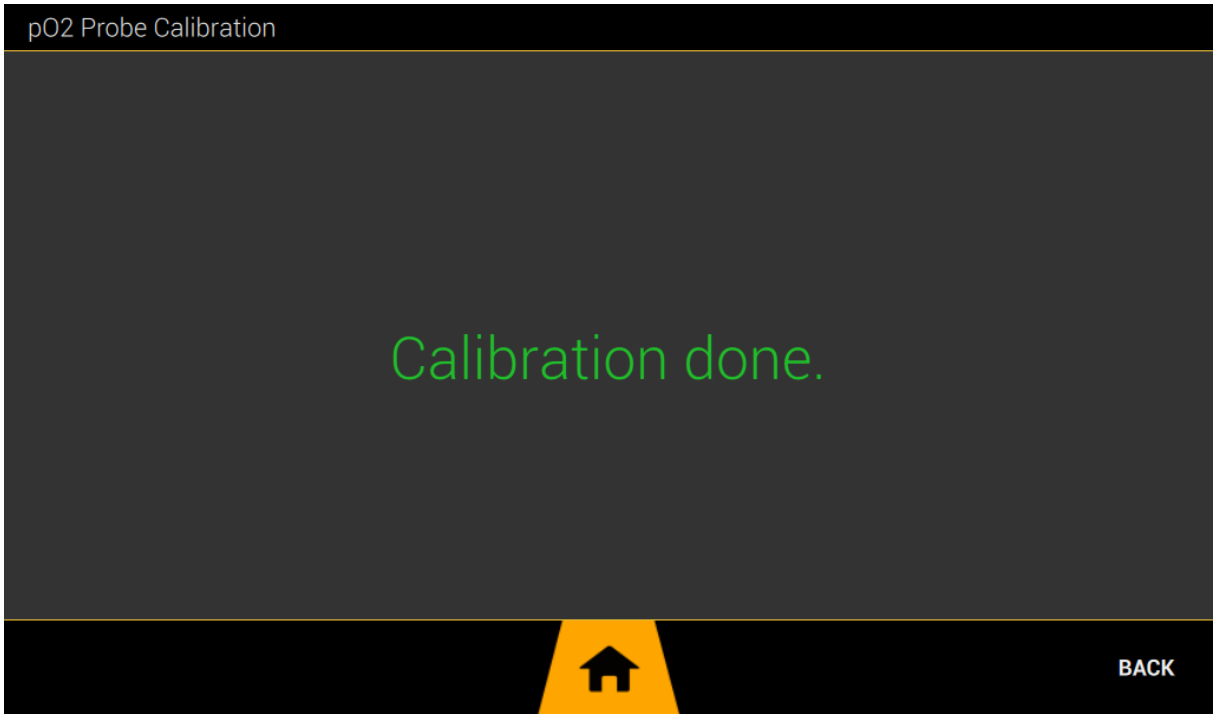
STEP 2	Check the calibration parameters. If necessary, adjust the values outside of **MAXIMAL SATURATION**, which is automatically calculated The values can be entered manually by tapping on the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.



STEP 3	If the values are correct, start the calibration by tapping the **START CALIBRATION** button. The calibration will start, the display shows **Calibration in progress....**



STEP 4	Wait for the calibration to complete. The completion of the calibration is indicated on the display by the text "**Calibration done**". New calibration data will be saved automatically.



10.6 ANTIFOAM CONTROL

Antifoam control is used to reduce the foam formed during various types of fermentation using a special syringe micro-pump or a peristaltic pump with a small diameter tube.

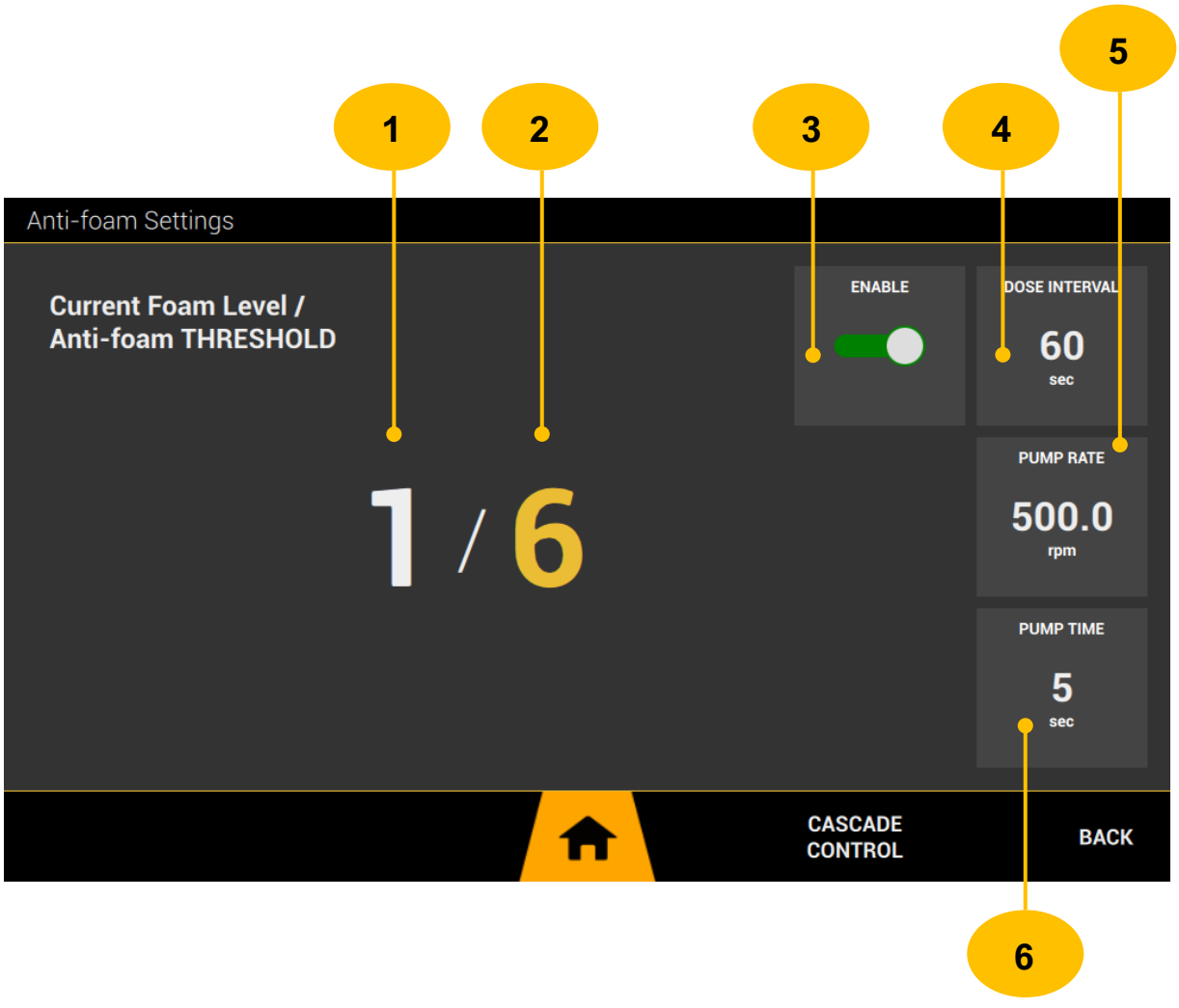
Minifor2Bio uses two probes to measure the amount of foam produced. One probe must be placed inside the vessel, the other probe is placed approximately 1 - 2 cm above the surface of the vessel medium. Attention, the probe above the surface should not be in direct contact with its own surface without foam. It is necessary to adapt the distance of the probe above the surface depending on the agitation unit and the frequency used. The measurement is based on the principle of electrical resistance measurement, a very small alternating current flows through the probes to eliminate the effect of electrolysis.

The antifoam adapter connects to the back panel, more in the chapter 1.2.

When using the **DOZITO** micro syringe pump, only set the interval in which the anti-foam solution is applied to the vessel.

When using a peristaltic pump, adjust the interval, dosing rate and dosing time of the anti-foam solution. You must set this pump to the **ANTIFOAM function** in **DEVICES** MANAGEMENT.

The DOZITO micro syringe pump has a single dose mechanical setting. More in the DOZITO manual.



1. **CURRENT FOAM LEVEL** – current measured resistance level. The moment foam starts to grow in the vessel, this value will increase. The value can change for different volumes of medium in the vessel.

2. **ANTI FOAM THRESHOLD** – threshold value for application of anti-foam solution. As soon as the measured value (**CURRENT FOAM LEVEL**) exceeds this set value, the application of the foam reduction solution will start. The application of the reducing solution using the DOZITO micro syringe pump or peristaltic pump will be active in a preset interval until the measured resistance value (**CURRENT FOAM LEVEL**) is not lower than the set **THRESHOLD** value. Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the **OK** button or cancel the change by tapping the **CANCEL** button.

3. **ENABLE** – enable/disable antifoam function. If the feature is off, it is not displayed on the home screen.

4. **DOSE INTERVAL** – the interval in which the request to dose the foam reduction solution in the vessel is repeated.

5. **PUMP RATE** - dosing rate for a peristaltic pump that has the function set to ANTIFOAM.

6. **PUMP TIME** - the time for which the peristaltic pump will dispense. By combining speed and time, you set the desired volume of foam reduction solution.

10.6.1 **THRESHOLD SETUP**

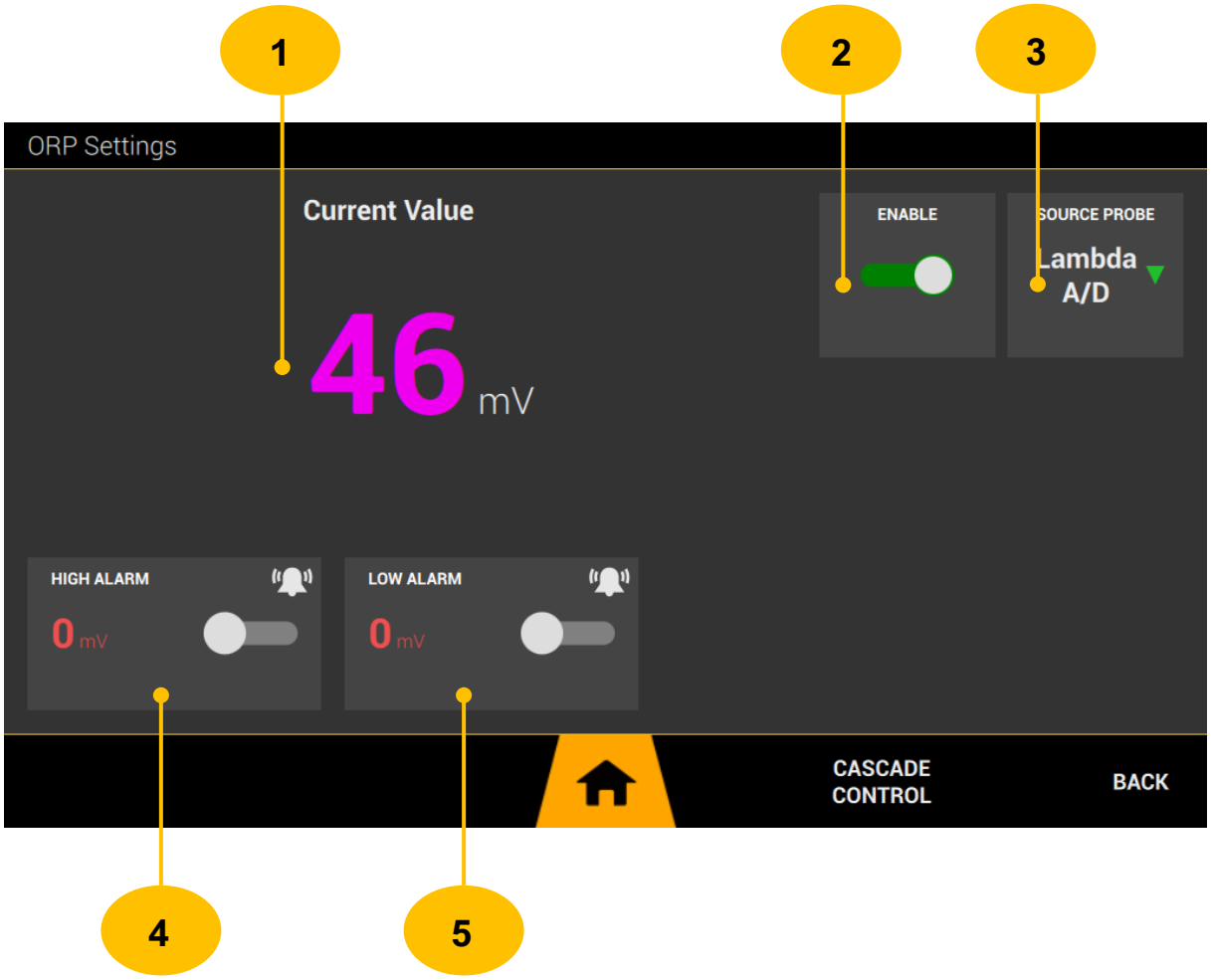
STEP 1	Prepare the vessel, medium and all other elements according to your fermentation requirements.
STEP 2	Connect the antifoam adapter to the back panel of the device. Connect the **BLACK** terminal (crocodile) to the input/output port vessel rod immersed in the medium. Connect the **YELLOW** clamp to the input/output port rod located approx. 1-2 cm above the medium level in the vessel.
STEP 3	Set the threshold one or two levels above the currently measured value of the foam level.

To use the LAMBDA peristaltic pump, the pump must be set to the ANTIFOAM function in the DEVICES management.

10.7 ORP MEASUREMENT

The function is used to measure ORP (oxidation reduction potential) using combined pH probes or digital ARC probes from Hamilton AG.

The Lambda A/D cannot detect the condition without a probe connected. If you are not using a combined pH probe with ORP, the ORP value will not be valid. In this case, turn off the ORP measurement function.



1. **CURRENT VALUE** – current measured ORP value in units of millivolts.

2. **ENABLE** – enable/disable ORP function. If the feature is off, it is not displayed on the home screen.

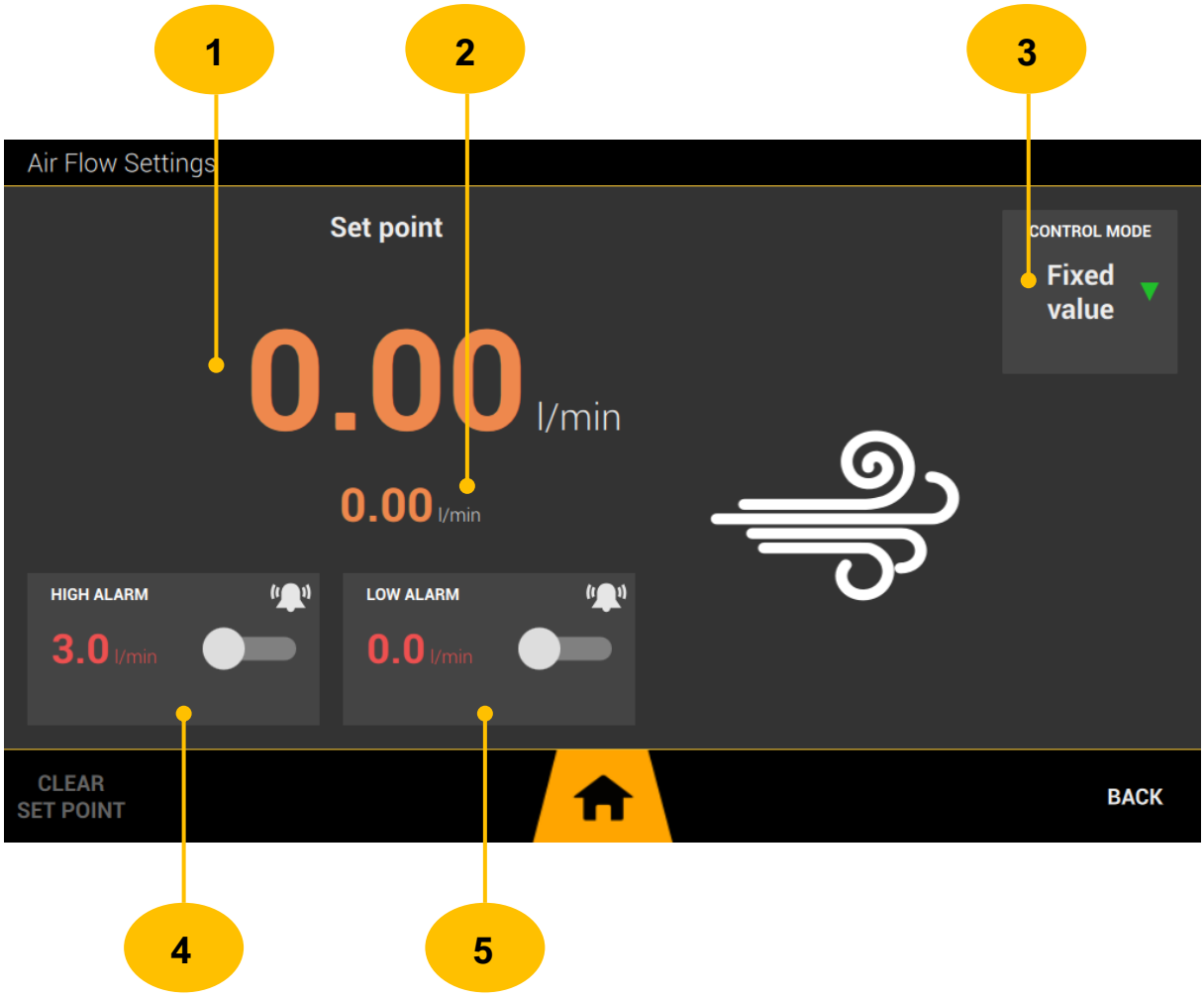
3. **SOURCE PROBE** - setting the signal source (value) for ORP measurement. Select Lambda Digital / ARC technology probe depending on which probe you connected to Minifor2Bio and have installed in the vessel.

4. **HIGH ALARM** - user-adjustable alarm for the upper limit of the measured value. If the measured value exceeds the high alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

5. **LOW ALARM** - user-adjustable alarm for the lower limit of the measured value. If the measured value is smaller than the low alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

10.8 GAS FLOW CONTROL

The function serves to regulate the flow of gas (primarily clean air). Several control modes are available for regulation (fixed value, profile, and cascade). The desired range of the measured temperature value can be monitored using user alarms defined in the HIGH-LOW range.



1. **SET POINT** - desired temperature value in the vessel for the regulator.
   Tap on the value to display a keyboard to change the value. Confirm the new value by tapping the "**OK**" button or cancel the change by tapping the "**CANCEL**" button.

2. **CURRENT VALUE** - process (measured) temperature value

3. **CONTROL MODE** - setting the type of temperature regulation. It can choose regulation to a fixed value, a profile or it can be a set point pH control using cascade control (dependency on another measured value).

   FIXED VALUE - regulation to a fixed value. The regulator will regulate to the set point value.

   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter (10.15).

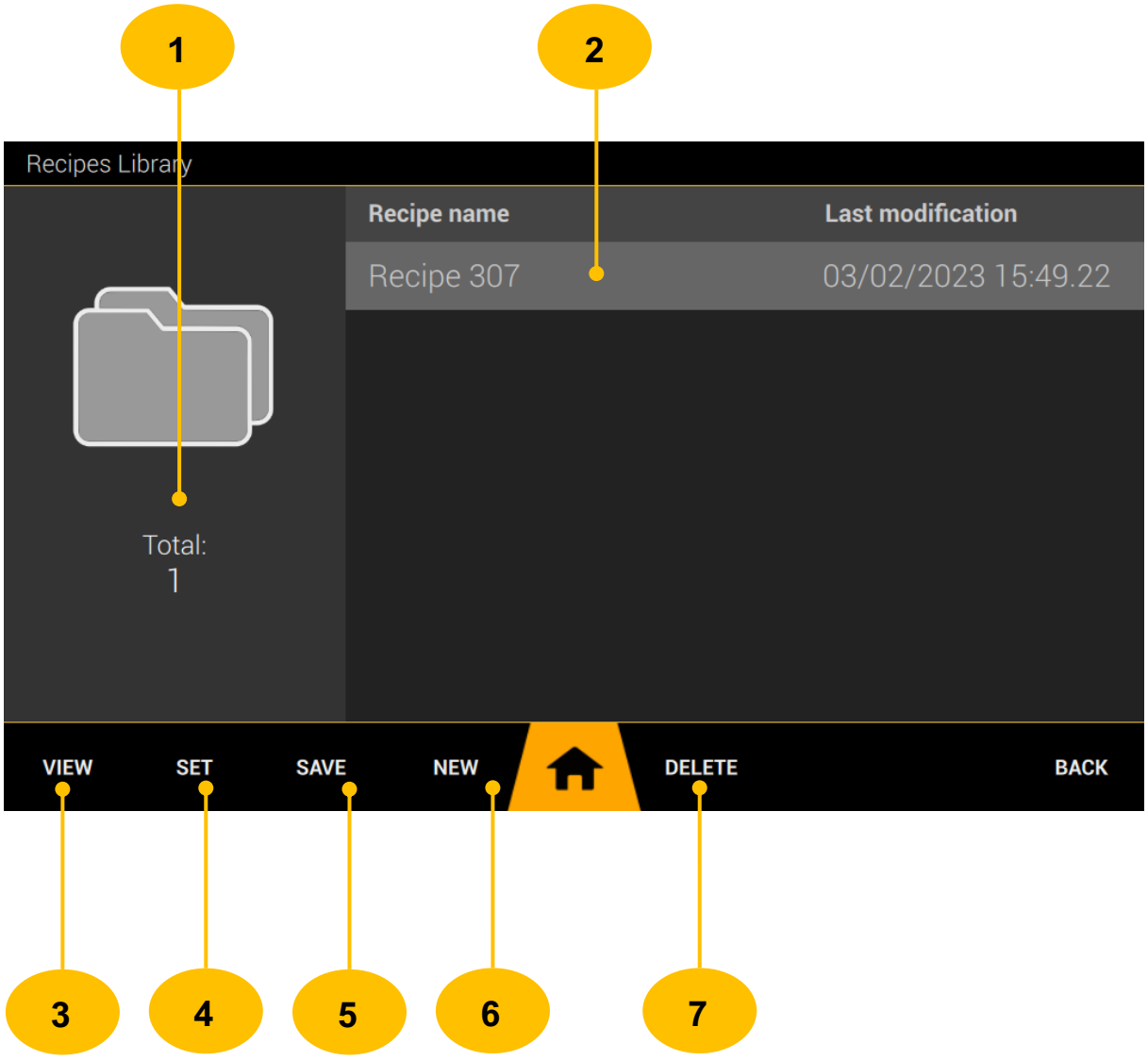
   CASCADE - By setting control mode to that state, temperature is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

4. **HIGH ALARM** - user-adjustable alarm for the upper limit of the measured value. If the measured value exceeds the high alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

5. **LOW ALARM** - user-adjustable alarm for the lower limit of the measured value. If the measured value is smaller than the low alarm value, an alarm is triggered. The alarm can be enabled/disabled with a switch next to the value.

10.9 RECIPES LIBRARY

The function is used to save/load complete settings of the Minifor2Bio fermentation process parameters. After the complete setting of the individual parameters, it is possible to save them under a user-defined name and later retrieve and use them. Modification of already existing recipes is carried out by loading, editing and subsequent re-saving.

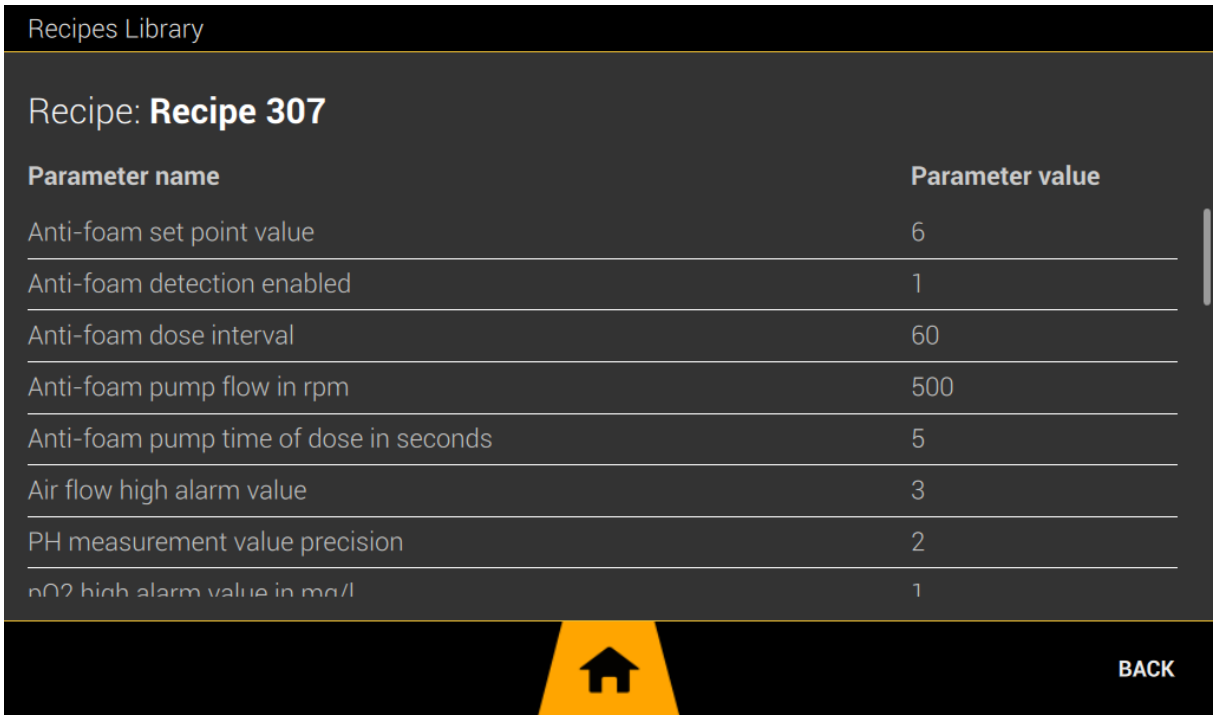


To edit a recipe, load the recipe (SET), make parameter adjustments and save (SAVE) under the same name.

1. **TOTAL** - total number of stored recipes.
2. **CURRENT VALUE** - list of saved recipes. Contains the name of the recipe along with the timestamp of the last modification.
3. **VIEW** - display of saved recipe parameters.
4. **SET** - loading and setting all recipe parameters.
5. **SAVE** - save (re-save) parameters under the marked recipe name in the list.
6. **NEW** - saving the fermentation parameter settings as a recipe under a new name.
7. **DELETE** - delete the marked recipe in the list.

10.9.1 **RECIPE VIEW**

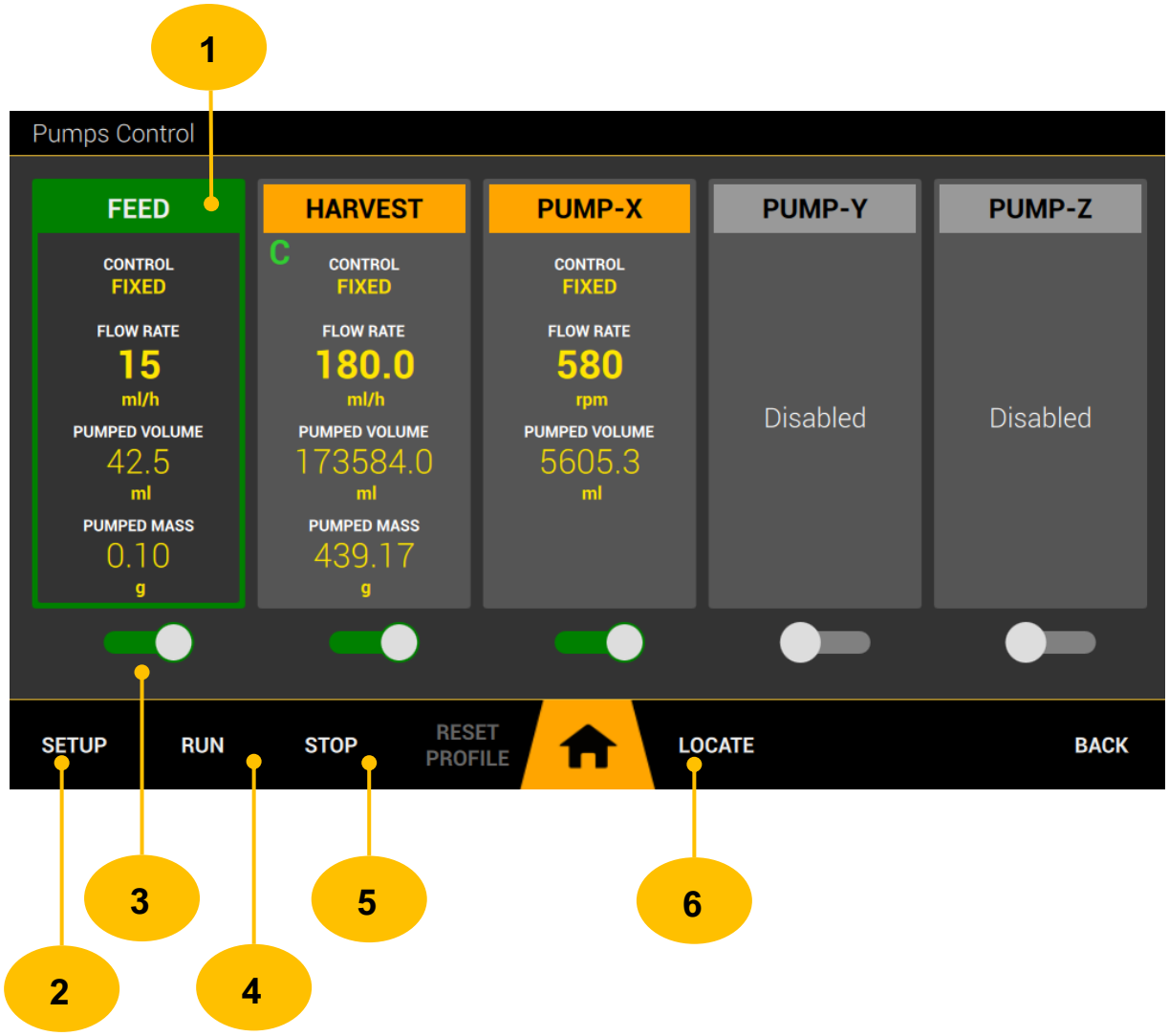
View recipe parameters. Swiping up/down scrolls through the list.



10.10 PUMPS CONTROL

The integrated pump controller enables the control of up to five connected external peristaltic pumps. These pumps can have different meanings in terms of fermentations. According to the meaning, the controller is divided into 5 meanings (FEED, HARVEST, PUMP-X, PUMP-Y and PUMP-Z). For proper function, this meaning (function) must be correctly assigned in DEVICES management (chapter 10.17). Each peristaltic pump can be controlled in fixed value, profile (chapter 10.15) or cascade (chapter 10.16) mode.

- **For correct function of pump controller you must assign function to pump in DEVICES management (chapter 10.17).**
- **Minifor2Bio use as target flow units RPM, other units are backward recalculate to RPM to ensure, that range of flow rate is correct with pump possibilities.**



1. **PUMP BAR** - pump parameters tile. Tap to mark the type of pump you want to manage (frame has green color).

2. **SETUP** - transition to the settings of the marked pump.

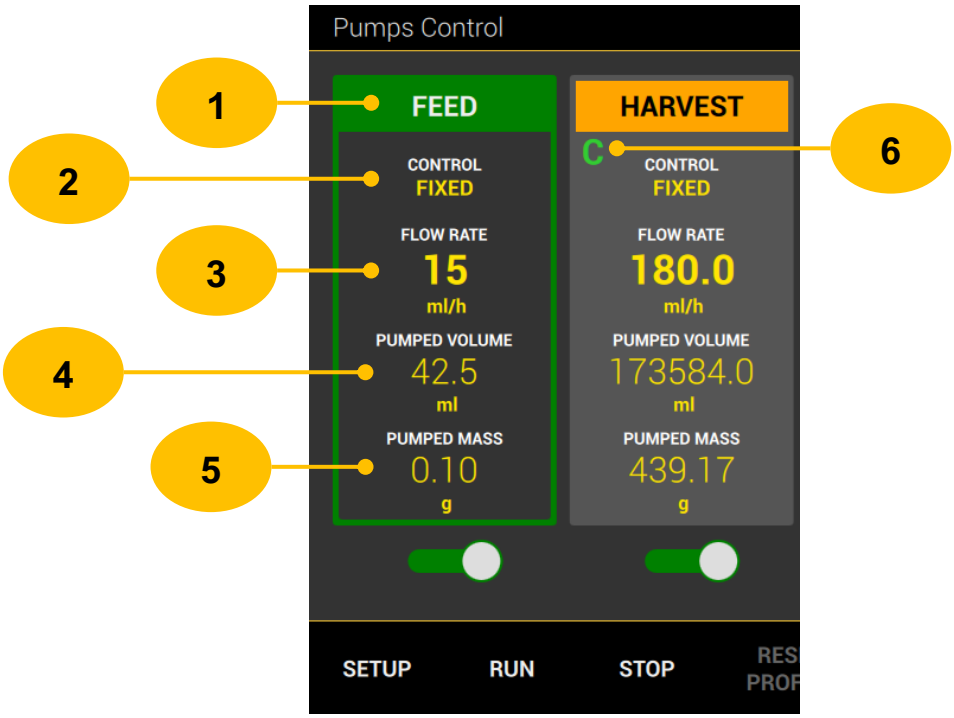
3. **ENABLE** – enable/disable pump control.

4. **RUN** - putting the pump into RUN mode. RUN mode is indicated by a green pump tile header.

5. **STOP** - putting the pump into STOP mode. STOP mode is indicated by a orange pump tile header.

6. **LOCATE** - by tapping, the display of the assigned pump must flash. If no connected pump starts flashing, the pump is not assigned correctly in **DEVICES** management.

10.10.1 TILE INDICATORS



1. **PUMP TYPE** – global pump identification, the background color of the label indicates the operational status of the pump (GREEN = RUN, ORANGE = STOP)

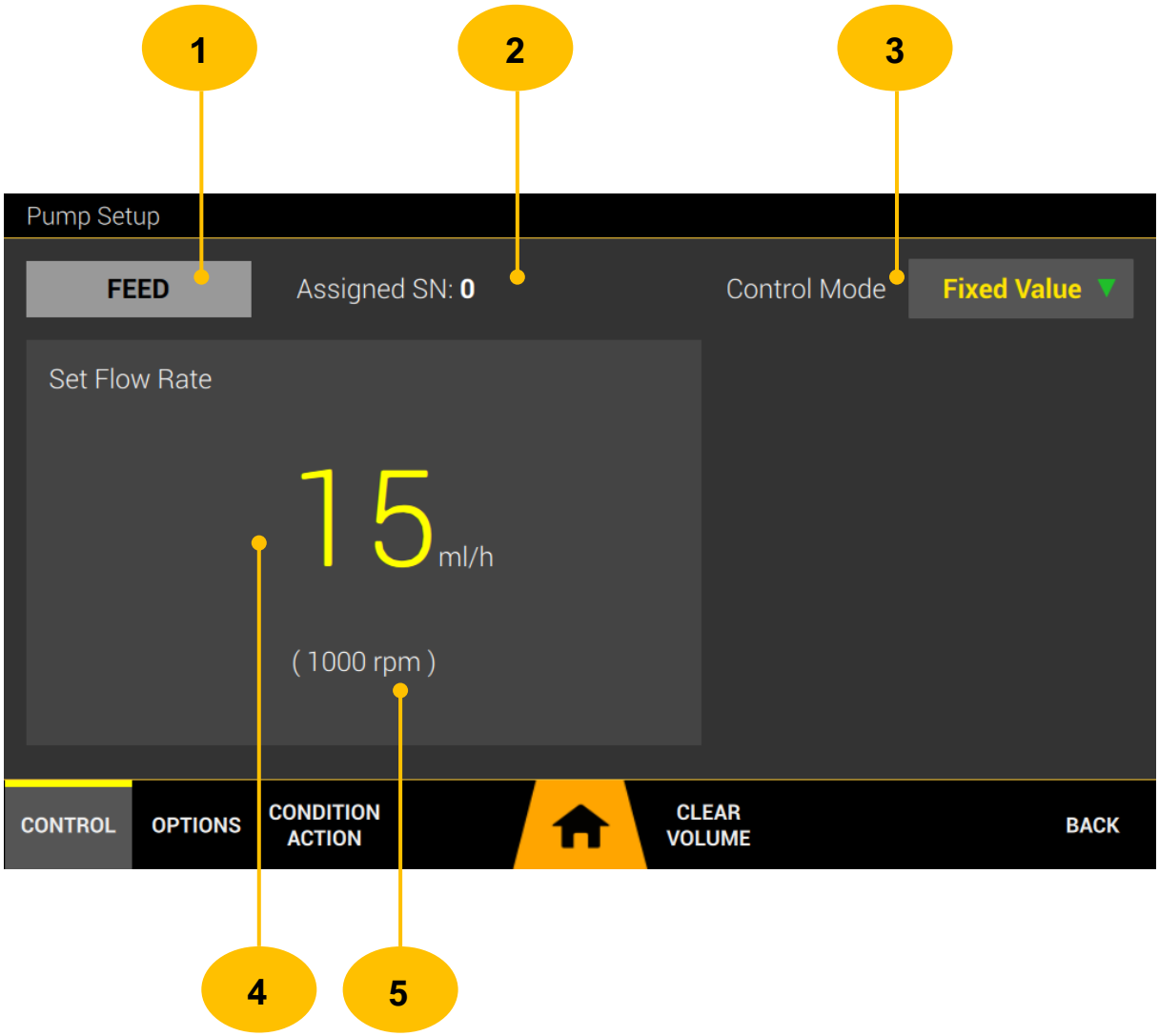
2. **CONTROL** - currently selected type of pump control (fixed value, profile or cascade).

3. **FLOW RATE** - the desired value of the flow rate by the controller.
4. **PUMPED VOLUME** - the total amount of the dispensed volume calculated on the basis of the calibration constant entered in the pump settings. This parameter is displayed only if the calibration constant is set (chapter 10.10.3).

5. **PUMPED MASS** – if a concentration value is set, the calculated pumped mass value is displayed (chapter 10.10.3).

6. **CONDITIONAL ACTION SYMBOL** – this symbol indicates a set conditional action. The color of the symbol indicates whether the conditional action has been processed (**GREEN**) or the action condition has not yet been met (**RED**).

10.10.2 SETUP - CONTROL



1. **PUMP TYPE** – global pump identification

2. **ASSIGNED SN** - the parameter must not be null. 0 indicates that it is not assigned to a specific pump in DEVICES management. In DEVICES management, the same pump function as the pump identification in the controller must be selected.

3. **CONTROL MODE** - setting the type of temperature regulation. It can choose regulation to a fixed value, a profile or it can be a set point pH control using cascade control (dependency on another measured value).

   FIXED VALUE - regulation to a fixed value. The regulator will regulate to the set point value.

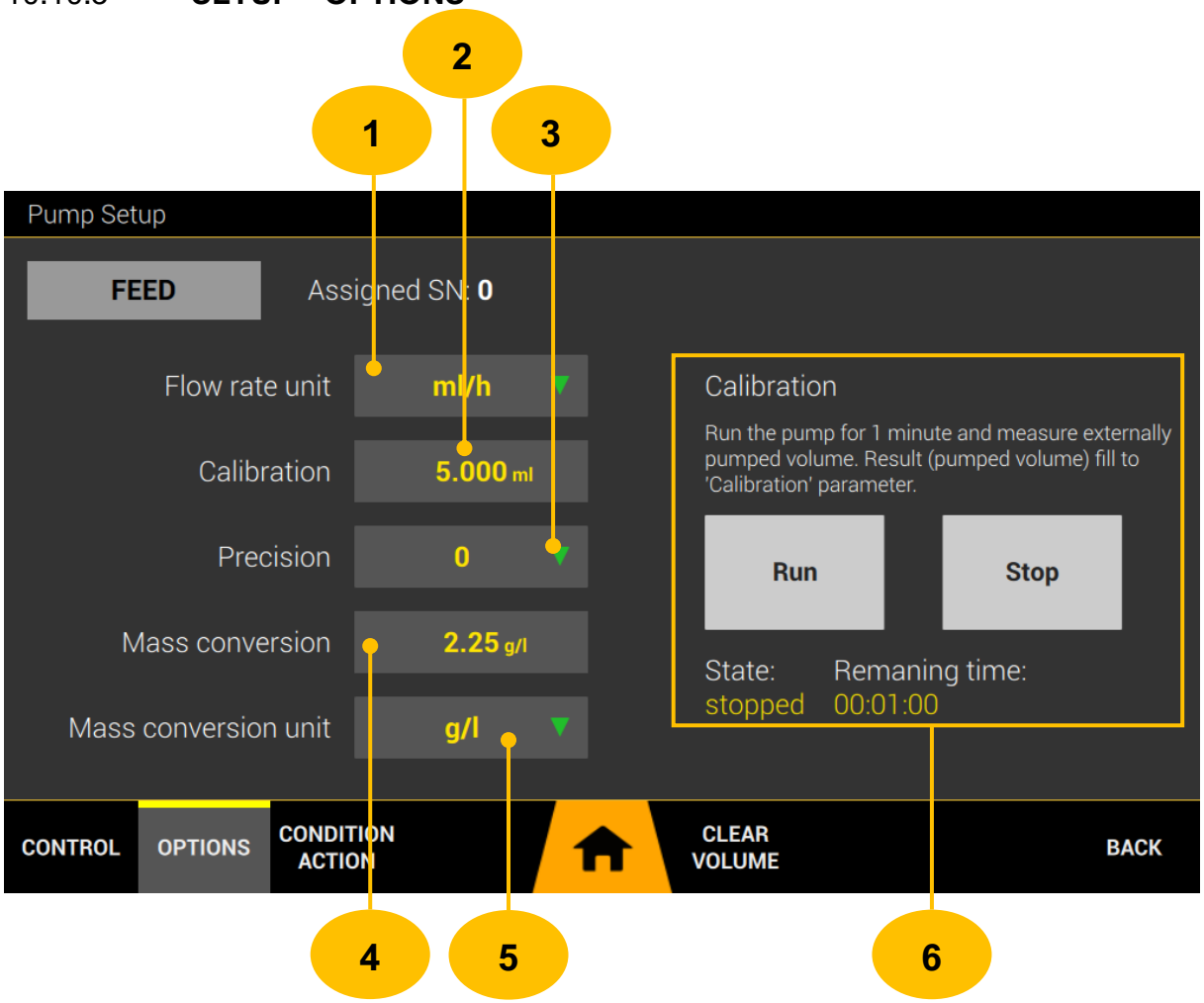
   TIME PROFILE - regulation will take place according to a preset profile (set of values changing over time), you can find how to set the profile in the chapter (10.15).

   CASCADE - By setting control mode to that state, temperature is available as a "CONTROL x" parameter in cascade control (chapter 10.16).

4. **FLOW RATE** - the desired value of the flow rate by the controller.

5. **FLOW RATE RPM** – minifor2bio uses rpm units to control the speed of external peristaltic pumps. Volume units are always recalculated to target rpm units.

10.10.3 SETUP – OPTIONS



1. **FLOW RATE UNIT** – selection of units for entering the dosing rate (rpm, ml/h, ml/min). If you choose volume units (ml/h or ml/min), it is necessary to set the calibration constant for correct function. You can get this constant by calibrating the pump (chapter 10.10.3.1).

2. **CALIBRATION** - calibration constant. This constant must be entered if you want to use volume units for the dosing rate.

3. **PRECISION** - the number of decimal places of the parameters and values you want to work with.

4. **MASS CONVERSION** - conversion constant. If you want to display the dispensed volume of the solution expressed in mass units, enter the concentration of the active substance in the solution.

5. **MASS CONVERSION UNIT** – choose the units in which you will convert volume values to mass units.

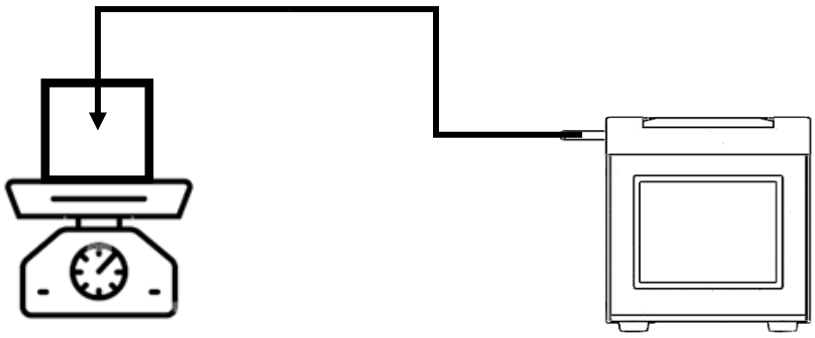
6. **CALIBRATION** – pump rpm to volume units calibration (chapter 10.10.3.1).

10.10.3.1 CALIBRATION

The calibration is used to determine the calibration constant for converting rpm units to volume units. The calibration process consists in measuring the dispensed volume of liquid during one minute of dosing at a predetermined dosing rate.

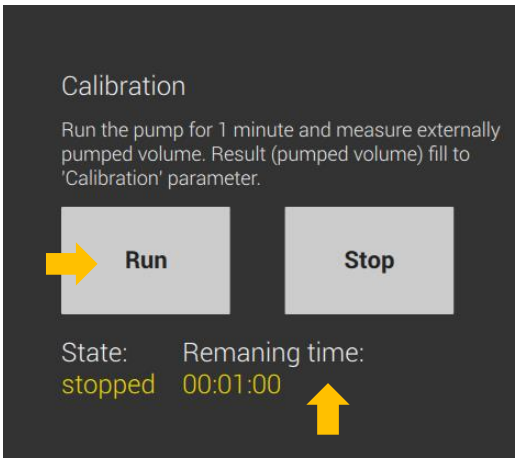
Pump calibration can only be performed in STOP operating mode.

Calibration example (Other flow meters can also be used for calibration):



Scales Pump

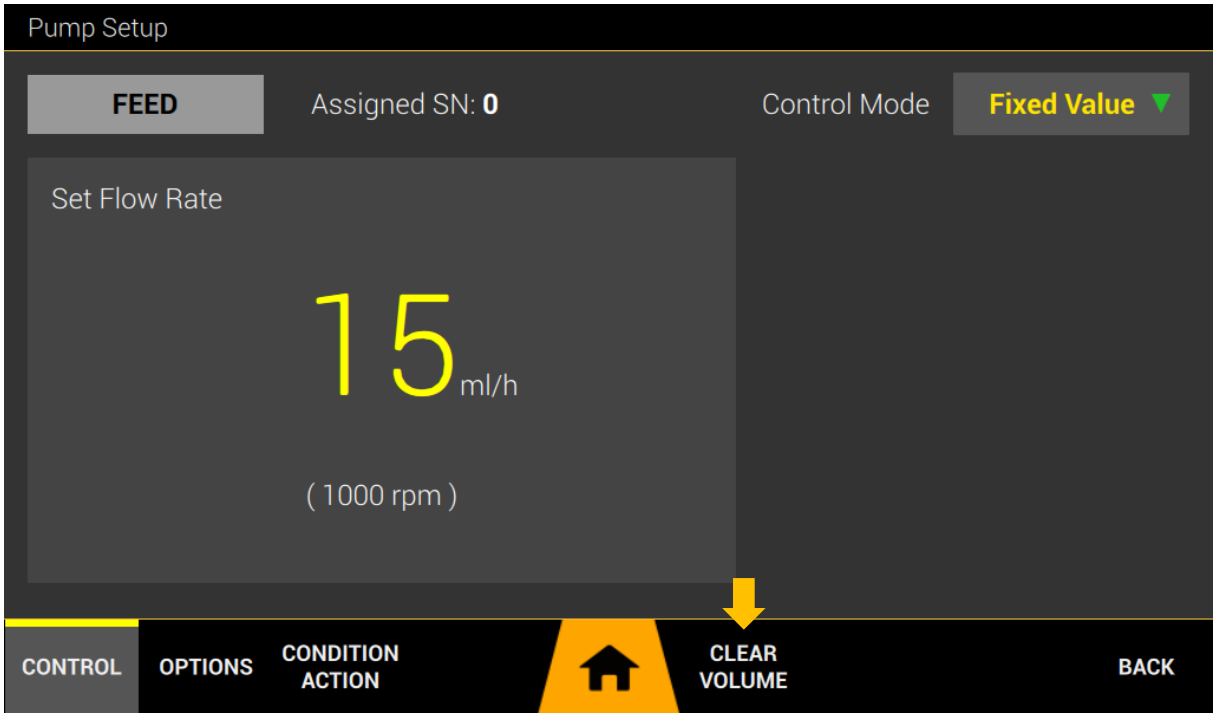
STEP 1	Prepare the pump to measure the dispensed quantity, for example in the picture above. Make sure Minifor2Bio is in STOP operating mode. **Make sure the external pump is in REMOTE mode!**
STEP 2	Start the calibration process by tapping the **RUN** button. The remaining calibration time is shown on the display in the state of the calibration process.



STEP 3	After the calibration time has elapsed (the pump status returns to **STOPPED** and the pump stops dosing), read the dispensed volume from the measuring device and enter it manually in the **CALIBRATION** field.

10.10.4 STATISTIC CLEAR

The dispensed volume statistics (if the calibration constant is set) are reset by tapping the **CLEAR VOLUME** button on the pump settings menu bar.

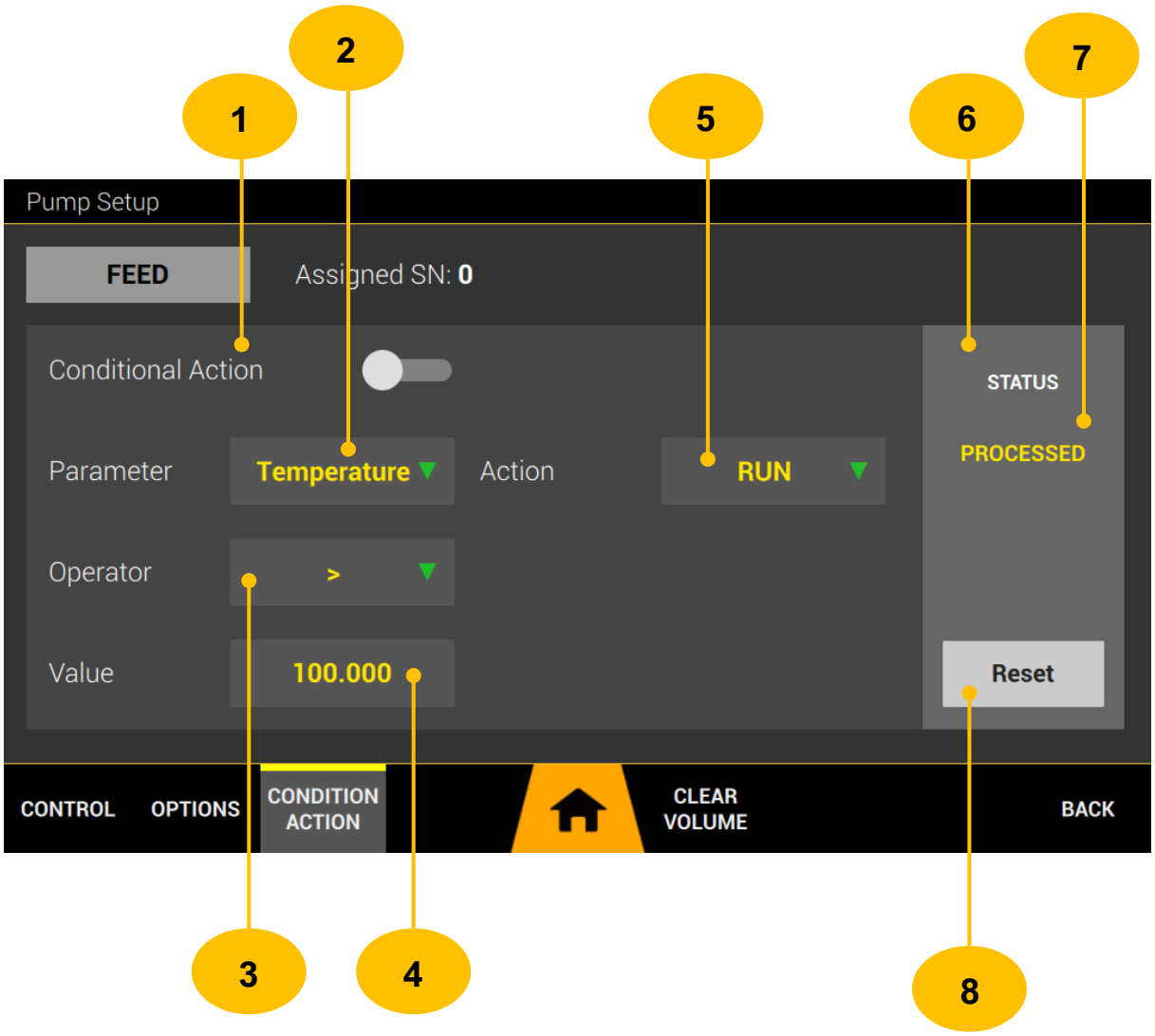


10.10.5 SETUP – CONDITIONAL ACTION

Conditional action serves to conditionally start or stop the external peristaltic pump. The condition is composed of the source value of the signal, the operator and the value to satisfy the condition.

A conditional action is processed only once, once the condition is met. The processing status of the condition is shown on the pump widget by the symbol C (green - the condition has been fulfilled and processed, red - the condition has not yet been fulfilled).

Conditional action can be reset manually with the RESET button.



1. **CONDITIONAL ACTION** – enable/disable feature.

2. **PARAMETER** – selection of the condition parameter to be compared with the value.

3. **OPERATOR** – condition operator.

4. **VALUE** – the value of the selected parameter to satisfy the condition depending on the selected operator.

5. **ACTION** – selecting the STOP/RUN action.

6. **STATUS WIDGET** – conditional status widget.

7. **STATUS** - the current processing status of the condition. WAITING means that the condition is waiting to be fulfilled. PROCESSED means that the condition has been met and the action taken.

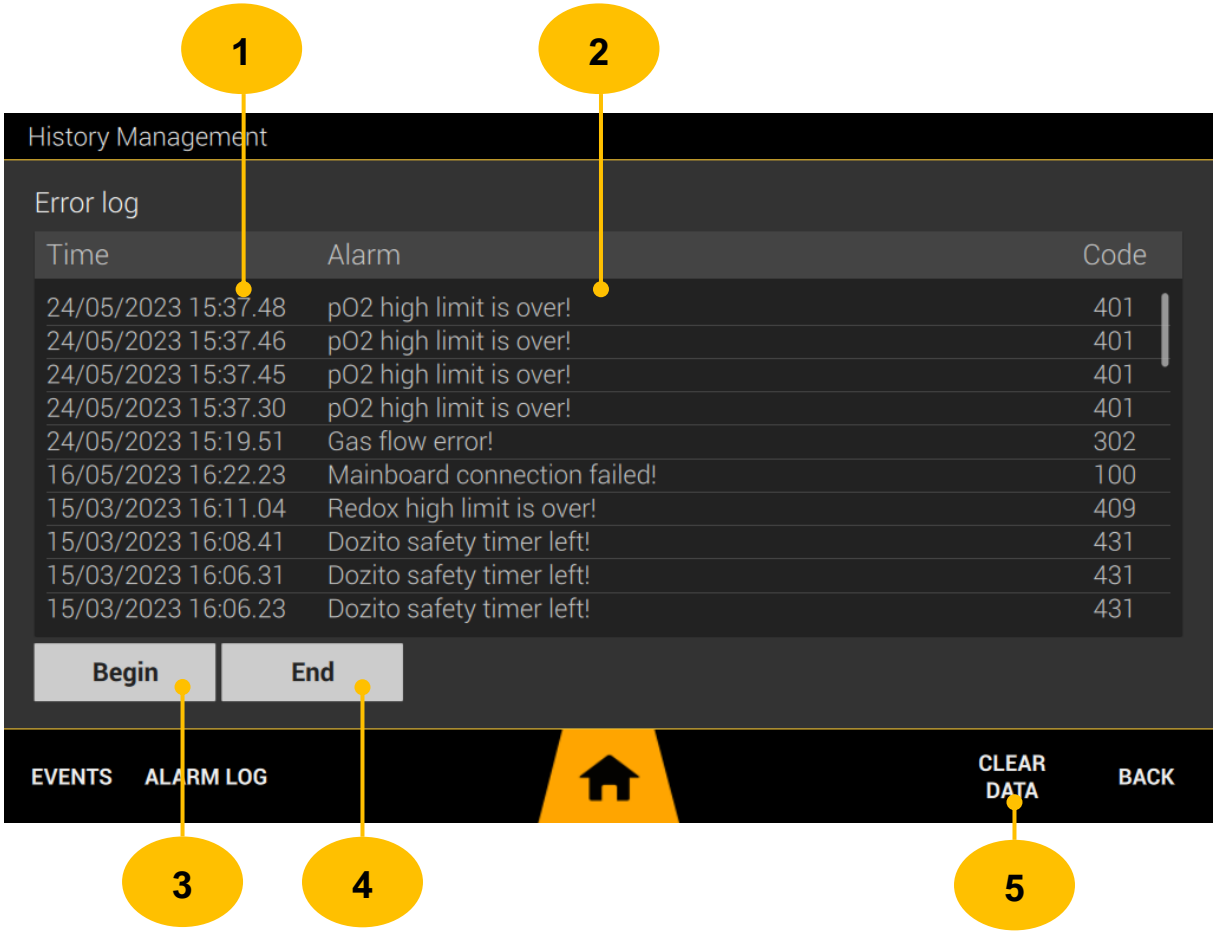
8. **RESET** - button for reset conditional action. Reset means that the evaluation of the condition will take place again and the selected action will also take place again.

If the condition is met (the selected parameter using the operator and the value is true), the conditional action will be executed immediately again!

10.11 HISTORY MANAGEMENT

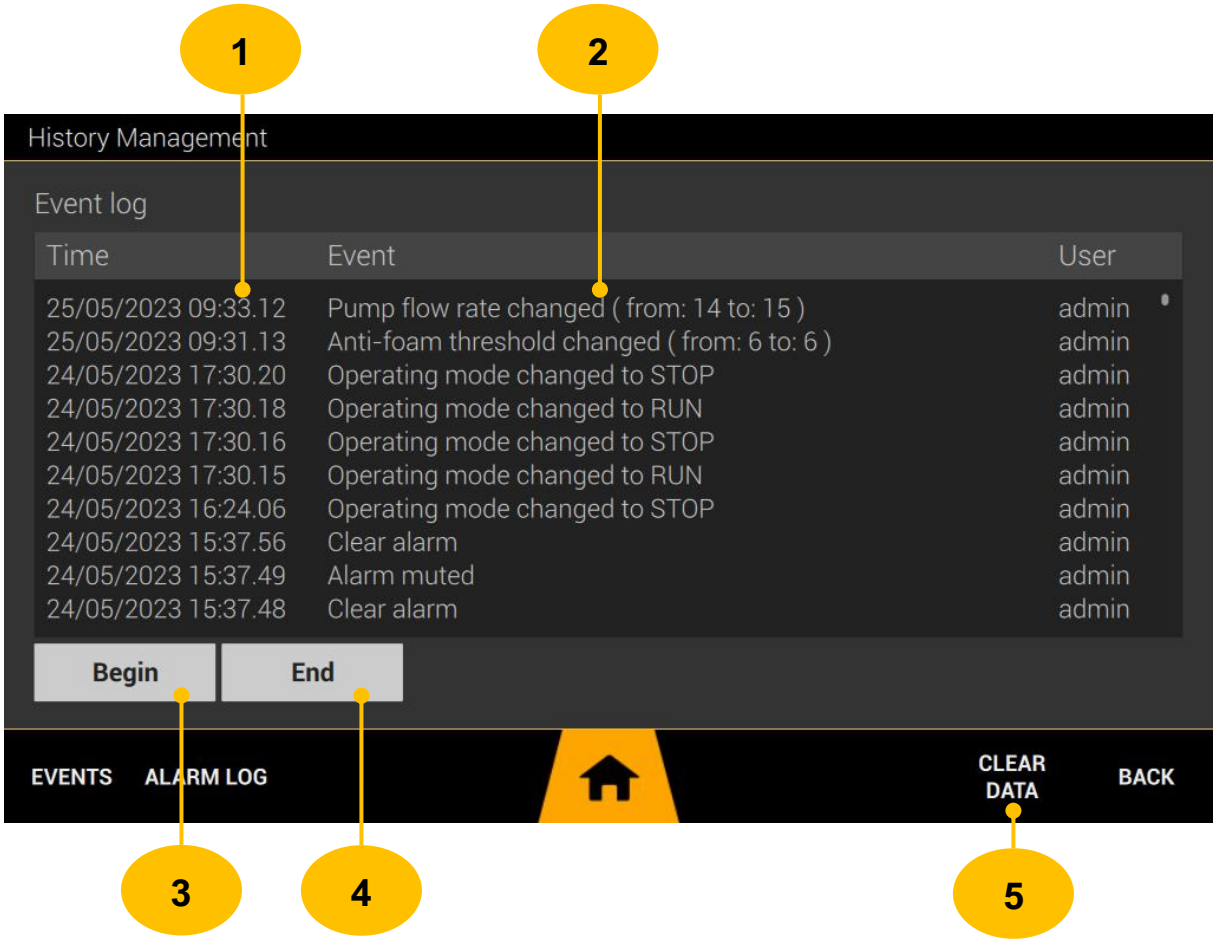
Minifor2Bio automatically records all events in the internal memory. Events are divided into two groups - error log and event log. The information is displayed in a table sorted by timestamp. Events can be deleted manually.

10.11.1 ERROR LOG



1. **TIMESTAMP** – time and date when the alarm/error occurred.
2. **ALARM DESCRIPTION** – the name of the alarm that was logged.
3. **BEGIN** – go to begin of the list.
4. **END** – go to end of the list.
5. **CLEAR DATA** – delete saved data.

10.11.2 EVENT LOG



1. **TIMESTAMP** – time and date when an event occurred.
2. **EVENT DESCRIPTION** – the name of the event that was logged.
3. **BEGIN** – go to begin of the list.
4. **END** – go to end of the list.
5. **CLEAR DATA** – delete saved data.

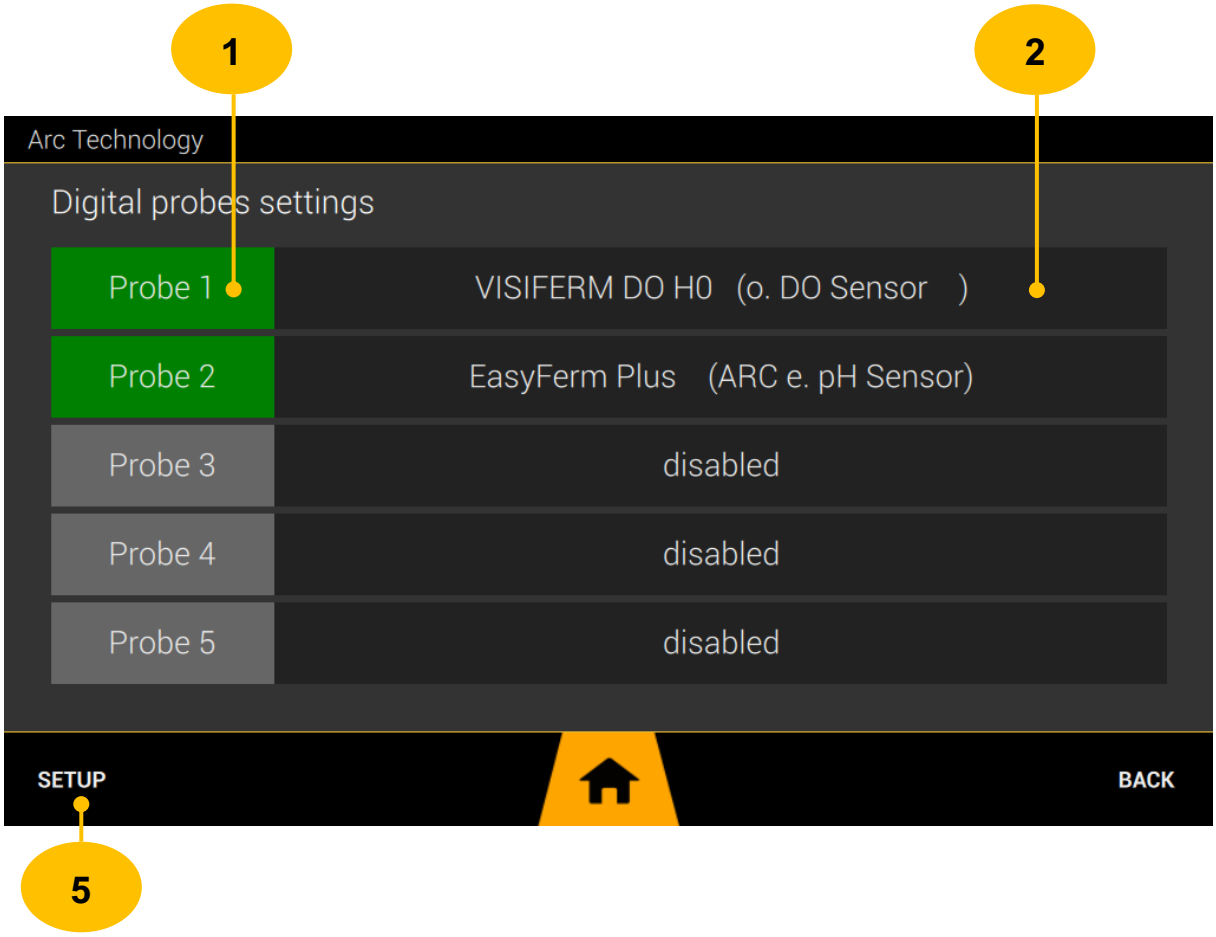
10.12 ARC TECHNOLOGY

Minifor2Bio is equipped with electronics and software for use with digital probes from Hamilton AG. This main menu item is used for basic management of these digital probes.

Minifor2Bio allows you to connect and use up to 5 digital ARC probes.

10.12.1 PROBE MANAGEMENT

Each probe is identified within the RS485 interface through addresses in the range 1-31. Default ARC probe address is 1. Must set probe address to connect to probe. Tap on the "PROBE x" widget to set the address.



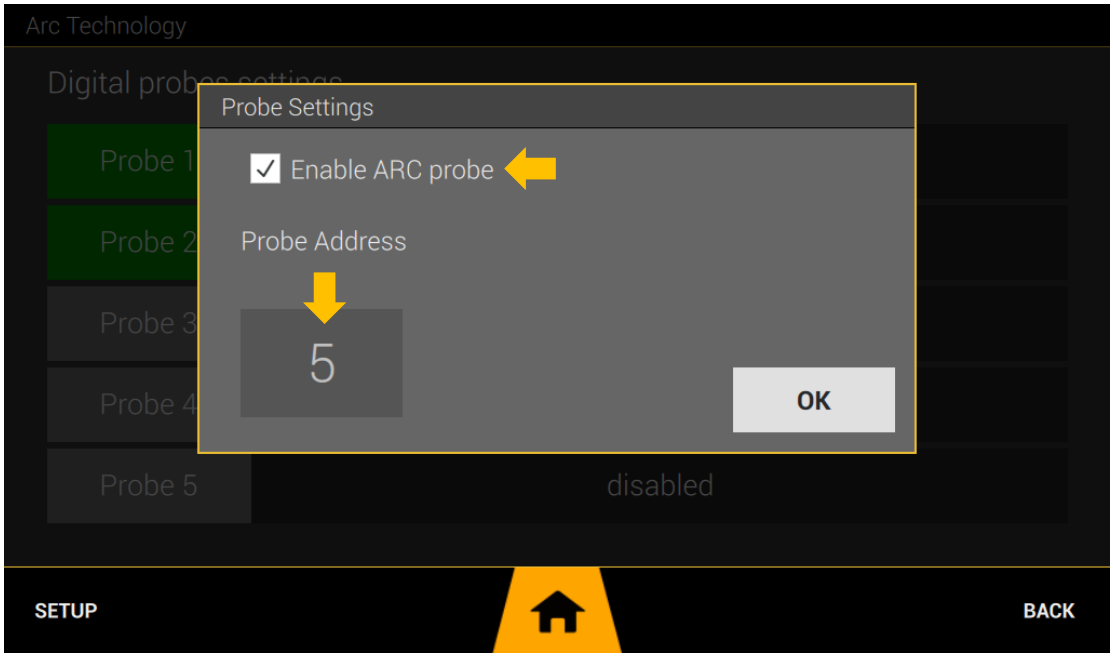
1. **PROBE (1-5)** – probe widget, tap to go to address settings

2. **PROBE NAME AND TYPE** – information about the commercial name of the probe, the type of probe is given in brackets. This information is provided by the probe itself. Tapping on the name of the probe takes you to the display of detailed information about the probe.

3. **SETUP** – go to RS 485 interface setup (chapter 10.12.3)

10.12.2 SET PROBE ADDRESS

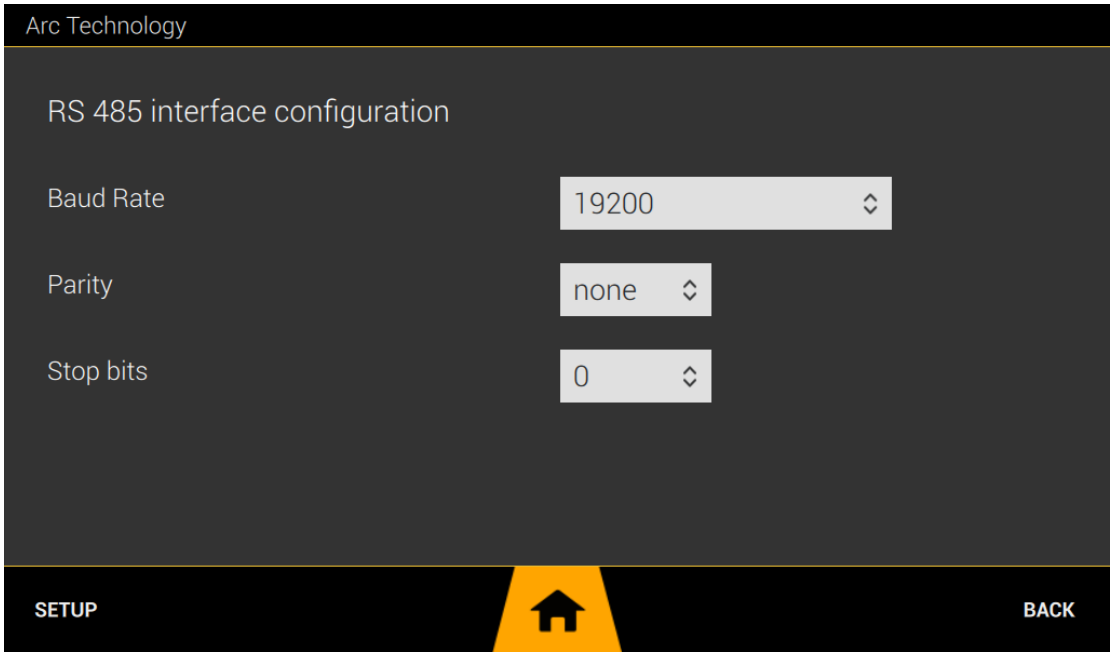
By tapping on the PROBE 1-5 widget, a modal window will appear on the display, where it is necessary to check the probe enable and enter the address of the probe.



10.12.3 COMMUNICATION INTERFACE SETUP

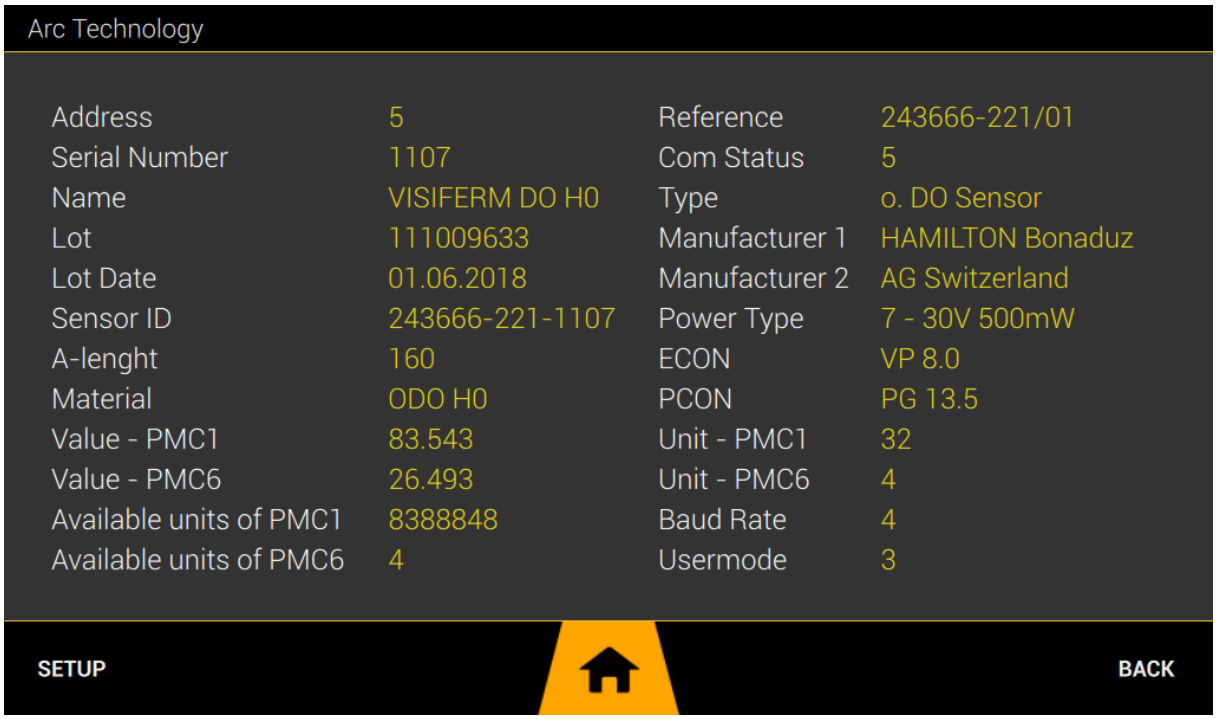
The communication interface for digital probes is RS 485, its settings are identical for all used probes.

Default parameters are 19200 baud, parity none, stop bits 2.



10.12.4 PROBE DETAILED INFORMATION

Tapping on the name of the probe takes you to the display of detailed information about the probe in probe management (chapter 10.12.1).



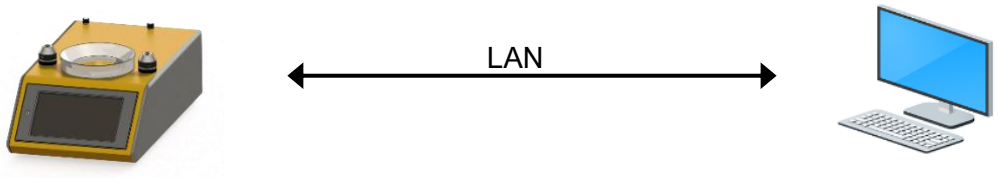
10.13 CONNECTIVITY

Minifor2Bio enables remote supervision and control via Ethernet technology for LAN computer networks, for an additional fee using Wi-Fi technology and USB.

- **Port 9898 must not be blocked in the LAN! These ports are used by Minifor2Bio for remote communication.**
- **When using for Internet connection, it is necessary to use a public IP address and set forwarding for port 9898 (unless other methods like VPN and similar are used).**

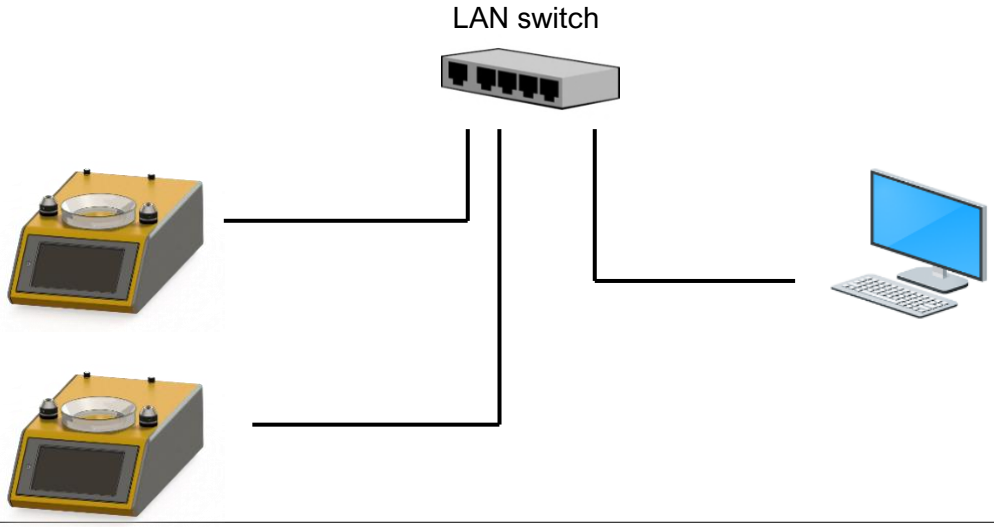
10.13.1 BASIC TOPOLOGY LAN WITH MINIFO2BIO

The basic connection of the minifor2bio to a PC is possible via a twisted LAN cable. In this configuration, it is necessary to set a fixed IP address and netmask.



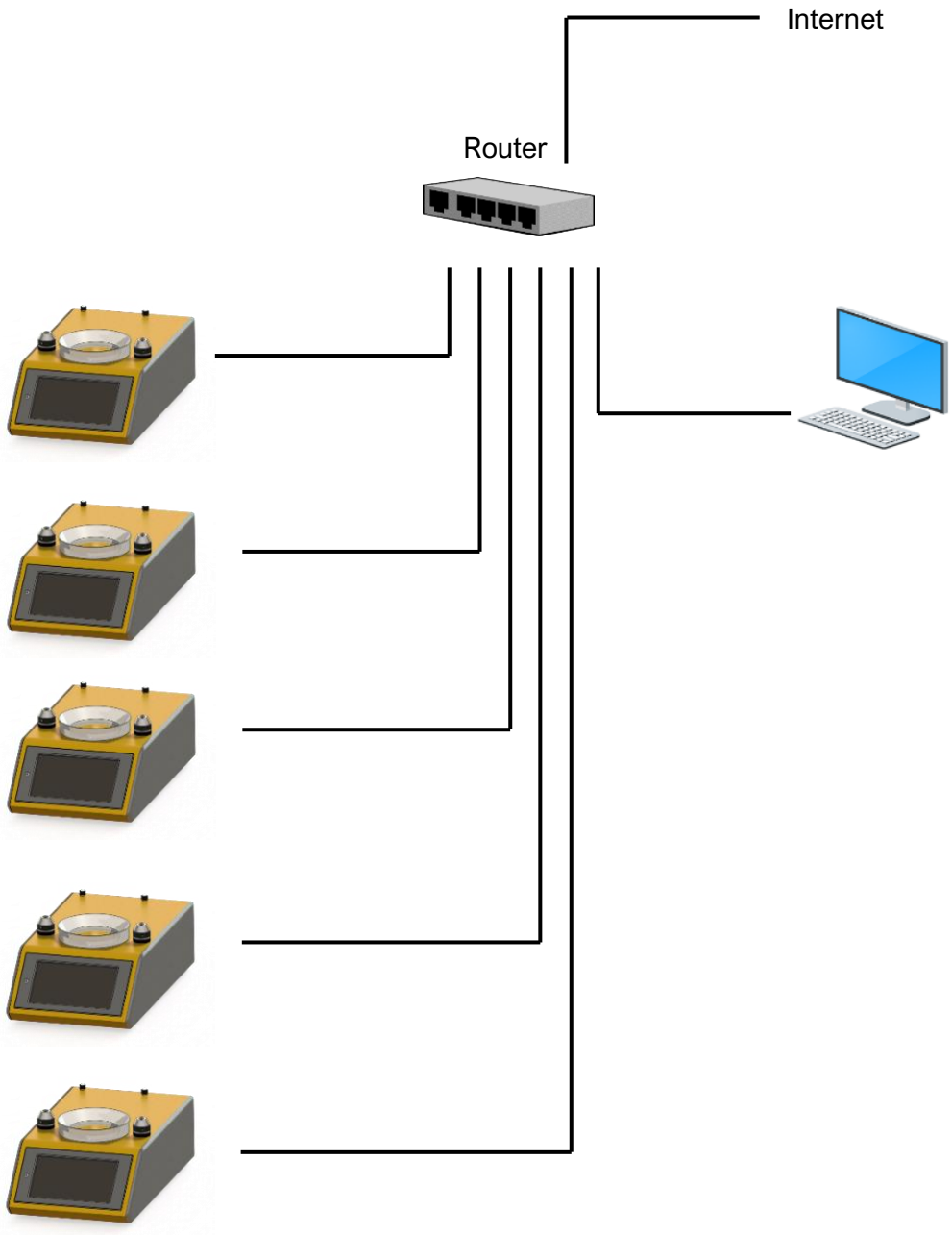
10.13.2 ADVANCED TOPOLOGY LAN WITH MINIFO2BIO

A standard connection of Minifor2Bio or more Minifor2Bio to a PC requires the use of a standard LAN infrastructure, where at least a LAN switch must be used. Without a DHCP server in the network, it is necessary to set fixed IP addresses and a network mask.



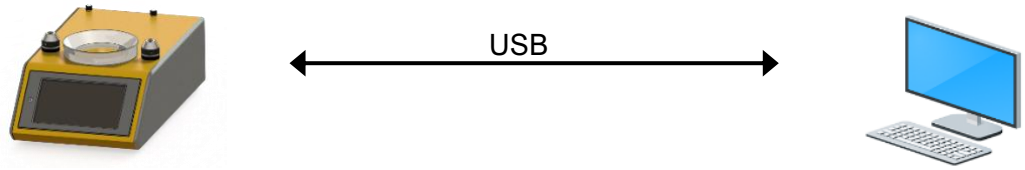
10.13.3 ADVANCED TOPOLOGY WITH INTERNET ACCESS

Full connection, including access via the Internet, requires a connection via a LAN infrastructure, where a router must be present to access the Internet. Without a DHCP server, it is necessary to set fixed IP addresses, netmask, gateway and DNS server addresses. In this connection, it is possible to use the functions of updating the software via the Internet or synchronizing the real time and date via the Internet.

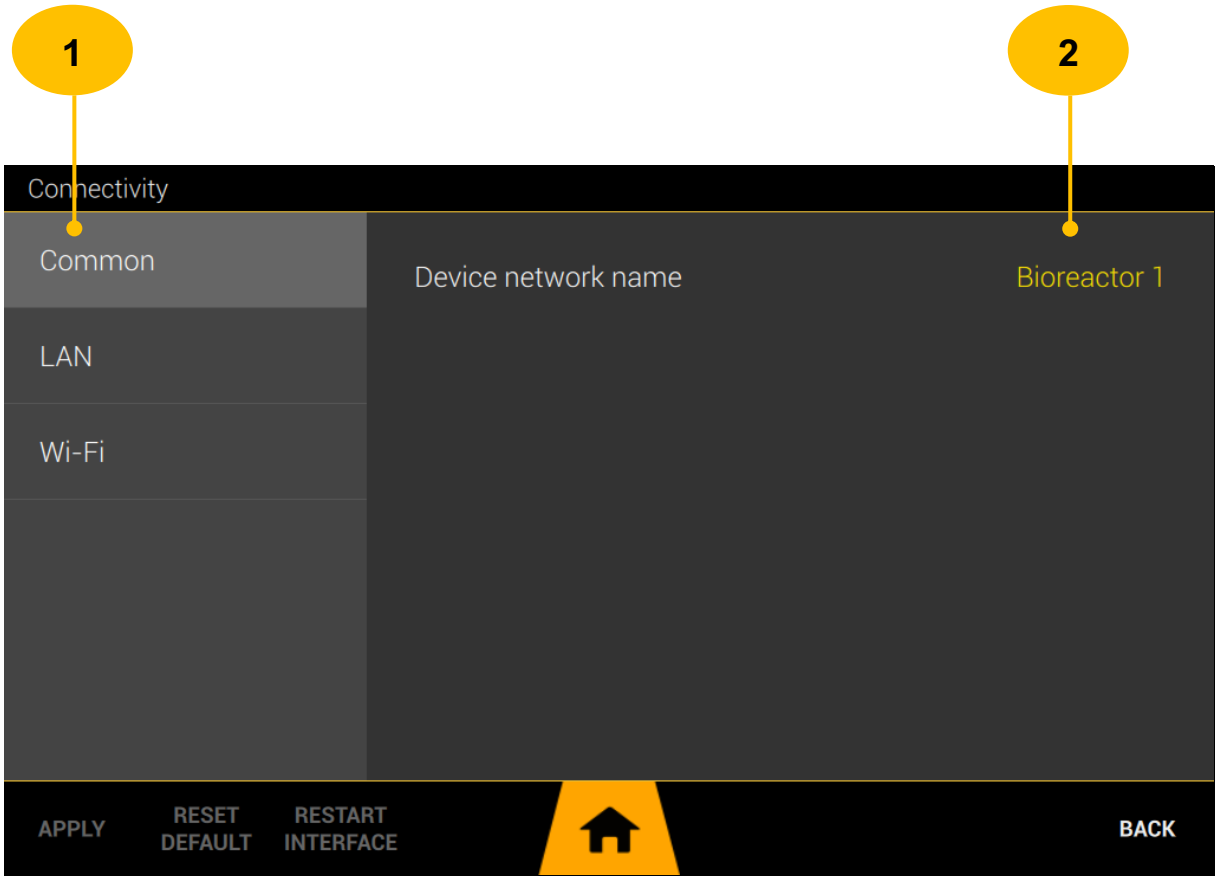


10.13.4 USB CONNECTION

Connect the USB cable on the back panel of the device (USB cable A-B).



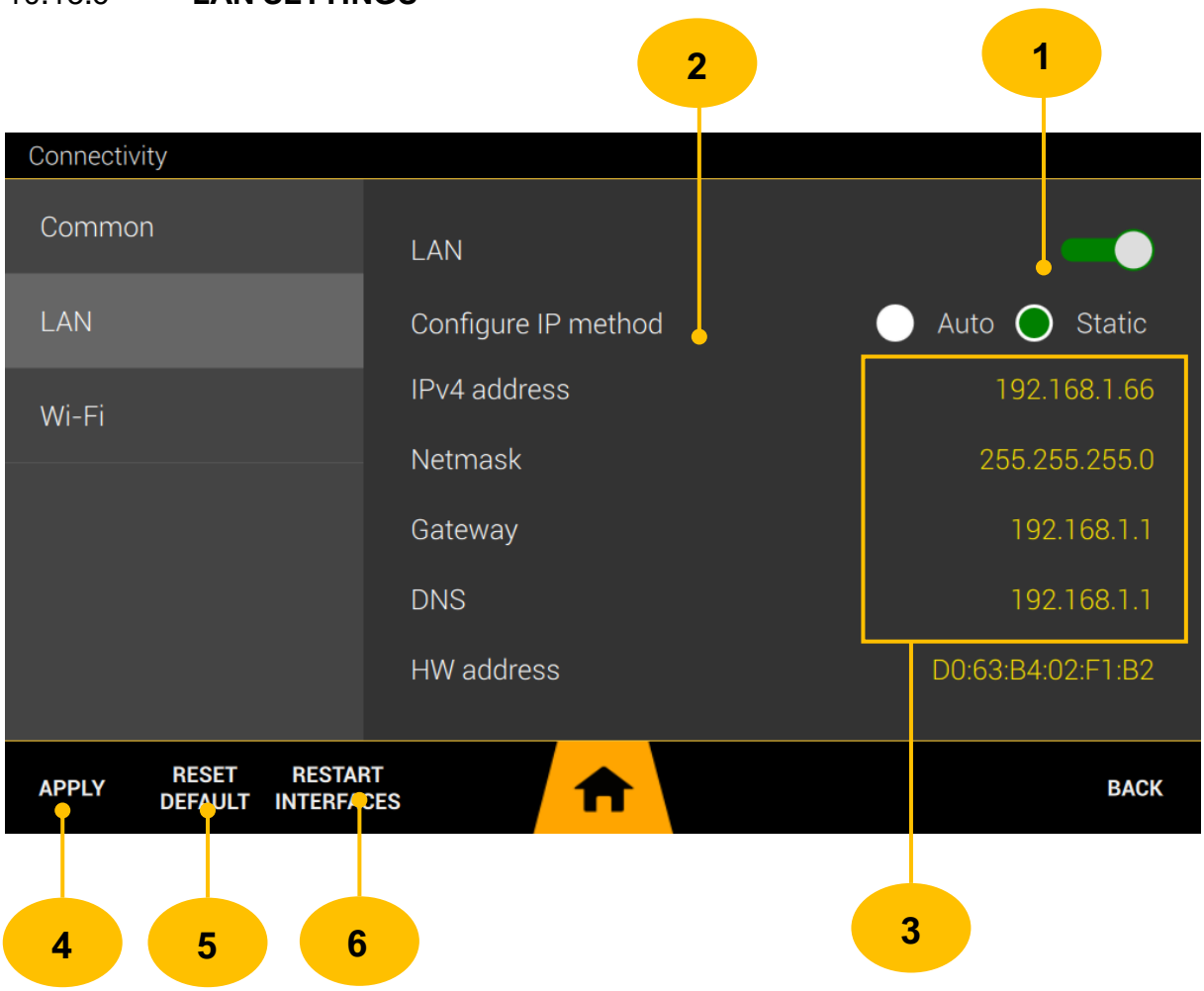
10.13.5 COMMON



1. **CATEGORY TAB**

2. **DEVICE NETWORK NAME** - this name will be visible in MIRETO application (Minifor2Bio Remote Tool).

10.13.6 LAN SETTINGS



1. **ENABLE** - enable/disable LAN interface.

2. **CONFIGURE IP METHOD** - choose how Minifor2Bio gets the configuration for network operation.
   AUTO - you can use this option if a DHCP server is available in the LAN network to which the Minifor2Bio is connected. The DHCP server ensures the correct configuration of individual TCP/IP protocol settings.
   STATIC - manual setting of TCP/IP protocol parameters (IP address, network mask, gateway and DNS server addresses).

3. **TCP/IP CONFIGURATION** - network configuration parameters.

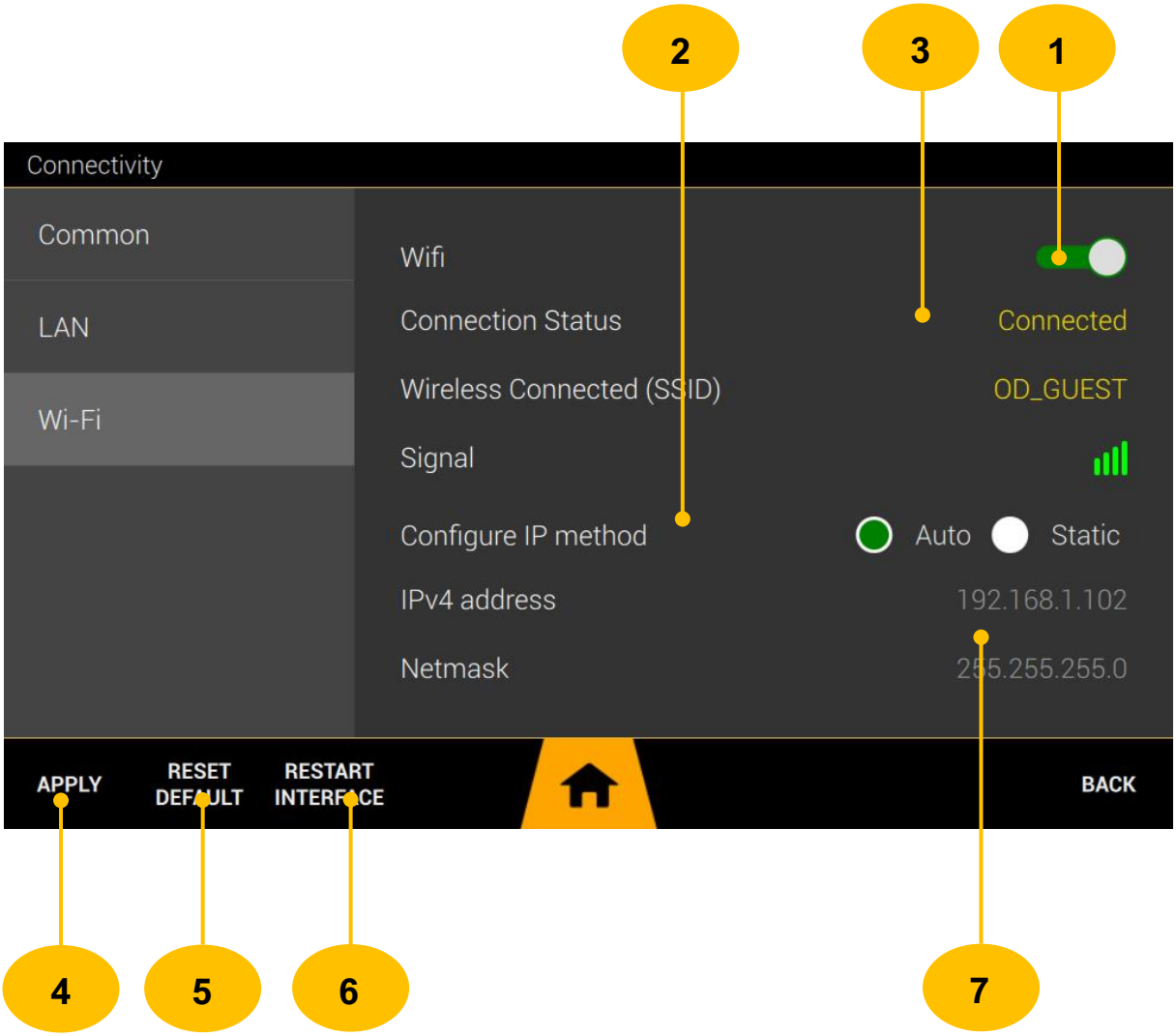
4. **APPLY** – after making a change in the settings, you must tap this button to apply the changes.

5. **RESET DEFAULT** – reset settings to factory state.

6. **RESTART INTERFACE** – restarting the WIFI interface.

10.13.7 WIFI SETTINGS

The WIFI interface can only work in client mode.



1. **ENABLE** - enable/disable LAN interface.

2. **CONFIGURE IP METHOD** - choose how Minifor2Bio gets the configuration for network operation.
   AUTO - you can use this option if a DHCP server is available in the LAN network to which the Minifor2Bio is connected. The DHCP server ensures the correct configuration of individual TCP/IP protocol settings.
   STATIC - manual setting of TCP/IP protocol parameters (IP address, network mask, gateway and DNS server addresses).

3. **CONNECTION STATUS** – connected/not connect, association state to the access point.
4. **APPLY** – after making a change in the settings, you must tap this button to apply the changes.

5. **RESET DEFAULT** – reset settings to factory state.

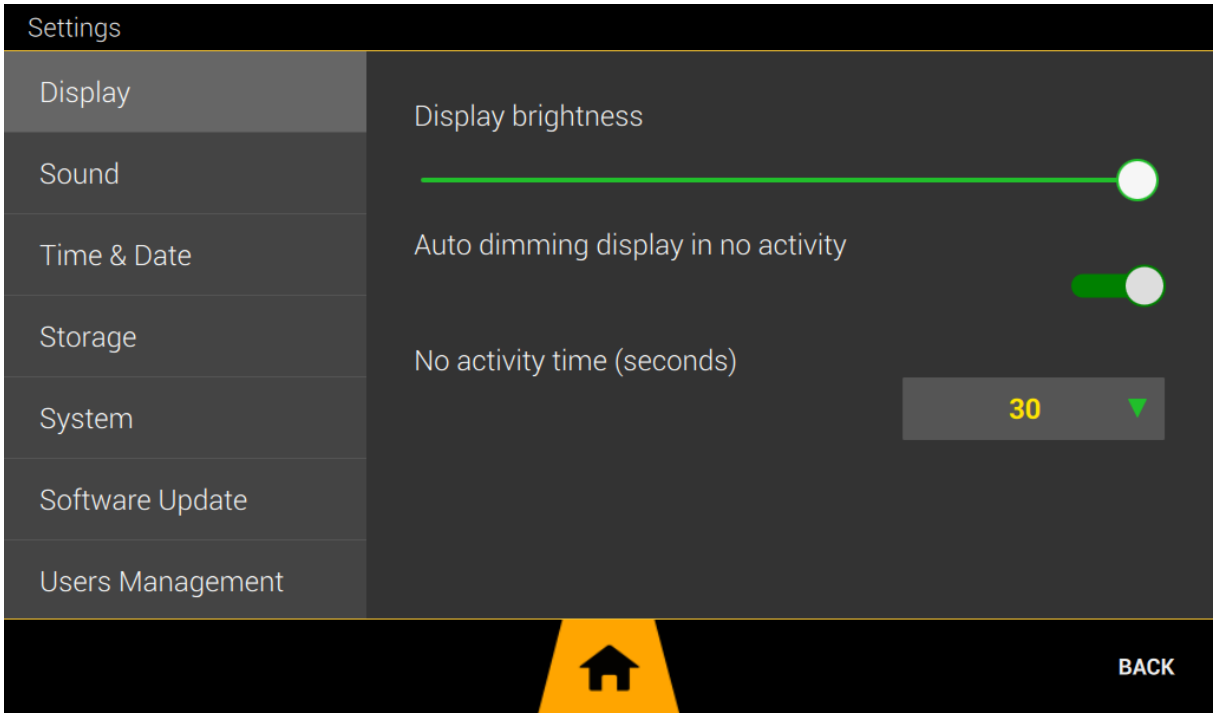
6. **RESTART INTERFACE** – restarting the WIFI interface.

7. **TCP/IP CONFIGURATION** - network configuration parameters.

10.14 SETTINGS

The general settings are divided into several categories according to their meaning. Tap the left column to switch categories.

10.14.1 DISPLAY



10.14.1.1 DISPLAY BRIGHTNESS

You can choose the display backlight intensity setting by dragging the slider to the side.

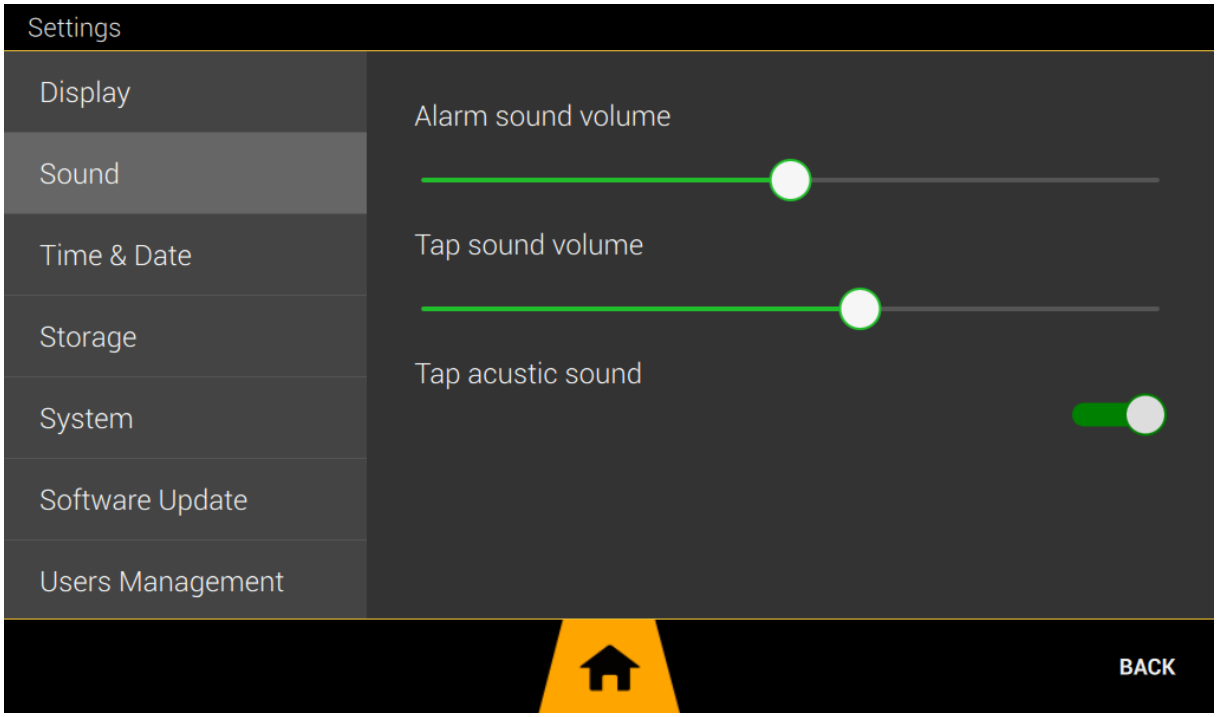
10.14.1.2 AUTO DIMMING DISPLAY IN NO ACTIVITY

The function serves to automatically decrease the brightness to a minimum level when there is no activity on the part of the user below the elapsed time. Tapping the display again will return the brightness to the preset level. The feature can be disabled by tapping the switch.

10.14.1.3 NO ACTIVITY TIME

Setting the time after which the display brightness level will be reduced to the minimum. The parameter is only applied when the auto dimming display function is enabled.

10.14.2 SOUND



10.14.2.1 ALARM SOUND VOLUME

Setting the level of acoustic signaling when an alarm/error is announced. Drag the slider to the sides to set the desired level.

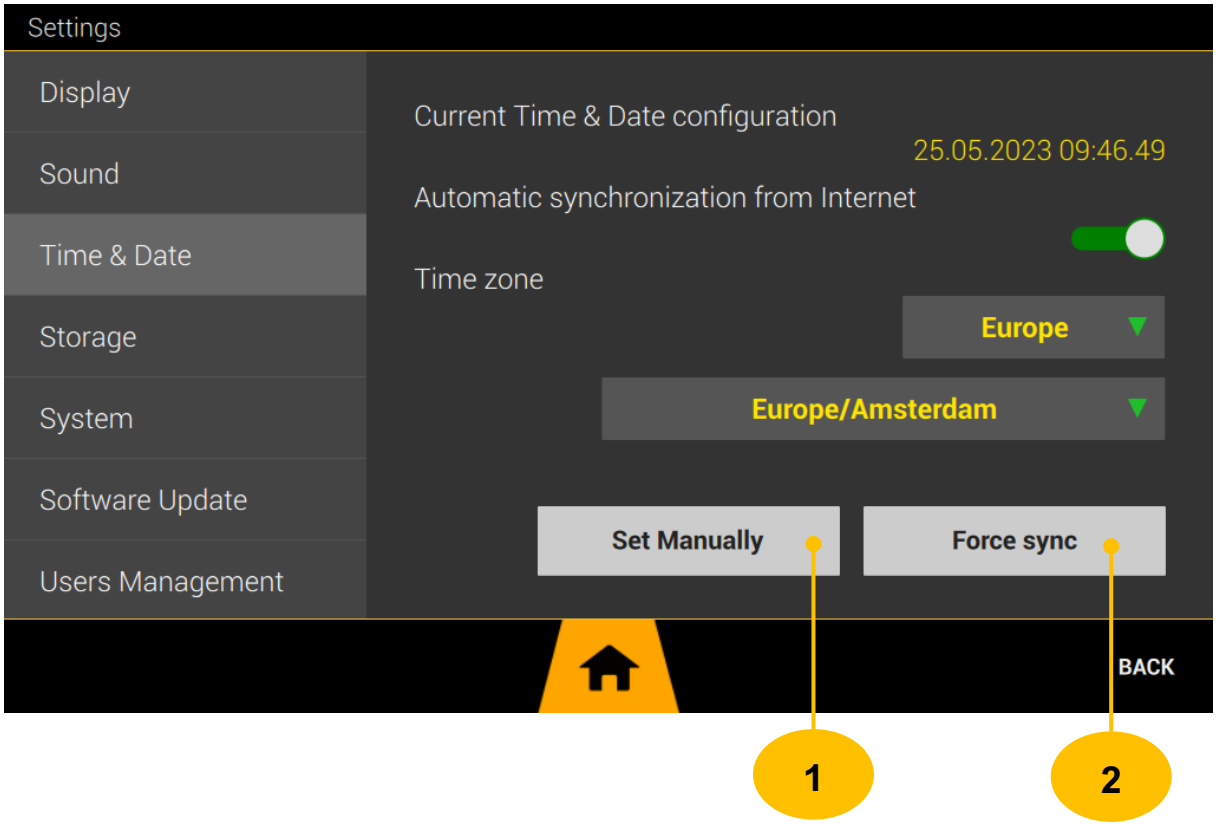
10.14.2.2 TAP SOUND VOLUME

Setting the level of the acoustic signal when touching the display. Drag the slider to the sides to set the desired volume level.

10.14.2.3 TAP ACUSTIC SOUND

Enable/disable acoustic signal when touching the display.

10.14.3 TIME AND DATE



1. **SET MANUALLY** – chapter 10.14.3.3

2. **FORCE SYNC** - if time synchronization via the Internet is active, tapping the button will force synchronization.

10.14.3.1 AUTOMATIC SYNCHRONIZATION FROM INTERNET

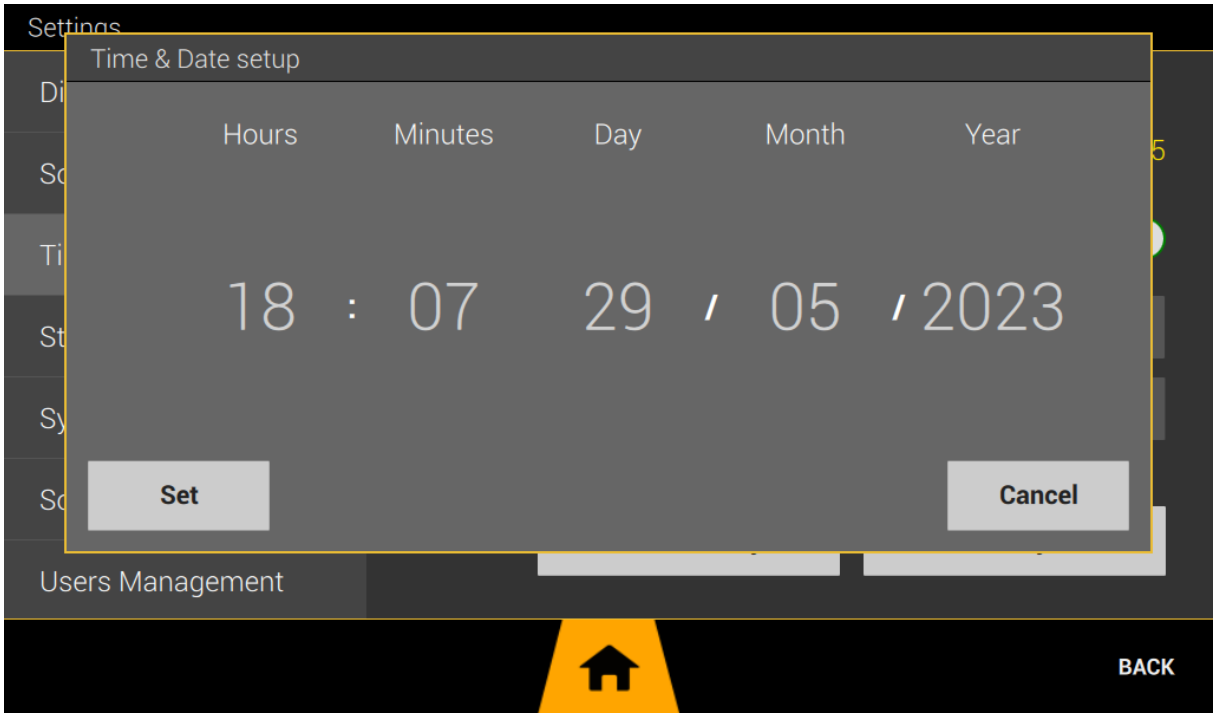
Enable/disable automatic time synchronization for the server on the Internet. Technology based on the NTP protocol (Network Time Protocol). For proper operation, Minifor2Bio must be connected to the Internet (properly configured network interface, more in chapter 10.13).

10.14.3.2 TIMEZONE

Time zone setting. This setting is especially necessary when the time synchronization function from the Internet is active (chapter 10.14.3.1).

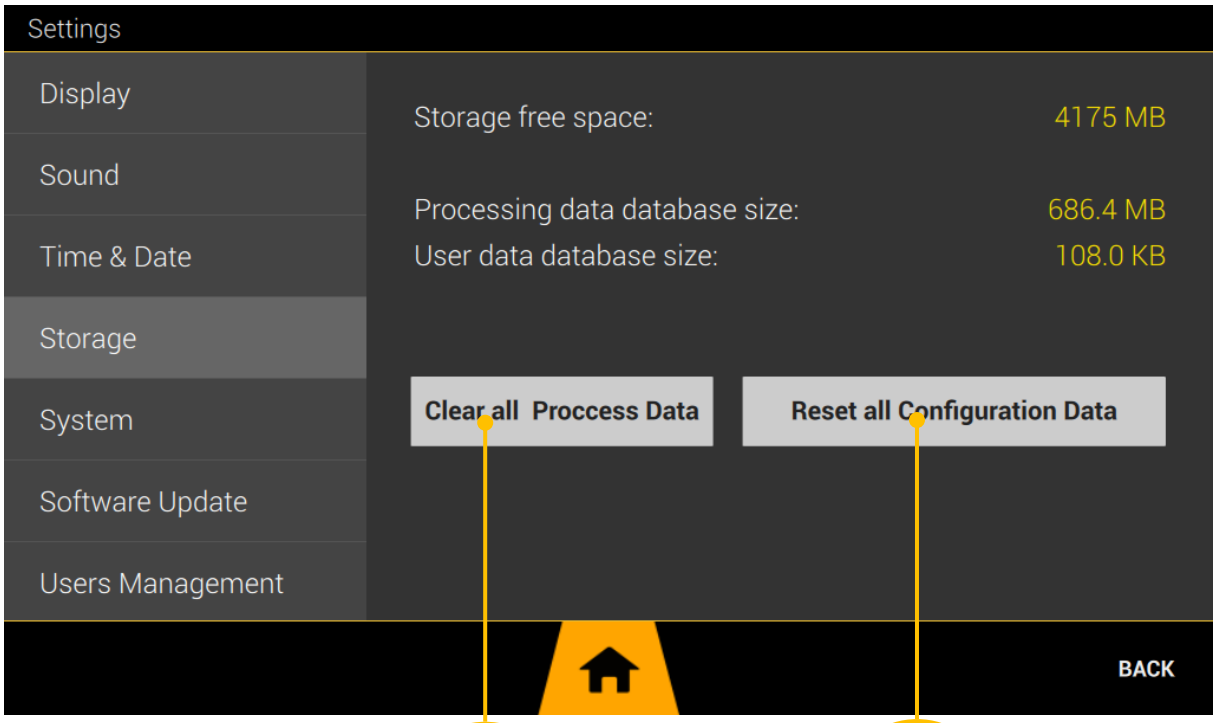
10.14.3.3 SET MANUALLY TIME AND DATE

Enter the time and date and confirm by tapping the **SET** button.



10.14.4 STORAGE

Internal storage management.



1. **CLEAR ALL PROCESS D** y tapping the button you ompted to confirm the deletion of all recorded s.

2. **RESET ALL CONFIGURATION DATA** - by tapping the button you will be prompted to confirm the reset of all configuration settings to the factory state.

10.14.4.1 STORAGE FREE SPACE

The value of the available free space of the internal storage.

10.14.4.2 PROCESSING DATA DATATABASE SIZE

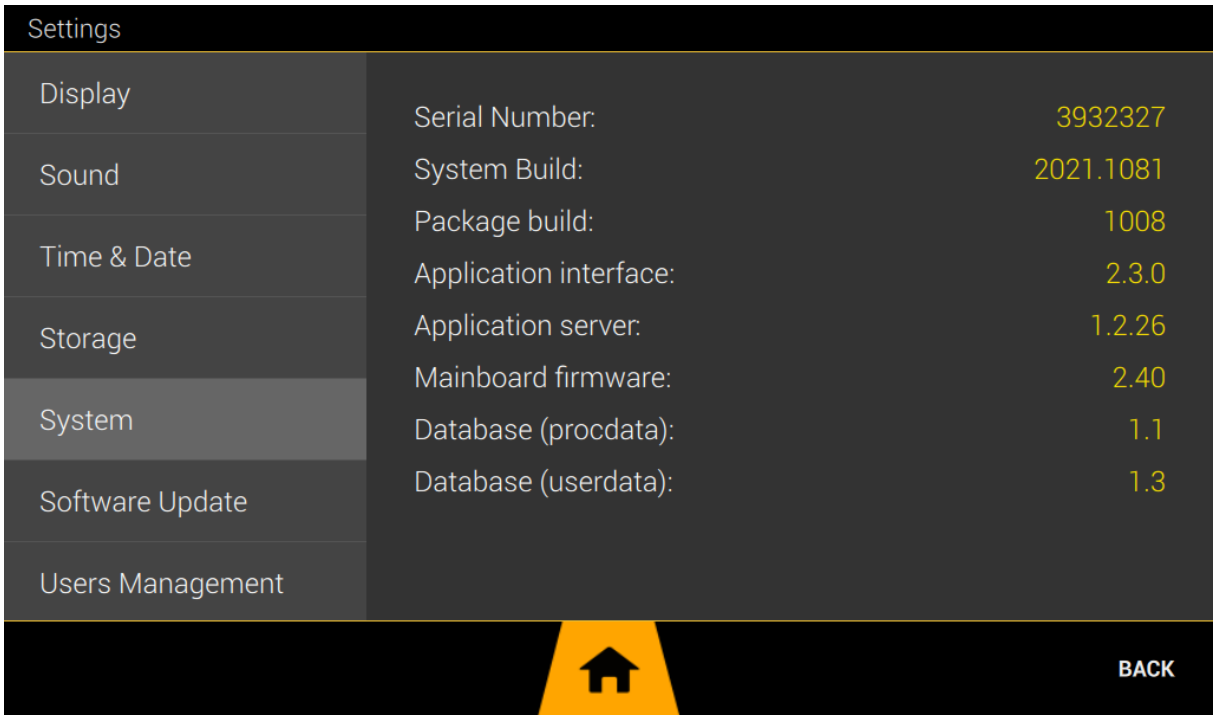
The size of the database in which all process data (parameter values, events, etc.) are recorded.

10.14.4.3 USER DATA DATABASE SIZE

The size of the database in which all configuration data (settings, profiles, cascades, etc.) are recorded.

10.14.5 SYSTEM

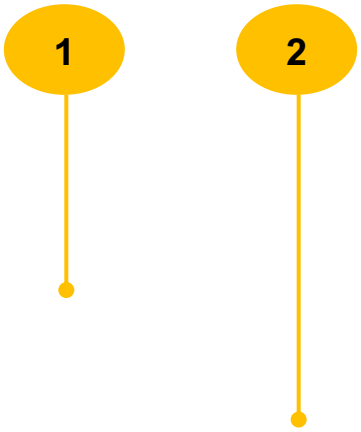
Information about the serial number and other information about the software equipment.

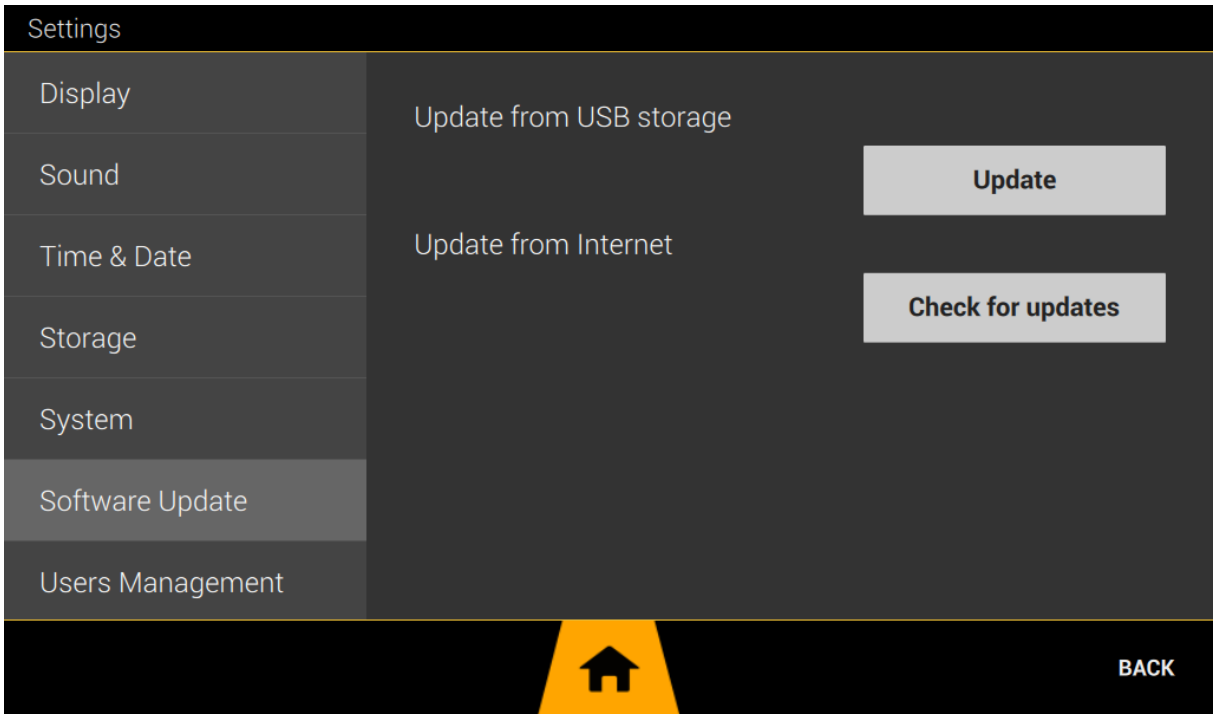


10.14.6 SOFTWARE UPDATE

Updating the software is possible in two ways. The first way to update is via a USB flash drive, which is plugged into the back panel of the Minifor2Bio (chapter 1.2). The second option is to update via the Internet, i.e. the update package is downloaded automatically from the manufacturer's server.

- **The software update is only available in the STOP operating state!**
- **Do not perform updates while the fermentation process is in progress. Some changes may require configuration changes and such, so always update before starting an experiment!**





1. **UPDATE** - Starts the update process via USB flash drive. In the first step, it checks the availability of the USB flash drive and the update package stored on it.

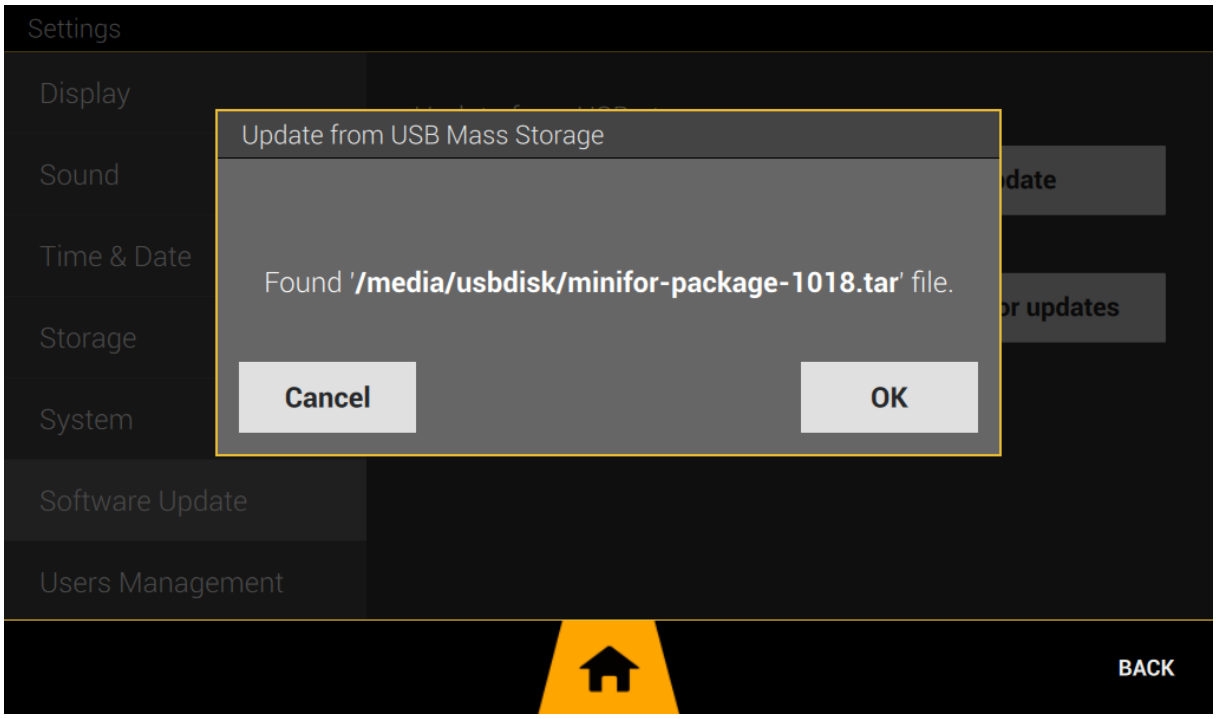
2. **CHECK FOR UPDATES** - Starts the process of checking the availability of an update for Minifor2Bio over the Internet on the manufacturer's servers (chapter 10.14.6.2).

10.14.6.1 UPDATE FROM USB STORAGE

For updates via USB flash drive, you must first download the update package from the manufacturer's website (www.fermentors.eu). The update package has the form "minifor-package-xxxx.tar". The "xxxx" symbol in the file name is the version number. This package must be saved without any modifications to a USB flash drive in the **root directory** (for example “E:\minifor-package-1018.tar"). The update package must not be saved in any subfolder of the USB flash drive!!!

STEP 1	Make sure the USB flash drive is formatted with the FAT32 file system. If not, format the USB flash drive with FAT32 file system.
STEP 2	Download the update package from the manufacturer's website. The file will be in "minifor-package-xxxx.tar" format. Save this downloaded package to the prepared USB flash drive from the previous step.

STEP 3	Connect the prepared USB flash drive with the update package to the back panel. Go to the Minifor2Bio main menu, MENU -> SETTINGS -> SOFTWARE UPDATE. Tap the **UPDATE** button.



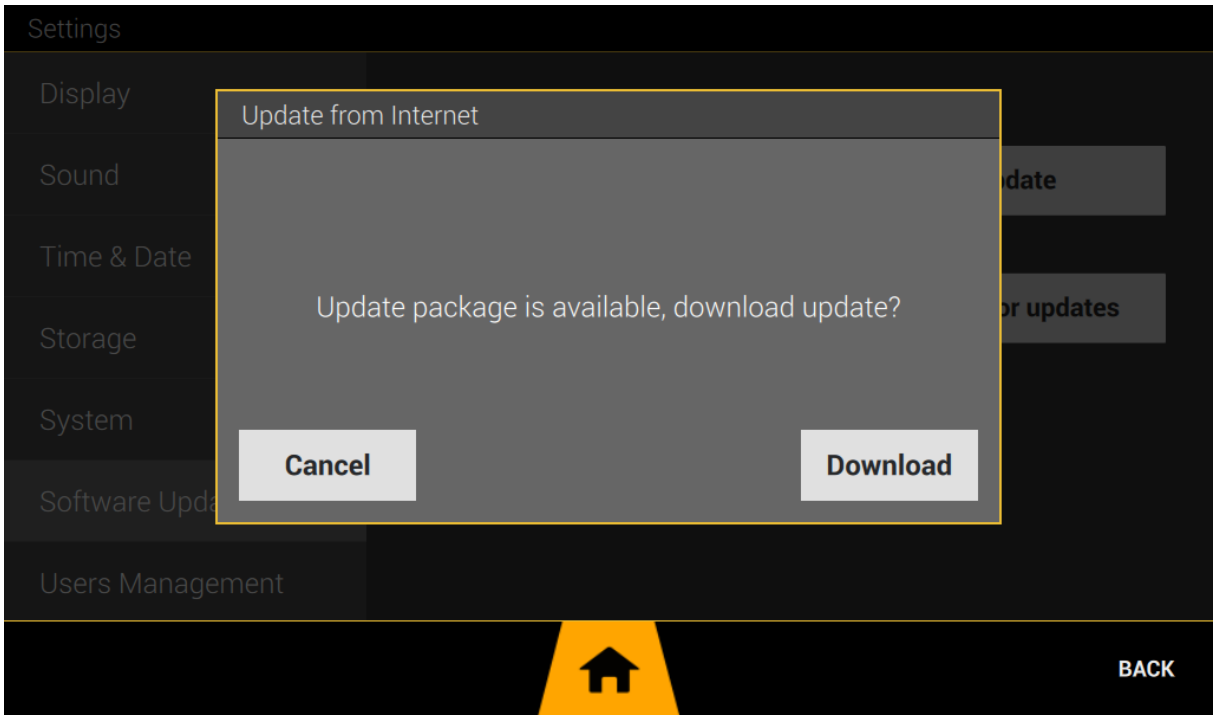
STEP 4	Tap the OK button to launch the update tool. **After the update is complete, Minifor2Bio will restart.**

10.14.6.2 UPDATE FROM INTERNET

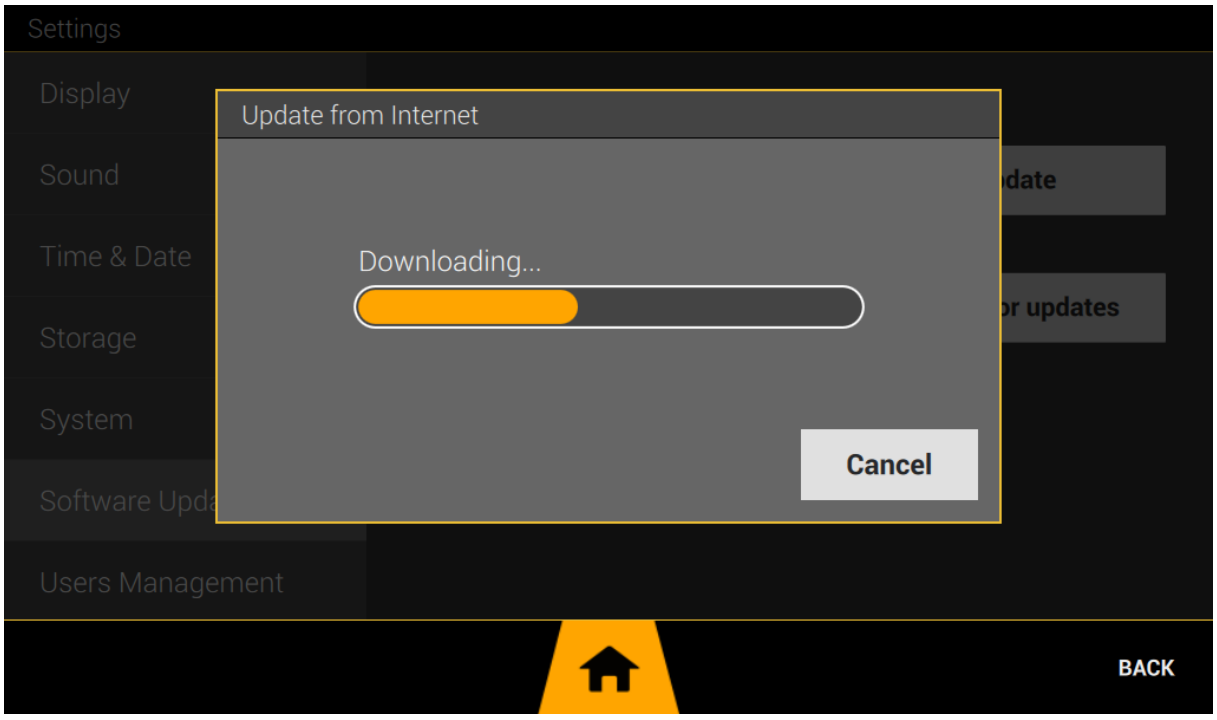
When updating from the Internet, the update package is downloaded from the manufacturer's servers. Tap CHECK FOR UPDATES to check if new updates are available. To update from the Internet, Minifor2Bio must have an available Internet connection (chapter 10.13).

- **Make sure the Minifor2Bio has a correctly configured network interface (LAN/WiFi) and access to the Internet (gateway, DNS).**
- **Software update is only available in the STOP operating state!**

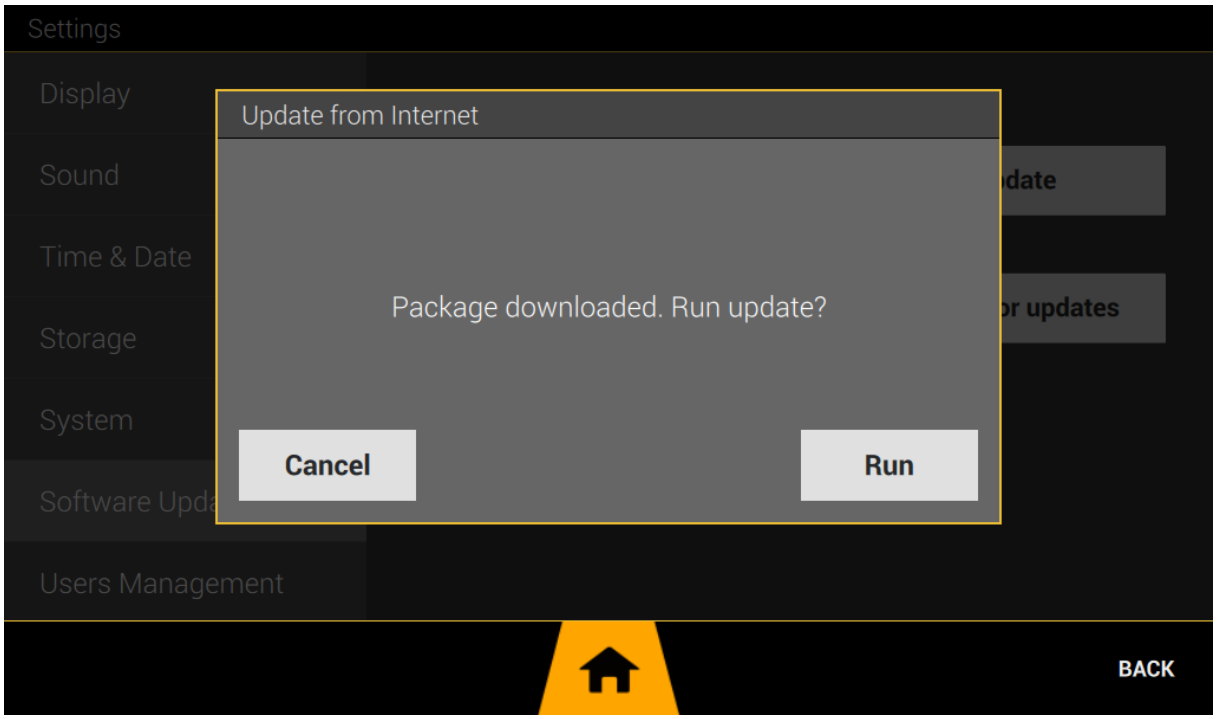
STEP 1	Tap on the **CHECK FOR UPDATES** button.



STEP 2	If a software update is available, a modal window will appear on the display asking if you want to update. Continue by tapping the **DOWNLOAD** button. In the next step, the update package will be downloaded.



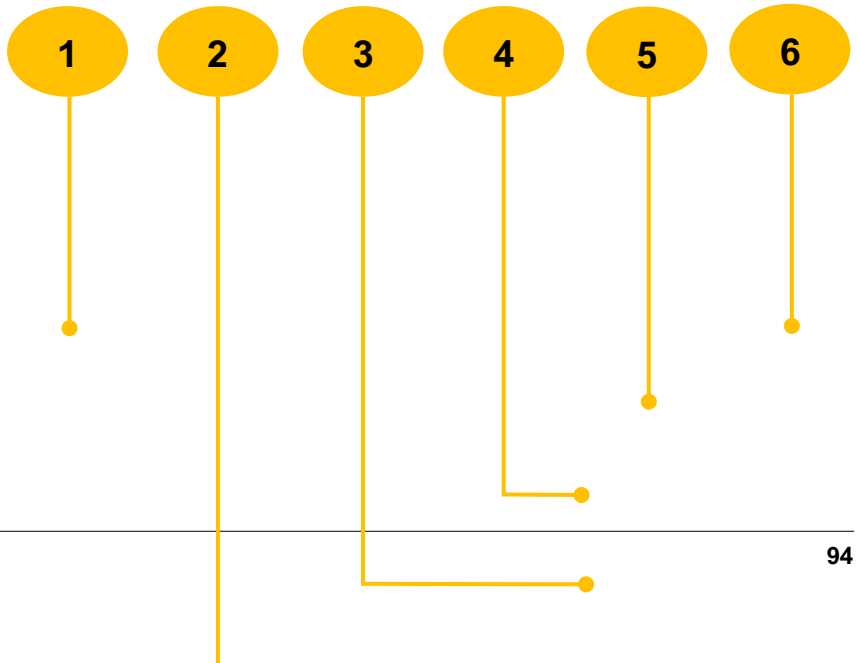
STEP 3	If a software update is available, a modal window will appear on the display asking if you want to update. Continue by tapping the **DOWNLOAD** button.

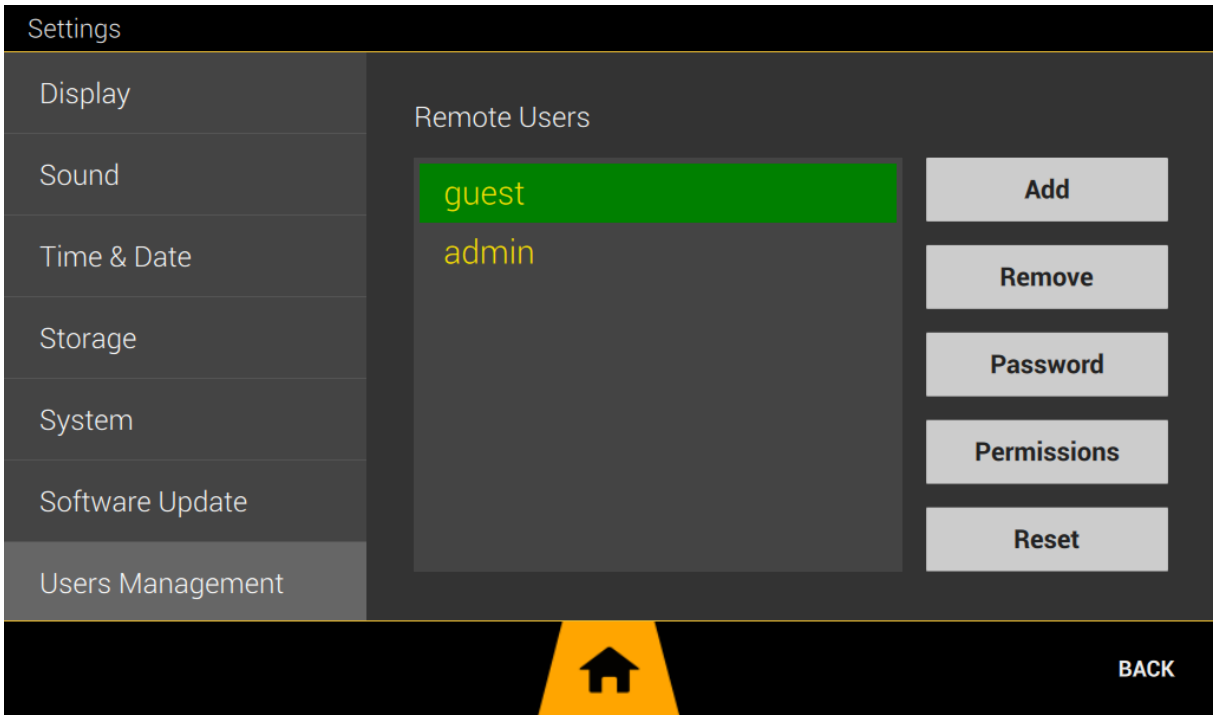


STEP 4	After downloading the update package, you will be prompted to confirm running the update tool. **Minifor2Bio will be restarted to complete the update.**

10.14.7 USERS MANAGEMENT

Users management is used to define users and their rights during remote control of Minifor2Bio using the MIRETO (Minifor Remote Tool) application. For MIRETO to function properly, it is necessary to define users on each Minifor2Bio.





1. **REMOTE USERS** - list of users for the MIRETO application.

2. **RESET** - resetting user accounts to factory settings.

3. **PERMISSIONS** - by tapping the button, a modal window will appear with options for setting the user rights of the marked user in the list.

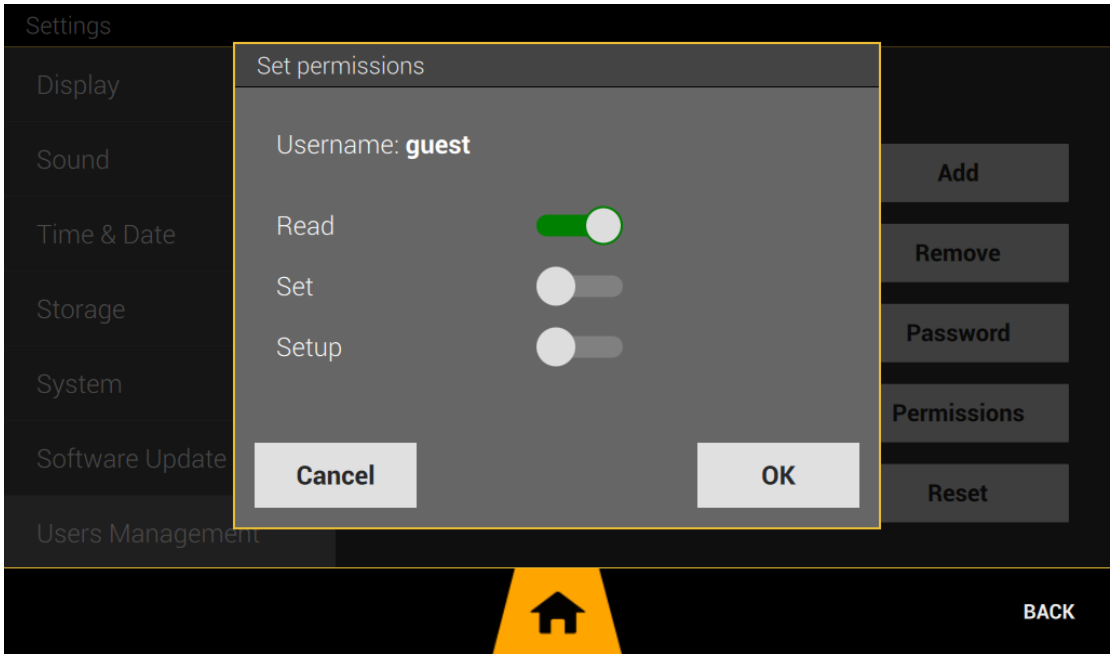
4. **PASSWORD** - tap to display a modal window with password settings for the selected user in the list.

5. **REMOVE** - tap to display a modal window asking to confirm the deletion of the user marked in the list.

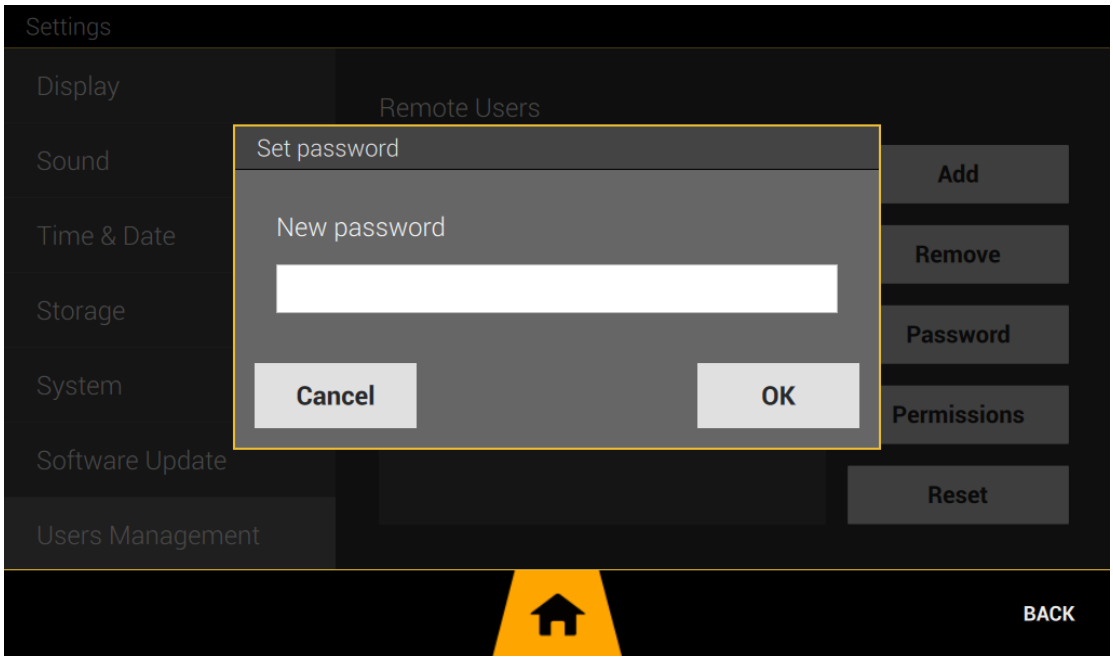
6. **ADD** - tap to display a modal window with the option to add a user account.

10.14.7.1 PERMISSIONS

User rights are divided into three categories (READ, SET, SETUP). READ - the remote user can only monitor operating information (cannot change operating parameters or device settings). SET - the remote user can change operating parameters (setpoints, profiles, etc.). However, it cannot change the settings of the device. SETUP - the remote user can change the device settings.



10.14.8 SET PASSWORD



10.15 PARAMETER PROFILES

For each parameter for which it is possible to define a set-point, CONTROL MODE can be selected as **TIME PROFILE**. Profiles can also be set for individual pumps in the pump controller (chapter 10.10).

The time profile is used for variable set-point control over time. The time profile consists of a different number of individual segments. For each segment, it is necessary to set its time length, the value that will be used as a set-point during this time and the method of applying the value (STEP, RAMP).

The **STEP** transition means that the value will be applied in steps.

The **RAMP** transition means that the target value will be reached gradually over the entire duration of the segment.

Each profile can use two different kinds of time base. Standalone type means that the profile will use its own timer for processing. It is independent of other parameters and is controlled (restarted) manually.

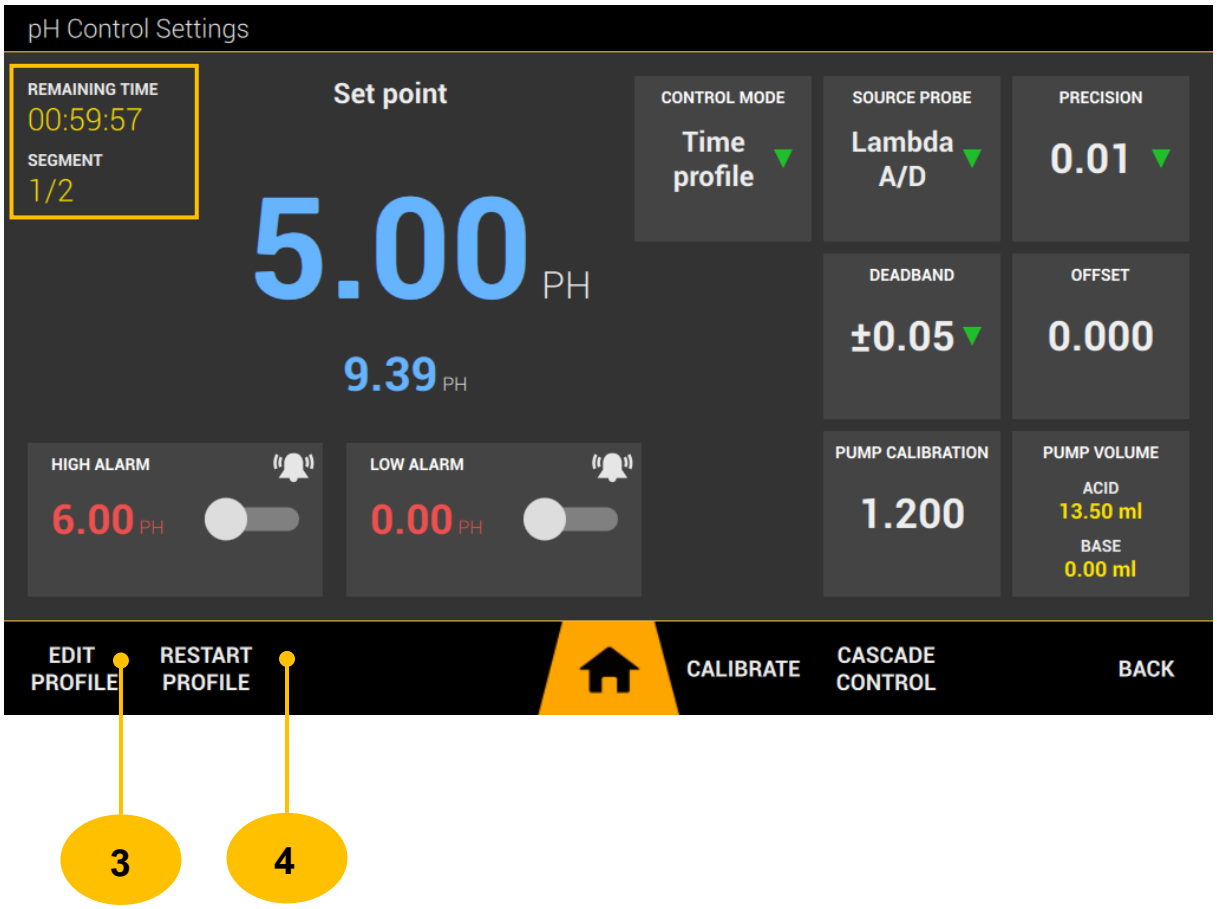
The **STANDANLONE** timer stops in the **STOP** operating mode and starts in the **RUN** operating mode.

The **ELAPSED TIME** type means that the profile will use the global EFT (Elapsed Fermentation Time) timer. When using this type of time base, any other profiles with this timer are synchronized with each other.

Changing the time base is only possible if the profile does not contain any segments! The reason is the difference in the meaning of time. Standalone is set as a relative time, while Elapsed time is an absolute time.

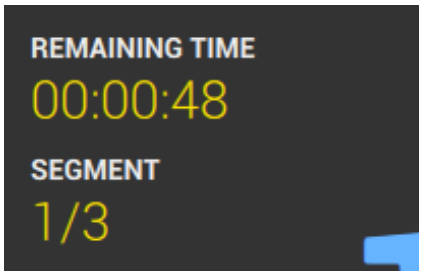
Once you set the control mode as PROFILE, the current remaining time of the profile segments and the current profile segment will be displayed for the parameter.

- **The number of segments (sections) of the profile is not limited.**
- **The STANDALONE time base (timer) is independent of other parameters and is controlled only by the STOP/RUN operating mode.**
- **To change the time base, it is necessary to remove all segments of the profile due to the time type difference (absolute, relative).**



1. **PROFILE STATUS** - profile processing status indicator. Depending on the set time base, either the remaining time of the currently processed segment or the elapsed fermentation time is displayed. The **SEGMENT** value expresses information about current segment/total number of set segments. This status is displayed if the control mode is set to Time profile.

Time base: **Elapsed time**



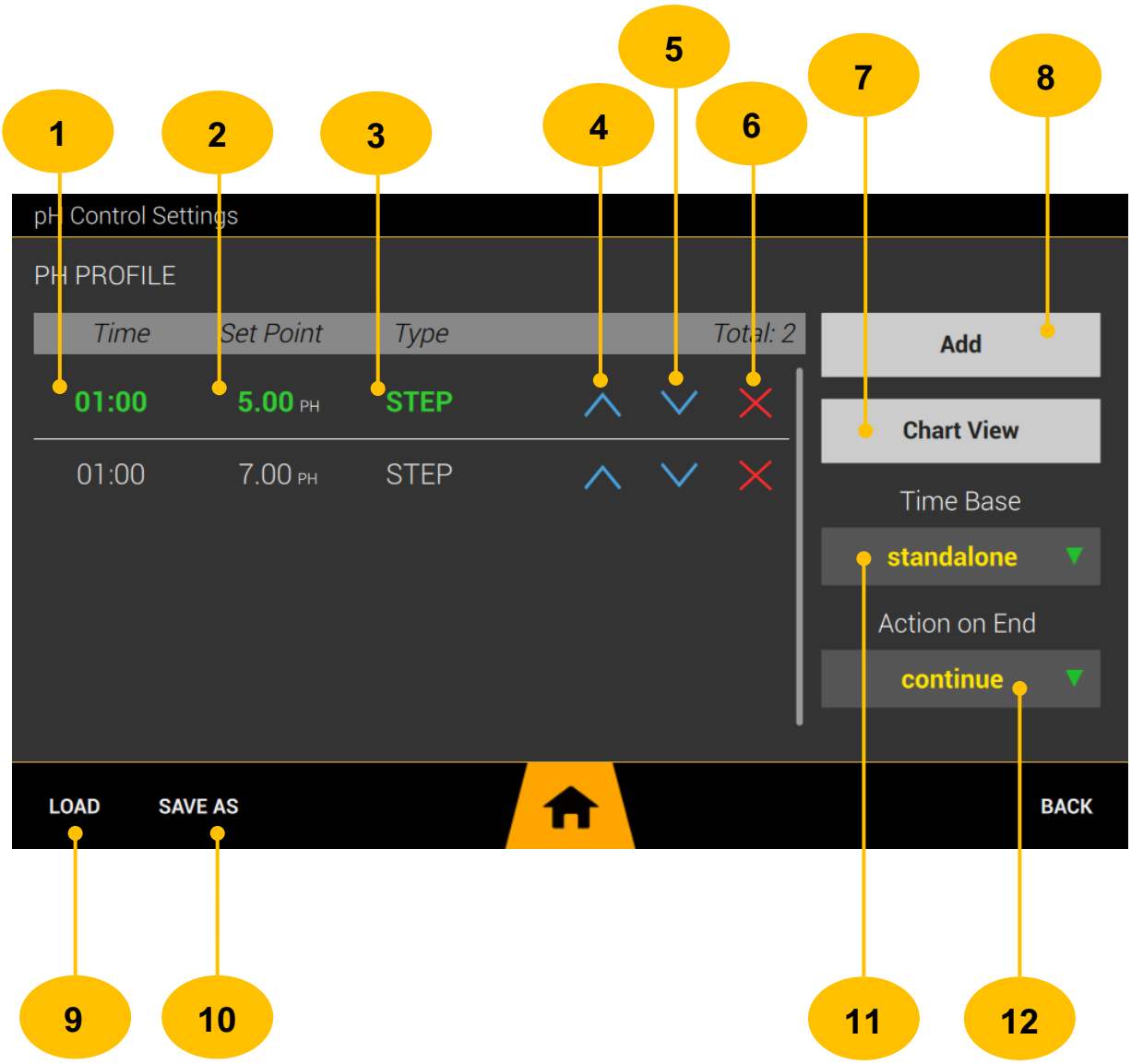
Time base: **Standalone**

2. **CONTROL MODE** - to use the profile you must select TIME PROFILE as the control mode.

3. **EDIT PROFILE** - access to profile settings.

4. **RESTART PROFILE** - restarting the profile is only accessible when the time base is set to standalone. If time base is set to elapsed time, this time is controlled globally (more in chapter 10.1.4).

10.15.1 PROFILE EDITING (TIME BASE - STANDALONE)



1. **SEGMENT TIME** - profile processing status indicator. Depending on the set time base, either the remaining time of the currently processed segment or the elapsed fermentation time is displayed. The **SEGMENT** value expresses information about current segment/total number of set segments. This status is displayed if the control mode is set to Time profile.

2. **SEGMENT TIME** – set segment time for which the segment value will be set.

3. **SEGMENT TRANSITION TYPE** – set type of transition between segment values.

   STEP - the value of the segment will be fixed for the set time of the segment, after the previous value it will be set by a jump.
   RAMP - the value of the segment will gradually increase during the set time of the segment. The starting value is the value from the previous segment (in the case of the first segment, it is the value 0). The transition is linear.

4. **MOVE SEGMENT UP** – tap the icon to move the segment up one row. Valid if the line is not on the first row.

5. **MOVE SEGMENT DOWN** – tap the icon to move the segment down one row. Valid if the line is not on the last row.

6. **REMOVE SEGMENT** – tap the icon to delete a profile segment.

7. **CHART VIEW** – graphical representation of the progress of the profile (chapter 10.15.3).

8. **ADD SEGMENT** – tap the button to add a new profile segment.

9. **LOAD** – tap the button to display a menu of saved profiles.

10. **SAVE AS** – tap the button to add a new profile segment.

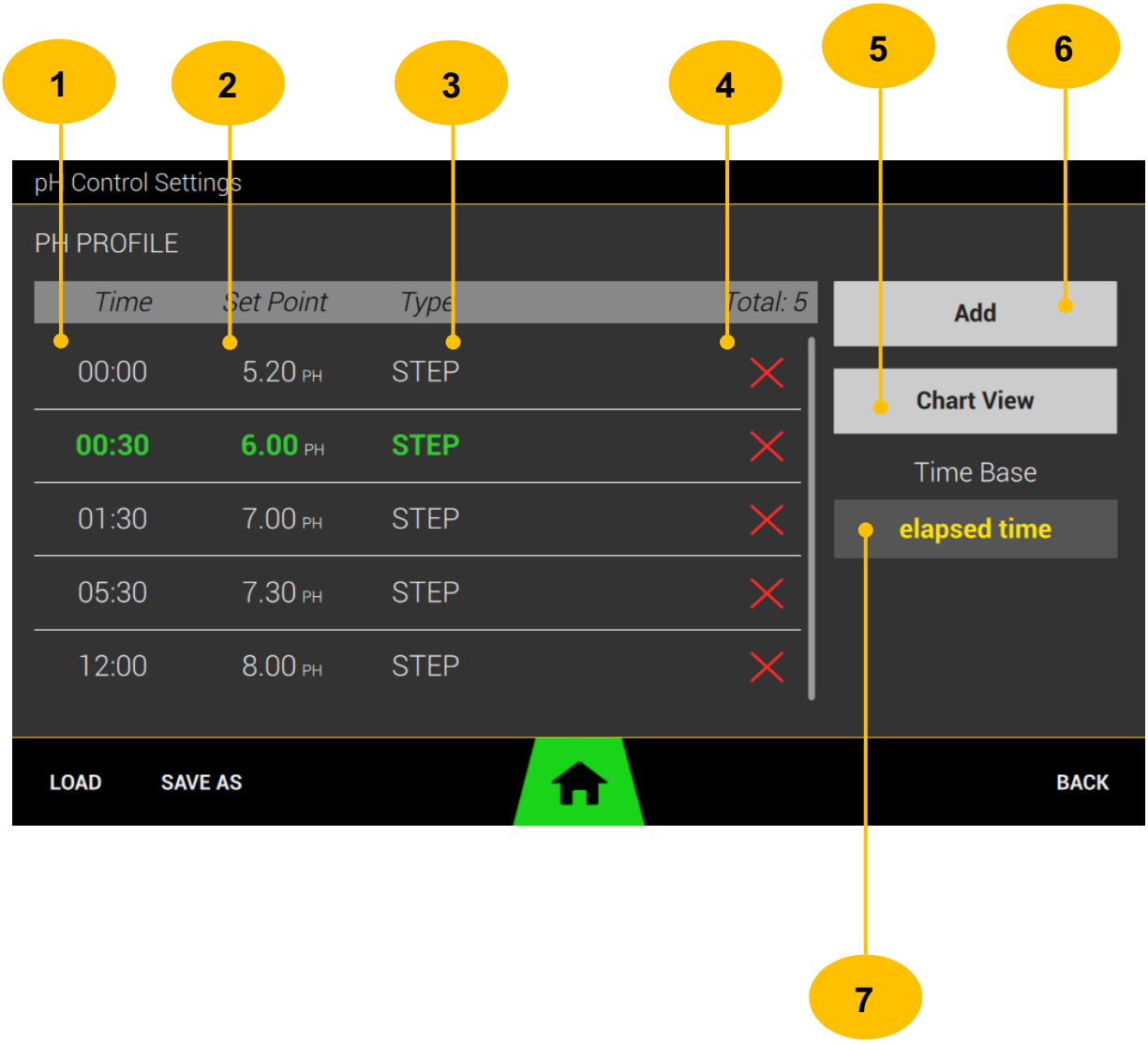
11. **TIME BASE** – the time base of the profile.

    STANDALONE - this time base uses its own timer and individual time lengths of segments are defined by relative time. The processing of the profile takes place in the form of a countdown of the set time, when the expiration of the segment's time is continued to the next one. This timer starts with the transition to the **RUN** operating mode and stops in the **STOP** operating mode. The timer can be manually restarted by tapping on the **RESTART PROFILE** button.

12. **ACTION ON END** – end action is a function that can be set after profile processing is complete. That is after the last segment timed out, what action to take.

    CONTINUE - continue with the value of the last segment of the profile.
    REPEAT - restart the profile, i.e. start processing the profile from the first segment.
    ZERO VALUE - set the parameter value (set-point) to zero.

10.15.2 PROFILE EDITING (TIME BASE - ELAPSED TIME)



1. **SEGMENT TIME** - profile processing status indicator. Depending on the set time base, either the remaining time of the currently processed segment or the elapsed fermentation time is displayed. The **SEGMENT** value expresses information about current segment/total number of set segments. This status is displayed if the control mode is set to Time profile.

2. **SEGMENT TIME** – set segment time for which the segment value will be set.

3. **SEGMENT TRANSITION TYPE** – set type of transition between segment values.

   STEP - the value of the segment will be fixed for the set time of the segment, after the previous value it will be set by a jump.

RAMP - the value of the segment will gradually increase during the set time of the segment. The starting value is the value from the previous segment (in the case of the first segment, it is the value 0). The transition is linear.

4. **REMOVE SEGMENT** – tap the icon to delete a profile segment.

5. **CHART VIEW** – graphical representation of the progress of the profile (chapter 10.15.3).

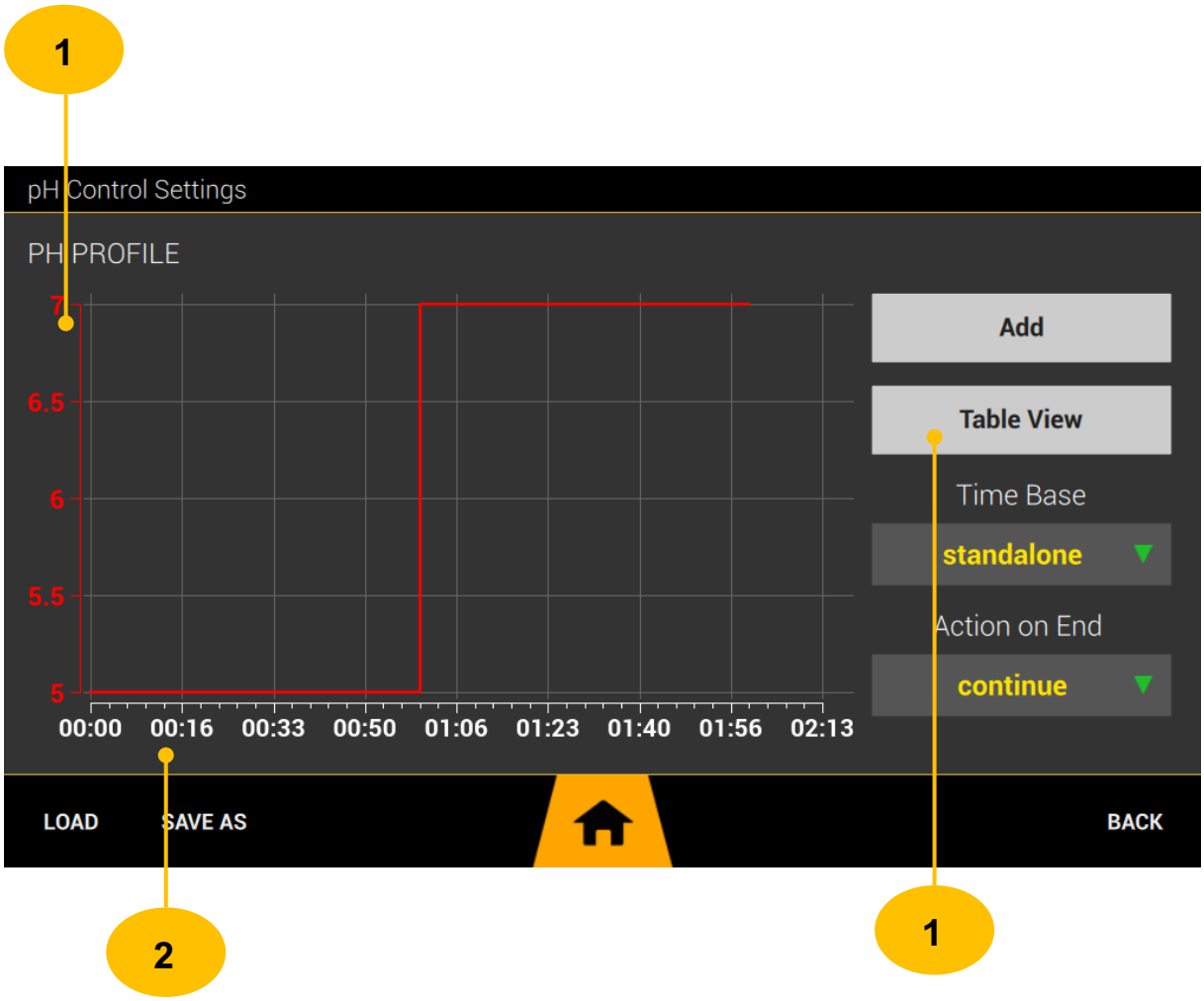
6. **ADD SEGMENT** – tap the button to add a new profile segment.

7. **TIME BASE** – the time base of the profile.

   ELAPSED TIME - this time base uses global elapsed fermentation time. Profile segments are processed according to the elapsed fermentation time. The time of individual segments is defined in absolute values (EFT time increases).

10.15.3 GRAPHIC REPRESENTATION OF THE PROFILE

Profile settings can be displayed graphically. The curve shows the change of the parameter value (set-point) over time. You can access the view by tapping the CHART VIEW button in the profile settings (chapter 10.15).

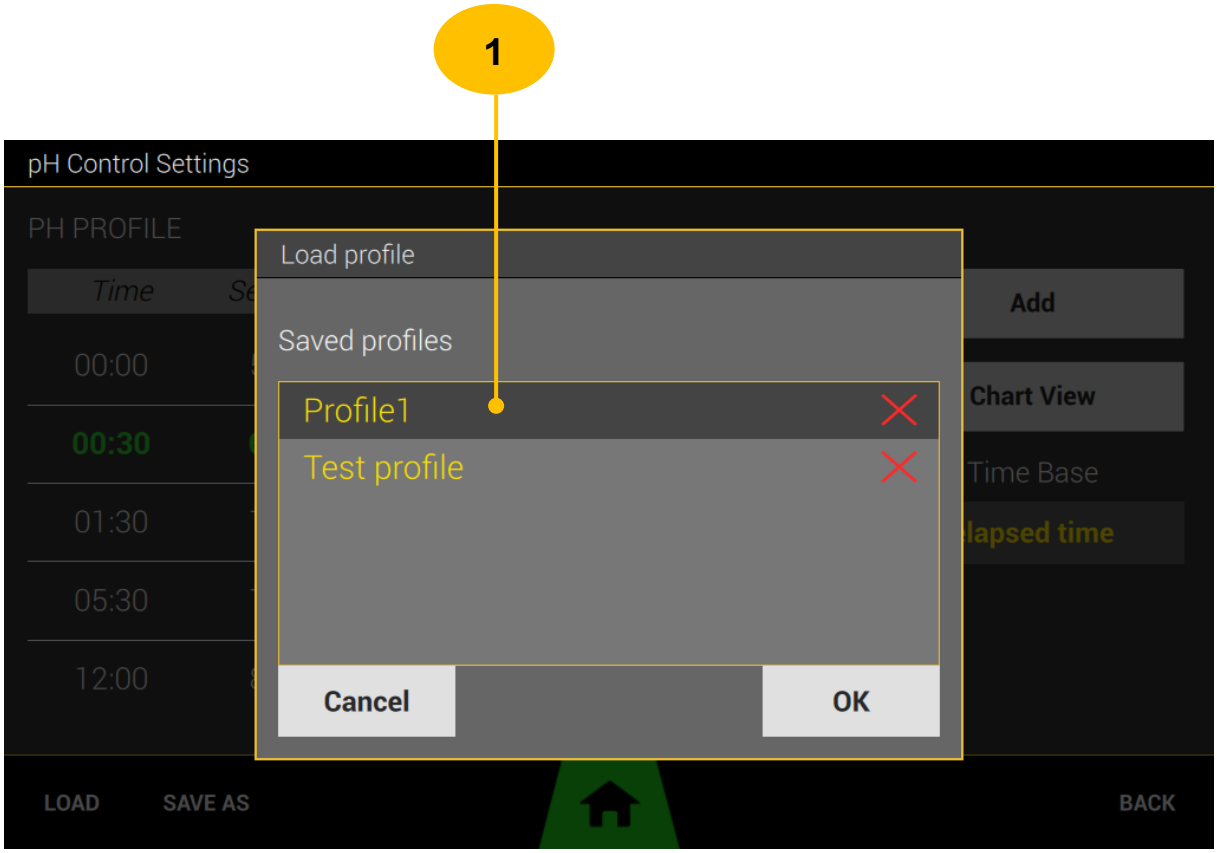


1. **Y AXIS** – axis on which parameter values are plotted (set-point).
2. **X AXIS** – timeline
3. **TABLE VIEW** – return to table view.

10.15.4 LOAD PROFILE FROM MEMORY

Saved user-defined profiles can be reloaded from the Minifor2Bio's internal memory.

STEP 1	Go to the profile settings of the desired parameter (chapter 10.15.1 or 10.15.2).
STEP 2	Tap the **LOAD** button on the bottom menu bar.
STEP 3	Select a profile by tapping on the name in the list and tap on the **OK** button.

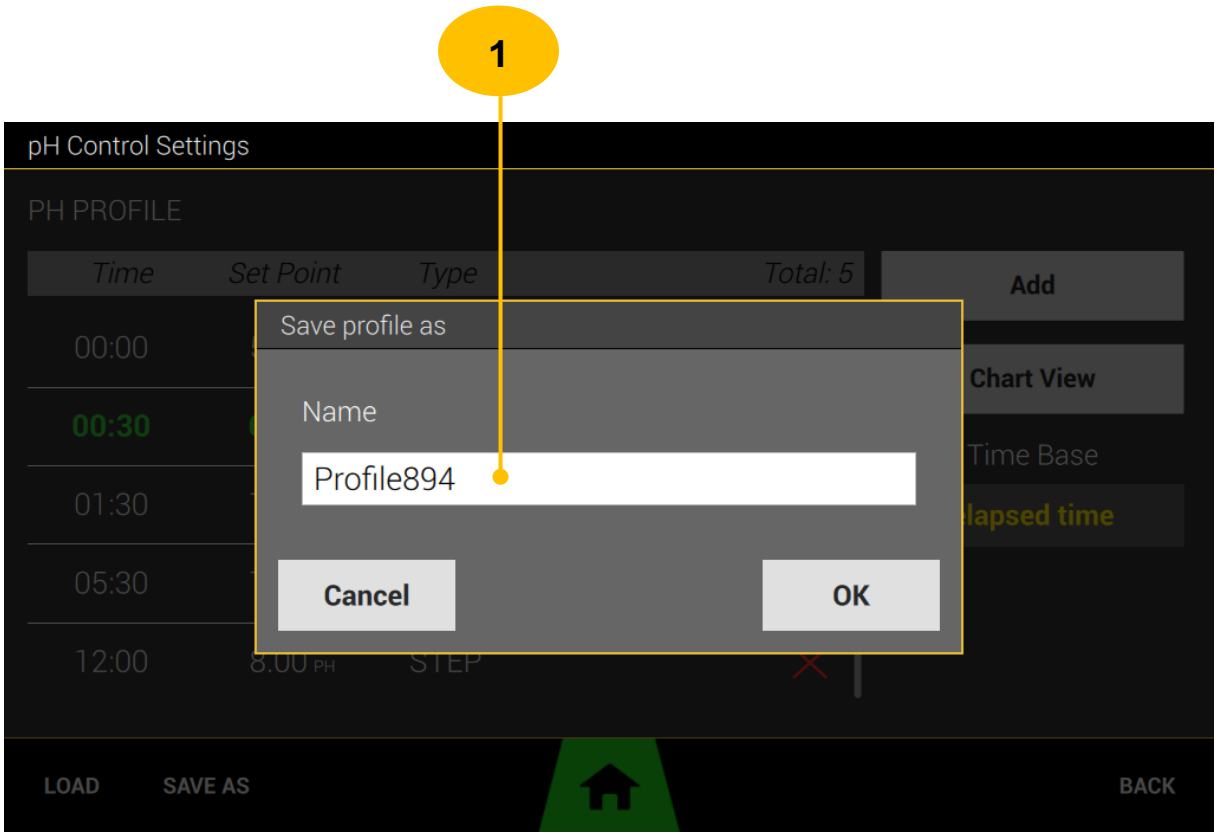


1. **PROFILE ITEM** – tapping on the profile name will load the profile parameters.

10.15.5 SAVE PROFILE TO MEMORY

The user-defined profile of the parameter can be saved in the internal memory of Minifor2Bio. It can then be loaded and used again. You can save a profile under any name.

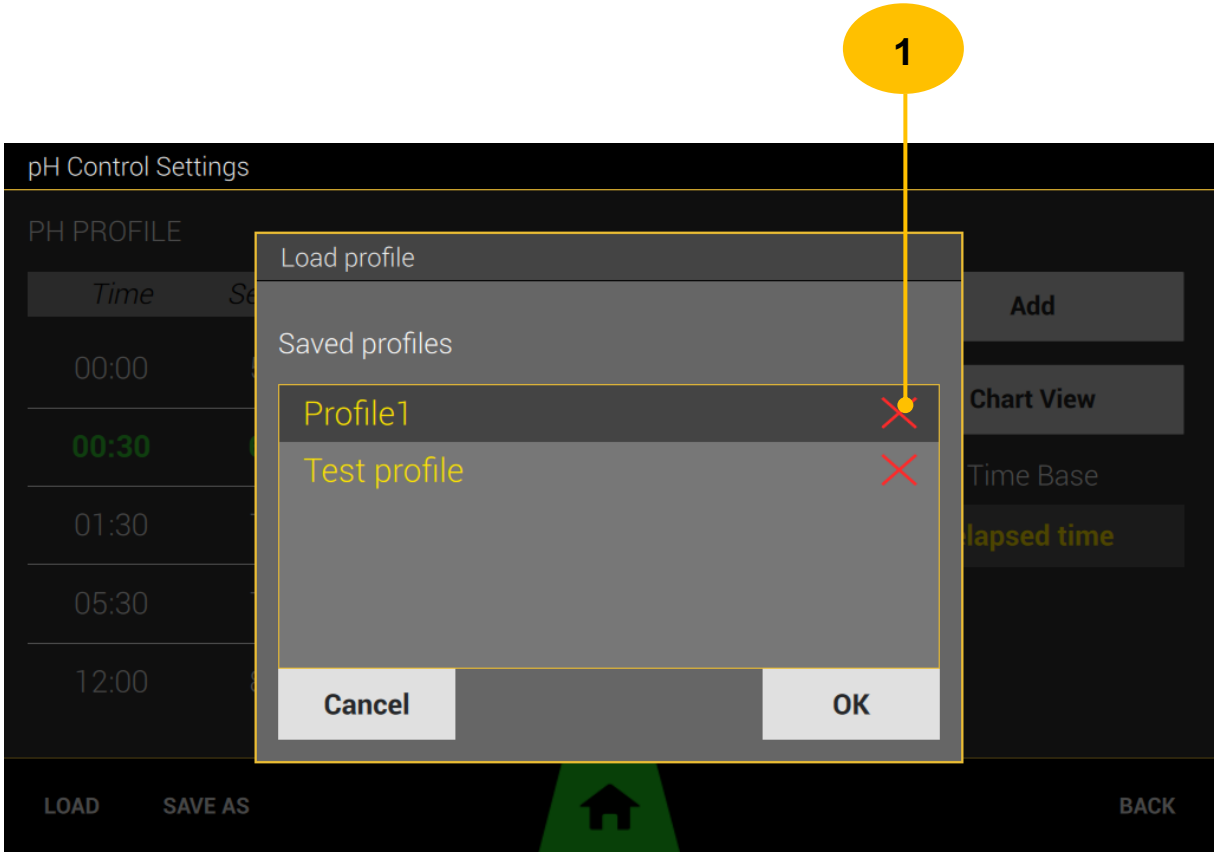
STEP 1	Go to the profile settings of the desired parameter (chapter 10.15.1 or 10.15.2).
STEP 2	Set the profile according to your requirements.
STEP 3	Tap the SAVE AS button. The display prompts you to enter a profile name. Enter the name and confirm by tapping the OK button.



1. **PROFILE NAME** – tap in the title edit field to appear on the keyboard display.

10.15.6 REMOVE SAVED PROFILE

You can delete saved profiles from the internal memory in the modal window to load the profile. Proceed in the same way as when loading a profile from the internal memory, with the difference that you tap on the cross symbol next to the name of the profile in the list.



1. **CROSS SYMBOL FOR DELETE PROFILE**

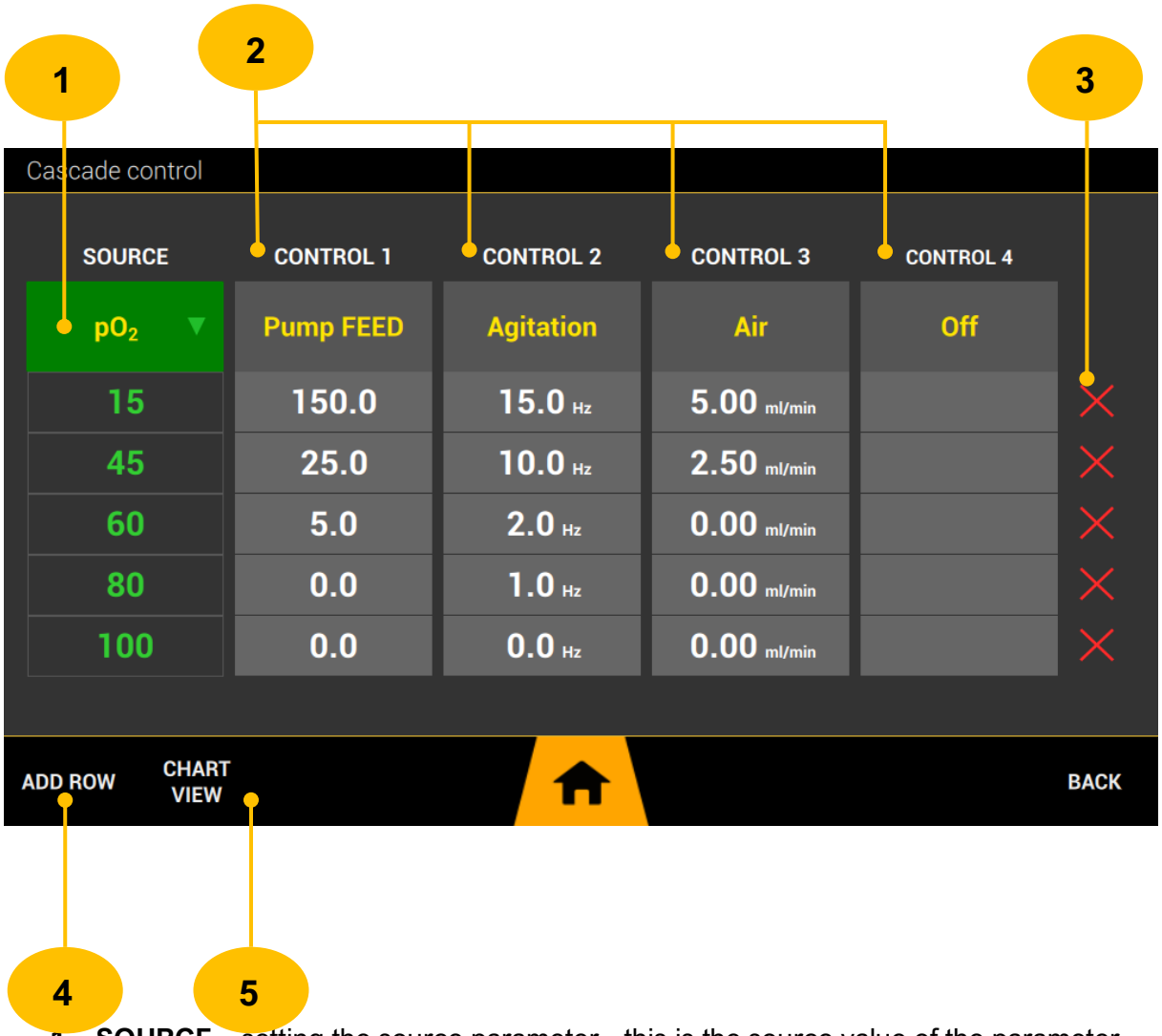
10.16 CASCADE CONTROL

Cascade control is a function that allows you to create links between individual parameters or controllers.

The function is designed to assign up to four additional parameters to the selected value of the **SOURCE** parameter.

For each value of the **SOURCE** parameter, you can set a proportional value for the **CONTROL** (1 to 4) parameter. In order to be able to use the required **CONTROL** parameter, it is first necessary to switch the control mode of the parameter to **CASCADE**. Subsequently, the required parameter will be available for use in cascade control.

- **Cascade control is a proportional control of the assigned parameters depending on the value of the SOURCE parameter.**
- **To use a parameter in CONTROL mode, it is necessary to first set the CASCADE control mode for this parameter!**



1. **SOURCE** – setting the source parameter - this is the source value of the parameter, for example pO2, depending on its size, the CONTROL members 1-4 will be affected.

2. **CONTORL 1 - 4** – setting of managed members. The set parameter will be proportionally controlled according to the set value in response to a change in the value of the SOURCE parameter.

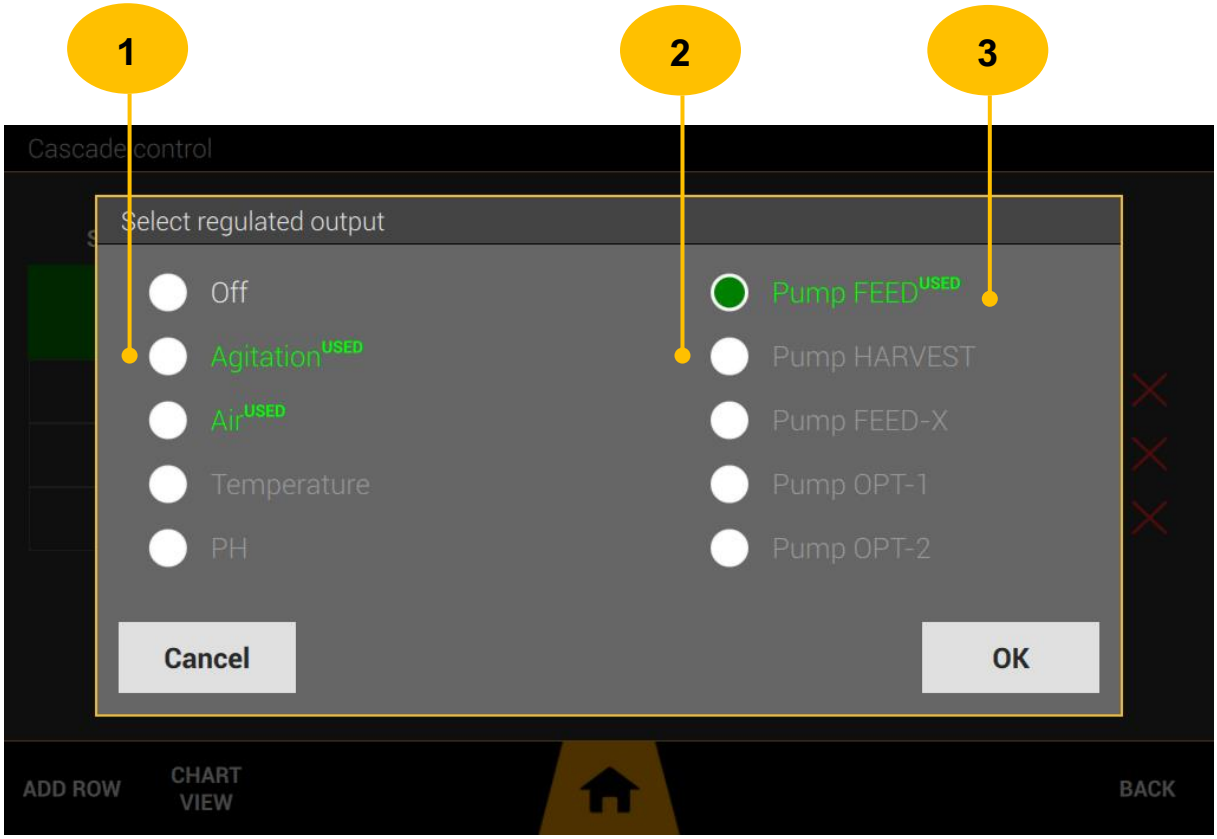
3. **REMOVE ROW** – tap the icon to delete a table row.

4. **ADD ROW** – tap the button to add a table row.

5. **CHART VIEW** – tap to view the definition in the chart.

10.16.1 SET CASCADE LOOPS

To set a member's CONTROL, tap the column after the CONTROL heading.



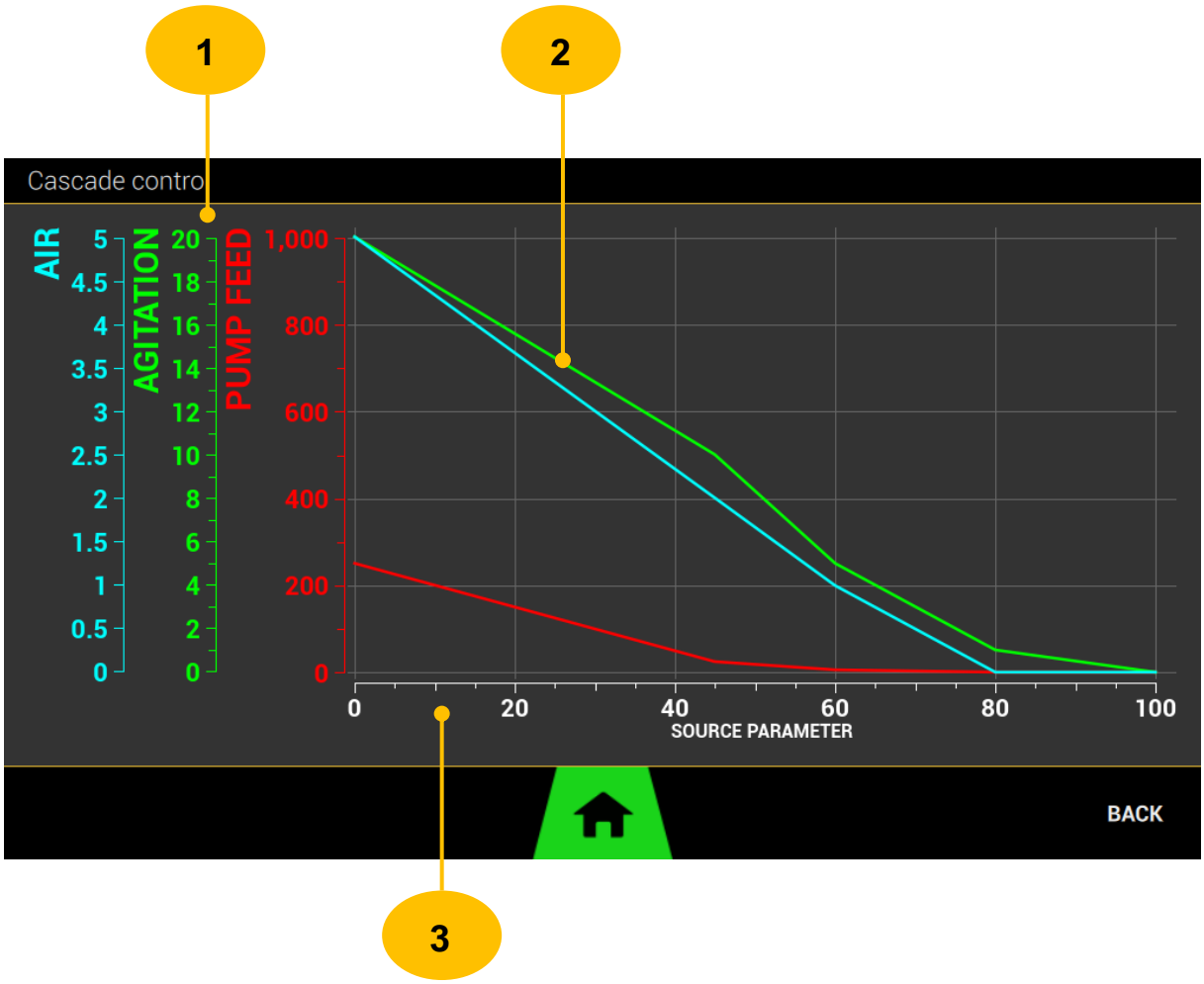
1. **USED MEMBER (PARAMETER)** – the used parameter can no longer be reused. This status is indicated by the green color and the USED symbol.

2. **UNAVAILABLE MEMBER (PARAMETER)** – grayed out parameter is unavailable. If you want to use it, you must first set the control mode to CASCADE for this parameter.

3. **SELECTED MEMBER (PARAMETER)** – this parameter is selected for the CONTROL member being set.

10.16.2 GRAPHICAL VIEW OF CASCADE CONFIGURATION

You can display the set cascade control parameters in a graph, which shows the behavior of the **CONTROL** member depending on the change in the **SOURCE** value.



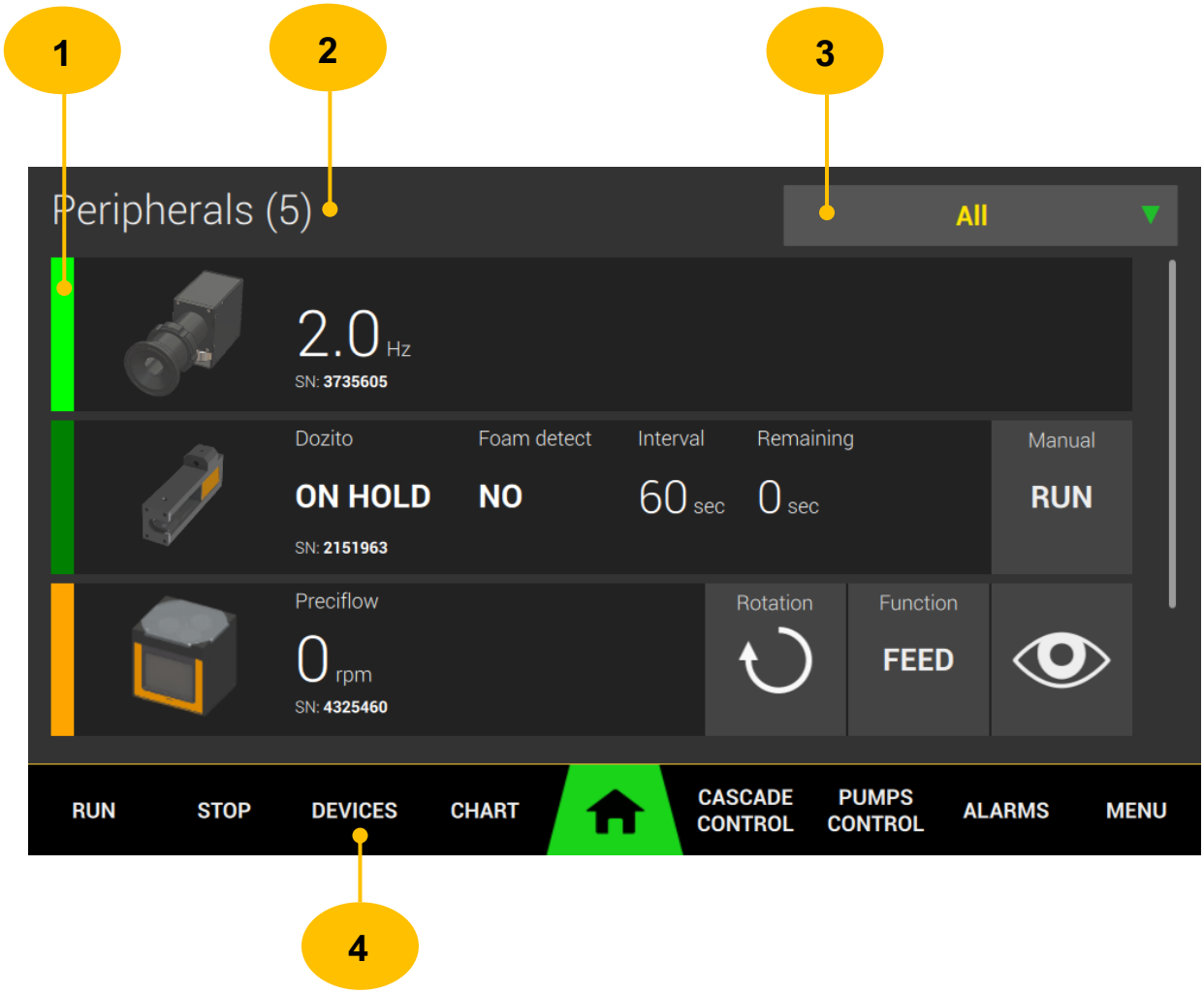
1. **CONTROL MEMBER LEGENDS** - legends for Y axes of individual set CONTROL members.

2. **RESULTING CURVE** – the resulting CONTROL curve for the range of the SOURCE value (X-axis).

3. **SOURCE MEMBER AXIS** – axis for SOURCE parameter values.

10.17 DEVICES MANAGEMENT

Devices management is used to manage connected external peripherals, such as peristaltic pumps, massflows, dozito and similar. External peripherals are automatically detected when connected to the back panel of the device and must always be displayed in this manager if they function correctly.



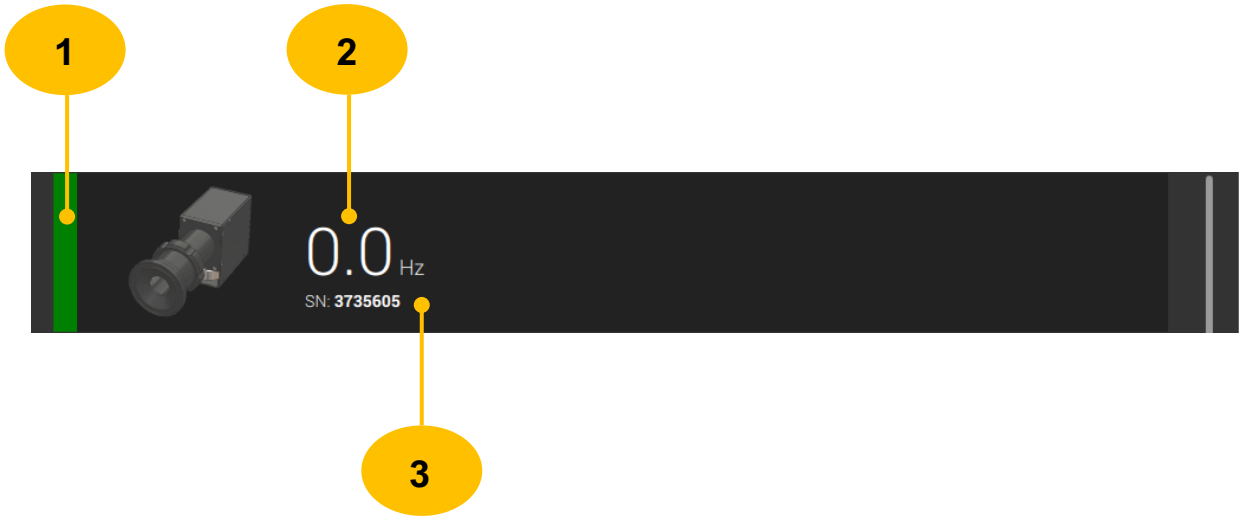
1. **DEVICE STATE** - current state (operational mode) of the device.
   GREEN - device is ready to use and managed by Minifor2Bio.
   LIME - device is connected, managed by Minifor2Bio and is currently active (for example, an external pump is pumping).
   ORANGE - device is connected, but not in REMOTE operating mode, i.e. not managed by Minifor2Bio. You must to change device to REMOTE operating mode.
   RED - device is connected and reports an error.

2. **TOTAL NUMBER OF DEVICES**

3. **FILTER** - you can use the filter to display only some external peripherals.

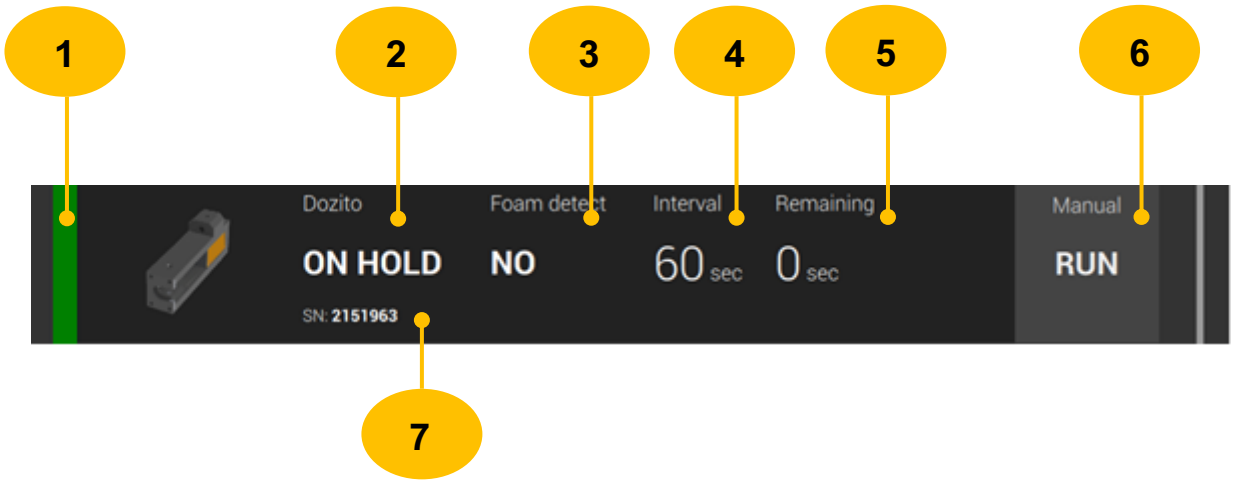
4. **DEVICES** - tap the button to display this management on the home screen.

10.17.1 AGITATION UNIT WIDGET



1. **DEVICE STATE** – chapter (10.17)
2. **CURRENT FREQUENCY**
3. **DEVICE SERIAL NUMBER**

10.17.2 DOZITO WIDGET



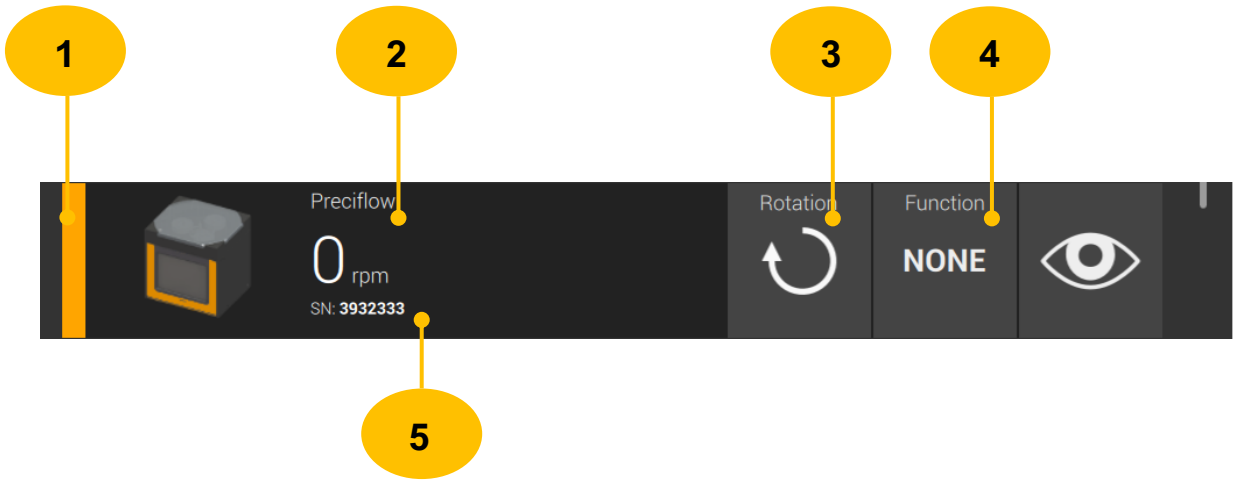
1. **DEVICE STATE** – chapter (10.17)
2. **DOSAGE STATE** - dosage status.

ON HOLD - waiting for a command. It is ready to be dosed if required by the antifom regulator.

DOSING - a dose is currently being administered.

3. **FOAM DETECT** - information from the antifoam controller, whether foam is detected (YES/NO). More information in chapter 10.6.
4. **INTERVAL** - the set interval of the antifoam controller (10.6.)
5. **REMAINING** - remaining time until application of a dose of anti-foam solution.
6. **RUN** - tap on the RUN button to start the batch manually.
7. **SERIAL NUMBER**

10.17.3 PERISTALTIC PUMP WIDGET

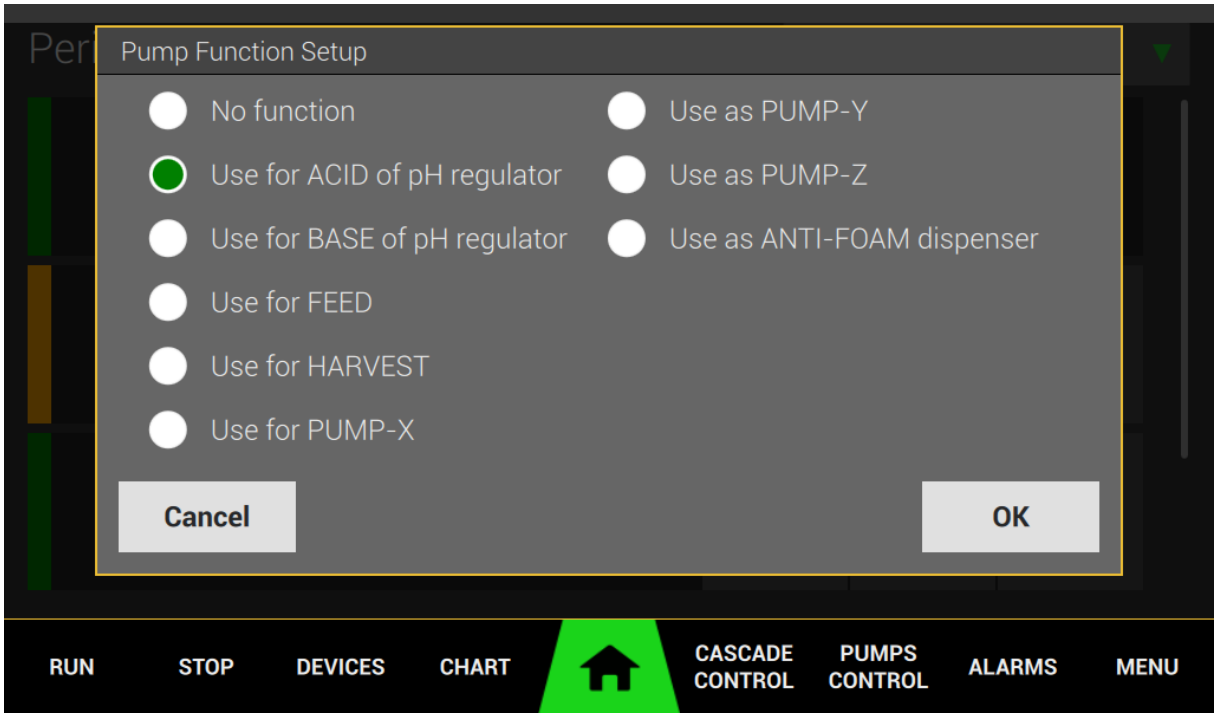


1. **DEVICE STATE** – chapter (10.17)
2. **PUMP TYPE** – Preciflow, Hi-flow, Maxiflow, Megaflow.
3. **ROTATION** – tap the button to change the sense of rotation of the peristaltic pump rotor.

4. **FUNCTION** – important function settings. Tap to display a window assigning the meaning/function of the pump you require.

10.17.3.1 FUNCTION ASSIGN

To use an external peristaltic pump, it is necessary to set which function the pump will perform.



Available pump functions:

1. **NO FUNCTION**

2. **USE FOR ACID OF pH REGULATOR** - The pH Control (regulator) will use this pump for pH regulation, specifically the pump must provide ACID liquid dosing in this case.

3. **USE FOR BASE OF pH REGULATOR** - The pH Control (regulator) will use this pump for pH regulation, specifically the pump must provide BASE liquid dosing in this case.

4. **USE FEED** - function used by PUMP CONTROL. If you set this function, it is possible to further manage the pump with the pump controller (chapter 10.10).

5. **USE HARVEST** - function used by PUMP CONTROL. If you set this function, it is possible to further manage the pump with the pump controller (chapter 10.10).

6. **USE PUMP-X** - function used by PUMP CONTROL. If you set this function, it is possible to further manage the pump with the pump controller (chapter 10.10).

7. **USE PUMP-Y** - function used by PUMP CONTROL. If you set this function, it is possible to further manage the pump with the pump controller (chapter 10.10).

8. **USE PUMP-Z** - function used by PUMP CONTROL. If you set this function, it is possible to further manage the pump with the pump controller (chapter 10.10).

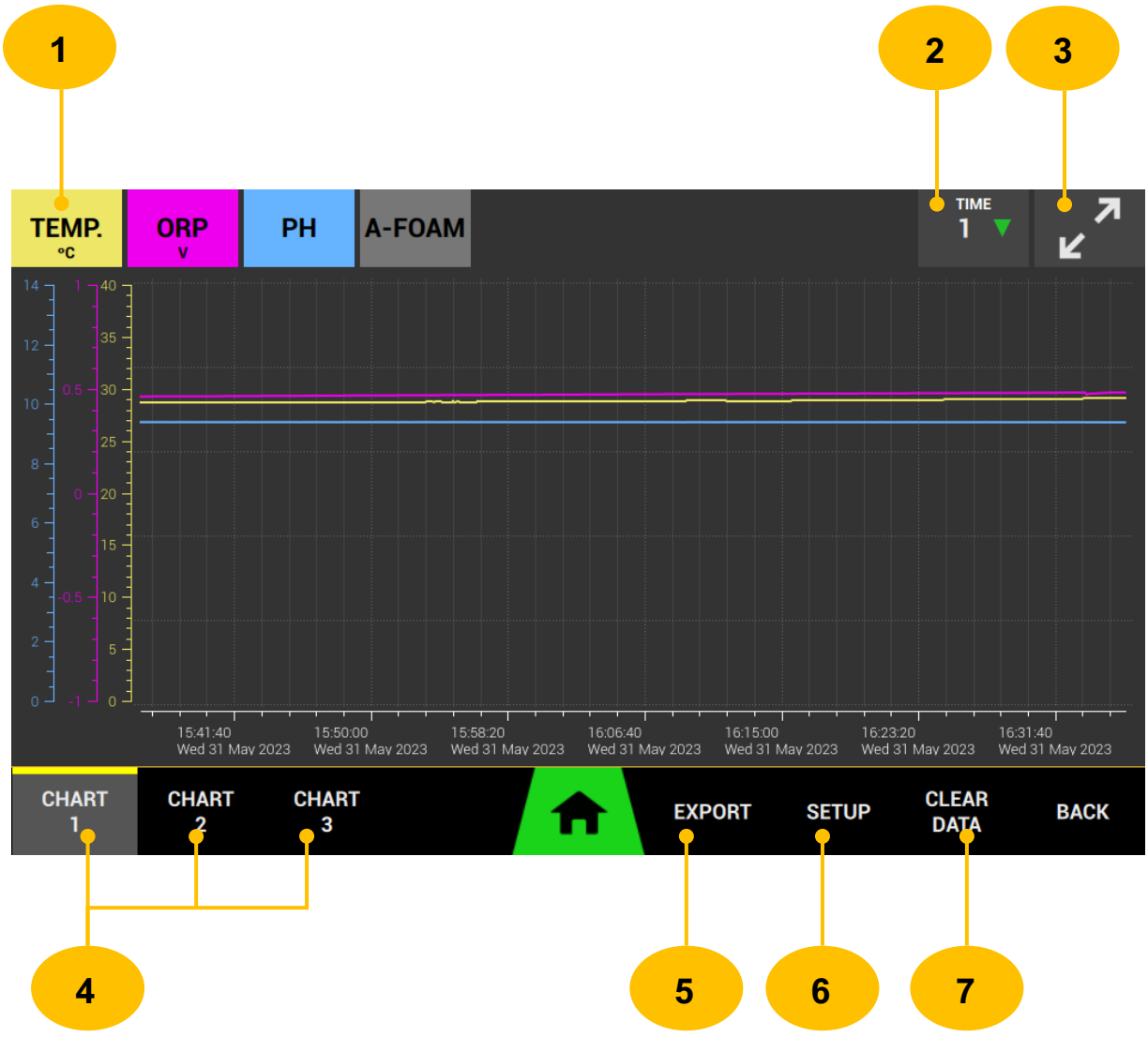
9. **USE AS ANTI-FOAM DISPENSER** - when using this function, it is possible to use it to dose anti-foam solution. Dosage parameters are given in the antifoam control chapter 10.6)

10.18 FERMENTATION STATISTICS (CHART VIEW)

Minifor2Bio is equipped with a function for displaying the measurement history of individual parameters in graphs. Allows presetting of three separate graphs according to your requirements.

Individual parameters (curves) of the graph can be displayed/suppressed as desired. The scale of the basic time axis (X axis) can be set in the range of 1, 6, 12, 18, 24 hours.

- **After turning off/on the entire Minifor2Bio, the history is always reloaded from the internal memory.**
- **You can swipe back and forth through the history. Swiping to the right moves the data back one full base timeline scale. Swiping to the left will move one full measure of the base timeline into the present.**



1. **PARAMETR** – tapping on the box displays or suppresses the corresponding curve of the parameter in the graph including its axis. A deactivated parameter is grayed out.

2. **TIME** – base timeline scale (X axis). It offers a resolution of 1, 6, 12, 18, 24 hours. This scale is used when scrolling through data (while swiping).

3. **FULLSCREEN** – full screen graph display. This feature is activated automatically after a period of inactivity.

4. **CHART SET** – preset charts. Tap the individual buttons to switch between the different layouts you want to see.

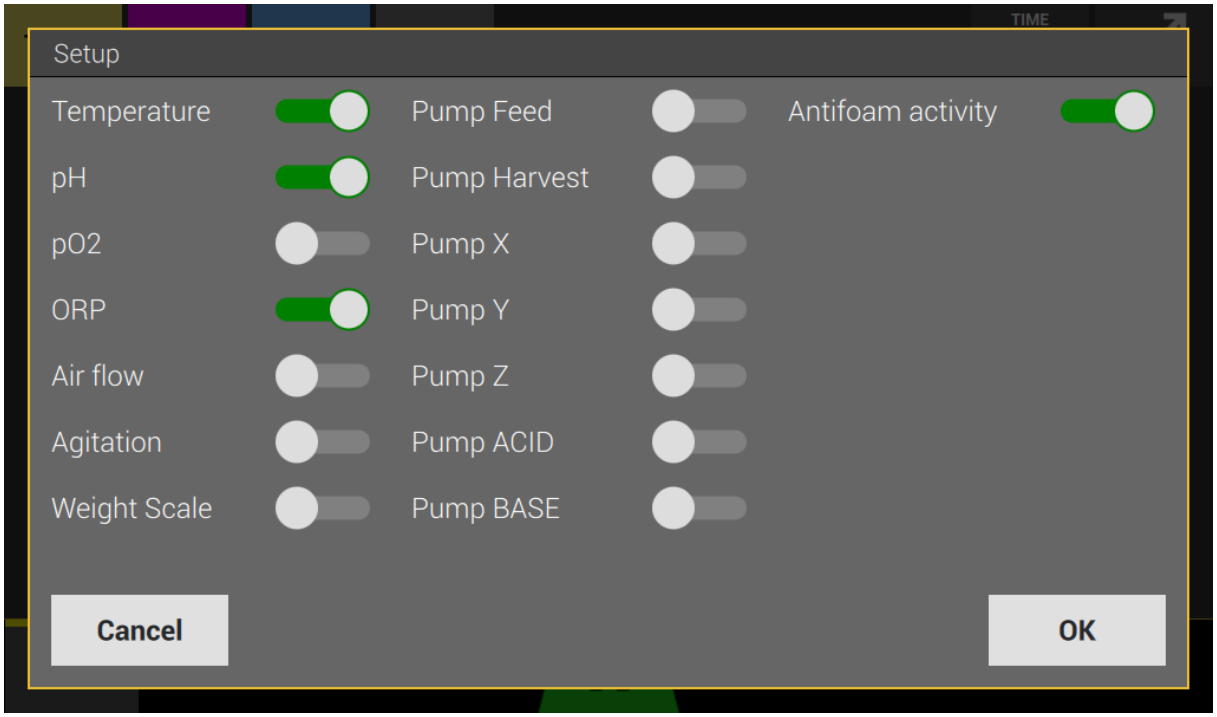
5. **EXPORT** – tap on the button to bring up a menu for exporting data to a USB flash drive.

6. **SETUP** – tap on the button to call up the settings menu for the currently selected graph.

7. **CLEAR DATA** – by tapping the button you will be prompted to confirm the deletion of process data.

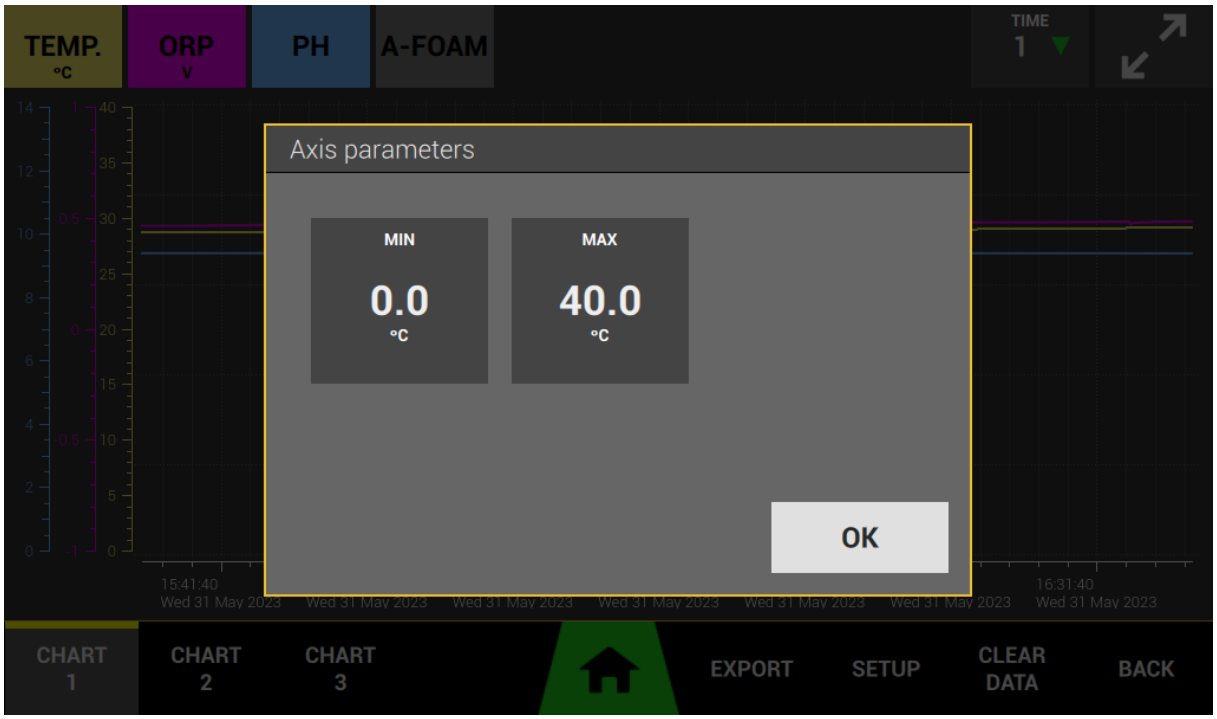
10.18.1 CHART PARAMETERS PRESET

Three graph sets are available for presetting displayed parameters. You can access the menu by tapping the **SETUP** button in the graph view.



10.18.2 PARAMETER AXIS SCALE SETTING

For each parameter, the range of the axis on which the values are plotted can be set. The settings can be accessed by tapping and holding the parameter in the upper part of the screen for at least 800 milliseconds.

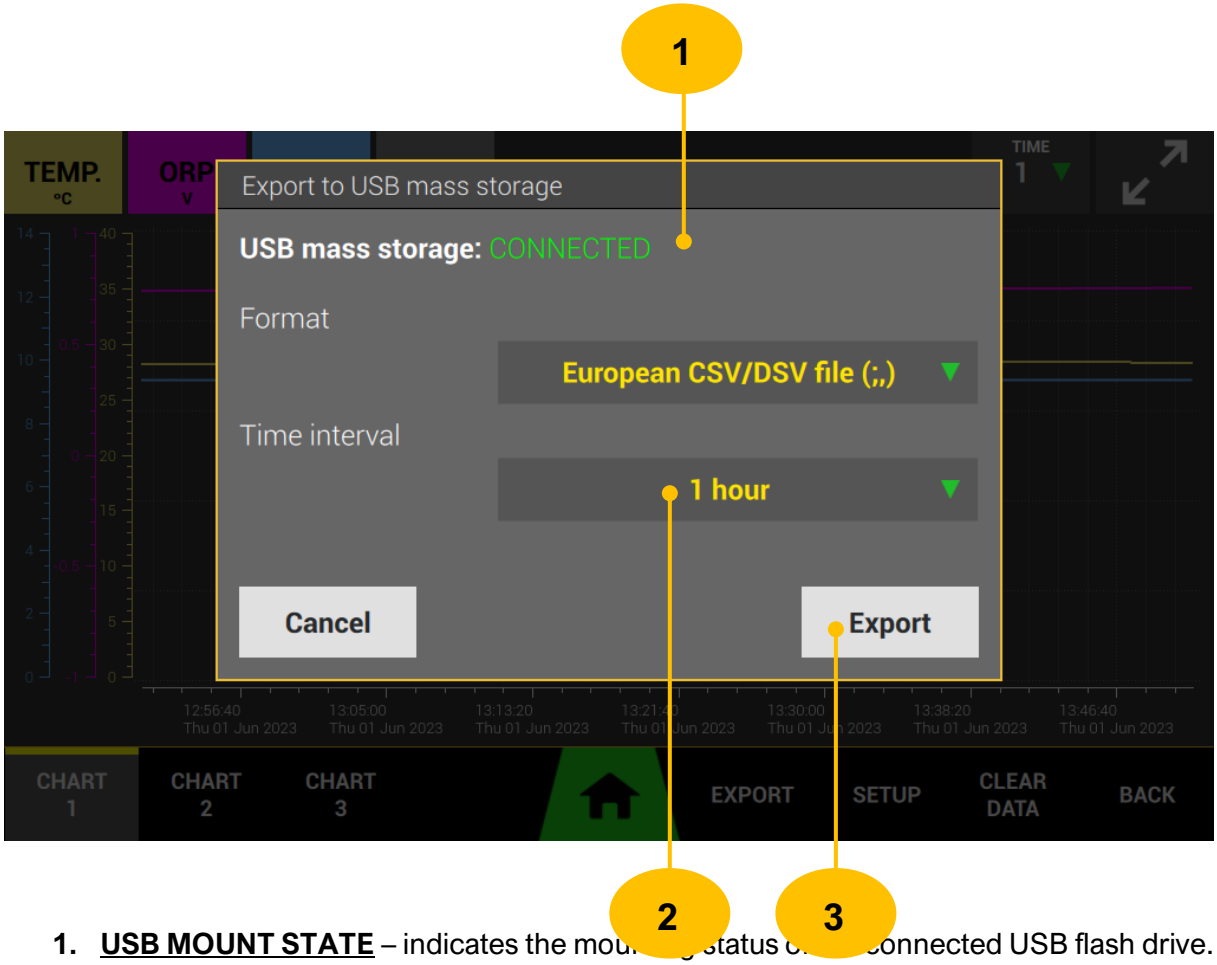


10.18.3 EXPORTING DATA TO USB FLASH DISK

It can export process data to a USB flash drive in CSV (comma separated values) format. You can access the menu by tapping on the EXPORT button on the chart view.

- **The USB flash drive must be formatted with the FAT32 file system.**
- **Attention!!! Very high resolution and depth into the past will cause a long export time (large amount of data). In general, the size of the resolution affects how long the data will be written to the USB flash drive.**

STEP 1	Insert the USB flash drive into the back panel of the device (chapter 1.2).
STEP 2	Go to the EXPORT menu in the graph view. Check that the USB mass storage status is CONNECTED.
STEP 3	Select the time interval (resolution) in which you want to export the data. **Notice: Very high resolution and depth into the past will cause a long export time (large amount of data). In general, the size of the resolution affects how long the data will be written to the USB flash drive.**
STEP 4	Tap the EXPORT button. The status "Exporting, please wait..." will be displayed on the screen. Wait until the status "Export done." is displayed.



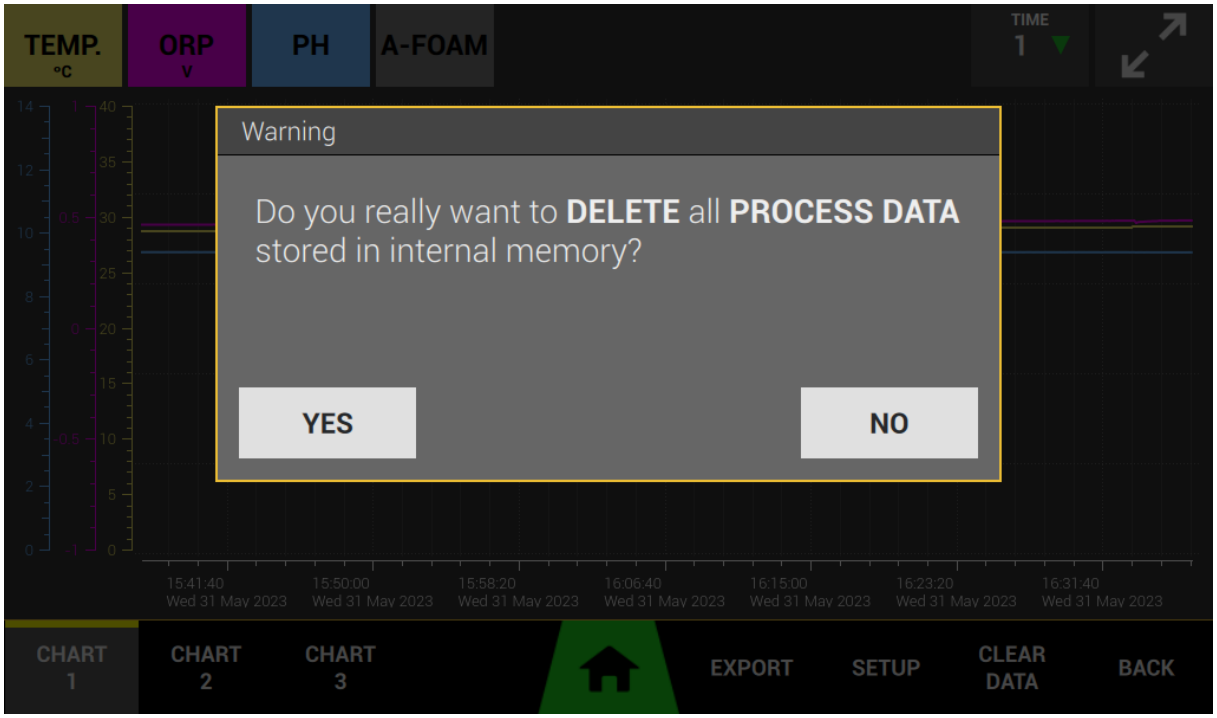
1. **USB MOUNT STATE** – indicates the mou[illegible] status o[illegible] connected USB flash drive.

2. **TIME INTERVAL** – selection of data export resolution.

3. **EXPORT** – tap the button to start exporting data.

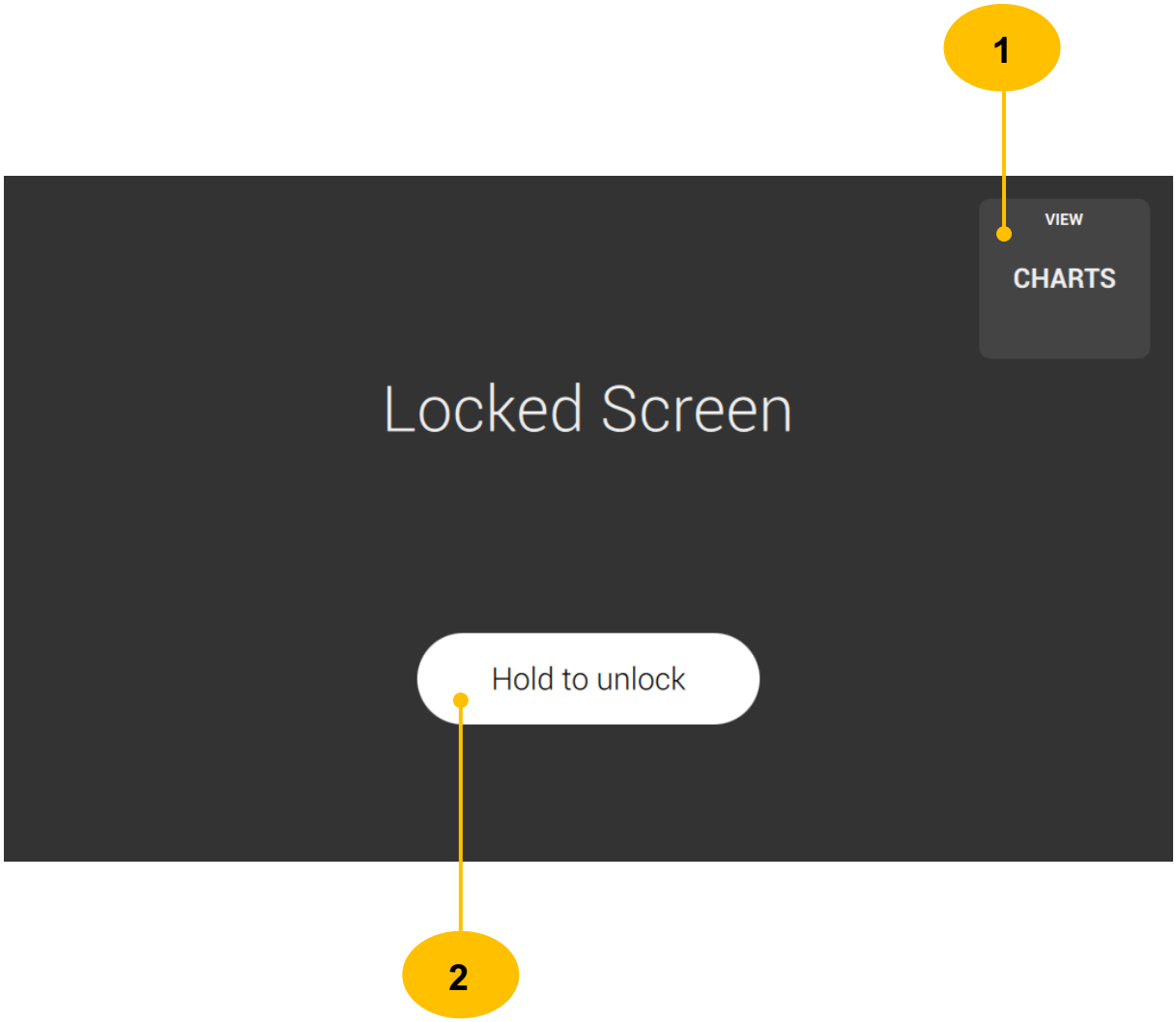
10.18.4 DELETING PROCESS DATA

You can manually delete the process data that is displayed in the graph. **We recommend this step before each new experiment.**



10.19 SCREEN LOCK

Minifor2Bio allows you to lock the screen to prevent unwanted changes to parameters or settings. The lock is activated by tapping the **LOCK SCREEN** button in the menu bar of the main menu. It is deactivated by tapping and holding the **HOLD TO UNLOCK** button.



1. **CHARTS** – tapping the button will display the graphs function without deactivating the lock.

2. **HOLD TO UNLOCK** – tapping and then holding the button deactivates the function.

11 GUARANTEE

12 SOFTWARE COMPONENTS AND LICENSING

12.1 EMBEDDED LINUX

Minifor2Bio is running on Buildroot.

Buildroot is a tool that simplifies and automates the process of building a complete Linux system for an embedded system, using cross-compilation.

In order to achieve this, Buildroot is able to generate a cross-compilation toolchain, a root filesystem, a Linux kernel image and a bootloader for your target. Buildroot can be used for any combination of these options, independently (you can for example use an existing cross-compilation toolchain, and build only your root filesystem with Buildroot).

Buildroot is useful mainly for people working with embedded systems. Embedded systems often use processors that are not the regular x86 processors everyone is used to having in his PC. They can be PowerPC processors, MIPS processors, ARM processors, etc.

Buildroot supports numerous processors and their variants; it also comes with default configurations for several boards available off-the-shelf. Besides this, a number of third-party projects are based on, or develop their BSP [1] or SDK [2] on top of Buildroot. is a simple, efficient and easy-to-use tool to generate embedded Linux systems through cross-compilation.

12.2 QT FRAMEWORK

Minifor2Bio is develop with QT 5.15.2 framework under LGPL v3

Qt is a cross-platform application development framework for desktop, embedded and mobile. Supported Platforms include Linux, OS X, Windows, VxWorks, QNX, Android, iOS, BlackBerry, Sailfish OS and others.

Qt is not a programming language on its own. It is a framework written in C++. A preprocessor, the MOC (Meta-Object Compiler), is used to extend the C++ language with features like signals and slots. Before the compilation step, the MOC parses the source files written in Qt-extended C++ and generates standard compliant C++ sources from them. Thus the framework itself and applications/libraries using it can be compiled by any standard compliant C++ compiler like Clang, GCC, ICC, MinGW and MSVC.

The 5.15.2 library is needed without any further modifications for the functionality of the software equipment. Application software Minifor2Bio use Qt as dynamically linked library.

13 REVISION HISTORY

Date	Description
2024-10-15	Manual pO2 Calibration: sodium sulfite Na_2SO_3 solution for 0% oxygen saturation.

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