INFORS HT

Operating manual

eve® - the bioprocess platform software

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Engineering and production in Switzerland

Contents

1 Introduction

eve® the bioprocess platform software, is able to do more than just plan, control and analyse your bioprocesses. eve® software integrates work flows, devices, bioprocess information and big data in a web-based platform that lets you organise your projects - no matter how complex they are.

eve® integrates complex control strategies based on soft-sensors and phase transition techniques and makes it accessible to non-expert users via a modern intuitive work-flow. On-line and off-line data are seamlessly integrated for comparison and graphical analysis in real time.

eve® is the platform for big data in bioprocesses. It uses cutting-edge NoSQL technology instead of traditional SQL. eve® catapults your bioprocesses into the world of big data, making bioprocess information centralised, unlimited and fast.

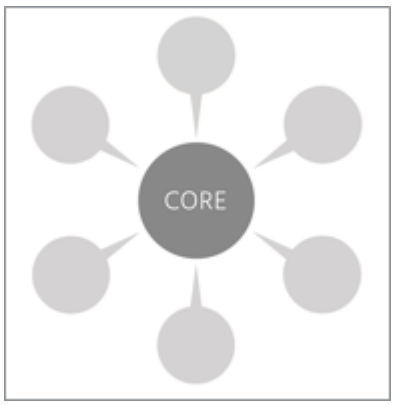
eve® software embraces incubator shakers and bioreactors of all sizes and types and allows to connect and manage your lab resources in a easy way.

1.1 Package structure

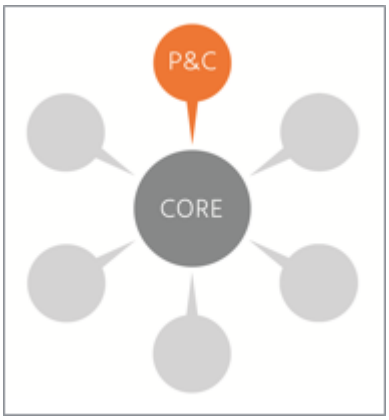
eve® has a modular structure and permits that only required capabilities need to be specified and each user can build a tailored set of functionality to meet their precise needs. The core software can be expanded with additional packages.

eve® Core:

Plan and monitor experiments, including data storage and export.



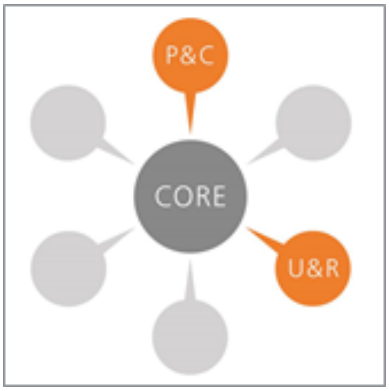
– Work flow oriented planing and monitoring of up to 99 batches
– Connect any number of bioreactors and shakers*
– Save batch data in a central NoSQL database (Elastic)
– Preconfigured, individually adjustable charts
– Libraries for organising and administrating process data
– Dynamic and fixed alarms
– Data import: .csv, .xls, .xlsx, .eve, .iri
– Data export: .csv, .eve
– Supported clients: OPC XML DA, OPC DA, OPC UA
  * Number depends on server performance



eve® Plan & Control:

Design complex strategies, control mechanisms and expanded analysis.

– Complete batch strategy system including preconfigured and programmable functions
– Comparison charts: compare current with completed batches (Golden Batch)
– Time- and event-based comparison between current and archived batches in adaptable charts
– Set control values manually or through the aid of a function (Strategy, etc.)
– Create soft sensors using integrated templates
– Plan multiple batches simultaneously in a single experiment
– Save experiment as recipes



eve® User Management & Reporting:

A perfect addition for people that would like to go beyond FDA part 11 compliance. Track, record and report all the actions in your batch or system.

– Export batch reports of your planned experiments and/or batches with all your recipe information
– Log of relevant changes and events (e.g. start batch, setpoints, off-line samples etc.)
– Log of changes in the software environment (e.g. configuration, updates etc.)
– Log of changes in the User Management (e.g. new user, role etc.)
– Enhanced User Management with 5 user roles (System Administrator, Manager, User, Operator and Guest)
– Automatic log-off
– High-security password and password aging
– Limit batch control to selected computer

1.2 About this document

This manual enables the safe and efficient handling of eve the bioprocess platform software. This manual must be accessible to the operators at all times. The operators must read thoroughly and fully understand this manual before commencement of any work.

Adhering to all the points, advice and instructions concerning safety and operation in this manual is a pre-condition for safe work.

This manual provides the information which are included in eve® the bioprocess platform software with the following license configuration:

– eve® Core

– eve® Plan & Control

– eve® User Management & Reporting

All of the figures in this manual showing the various menus, dialogue boxes and pages of the eve bioprocess platform software reflect the view of a user with the authorisation level of a Manager.

All relevant text statements about general information and direct warnings in this manual are marked as follows:

This note gives a simple application example for a function or setting in the bioprocess platform software eve and indicates an easy solution for a specific demand.

This symbol indicates further information about a function or setting in the bioprocess platform software eve.

This symbol indicates a hazard situation which could result in malfunction of the software and/or data loss.

In addition, the following concept of lists will also be used:

– Normal lists use a simple dash

> Specific actions which must be carried out in this order use an orange angle bracket

> Screens which appear and the results of other actions use a grey angle bracket

[] Text inside square brackets refers to control elements (buttons)

2 Installation

2.1 Requirements

2.1.1 Hardware

For a successful operation of eve the bioprocess platform software the following minimal requirements have to be met:

System requirements for up to 6 devices:

Category	Requirements
processor	Intel i5 or above
memory	16 GB RAM
hard disc	250 GB SSD or SAS (500 GB SSD recommended)
monitor resolution	1280 x 1024 (1920 x 1080 recommended)
network	Gigabit Ethernet LAN adapter
operating system	64-bit, all systems (see "Operating system" on the next page)

System requirements for up to 20 devices:

Category	Requirements
processor	Intel i7, i9 or Xeon (at least 4 cores)
memory	16 GB RAM (32 GB recommended)
hard disc	500 GB SSD or SAS
monitor resolution	1280 x 1024 (1920 x 1080 recommended)
network	Gigabit Ethernet LAN adapter
operating system	64-bit, only Windows Server (see "Operating system" on the next page)

System requirements for up to 80 devices:

Category	Requirements
processor	Intel Xeon (at least 8 cores)
memory	32 GB RAM (64 GB recommended)
hard disc	1 TB SSD or SAS
monitor resolution	1280 x 1024 (1920 x 1080 recommended)
network	Gigabit Ethernet LAN adapter
operating system	64-bit, only Windows Server (see "Operating system" on the next page)

2.1.2 Operating system

To install and run eve® the bioprocess platform software, one of the following operating systems (64bit) has to be installed:

– Windows 7 Professional
– Windows 10 Pro
– Windows Server 2012 R2 Standard
– Windows Server 2016

In addition, we recommend one of the following web browser:

– Chrome
– Edge
– Internet Explorer 11

Please avoid any additional applications that are using a lot of resources (CPU, memory, I/O, Bandwidth etc.).

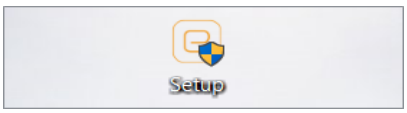
2.1.3 System requirements

Before you install eve® the bioprocess platform software please ensure that the following requirements are met:

– Port 80 and 8080 must not be used or blocked
– No pre installed version of elasticsearch data base

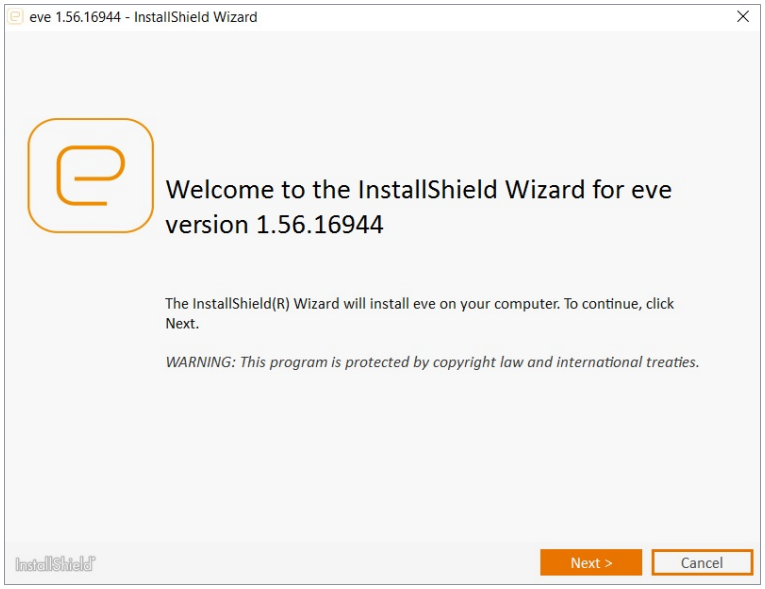
During the installation of eve® the computer must have access to the internet.

2.2 Installation



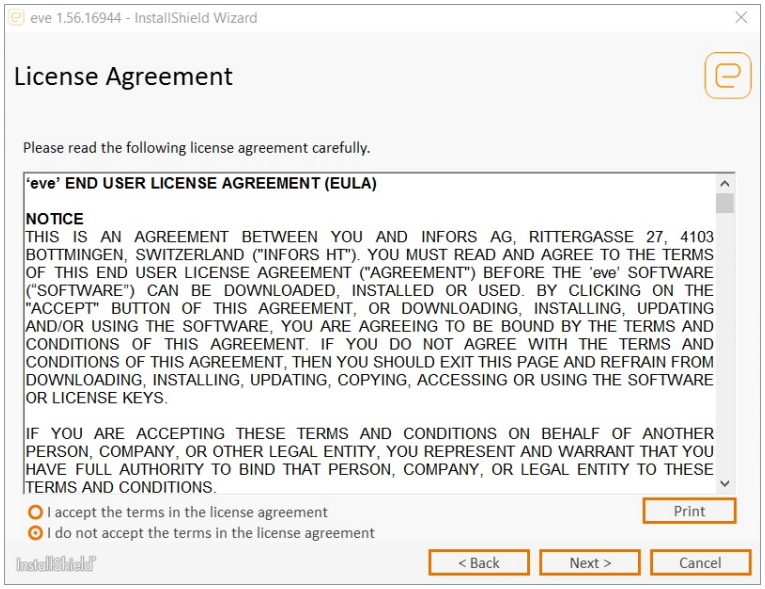
> Click on the eve Setup.exe file.

> The Welcome to the InstallShield Wizard for eve screen appears.



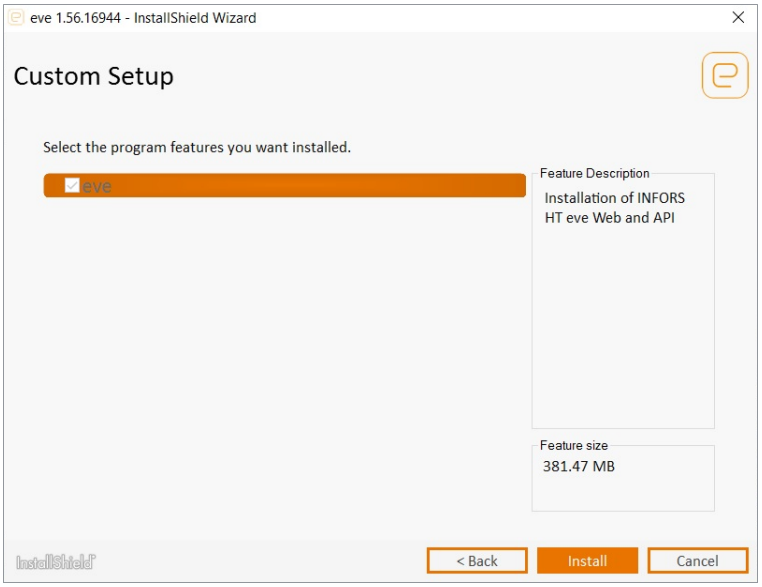
> Click the [NEXT] button at the bottom of the welcome screen.

> The license agreement screen appears.



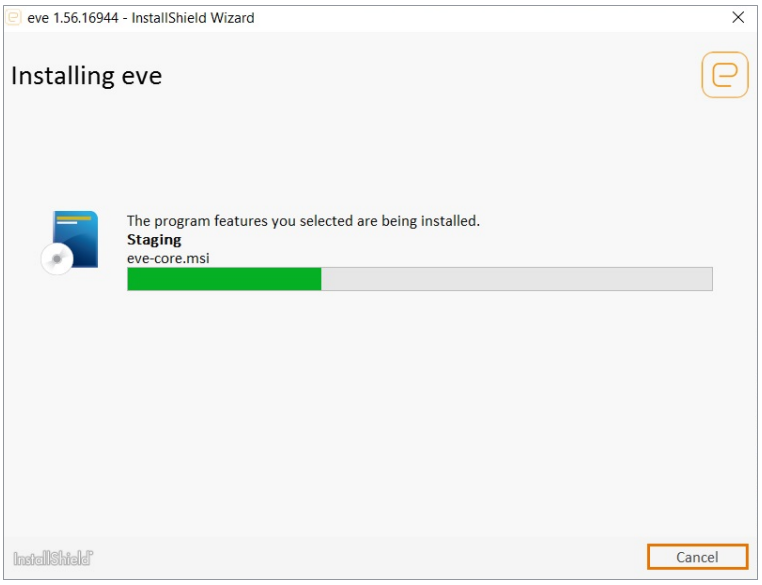
> Click the "I accept the terms in the license agreement" and click the [NEXT] button at the bottom of the license agreement screen.

> The custom setup screen appears.

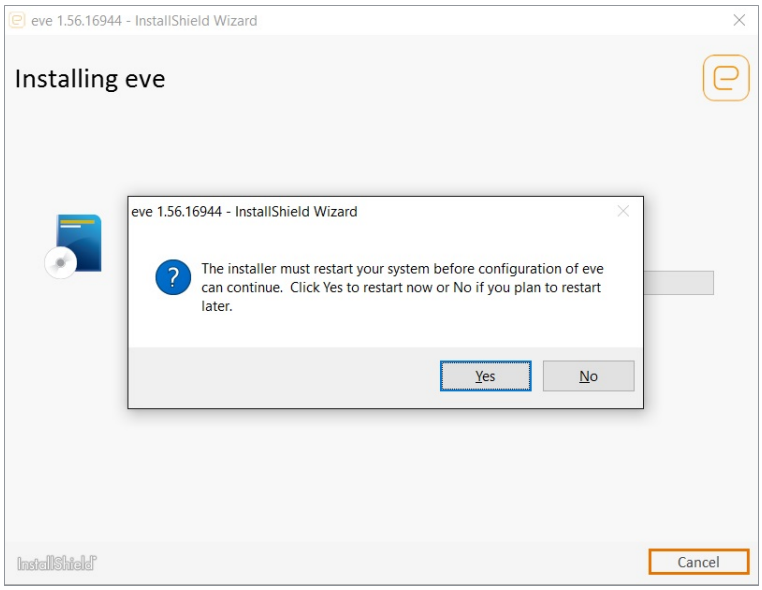


> Click the [INSTALL] button at the bottom of the custom setup screen.

> All the program features are then being installed.

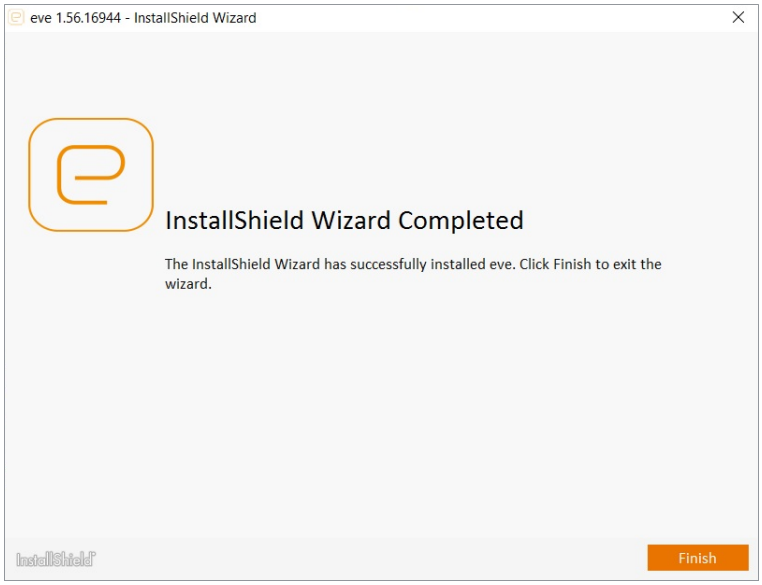


> During the installation the installer needs a reboot before the configuration of eve® can continue.



> Click the yes button in order to restart the computer.

> After restart the InstahllShieldWizard completed screen appears.



> Click the [FINISH] button at the bottom of the InstallShield Wizard completed screen.

> eve® the bioprocess platform software has been installed successfully.

2.3 Software maintenance

In order to update, repair or uninstall eve® the bioprocess platform software proceed as follows:

Update:

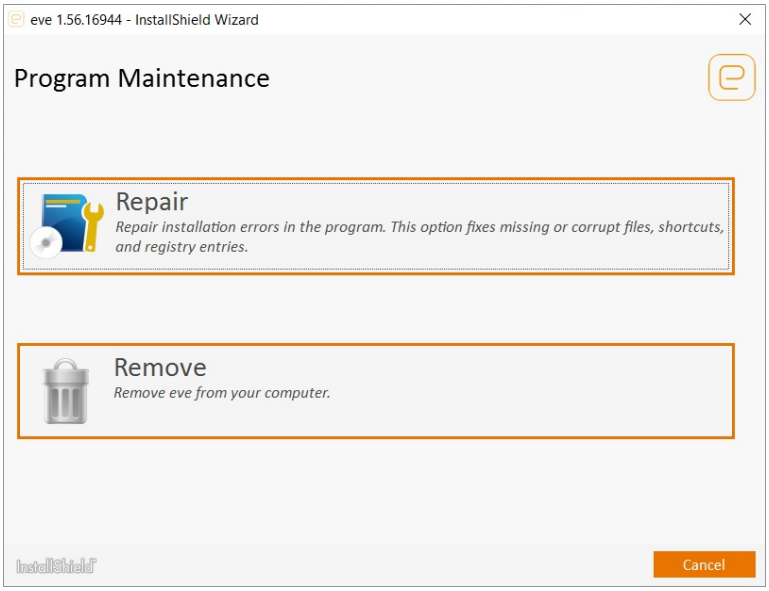
> Click on the newly received eve Setup.exe file.

> Follow the same instructions as for the first installation (see "Installation" on page 12).

Repair and uninstall:

> Click on the eve Setup.exe file which was originally used for the first installation.

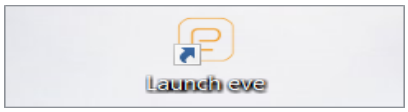
> The program maintenance screen appears.



> Click on the corresponding orange field (repair or uninstall) and continue with the process.

2.4 First log-in

After a successful installation of eve® the software can be started as follows:



> Click on the launch eve icon which is available on your desktop.

> The default web browser of your operating systems starts and the eve® login-in screen appears.

For the first log-in please use the default user name:

User name: Administrator
Password: Administrator

> Enter your user name and the corresponding password.

> Click the [LOGIN] button.

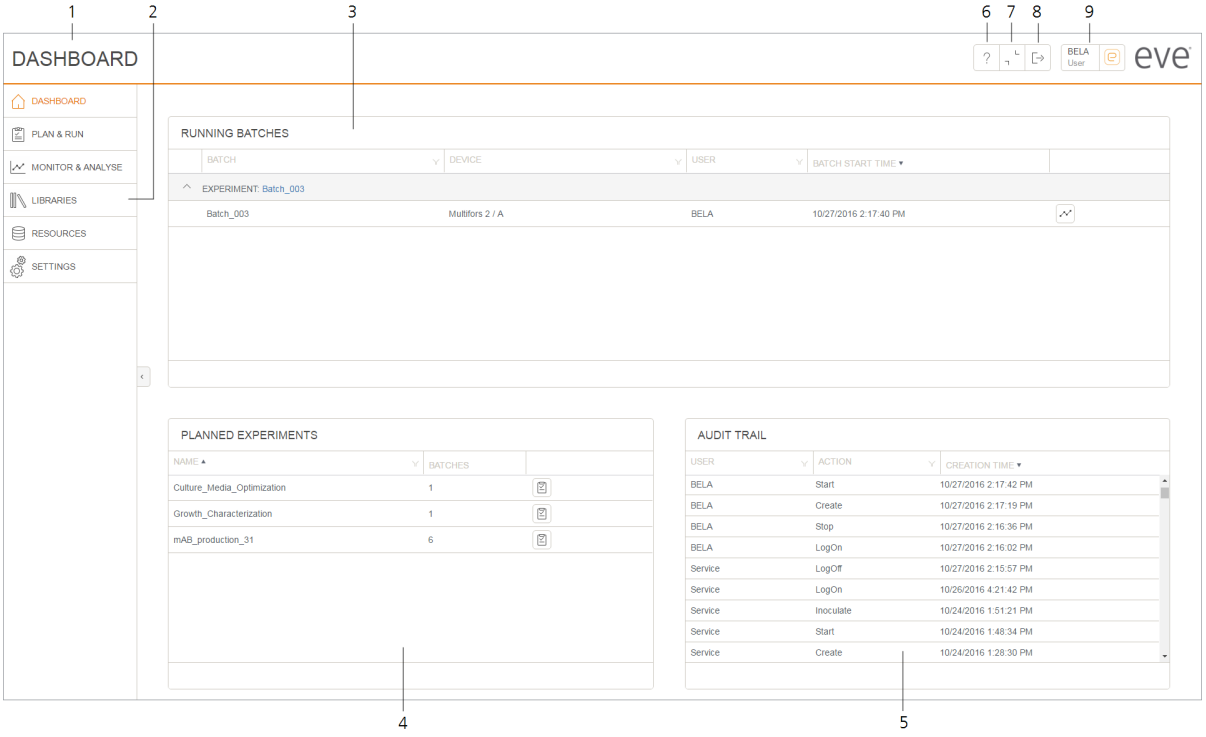
> The DASHBOARD screen appears.

Administrator are only allowed to manage the equipment and user accounts (see "Resources" on page 149). Full feature access is exclusively activated for users with a role as a manager or user.

3 Dashboard

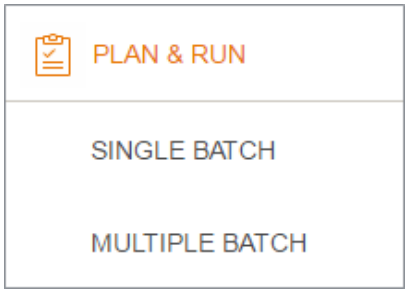
The dashboard is the main overview window of eve® the bioprocess platform software. The widget-like tiles of running and planned batch processes support a fast, easy control and access of the experiments and batch processes.

3.1 Dashboard screen



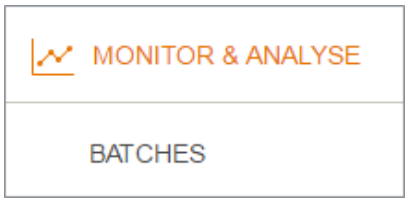
Number	Function
1	Display of current position
2	Main menu structure
3	Running batch overview and control table
4	Planned experiment overview and control table
5	Audit trail overview
6	Help (eve documentation)
7	Full screen mode
8	Log out of software
9	User profile

3.2 Main menus



PLAN & RUN:
In the PLAN & RUN menu single and multiple batch processes can be planned and started. The following functions are available:

– Clean and intuitive work flow procedure for batch processes
– Connection to a comprehensive organism, culture media and soft-sensor library
– Revolutionary strategy design tool for batch processes with integrated functions and soft-sensors

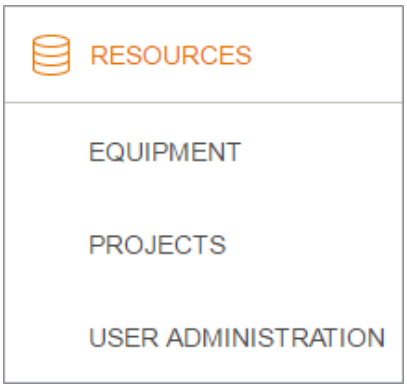


MONITOR & ANALYSE:
In the MONITOR & ANALYSE menu all batch processes can be monitored, controlled and analysed. The following functions are available:

– Monitor and control batch processes
– Compare live and historical batch data
– Advanced chart customisation

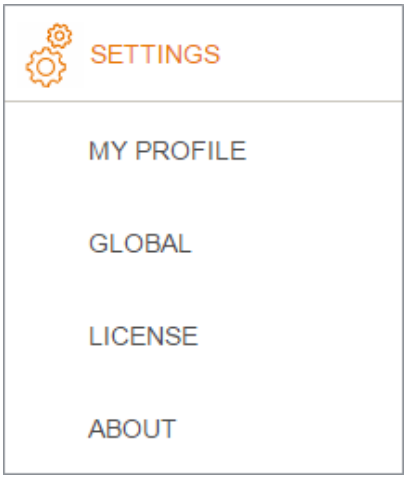
LIBRARIES:
In the LIBRARIES menu all the stored information about, batches, recipes, organisms, culture media, soft-sensors and audit is accessible. The following functions are available:

– Import and export of batch data
– Creation of organism, culture media and compounds library
– Built-in soft-sensor scripting engine
– Audit trail on user actions



RESOURCES:
In the RESOURCES menu the configuration of equipment, projects and users can be managed. The following functions are available:

– Quick and easy device connection
– Project and data structuring
– User management



SETTINGS:
In the SETTINGS menu the configuration of user specific and global settings can be changed. In addition, information about the software and the license configuration is provided. The following functions are available:

– Profile customisation
– Log-off and data export configuration
– Software information
– License configuration

3.3 Control keys

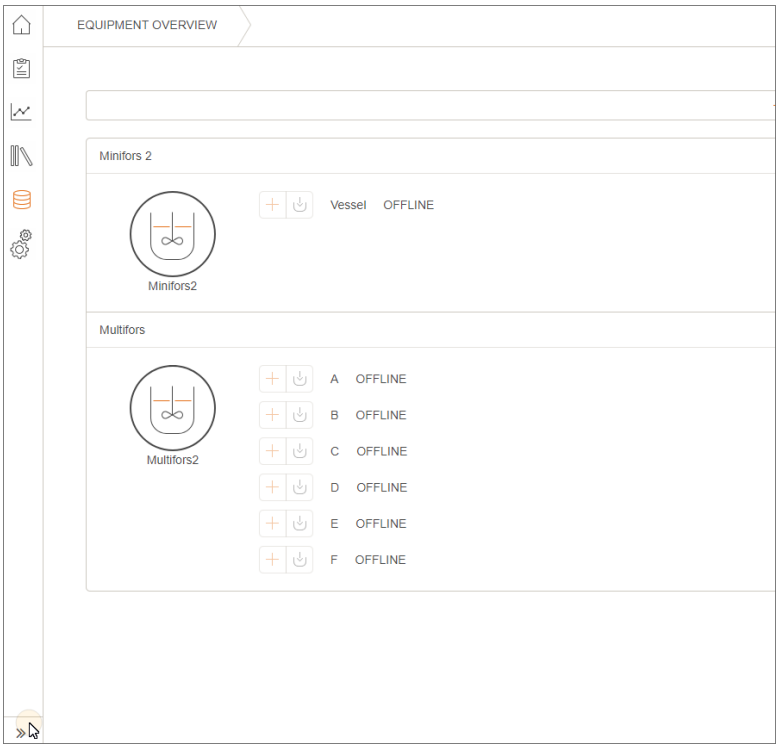
Control key	Description
	Help
	Full screen
	Windowed screen
	Log out
	User profile
	Open (planned) batch
	Open (completed and running) batch
	Export
	Report
	Edit
	Delete
	Settings
	Load
	Expand
	Minimise
	Add
	Close
	Time
	Skip phase
	Filter table
	Archive
	Binding (soft-sensor)

In eve several options are available to improve the navigation and work space behaviour in the software. By default on bottom the left-hand side of the screen the menu structure is always minimised.

3.3.1 Menu structure appearance

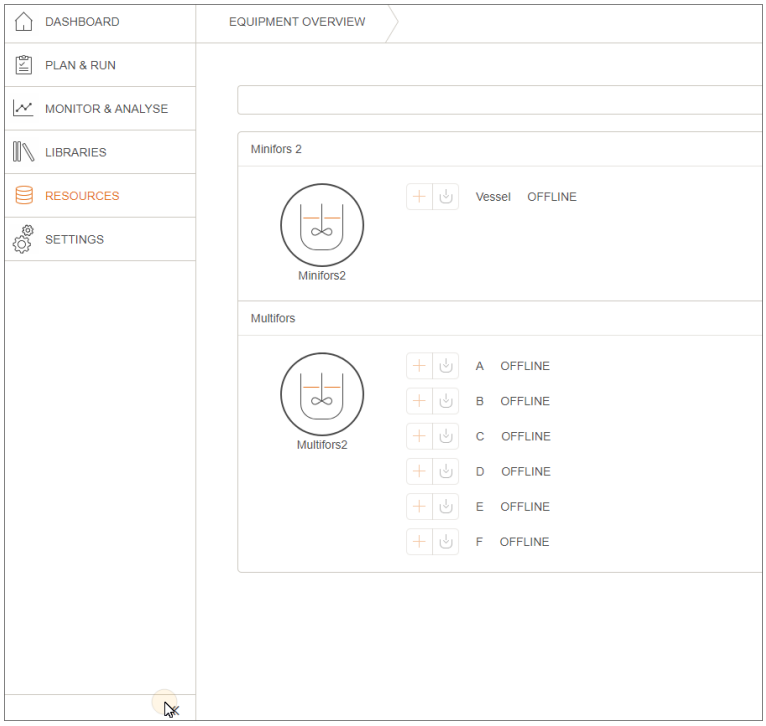
To expand the menu structure, proceed as follows:

> Click the small arrow tab which is attached to the menu structure in order to expand the menu structure.



> The entire menu structure is expanded and the menu titles are displayed.

> Click again the small arrow tab in order to minimise the menu structure.



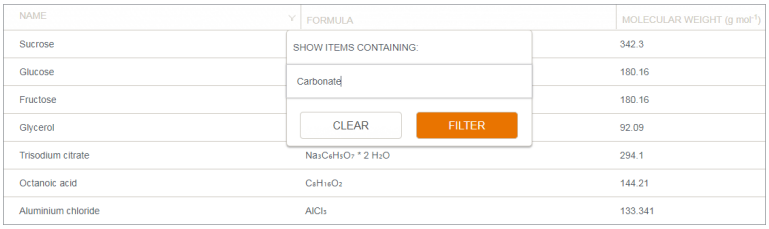
> The menu structure is minimised again.

3.3.2 Search and filter tables

Almost every table in eve® the bioprocess platform software can be searched and filtered and allows you to search quickly for a specific entry (e.g. culture media compound).

> Enter any term and click the [FILTER] button in order to look for a specific entry.

> The entries of the table are filtered according to the entry.



> Click on any header in a table in order to search for a specific entry or sort the entries in an ascending or descending order.

> The options for sort and filter appear.

> Click the header in order to sort the table in an ascending order.

> The entries of the table are in an ascending order.

> Click the header again in order to sort the table in a descending order.

> The entries of the table are in a descending order.

3.3.2.1 Advanced filtering

Two data libraries namely, BATCH and AUDIT TRAIL have an advanced search function. This search is a very powerful full-text search function and is capable of searching for:

– Project names (e.g. EcoliGFP)
– Experiment names (e.g. GrowthExp001)
– Batch names (e.g. E_coli_001)
– Batch descriptions (e.g. growth studies of EColi)
– Device names (e.g. Labfors)
– Unit names (e.g. "B")
– Organism names (e.g. "Escherichia coli")
– Clone names (e.g. K-12)
– Culture media names (e.g. BasalSaltMedia)
– Culture media compound names (e.g. Glucose)
– Phase names (e.g. Fed-batch)
– Function names (e.g. linear)
– States (e.g. completed)
– User names (e.g. User1)

– Event type (Audit Trail, e.g. Inoculate)

– Action (Audit Trail, e.g.

– Each query (search/filter) is a series of terms and operators.

– A term can be a single word - *Escherichia* or - *coli* or - a phrase surrounded by double quotes - "*Escherichia coli*" - which searches for all the words in the phrase, in the same order:

Escherichia coli

states that:

- Escherichia OR coli has to be present

– Wildcard searches can be run on individual terms, using ? to replace a single character, and * to replace zero or more characters:

*Lab**

states that:

- Lab has to be present and more characters could follow

– By default, all terms are optional, as long as one term matches.

– The preferred operators are + (this term **must** be present) and - (this term **must not** be present). All other terms are optional. For example, this query:

Coli Labfors +K-12 -planned

states that:

- K-12 must be present
- Planned must not be present
- Coli and Labfors are optional - their presence increases the relevance

The familiar operators AND, OR and NOT (also written &&, || and !) are also supported. However, the effects of these operators can be more complicated than is obvious at first glance. NOT takes precedence over AND, which takes precedence over OR. While the + and - only affect the term to the right of the operator, AND and OR can affect the terms to the left and right.

Rewriting the above query using AND, OR and NOT demonstrates the power and complexity of this function:

Coli OR Labfors AND K-12 AND NOT planned

This is incorrect because Labfors is now a required term.

(Coli OR Labfors) AND K-12 AND NOT planned

This is incorrect because at least one of coli or labfors is now required and the search for those terms would be scored differently from the original query.

((Coli AND K-12) OR (Labfors AND K-12) OR K-12) AND NOT planned

This form now replicates the logic from the original query correctly, but the relevance scoring bears little resemblance to the original.

To execute such search/filter queries proceed as follows:

SEARCH

> Enter the search/filter term in the search entry field.

> Click the [SEARCH] (or enter) button.

> The query result is a list of all library entries matching the search/-filter.

4 Plan & Run

Bioprocesses can be either conducted in parallel or one at a time. The bioprocess platform software eve allows you to chose your desired work flow and then plan and run experiments and batches easily.

The PLAN & RUN menu includes the following sub-menus and allows you to configure your bioprocesses individually:

Menu	Function
Single batch	- Experiments with one single batch process - Configuration of all process parameters - Supportive experiment work flow - Detailed organism and culture media library - Revolutionary strategy design tool
Multiple batch	- Reference batch for multiple batch applications - Overview table of all planned batch processes - Experiment with multiple batch processes - Configuration of all process parameters - Supportive experiment work flow - Detailed organism and culture media library - Revolutionary strategy design tool

In order to plan and run a batch process proceed as follows:

> Click the [PLAN & RUN] button on the left-hand side of the screen.

> The sub-menus of PLAN & RUN appear.

4.1 Single Batch

The SINGLE BATCH is a function which allows you to plan and run individual batch processes. The entire work flow can be divided into four steps. In each of the four work flow steps, the specific details can be configured and used for your batch process. The icon of each step indicate the position in the work flow and can be simultaneously used as a navigation button. The four work flow steps are as follows:

– Basic setup (see "Basic setup" on the facing page)

– Organism (see "Organism information" on page 36)

– Culture media (see "Culture media information" on page 40)

– Strategy (see "Batch strategy" on page 44)

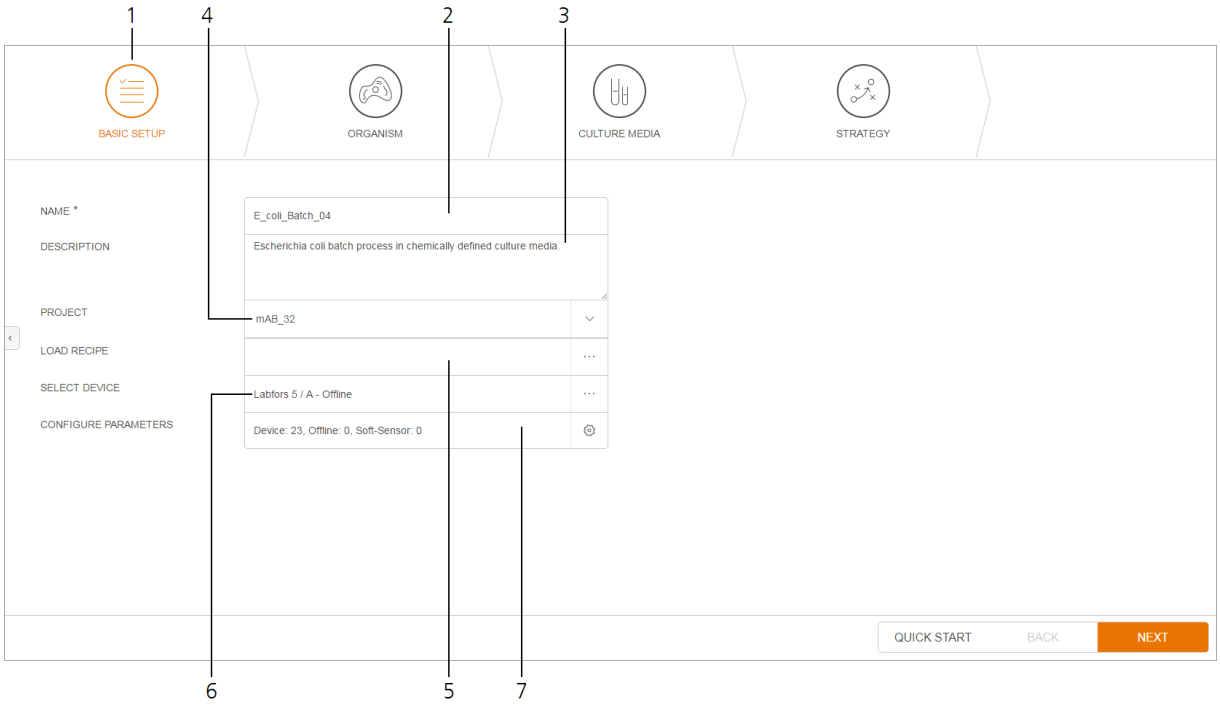
4.1.1 Basic setup

In the BASIC SETUP section generic information about the batch process can be configured. In addition, the allocation to a project, loading of recipes and the selection of the equipment with the subsequent configuration of all the process parameters can be managed.

SINGLE BATCH

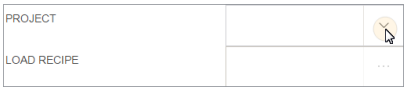
> Click the [SINGLE BATCH] button on the left-hand side of the PLAN & RUN menu.

> The BASIC SETUP screen appears.



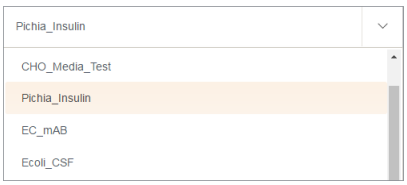
Number	Function
1	Current work flow position (BASIC SETUP)
2	Name of the batch process
3	Description of the batch process
4	Allocation to a project
5	Selection of a recipe
6	Selection of the device
7	Configuration of the process parameters

4.1.1.1 Project allocation



> Click the ⌄ icon to get a list of the stored projects.

> A list of the created projects appears.

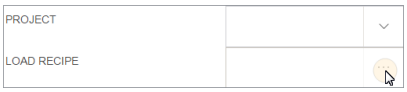


> Select your appropriate project.

> The batch process is allocated to the specific project.

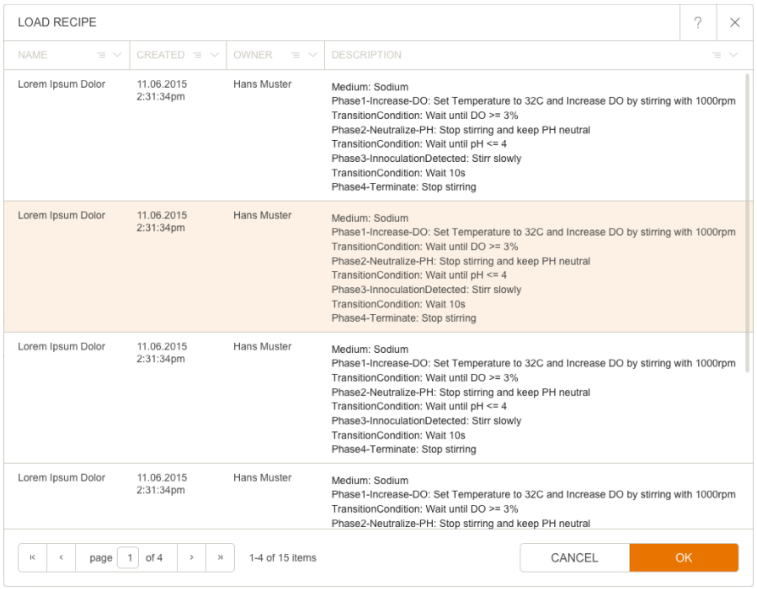
The allocation of a batch process to a any project is only possible if a projects is created in the library (see "Projects" on page 162). If no project was created the allocation is by default a "no-name" project.

4.1.1.2 Load and apply recipe



> Click the ⋯ icon in the LOAD RECIPEfield in order to select the appropriate recipe for your batch process.

> The LOAD RECIPE pop-up screen appears.



> Select the corresponding recipe and click the [OK] button at the bottom of the LOAD RECIPE pop-up screen.

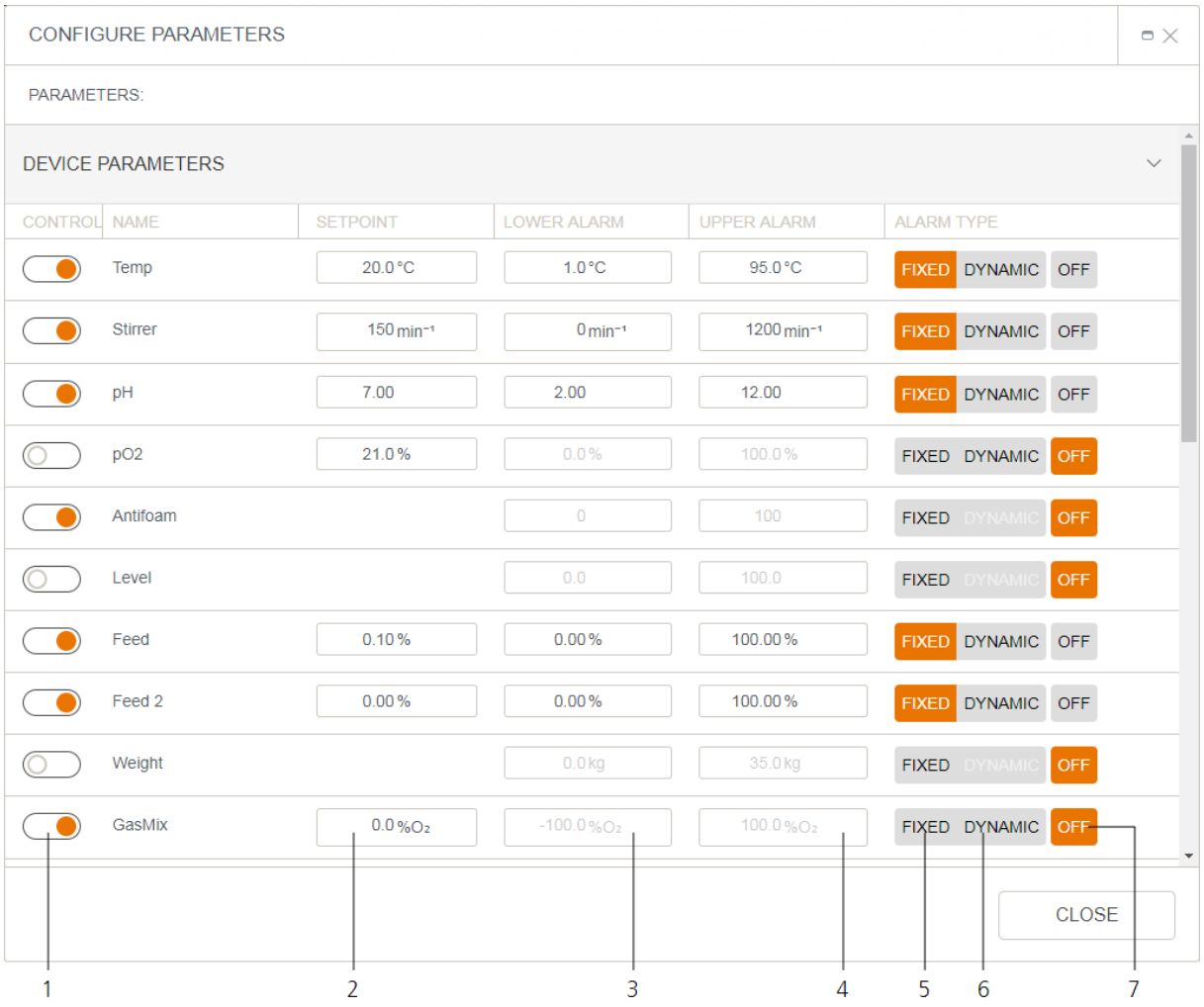
> Depending on your recipe the entire work flow is configured.

If no recipe is selectable you have to create a recipe from an existing batch (see "Create new recipe" on page 117).

4.1.1.3 Parameter configuration

In the CONFIGURE PARAMETER section three different kinds of parameters can be configured and selected:

– Device parameters (see "Device parameters:" on the next page)
– Offline parameters (see "Offline parameter:" on page 32)
– Soft-sensors (see "Soft-sensor:" on page 34)



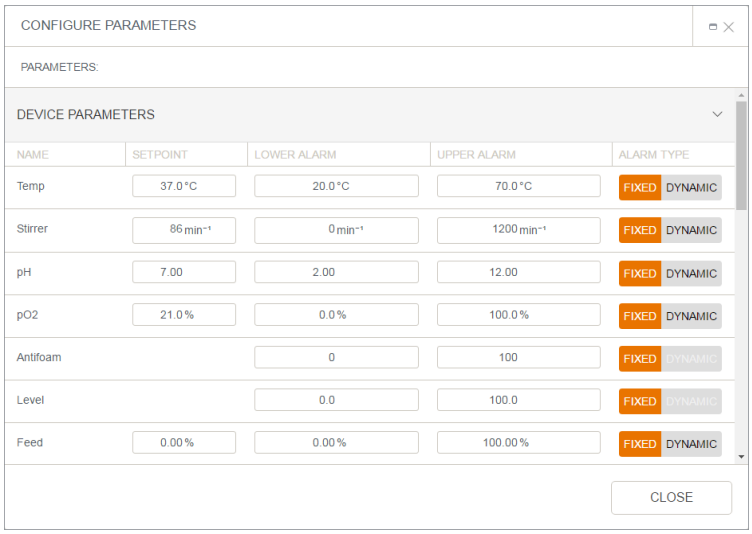
Number	Function
1	Control parameter on / off
2	Field for device parameter set point value
3	Field for lower alarm value
4	Field for upper alarm value
5	Fixed alarm type: Any specific value under or above a set point which defines absolute boundary limits that should not be reached.
6	Dynamic alarm type: A certain window which moves with the set point (e.g. always ± 5 °C of the temperature set point).
7	Alarm on / off

Device parameters:

The configure device parameters allows you to set the following:

– Set Control parameter on / off(see "Control parameter on / off:" below)
– Setpoints of device parameters (see "Setpoint of device parameters:" on the facing page)
– Alarm type (see "Alarm type:" on the facing page)
– Limit and range of alarms (see "Limit and range of alarms:" on the facing page)
– Set arlarm on / off (see "Alarm on / off:" on the facing page)

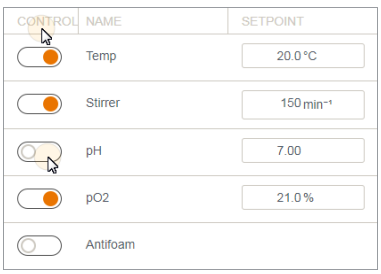
> Click the ⚙ icon in the CONFIGURE PARAMETERS section in order to configure your parameters.
> The CONFIGURE PARAMETERS pop-up screen appears.



> By default the list of device parameters is expanded.

Control parameter on / off:

In order to change the control of a specific parameter click directly into device parameter list:

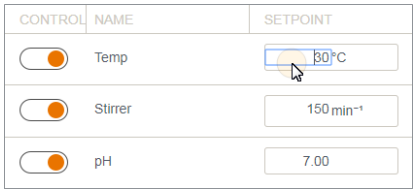


> Click on any control toggle button of a specific parameter.
> The control of the specific parameter is on / off.

If you click on the CONTROL column header itself you can either switch all parameter control on or off simultaneously.

Setpoint of device parameters:

In order to change a setpoint of a specific parameter click directly into the device parameters list:

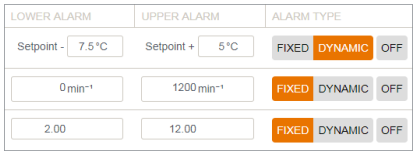


> Click into any setpoint field of a specific parameter and enter the new value.

> The new setpoint of the parameter is set.

Alarm type:

In order to change the alarm type of a specific parameter click directly into the device parameters list:

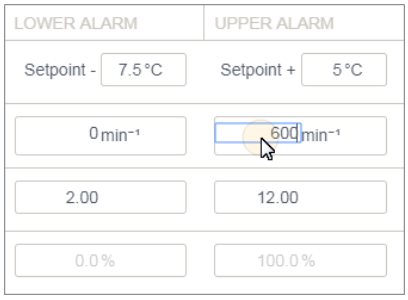


> Click either on the FIXED or DYNAMIC alarm type button.

> The alarm type of the specific parameter has changed an the lower and upper alarms can be configured.

Limit and range of alarms:

Depending on the selected alarm type the ranges and limits of the alarm can be set differently. In order to change the range or limit of a specific parameter alarm click directly into the device parameters list:



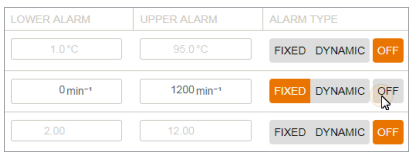
> Click into either the upper or lower alarm field of the specific parameter.

> Change the value either by entering a new value.

> The new range or limits of the alarm is set.

Alarm on / off:

In order to change if an alarm is enabled or disabled of a specific parameter click directly into the device parameters list:



> Click on the OFF button of the specific parameter.

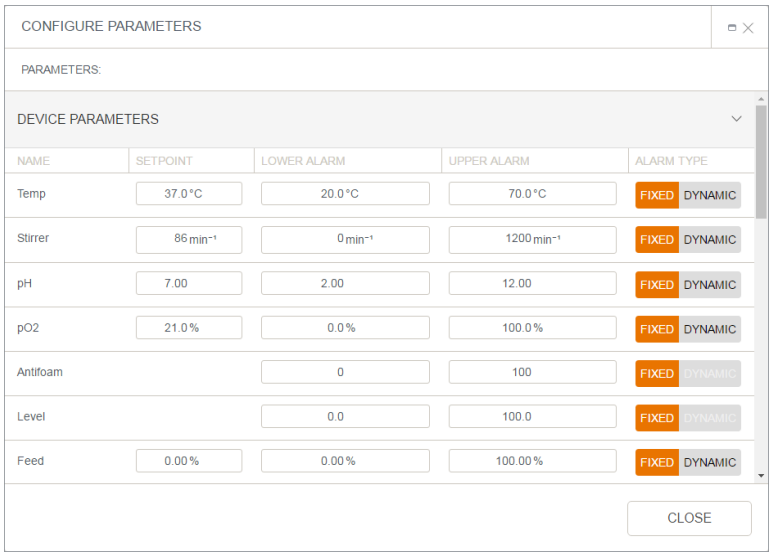
> The alarm of the specific parameter if on / off.

Offline parameter:

Each batch process can have several configured offline parameters. In order to add an offline parameter proceed as follows:

> Click the ⚙ icon in the CONFIGURE PARAMETERS section in order to configure your parameters.

> The CONFIGURE PARAMETERS pop-up screen appears.

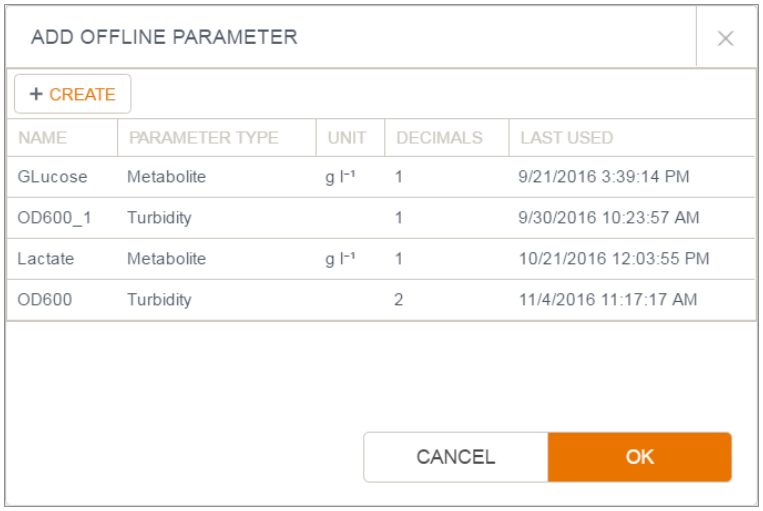


> By default the list of device parameters is expanded.

> Click the offline parameters tab in order to add an offline parameter.

> Click the [ADD A NEW OFFLINE PARAMETER] button.

> The ADD OFFLINE PARAMETER pop-up screen appears.



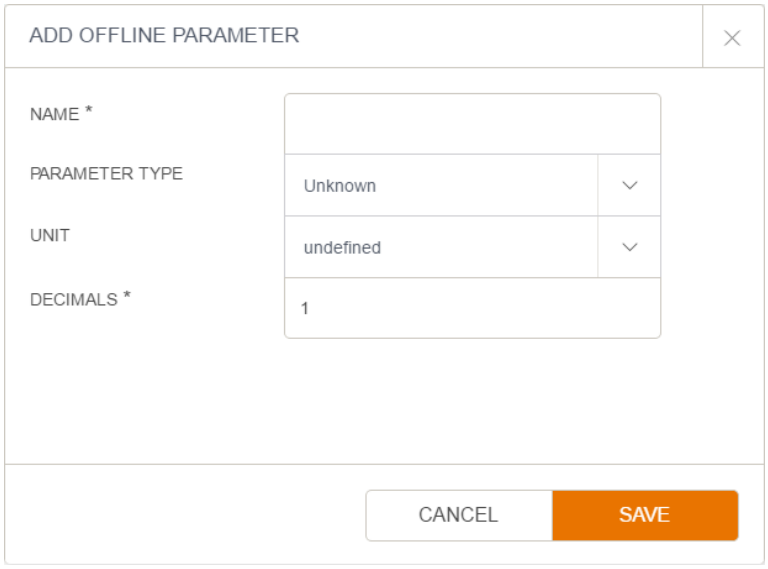
> Select an appropriate offline parameter from the list and click the [OK] button at the bottom of the pop-up screen.

> The new offline parameter is added to the offline parameter list.

To configure a completely new offline parameter proceed as follows:

> Click the [CREATE] button in the ADD OFFLINE PARAMETER pop-up screen.

> A new pop-up screen with the configuration of the offline parameter appears.



> Enter any name for the offline parameter (mandatory).

> Select a parameter type for the offline parameter (optional).

> Select the units for the offline parameter (optional).

> Define the decimals for the offline parameter (mandatory).

> Click the [SAVE] button in order to save your settings.

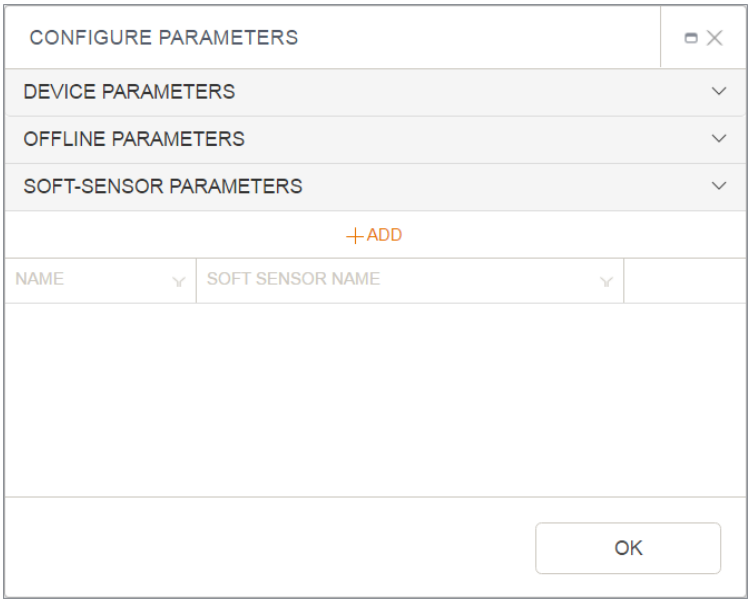
Configuring an offline parameter can be helpful if you already know what kind of samples you will take during the cultivation process. For example the definition of biomass (x_t)- and substrate concentration (s_t) may be useful for visualising the taken offline samples in the chart display.

Soft-sensor:

> If no appropriate soft-sensor is listed you have to configure a new soft-sensor in the library (see "Soft-sensors" on page 131)

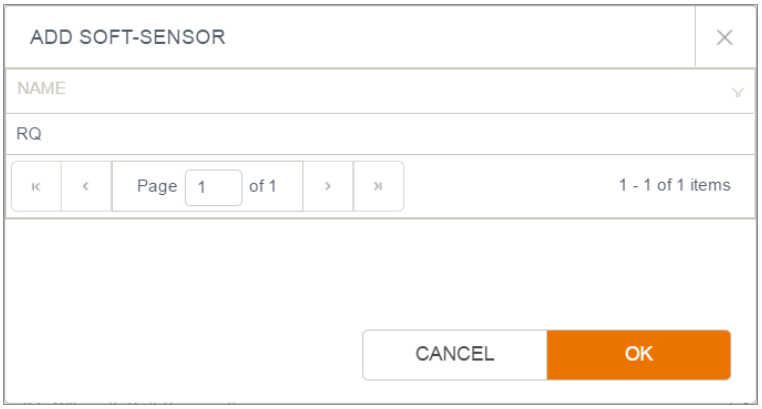
To select a soft-sensor for your batch proceed as follows:

> Click the [SOFT SENSOR PARAMETERS] button in the CONFIGURE PARAMETERS section.



> Click the [ADD] button at the top of the soft-sensor parameters list.

> A new window select a soft-sensor appears.



> Click on the soft-sensor from your soft-sensor library.

> Click the edit button to change the constant values if necessary.

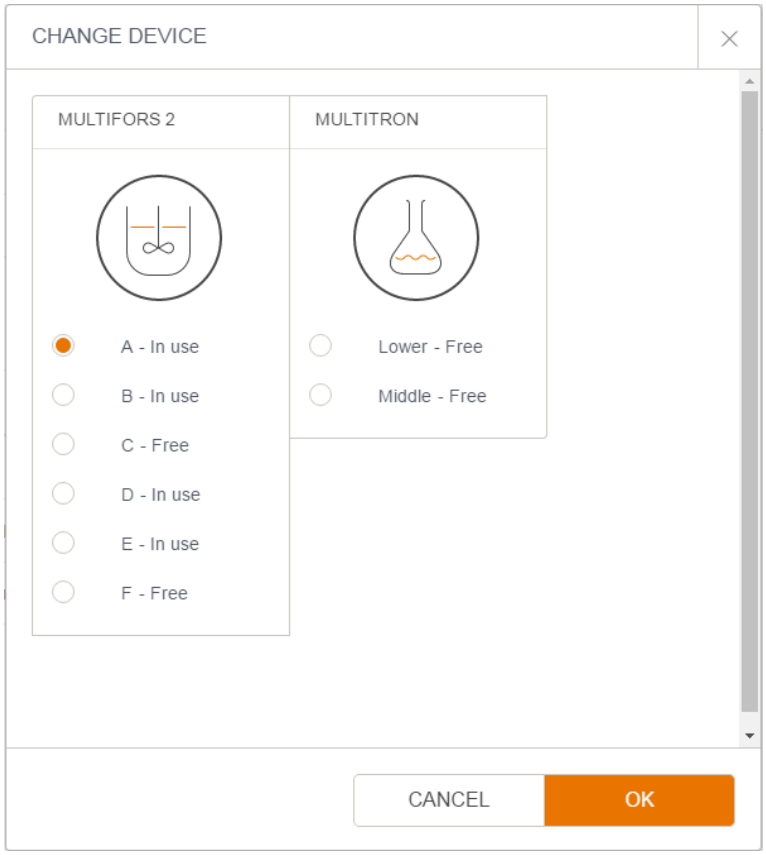
> Click the [OK]button to save your selected soft-sensorparameter.

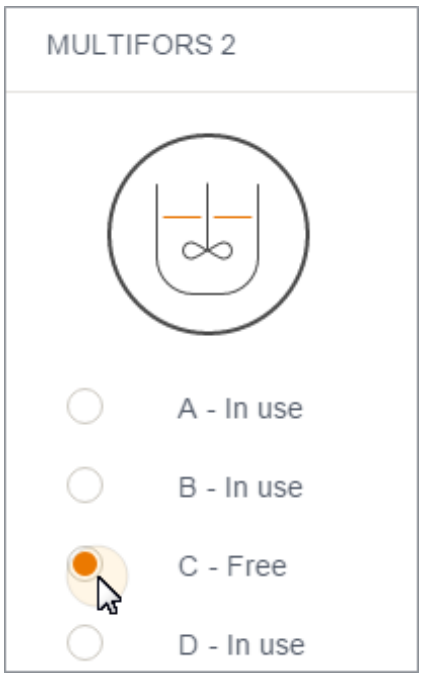
> The selected soft-sensors are displayed in the parameter list.

4.1.1.4 Device Selection

> Click the ··· icon in the SELECT DEVICE field in order to select the appropriate device for your batch process.

> The CHANGE DEVICE pop-up screen appears, where all your configured devices are listed.





> Click on any free vessel in order to continue with the configuration of the batch process.

> Click the [OK] button at the bottom of the CHANGE DEVICE pop-up screen in order to save your settings and get back to the BASIC SETUP screen.

If you simply want to plan an experiment it is also possible to select a bioreactor vessel which is in use. However, to start a batch process the device must be free.

4.1.2 Organism information

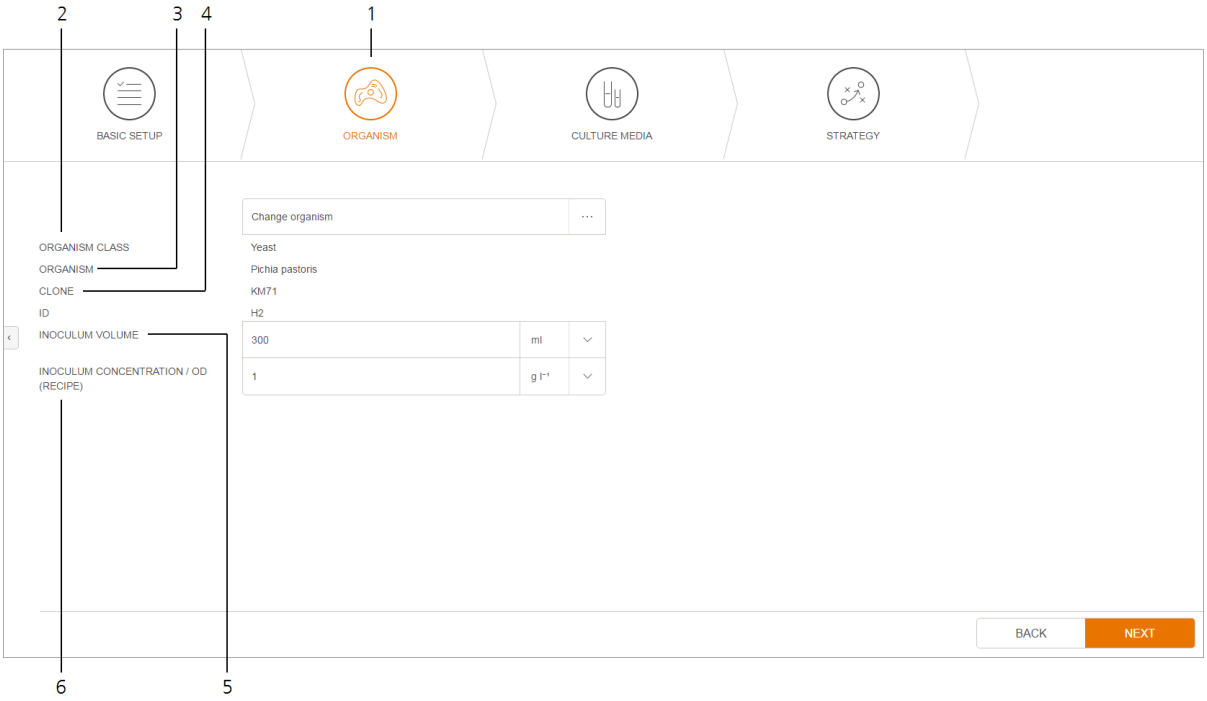
The organism information allows you to specify further details about the organism of the specific batch process. This information is optional. However, the information can be connected/linked to several other applications and allows easy storage of batch information in one place.

Configuring the organism information, following conditions have to be met:

– The BASIC SETUP of the batch has to be specified (see "Basic setup" on page 27)
– The allocation of a specific device (see "Device Selection" on the previous page)
– Optional: Configuration of the process parameters (see "Parameter configuration" on page 29)

In order to access the organism information proceed as follows:

> Click the [SINGLE BATCH] button on the left-hand side of the PLAN & RUN menu.
> Click on the ORGANISM icon in the work flow illustration or on the [NEXT] button at the bottom of the screen.
> The ORGANISM screen appears.



Number	Meaning
1	Current work flow position (ORGANISM)
2	Specification of organism group
3	Specification of organism
4	Specification of clone/strain
5	ID Number
6	Inocoulum volume at inoculation time point
7	Inoculum concentration/OD at inoculation time point

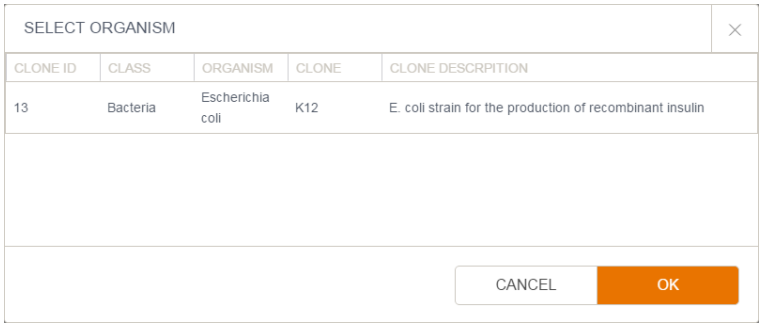
Inoculum volume and inoculum concentration/OD can also be specified during a running batch process as soon as the batch is inoculated (see "Inoculate batch process" on page 102).

4.1.2.1 Select organism

> If no organism is selectable you have to create a organism in the library (see "Add new organism" on page 120).

> Click the ··· icon in the ORGANISM CLASS section to select the appropriate organism for your batch process.

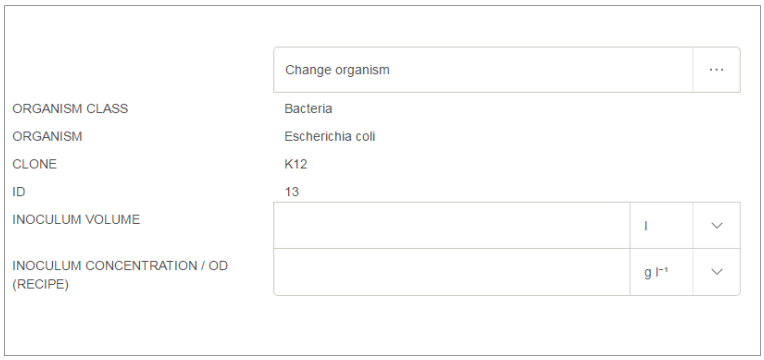
> The select organism pop-up screen appears.



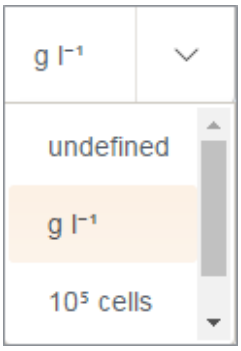
> Click on the appropriate organism for your batch process.

> Click the [OK] button in order to save your settings.

> Information about the specific organism is displayed in the organism screen.



4.1.2.2 Inoculum information



Inoculum volume:

> Enter any value in the INOCULUM VOLUME field for your inoculum volume.

> Select the corresponding unit for your inoculum volume in the drop down menu next to it.

> The inoculum volume with the corresponding unit is displayed.

Inoculum concentration:

> Enter any value in the INOCULUM CONCENTRATION field for your inoculum concentration.

> Select the corresponding unit for your inoculum concentration in the drop down menu next to it.

> The inoculum concentration with the corresponding unit is displayed.

Specifying the inoculum concentration (x_0) as an example enables the possibility to use this value for a biomass growth model. Furthermore, any entered information in this section is saved to the batch process and always accessible.

4.1.3 Culture media information

The culture media information allows you to specify further details about the culture media of the specific batch process. This information is optional. However, the information can be connected/linked to several other applications and allows easy storage of batch information in one place.

Configuring the culture media, the following conditions have to be met:

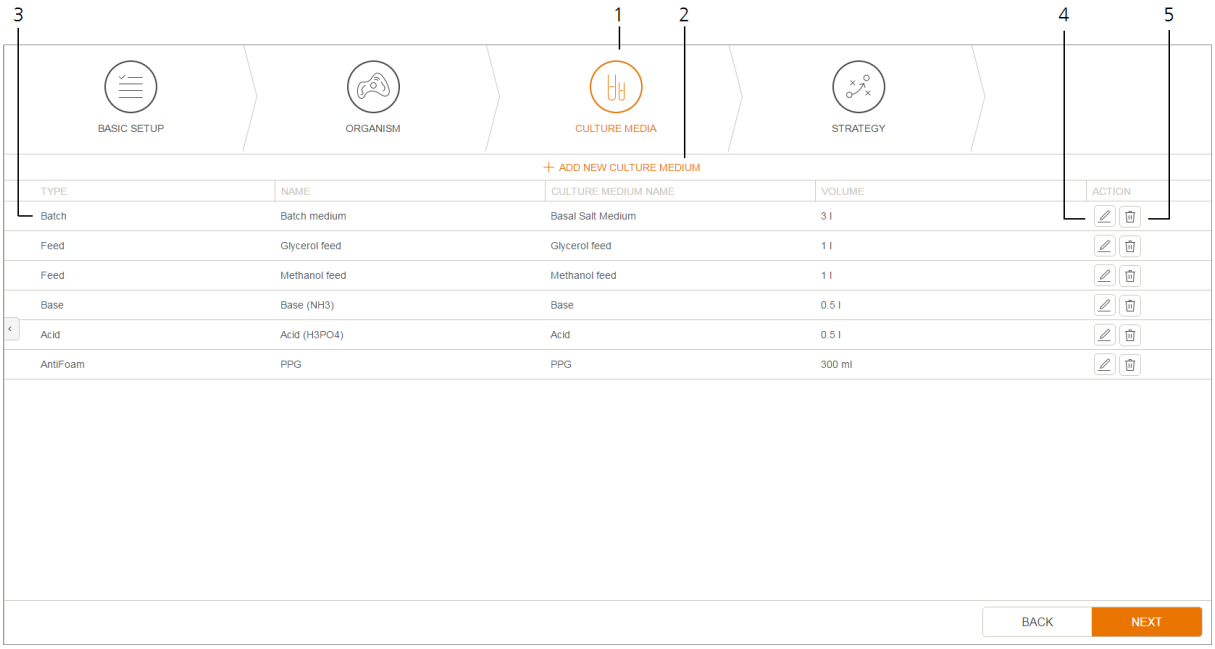
– The basic setup of the batch has to be specified (see "Basic setup" on page 27)
– The allocation of a specific device (see "Device Selection" on page 35)
– Optional: Configuration of the process parameters (see "Parameter configuration" on page 29)
– Optional: Configuration of the organism information (see "Organism information" on page 36)

In order to access the culture media information proceed as follows:

> Click the [SINGLE BATCH] button on the left-hand side of the PLAN & RUN menu.

> Click on the CULTURE MEDIA icon in the work flow illustration or on the [NEXT] button at the bottom of the screen.

> The CULTURE MEDIA screen appears.

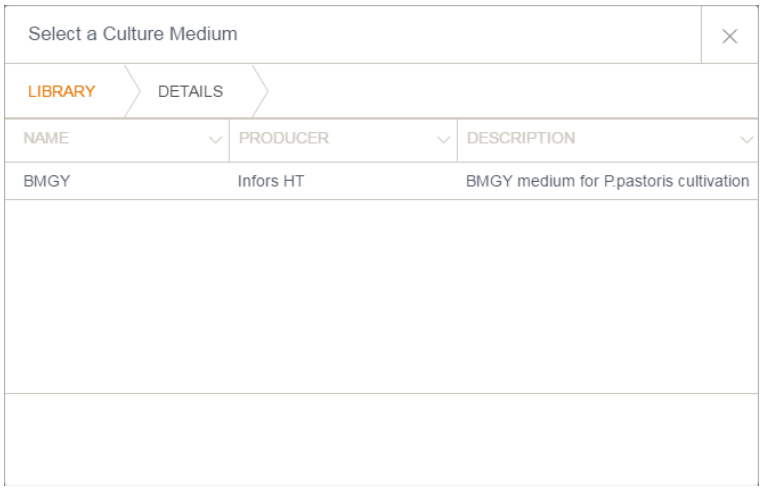


Number	Meaning
1	Current work flow position (CULTURE MEDIA)
2	Selection of stored culture media
3	Culture media entries
4	Edit specific culture media entry
5	Delete specific culture media entry

4.1.3.1 Culture media selection

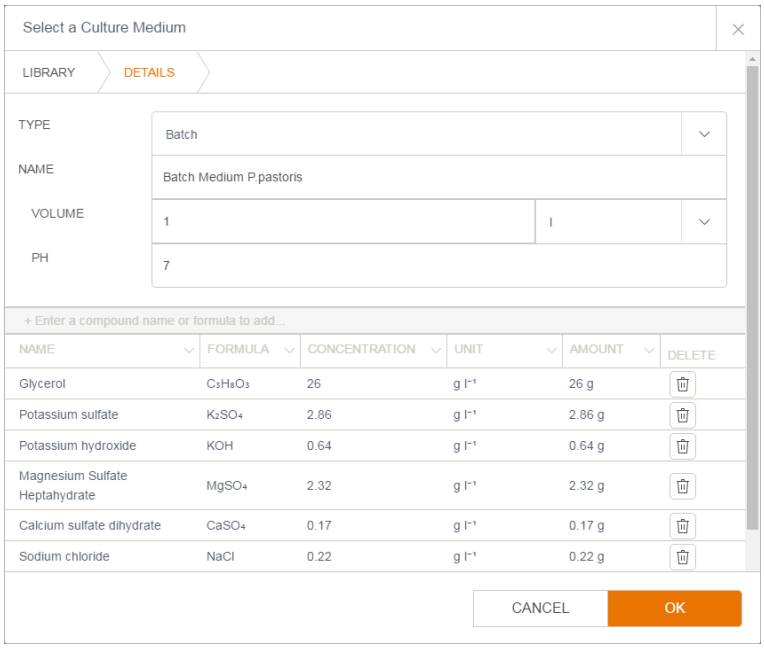
> Click the [ADD CULTURE MEDIA] button at the top of the culture media screen.

> The SELECT A CULTURE MEDIA pop-up screen appears.

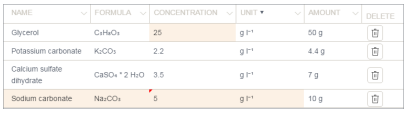


> Select the appropriate culture media for your batch process.

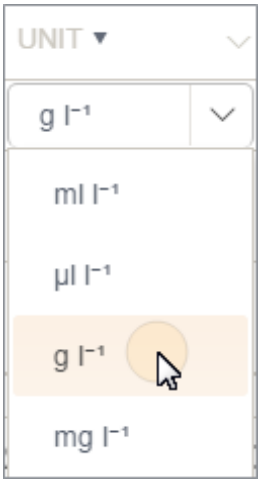
> As soon as you click on a culture medium the list of the compounds appears.



> Click the [OK] button in order to save your selection.



NAME	FORMULA	CONCENTRATION	UNIT	AMOUNT	DELETE
Glycerol	$C_3H_8O_3$	25	g l⁻¹	50 g	
Potassium carbonate	K_2CO_3	2.2	g l⁻¹	4.4 g	
Calcium sulfate dihydrate	$CaSO_4 * 2 H_2O$	3.5	g l⁻¹	7 g	
Sodium carbonate	Na_2CO_3	5	g l⁻¹	10 g	



> Change the unit of the specific culture media compound.

> The changed value will turn immediately into orange as an indication of change.

NAME	FORMULA	CONCENTRATION	UNIT	AMOUNT	DELETE
Glycerol	$C_3H_8O_3$	25	g l⁻¹	50 g	
Potassium carbonate	K_2CO_3	2.2	g l⁻¹	4.4 g	
Calcium sulfate dihydrate	$CaSO_4 * 2 H_2O$	3.5	g l⁻¹	7 g	
Sodium carbonate	Na_2CO_3	5	g l⁻¹	10 g	

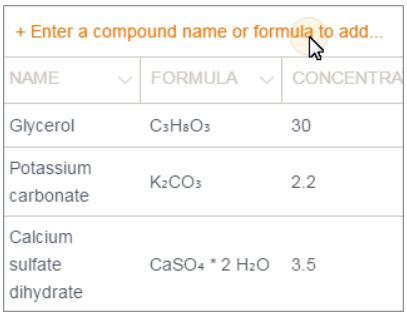
By clicking on the icon you can easily delete a culture medium compound from the current culture media compound list.

4.1.3.2 Edit culture media compounds

Simple changes of the culture media compounds can be conducted by clicking into the corresponding fields. Each amount and unit of a specific culture media compound can be changed directly in the displayed list.

> Click directly on the specific culture media compound which you want to change and enter the new value.

Add a culture media compound:



> Click into the enter a compound field at the top of the culture media compound list.

> Enter the new culture media compound.

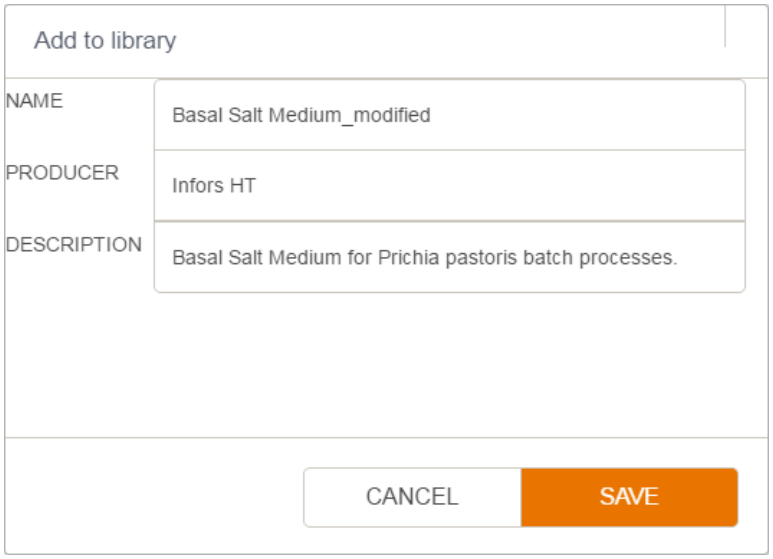
As you start to type any culture media compound a list of proposed culture media compounds (synchronised from the culture media compounds library) appears and allows you to select you desired culture media compound.

Save changes of the selected culture media:

Changing any values or compounds of the selected culture media results into two options for saving the altered culture medium:

– Save the altered culture medium to the culture media library
– Save the altered culture medium to the current batch process

> Click the [SAVE TO LIBRARY] button to save the altered culture media to the culture media library.
> The save to library work flow steps appears.



> Enter a new name for the altered culture media.
> Click the [SAVE] button in order to save the altered culture medium in the culture media library and continue in the PLAN & RUN work flow.

Click the [OK] button if you simply want to save the altered culture medium to your batch process and continue in the PLAN & RUN work flow.

If you do not save the altered culture media to your culture media library the culture media will not be available for any further procedures.

4.1.4 Batch strategy

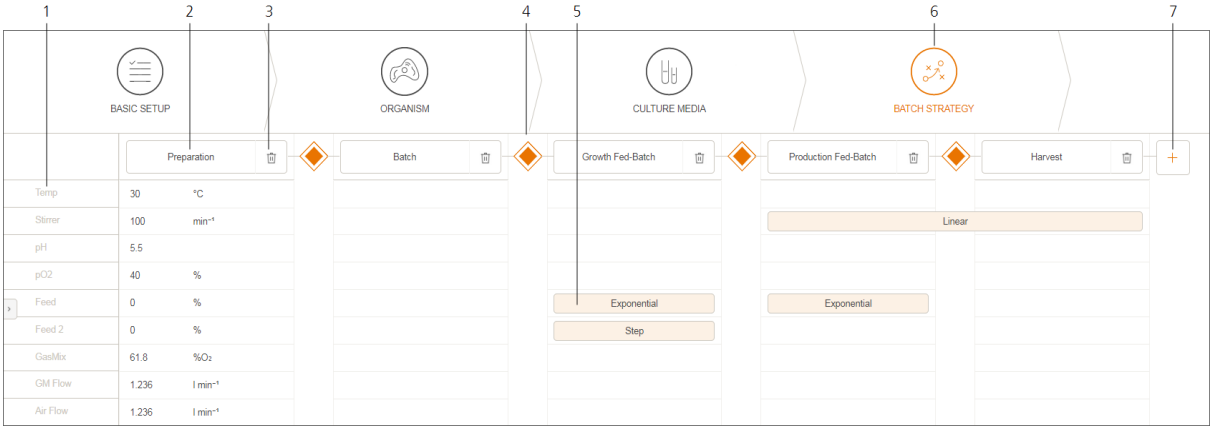
The BATCH STRATEGY section is the source of every advanced batch process strategy configuration. Multiple phases with specific transitions and different parameter set points are easy to configure. In addition, customised functions or scripts for any complex strategy can be applied as required.

Configuring the batch strategy, the following conditions have to be met:

– The setup of the batch has to be specified (see "Basic setup" on page 27)
– The allocation of a specific device (see "Device Selection" on page 35)
– Optional: Configuration of the process parameters (see "Parameter configuration" on page 29)
– Optional: Configuration of the organism information (see "Organism information" on page 36)
– Optional: Configuration of the culture media information (see "Culture media information" on page 40)

In order to access the batch strategy proceed as follows:

> Click the [SINGLE BATCH] button on the left-hand side of the PLAN & RUN menu.
> Click on the BATCH STRATEGY icon in the work flow illustration or on the [NEXT] button at the bottom of the screen.
> The strategy screen appears.



Number	Meaning
1	List of all configured process parameters
2	Name of the phase
3	Icon for deleting a phase
4	Icon for transition rule between several phases
5	Visualisation of a configured function
6	Current work flow position
7	Icon for adding a phase

For a simple fed-batch cultivation the preprogrammed function "exponential" can be used to get a exponential feeding profile. The exponential feed profile is based on $F_t = F_0 \cdot e^{\mu \cdot t}$ where F_0 and $^{\mu \cdot t}$ have to be defined.

4.1.4.1 Phase configuration

Each batch process can consists of several phases. Defining the number of phases at the very beginning helps to build the frame work of the strategy. As soon as all the phases are configured it is easy to configure each parameter for every phase. In each phase several process parameters can be controlled by three types:

– Fixed values (e.g. Temperature 30 °C)
– Functions (e.g. exponential feed rate)
– Enabled (on) / Disabled (off) (e.g. activation of soft-sensor)

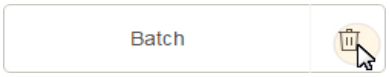
> By default every batch process starts with the phases "Preparation" and "Batch". The transition for this two phases is triggered by inoculating the batch (see "Inoculate batch process" on page 102). However, the two preconfigured phases can be renamed or deleted.

Add a phase:

> Click the [PLUS] button on the right-hand side of the last phase container.
> A new phase is attached to your strategy and connected by a unconfigured transition.

> Click into the name of the phase and enter a new name.
> The new phase is ready for the configuration of all process parameters.

Delete a phase:



> Click the icon on the right-hand side of the phase container.
> Confirm the deletion of the selected phase.
> The entire phase is deleted immediately.

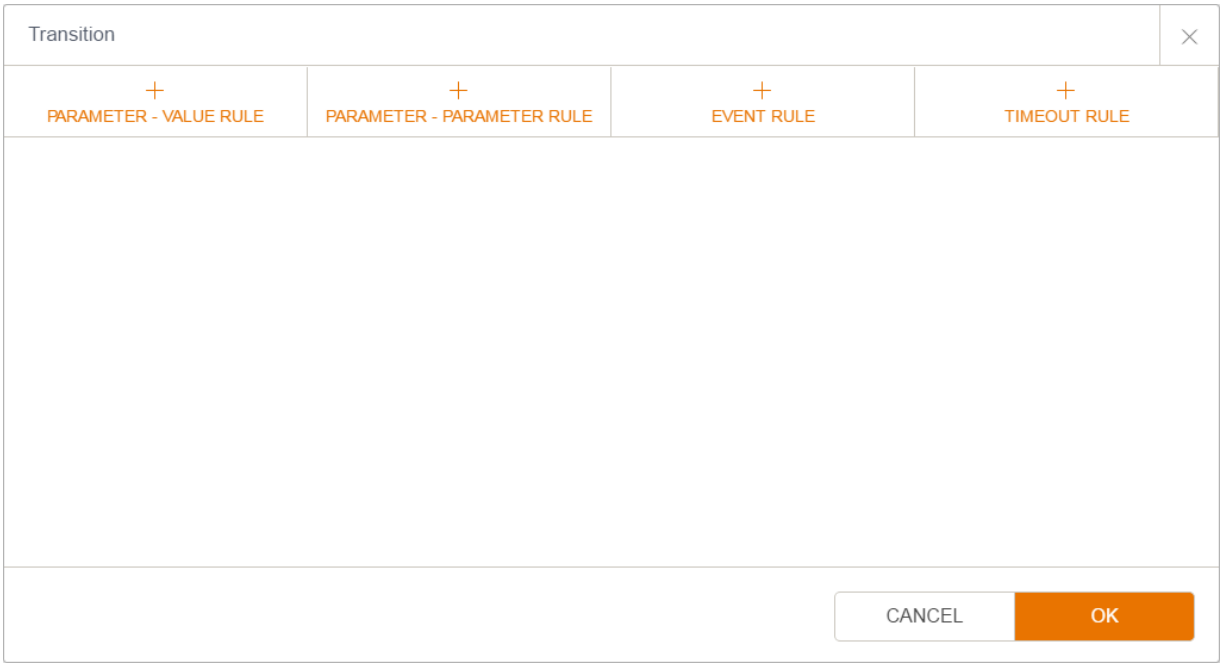
4.1.4.2 Transition rules

Transition rules define in which circumstances the strategy continues and the next phase gets active. Each transition rule operates as a trigger and starts the strategy for every phase.

The following five different options are available:

– Parameter - value rule (see "Parameter - value rule:" on the next page)
– Parameter - parameter rule (see "Parameter - Parameter rule:" on page 49)
– Event rule (see "Event rule:" on page 50)
– Time rule (see "Time-out rule:" on page 50)
– Combining of several transition rules (see "Combining transition rules:" on page 52)

> Add a new phase to the strategy.
> Click the orange transition icon between two phases.
> The TRANSITION RULES screen appears.

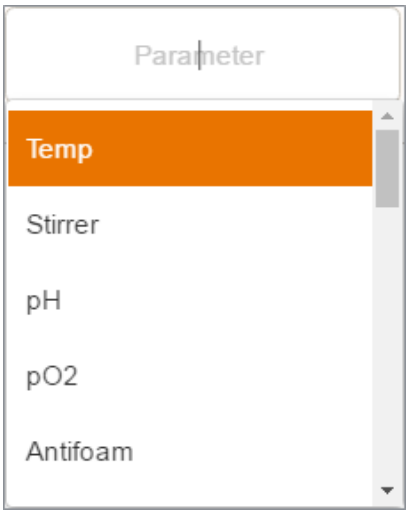


Parameter - value rule:

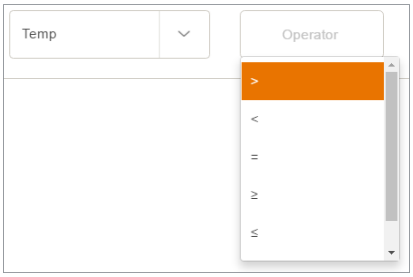
The parameter - value rule is the standard transition rule where any defined parameter reaches a certain value and triggers the transition rule.

> Click the [PARAMETER - VALUE RULE] button at the top of the TRANSITION RULE screen.

> A new rule is added to the list with a drop down list of all parameters, a boolean expression and a value field.



> Select any specific parameter from the drop down list.



> Select any appropriate boolean expression from the drop down list.

> Enter any value for the transition rule in the corresponding field.

> Click the [OK] button in order to save your settings.

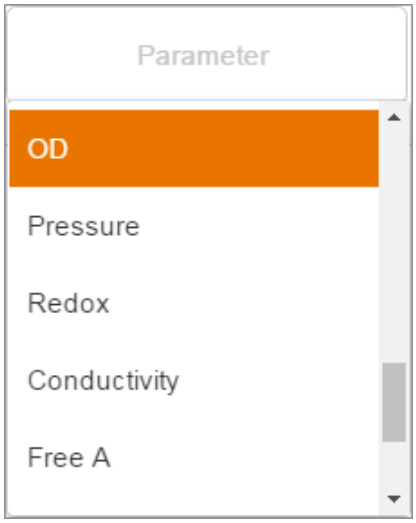
If you want to delete a transition rule simply click on the 🗑 icon on the right-hand side of the transition rule.

Parameter - Parameter rule:

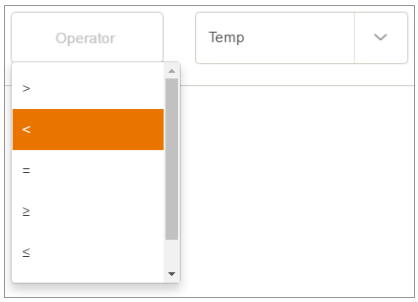
The parameter - parameter rule can be used to compare calculated and measured parameters (e.g. off-line and on-line values) or any other similar parameters.

> Click the [PARAMETER - PARAMETER RULE] button at the top of the TRANSITION RULE screen.

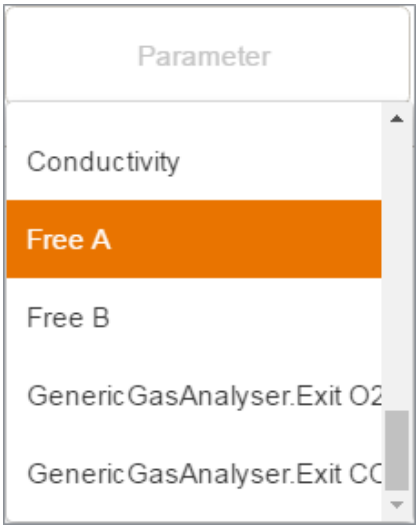
> A new rule is added to the list with a drop down list of all parameters, a boolean expression and a value field.



> Select any specific parameter from the drop down list.



> Select any appropriate boolean expression from the drop down list.



> Select any corresponding parameter from the drop down list.

> Click the [OK] button to save your settings.

Event rule:

The event rule is based on any event during the batch process and can be used to trigger the transition rule by this specific event (e.g. inoculation).

> Click the [EVENT RULE] button at the top of the TRANSITION RULE screen.

> A new rule is added to the list with a drop down list of all parameters, a boolean expression and a value field.

> Select any process event from the drop down list.

> Click the [OK] button in order to save your settings.

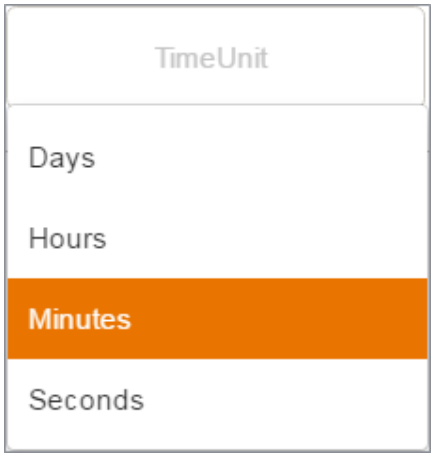
Time-out rule:

The time-out rule can be used to define the duration of a specific phase.

> Click the [TIMEOUT RULE] button at the top of the TRANSITION RULE screen.

> A new rule is added to the list with a drop down list of all parameters, a boolean expression and a value field.

> Enter any value for the duration of the phase in the corresponding field.



> Select any appropriate time unit from the drop down list.
> Click the [OK] button in order to save your settings.

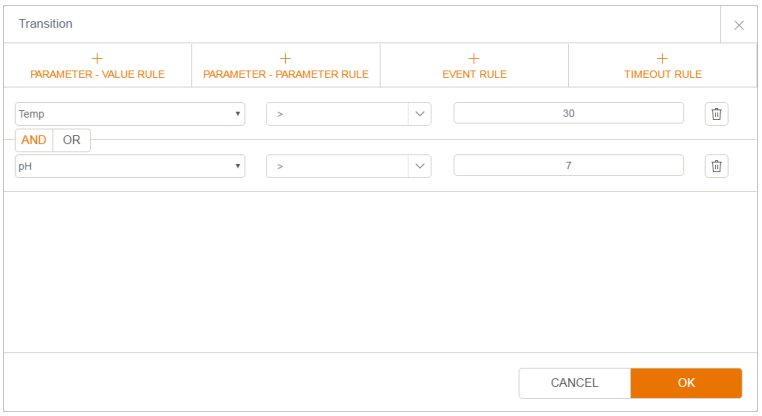
Combining transition rules:

All of the four transition rules can be combined. A specific transition rule also can be used multiple times (e.g. 3 times parameter - value rule).

> Click on any of the four transition rule buttons.

> An additional transition rule appears in the transition rule screen.

> Select one of the boolean connection buttons.

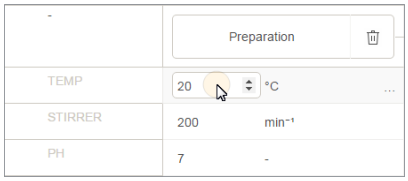


> Click the [OK] button in order to save your settings.

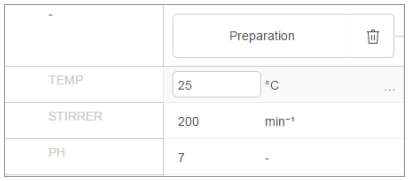
Several transition rules can only be combined by one of the boolean connection buttons (e.g. 3 different transitions rules are connected with "AND").

4.1.4.3 Parameter set points

Defining different kind of phases allows you to change the set point of a parameter at a specific time point during the process strategy.



> Click in any parameter entry field in order to change the specific set point.



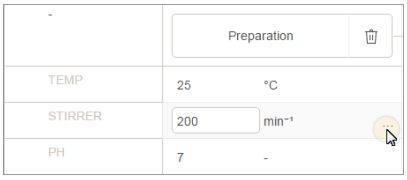
> Enter a new value for the specific parameter set point.

The set point of a parameter continues as long as no other value/function is configured for this specific parameter (i.e. also for several process phases). This rule is also true for any configured function which reaches a certain maximum/minimum at a specific time point. As long as no other specific set point is configured in the strategy the parameter value will not change.

4.1.4.4 Predefined functions

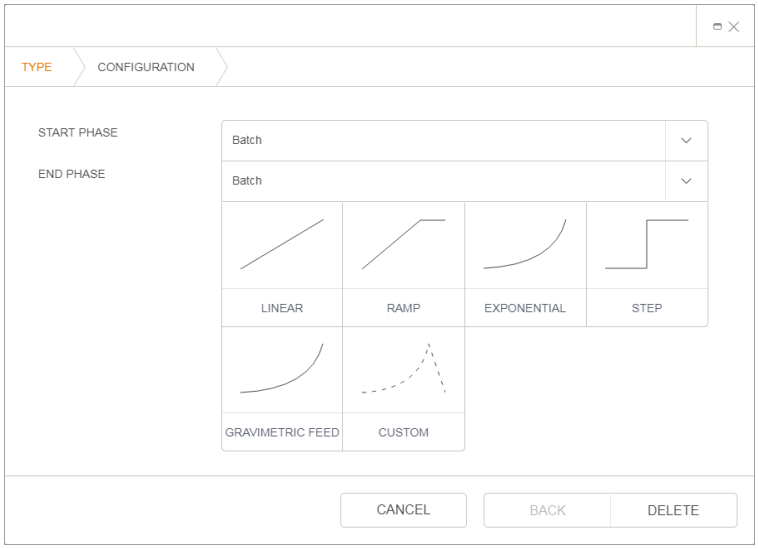
For each parameter any function can be configured within a specific process phase or for several process phases. eve provides a set of predefined functions which can be applied to any parameter. The following predefined functions are available:

– Linear (see "Linear function:" below)
– Ramp (see "Ramp function:" on page 56)
– Exponential (see "Exponential function:" on page 57)
– Step (see "Step function:" on page 58)
– Gravimetric Feed (see "Gravimetric Feed:" on page 60)

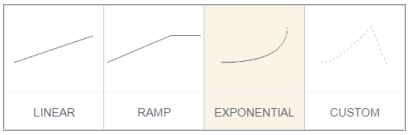


> Click the ··· icon on the right-hand side of the parameter entry field in order to configure any function for a specific parameter.

> The CREATE FUNCTION screen appears.



> Select for how many phases the specific function should be applied (e.g. preparation- and batch-phase or a single phase).

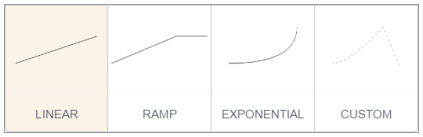


> Select any of the provided functions and click on the corresponding icon.

> The FUNCTION CONFIGURATION screen appears where - depending on the function - several constants can be defined

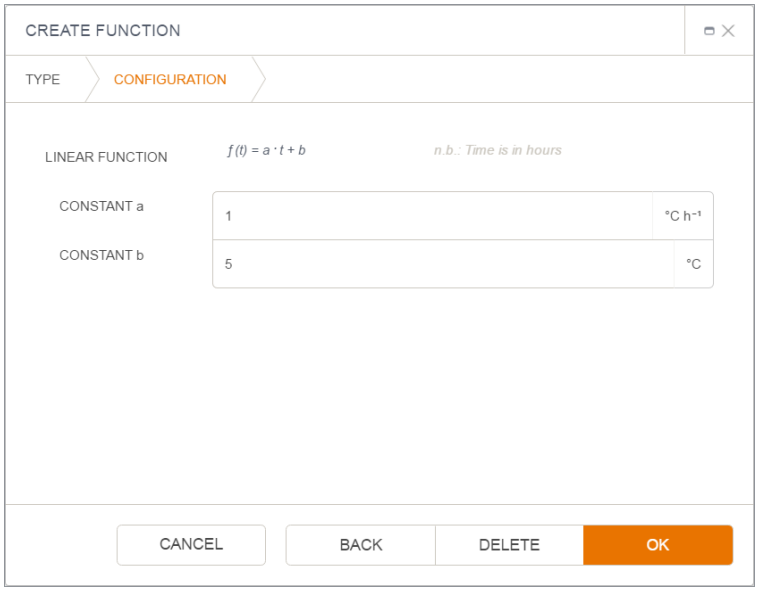
Linear function:

The preconfigured linear function consists of the two constants namely, the slope and the offset (intercept). For each constant any real number can be configured.



> Click the linear function icon in order to configure the linear function.

> The linear function configuration screen appears.



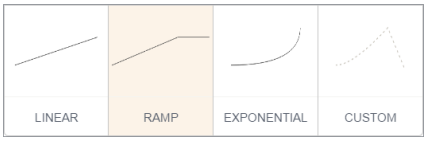
> Enter any real numbers for the constants slope (a) and offset (b).

> Click the [OK] button in order to save your settings.

If the configured function does not reach the planned end value (maximum/minimum) within the configured phase (see "Transition rules" on page 47) the set point of this specific parameter will no longer follow the configured function and the last value will be applied.

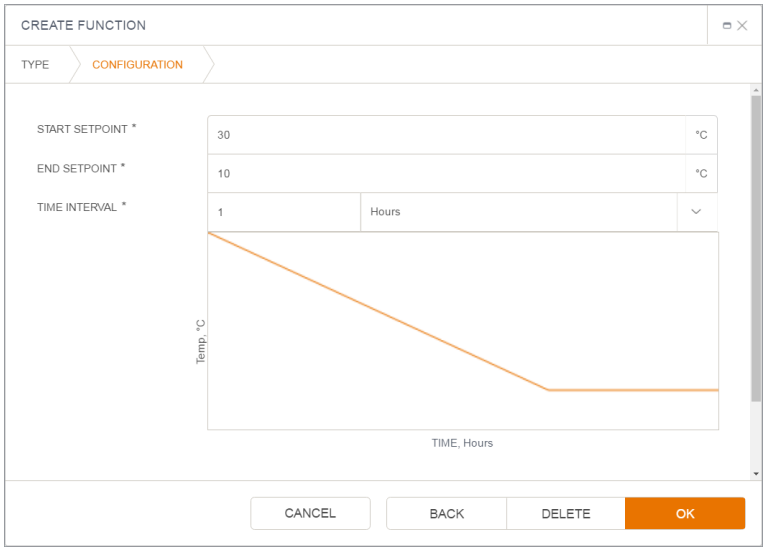
Ramp function:

The preconfigured ramp function is based on the linear function but consists of the start and the end point and any specified time interval. This function is especially applicable when no previous information (i.e. calculation and models) of the parameter is available.



> Click the ramp function icon in order to configure the ramp function.

> The ramp function configuration screen appears.



> Enter any real number for the start and end set point.

> Enter any real number for the time interval and select the corresponding time unit.

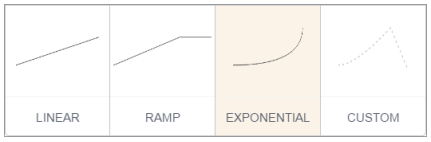
> A live visualisation of the configured function is displayed.

> Click the [OK] button in order to save your settings

The time interval defines the slope of the ramp function and by that how fast the end set point is reached. If the configured function does not reach the planned end value (maximum/minimum) within the configured phase (see "Transition rules" on page 47) the set point of this specific parameter will no longer follow the configured function and the last value will be applied.

Exponential function:

The preconfigured exponential function consists of two constants namely, the factor and the exponent. For each constant, any real number can be configured.



> Click the exponential function icon in order to configure the exponential function.

> The exponential function configuration screen appears.

> Enter any real number for factor a (F_0) and the exponent b (μ).

> A live visualisation of the configured function is displayed.

> Click the [OK] button in order to save your settings.

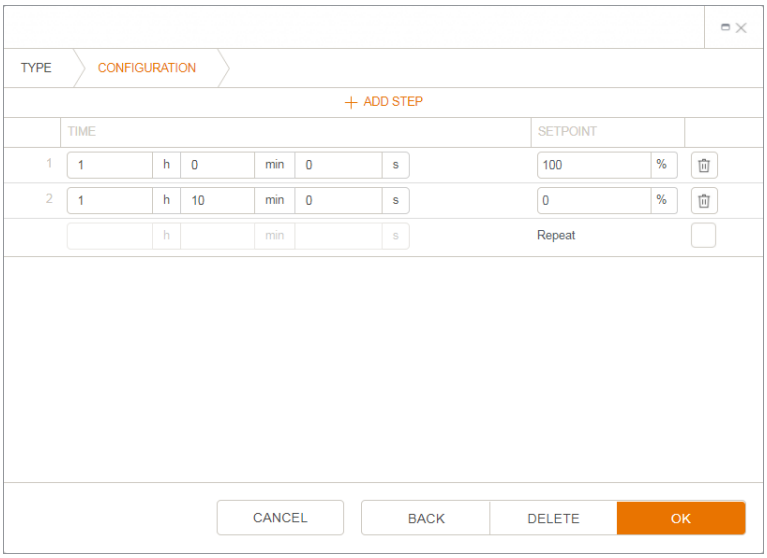
If the configured function does not reach the planned end value (maximum/minimum) within the configured phase (see "Transition rules" on page 47) the set point of this specific parameter will no longer follow the configured function and the last value will be applied.

Step function:

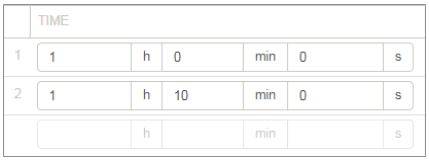
The step function is a table that allows to configure a certain parameter value as setpoint for any given timepoint (absolute).

> Click the step function icon in order to configure the step function.

> The step function configuration screen appears.

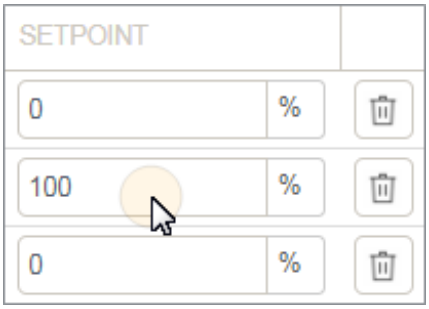


> Click the [ADD STEP] button in order to add any additional step to your table.



> Within a step configure the specific (absolute) timepoint (hh:mm:ss) when the setpoint change should be applied.

> The table is always ordered automatically as soon as you enter a new value.



> Click into the setpoint entry field in order to confgure any setpoint of the parameter for this specific step.

> If necessary, you can click the repeat checkbox in order to repeat the entire step function (all steps).

The repeat function within the step function is especially useful when a repetitive profile is applied.

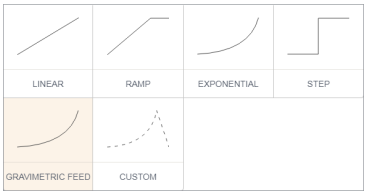
If the configured function does not reach the planned end value (maximum/minimum) within the configured phase (see "Transition rules" on page 47) the set point of this specific parameter will no longer follow the configured function and the last value will be applied.

Gravimetric Feed:

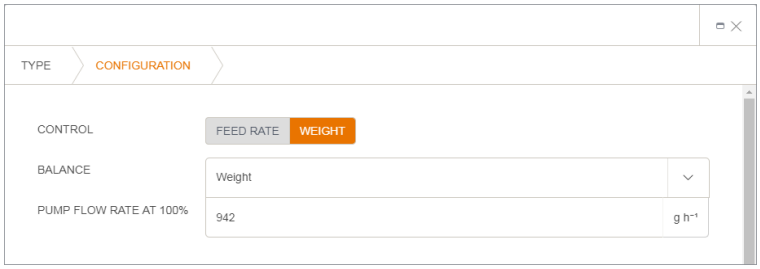
Gravimetric Feed is a function designed for feed pumps (although available for all parameter types). The evolution of the setpoint will follow a feed rate profile in g h^{-1} based on the flow rate of the pump and controlled by the weight of a specific balance.

Two types of the gravimetric feed are available, namely:

– Feed rate based: If this mode is selected, the feed is optimised for feed rate. The overall (absolute) weight can drift due to interferences on the balance.
– Weight based: If this mode is selected, the feed is optimised for feed integral. The feed rate will fluctuate more.



> Click the step function icon in order to configure the step function.
> The step function configuration screen appears.



> Select the type of gravimetric feed control by clicking on the [FEED RATE] or [WEIGHT] button.
> Select the connected balance for your gravimetric feed.

In the drop down selection all parameters of type "Weight" and "Unknown" are displayed and selectable.

> Enter the maximal flow rate of the used pump at 100% (Infors HT equipment provides a built in calibration function for that) in g h^{-1}.
> Enter the values for factor a (F_0) and the exponent b (μ).

> Click the [OK] button in order to save your settings.

4.2 Multiple Batch

The MULTIPLE BATCH is a function which allows you to plan and run batch processes in parallel. The entire work flow is almost the same as for a single batch process (four work flow steps). However, at the beginning of a multiple batch process a reference batch has to be configured which defines a rough frame work for all the batch processes.

4.2.1 Reference batch configuration

The reference batch is the source configuration of every multiple batch experiment and will be applied automatically to all batch processes within the specific experiment.

> Click the [MULTIPLE BATCH] button on the left-hand side of the PLAN & RUN menu.

> A generic setup screen for multiple batch experiment appears.

> Enter any name for the multiple batch experiment.

The name of the multiple batch experiment will be used both, for the experiment and the single batch processes within the experiment. Each batch process will have an ascending number next to the batch name.

> Enter any description about the multiple batch experiment.

> Follow the instructions of single batch for the project allocation (see "Project allocation" on page 28).

> Enter the amount of batch processes within the multiple batch experiment.

> Click the [CONFIGURE REFERENCE BATCH] button at the bottom right-hand side of the screen

> The basic setup screen with the entered experiment name and description appears.

> Follow the instructions of single batch for the device selection (see "Device Selection" on page 35)

> Follow the instruction of single batch for the parameter configuration (see "Parameter configuration" on page 29).

> Follow the instruction of single batch for the organism information (see "Organism information" on page 36)

> Follow the instruction of single batch for the culture media selection (see "Culture media selection" on page 41)

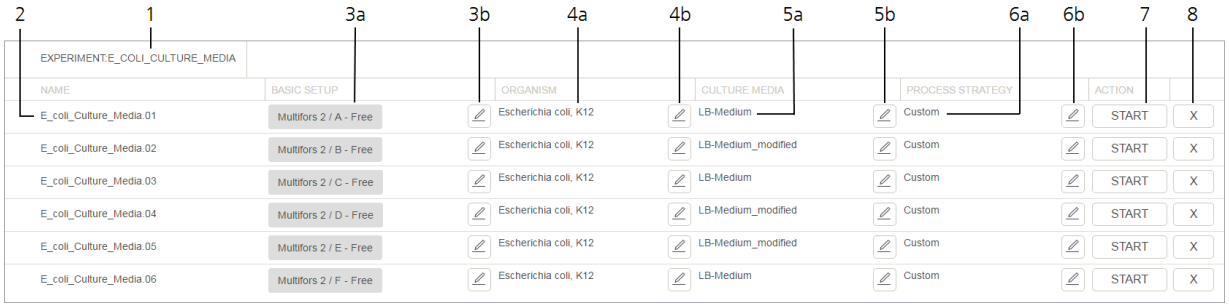
> Follow the instruction of single batch for the strategy configuration (see "Batch strategy" on page 44).

> Click the [GENERATE EXPERIMENT] button at the bottom right-hand side of the strategy screen.

> The multiple batch overview table of all the planned batch processes appears.

4.2.2 Multiple batch overview table

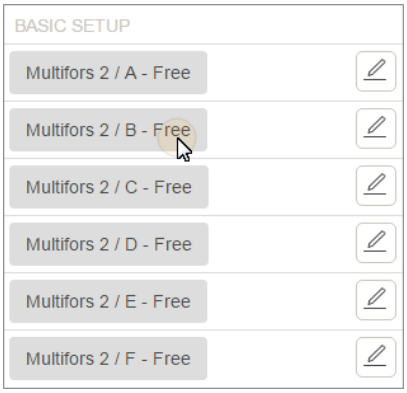
The reference batch is applied to the number of defined batch processes within the multiple batch experiment. As soon as the experiment is generated the following multiple batch overview table appears:



Number	Function
1	Name of the multiple batch experiment
2	Name of the single batch processes where each batch process gets a individual number
3a, 3b	Button for selecting equipment, change basic setup
4a, 4b	Organism description, change organism information
5a, 5b	Culture media description, change culture media information
6a, 6b	Strategy description, change strategy
7	Start button for single batch process
8	Delete button in order to delete a single batch process from the overview table

4.2.2.1 Change device

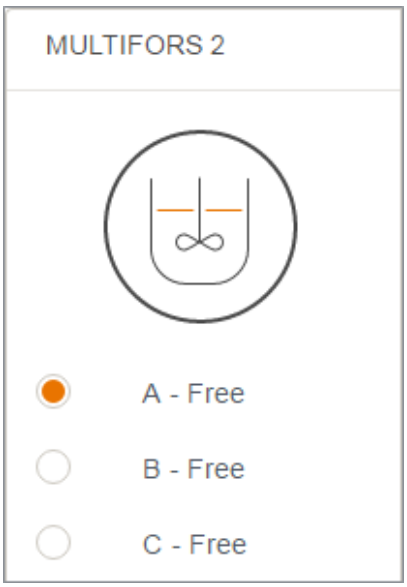
In order to change the device for a single batch process proceed as follows:



> Click on the device name button in the basic setup column of the multiple batch overview table.

> The CHANGE DEVICE pop up screen appears.

> The vessels of your devices are listed (in use/free) and can be selected.

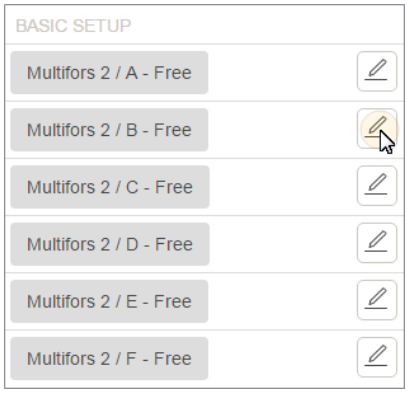


> Click on any free vessel of your devices.

> Click the [OK] button in order to save your settings and get back to the multiple batch overview table.

4.2.2.2 Change basic setup

In order to change the basic setup for a single batch process proceed as follows:



> Click the icon in the basic setup column of the multiple batch overview table.

> The BASIC SETUP screen of this specific batch process appears.

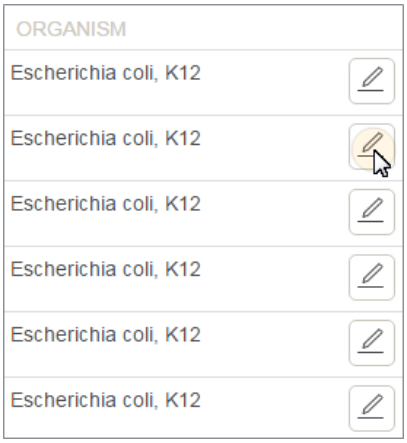
> Follow the instruction of single batch for edit the basic setup (see "Basic setup" on page 27)

> Click the [BACK TO OVERVIEW] button to get back to the multiple batch overview table.

If you want to change the name of a single batch process you can click directly into the name column of the multiple batch overview table and change it.

4.2.2.3 Change organism information

In order to change the organism information for a single batch process proceed as follows:

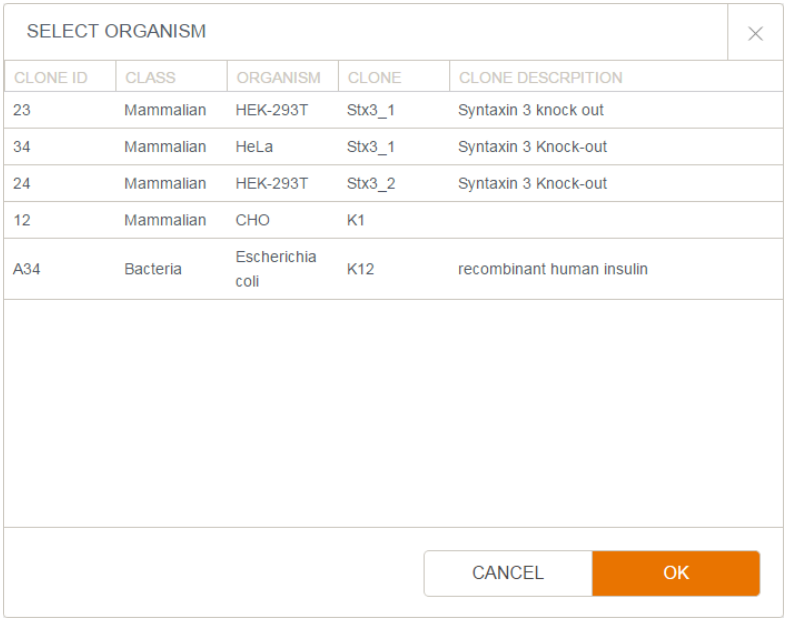


> Click the ✎ icon in the organism column of the multiple batch overview table.

> The ORGANISM screen of this specific batch process appears.

> Change the organism by clicking the ··· icon next to the change organism option.

> The SELECT ORGANISM pop up screen appears.



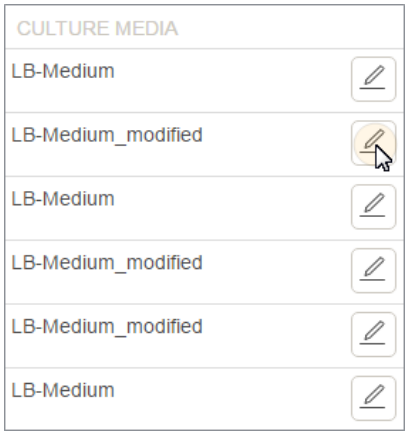
> Click on the appropriate organism for your single batch process.

> Click the [OK] button in order to save your settings.

> Click the [BACK TO OVERVIEW] button to get back to the multiple batch overview table.

4.2.2.4 Change culture media information

In order to change the culture media information for a single batch process proceed as follows:



> Click the ✎ icon in the culture media column of the multiple batch overview table.

> The CULTURE MEDIA screen of this specific batch process appears.

> Click the [ADD CULTURE MEDIA] button on the top of the CULTURE MEDIA screen.

If you want to delete or edit an existing culture media click the 🗑 or ✎ icon on the right-hand side of the culture media list.

> The ADD CULTURE MEDIA pop-up screen appears.

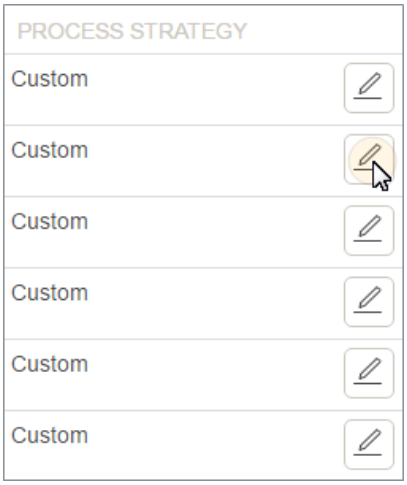
> Follow the instruction of single batch for edit the culture media (see "Edit culture media compounds" on page 42).

> Click the [OK] button in order to save your settings.

> Click the back to overview button to get back to the multiple batch overview table.

4.2.2.5 Change strategy

In order to change the strategy for single batch process proceed as follows:



> Click the ✎ icon in the strategy column of the multiple batch overview table.

> The STRATEGY screen of this specific batch process appears.

> Follow the instructions of single batch to edit the strategy (see "Batch strategy" on page 44).

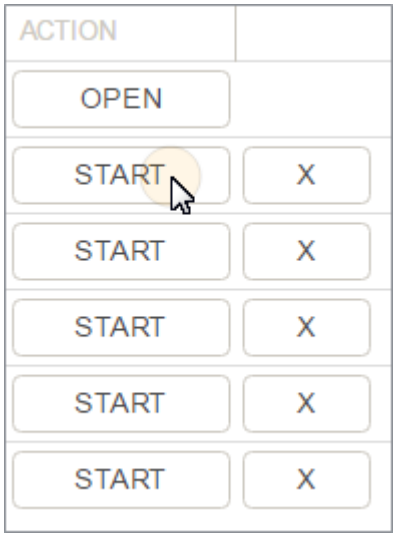
> Click the [BACK TO OVERVIEW] button to get back to the multiple batch overview table.

4.2.2.6 Start, open or delete a batch process

The multiple batch overview table allows three different actions for a single batch process:

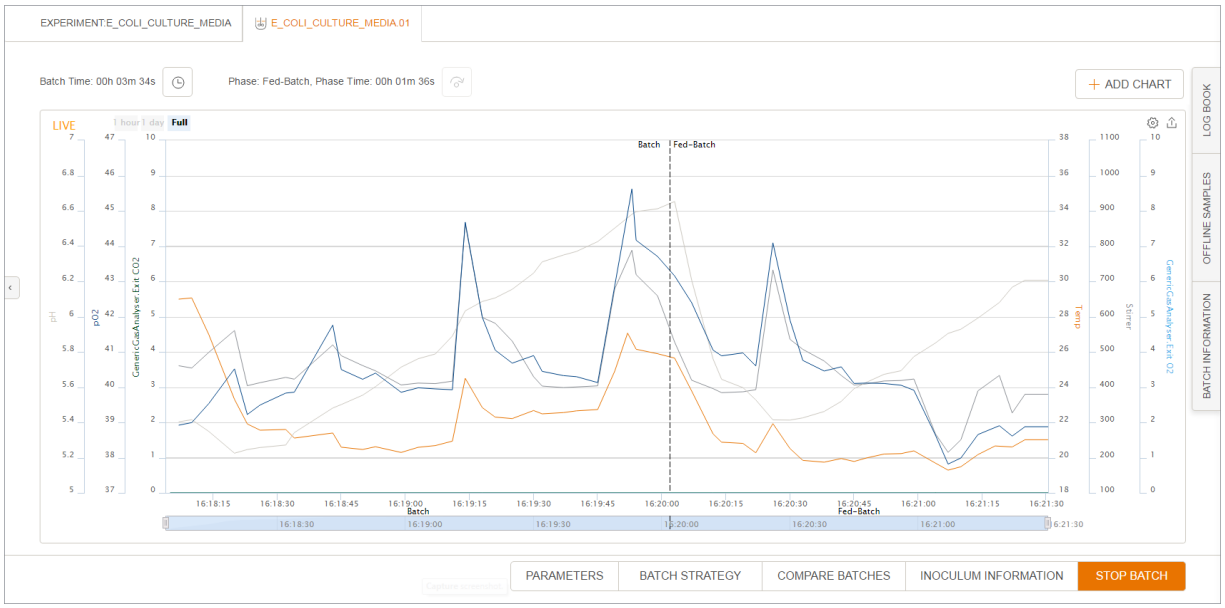
– Start batch process (see "Start single batch process:" below)
– Open batch process (see "Open single batch process:" on the next page)
– Delete batch process (see "Delete single batch process:" on page 71)

Start single batch process:

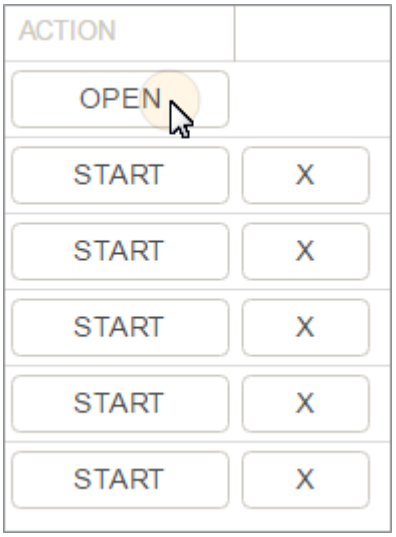


> Click the [START] button in the action column of multiple batch overview table.

> The MONITOR screen of this specific batch process appears.

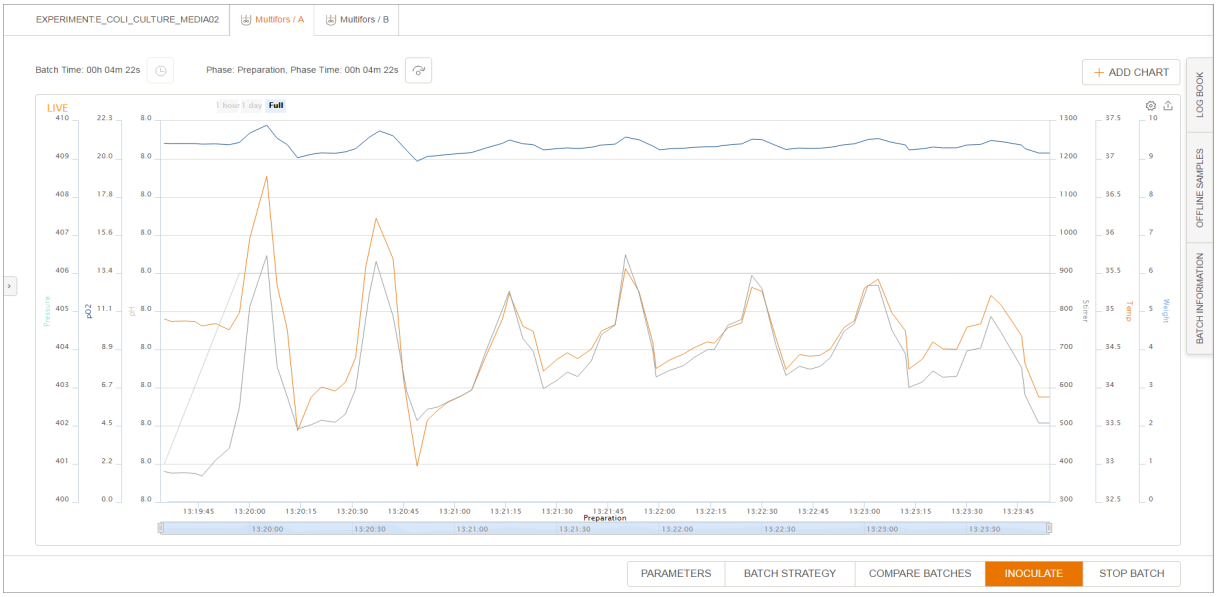


Open single batch process:

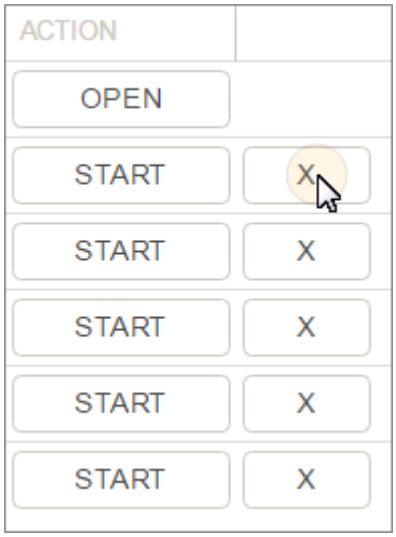


> Click the [OPEN] button in the action column of multiple batch overview table.

> The MONITOR screen of the specific batch process appears.



At the top of the chart the name of the multiple batch experiment is displayed. Click on it to get back to the multiple batch overview table. In addition, the running/started batch processes within the experiment are listed in a tab which lets you switch between several batch processes quickly.



Delete single batch process:

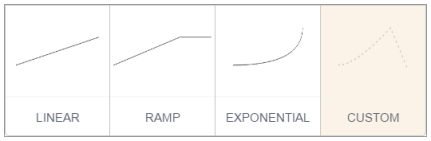
> Click the [DELETE] button on the right-hand side of the action column in the multiple batch overview table.

> Confirm that you really want to delete the specific batch process from the multiple batch overview table.

> The new list (updated) of all the batch processes within the multiple batch experiment appears.

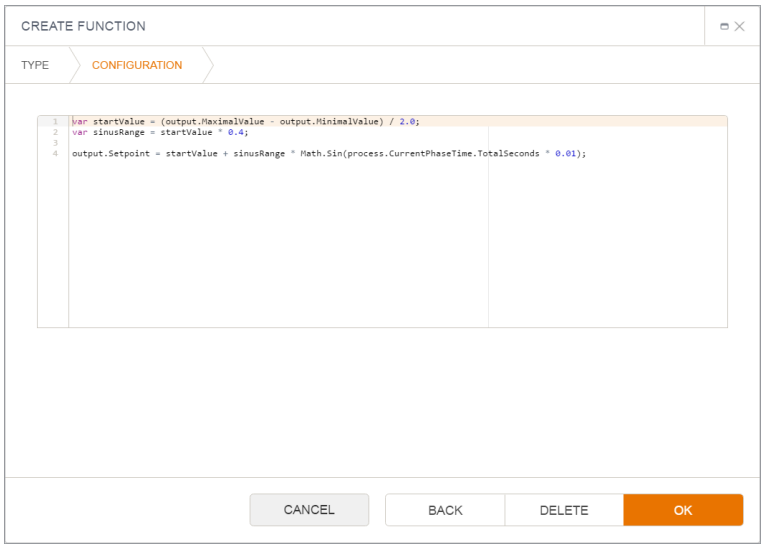
4.2.2.7 Custom functions and scripts

The custom parameter functions and scripts allows you to program any function or script for parameters or advanced customised control strategies. The scripts are based on the C# (C sharp) scripting language and are exactly the same as for soft-sensors (see "Edit a soft-sensor" on page 142).



> Click the custom function icon in order to configure the custom function.

> The custom function configuration screen appears.



> Enter any function or script in the editor window.

Sine function example:

```
//Setpoint as a Sine

var startValue = (output.MaximalValue - output.MinimalValue) / 2.0;

var sineRange = startValue * 0.7;

output.Setpoint = startValue + sine Range * Math.Sin
```

> An automatic syntax checker will ensure the correct syntax. Syntax errors will be notified and displayed with an error message in the corresponding script line.

> Click the [OK] button in order to save your settings.

If the configured function does not reach the planned end value (maximum/minimum) within the configured phase (see "Transition rules" on page 47) the set point of this specific parameter will no longer follow the configured function and the last value will be applied.

Fore a more comprehensive description about the scripting in eve®, please ask for the eve® scripting guide.

5 Monitor & Analyse

In the MONITOR & ANALYSE menu, all your running and completed batch processes can be monitored and analysed. The monitor section allows you to configure the measured values from the batch process, displaying and structuring them in a convenient way.

This chapter covers the following topics:

In order to monitor and analyse a batch process proceed as follows:

> Click the [MONITOR & ANALYSE] button on the left-hand side of the screen.

> The sub-menu of MONITOR & ANALYSE appears.

5.1 Monitor a batch process

In order to monitor and display a batch process, different ways to open the chart display are available, depending on the status of the selected batch process.

Running batch process:

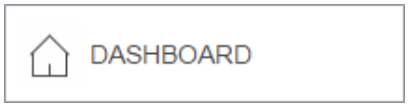
> Click the [BATCHES] button on the left-hand side of the MONITOR & ANALYSE menu.

> The BATCHES screen appears with all the running and completed batch processes.

> Click the [OPEN] button on the right-hand side of the batches list.

> The chart display of the specific batch process appears.

In addition, every running experiment and its batch processes can be accessed through the dashboard:



> Click the [DASHBOARD] button on the left-hand side of the menu.

> The DASHBOARD screen appears with the running batches and planned experiments.

> Click either directly on the experiment name (link) or on the [OPEN] button on the right-hand side of the batch process.

> The chart display of the specific batch process appears.

Completed batch processes:

> Click the [LIBRARIES] button on the left-hand side of the menu.

> Click the [BATCHES] button in the sub-menu selection.

> The BATCHES screen appears with all running and completed experiments and batch processes.

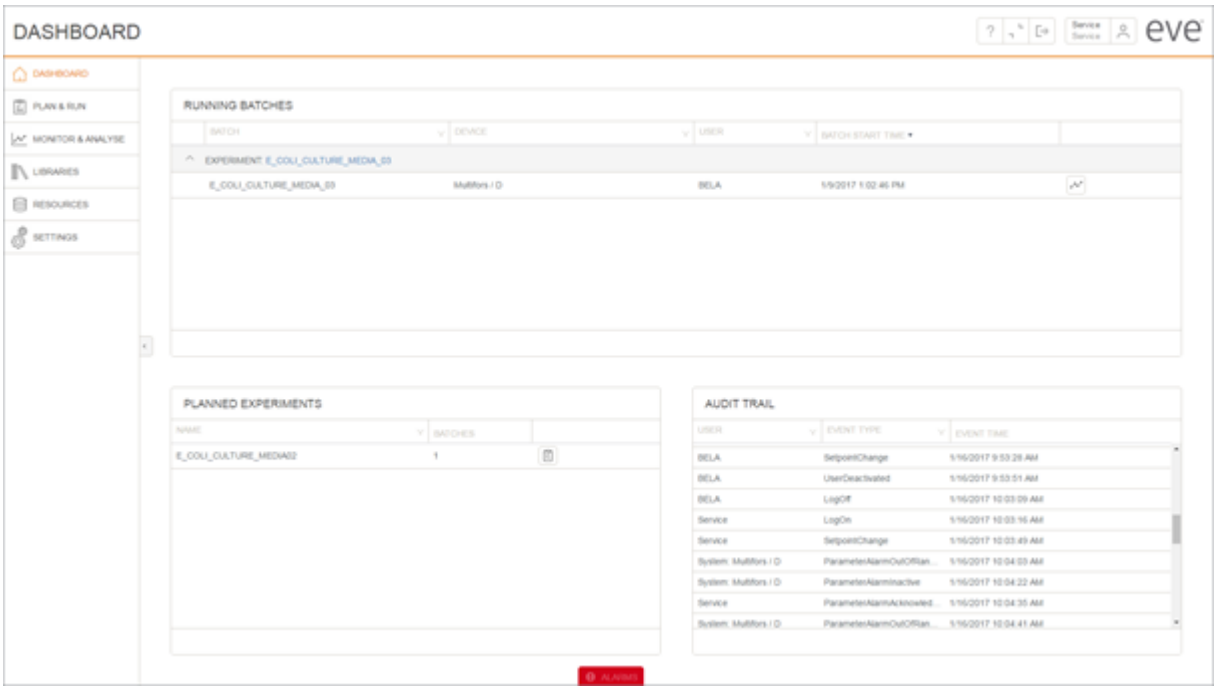
> Click the [OPEN] button on the right-hand side of the experiment list.

> The chart display of the specific batch appears.

5.1.1 Alarms

Alarms can be configured for every parameter. Each parameter alarm can have a defined range with fixed or dynamic limits (see "Parameter configuration" on page 29). When a parameter value is out of range the alarm signal turns red.

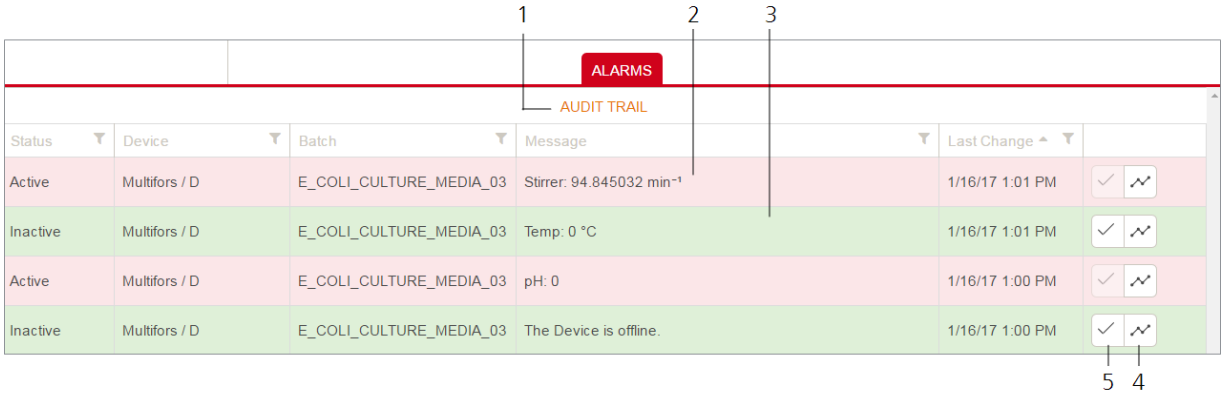
The visual notification of an alarm is a tab at the bottom (centre) of the window in each menu/sub-menu. Depending on the alarm state the alarm tab is flashing in red or appears in white.



To see and expand the list of the current alarms, proceed as follows:

> Click the [ALARMS] button at the bottom of the window (either in red or white).

> The alarm list appears.



Number	Function
1	Direct link to Audit trail
2	Active alarm (parameter is out of range)
3	Inactive alarm (parameter was out of range)
4	Open batch with chart
5	Acknowledge alarm (only applicable for inactives)

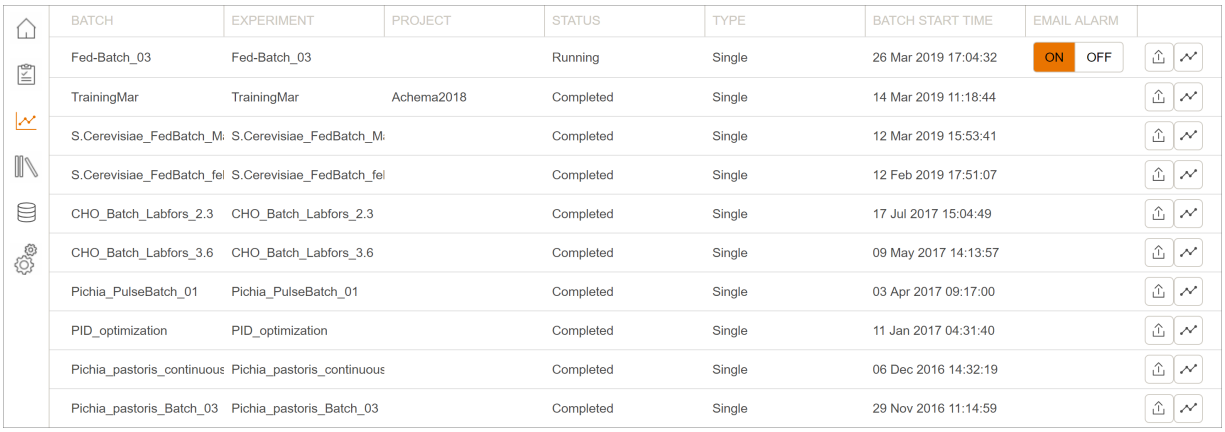
5.1.1.1 Subscribe to e-mail alarm notifications

All running batches can be monitored additionally by e-mail alarm notifications (see "Settings" on page 169). In the MONITOR & ANALYSE batch library each user can subscribe (receiving e-mail alarm notifications) to certain batches.

To subscribe to a batch, proceed as follows:

> Click on the toggle button in the E-MAIL ALARM column of a specific batch.

> You are subscribed/unsubscibed to the specific batch



E-Mail alarm notifications will be sent only once when a parameter is out of range.

5.1.1.2 Active alarm

An alarm is active when the current value of the parameter is out of range. The user cannot acknowledge the alarm but only open the batch by clicking the icon. When an alarm is active, the entry itself and the alarm notification tab is red.

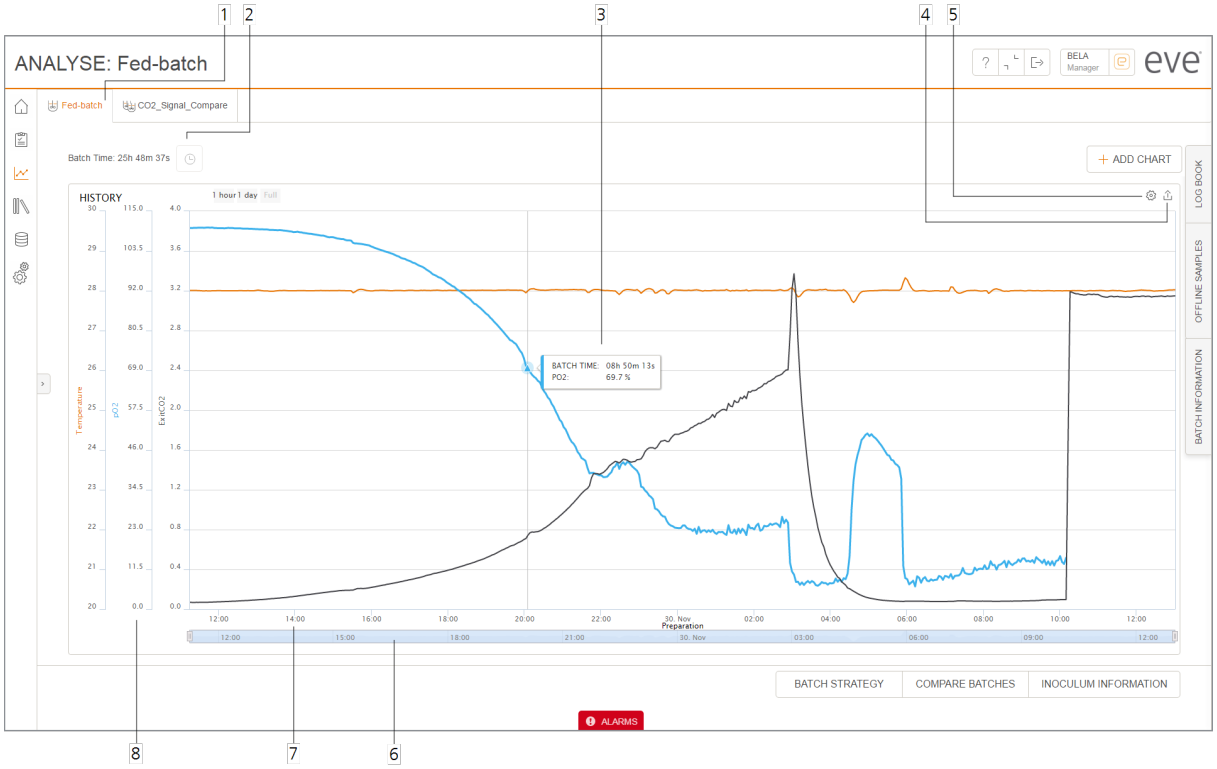
Parameters which are out of range are both, shown in the alarm tab list and the audit trail (see "Audit trail" on page 144).

5.1.1.3 Inactive alarm

An alarm is inactive when the current value of the parameter has been out of range but is within the range again. The user can acknowledge the alarm by clicking the icon. When an alarm is inactive, the entry itself is green but the notification tab is red.

Parameters which has been out of range are both, shown in the alarm tab list and the audit trail (see "Audit trail" on page 144).

5.2 Chart configuration



Number	Meaning
1	Tab of current batch / compare view
2	Edit mode to switch between batch time and inoculation time
3	Tool tip
4	Export function
5	Chart settings: axis configuration, templates, refresh rate and delete chart
6	Zoom and navigation window
7	x (time) axis
8	y axis

5.2.1 Axis configuration

By default all the parameters are displayed on the first left axis (L1). In order to change the appearance of the parameters proceed as follows:

> Click the ⚙ icon on the right-hand side of the chart display.

> A menu with setting options for the chart display appears.

> Click the CONFIGURE AXIS option.

> The CONFIGURE AXIS pop-up screen appears.

5.2.1.1 Change parameter position

In order to change the position of a specific parameter, proceed as follows:

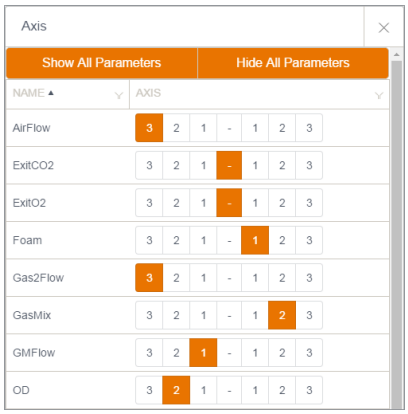
> Click on any number in order to allocate your parameter to one of the six axes (left 1-3 and right 1-3).

> The specific parameter appears on the selected axis (second left in this case) on the chart display.

> Click on the dash in order to hide a parameter.

> The specific parameter disappears from the chart display.

If two or more parameters have a similar axis scale it is also possible to combine them on one axis:

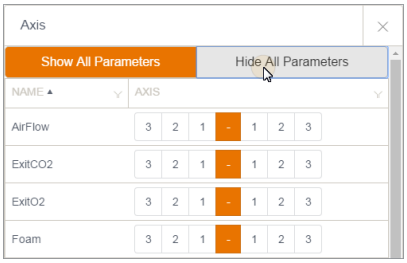


> Click on the same number in order to allocate your two parameters to the same axis.

> Both of the parameters appear on the same axis on the chart display.

As soon as you allocate a parameter to a specific axis the parameter will appear on the selected axis (live synchronisation in the background on the chart display).

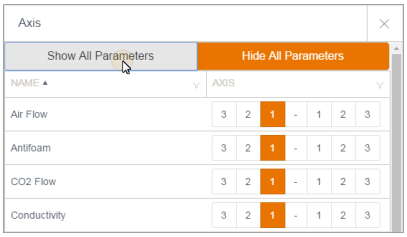
5.2.1.2 Show and hide all parameters



Hide all parameters:

> Click the [HIDE ALL PARAMETERS] button at the top of the AXIS PARAMETERS pop-up screen.

> All the parameters disappear from the chart display.



Show all parameters:

> Click the [SHOWALL PARAMETERS] button at the top of the AXIS PARAMETERS pop-up screen.

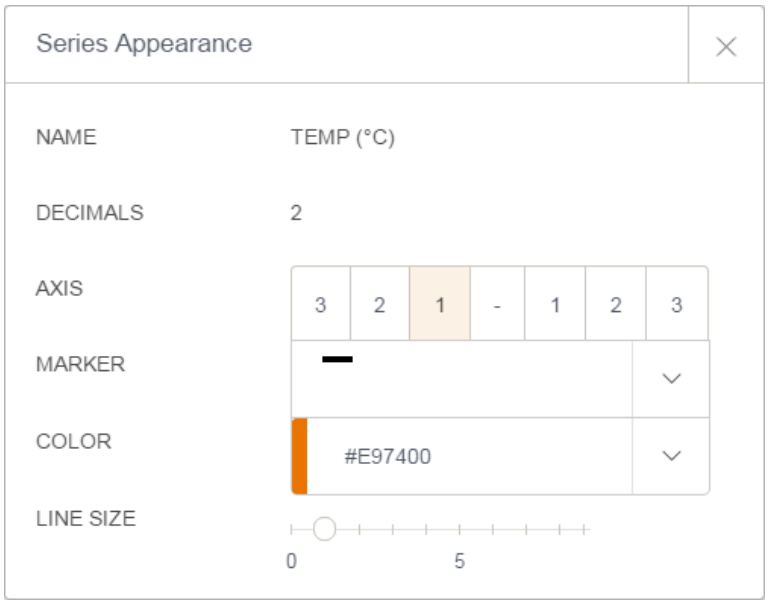
> All the parameters appear on the chart display on the first left axis.

5.2.2 Parameter appearance

The appearance of each parameter can be customised, completely. In order to configure the appearance of a specific parameter, proceed as follows:

> Click directly on the axis caption (parameter name) either on the left-hand side or right-hand side of the main chart display.

> The PARAMETER APPEARANCE pop-up screen appears.

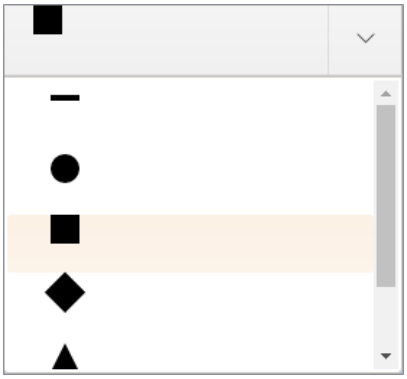


5.2.2.1 Change axis

> Click on any number in the AXIS option in order to allocate your parameter to one of the six axes (left 1-3 and right 1-3).

> The specific parameter appears on the selected axis (first left in this case).

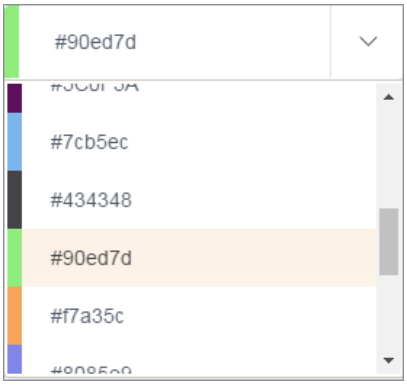
5.2.2.2 Change marker



> Click on the ⌄ icon in the MARKER option to change the marker of your parameter appearance.
> A drop down list with different markers appears.
> Select a new marker for the specific parameter.

> The specific parameter appears with the new marker.

5.2.2.3 Change color



> Click on the ⌄ icon in the COLOR option in order to change the color of your parameter appearance.
> A drop down list with different colors appears.
> Select a new color for the specific parameter.

> The specific parameter appears with the new color.

5.2.2.4 Change line size

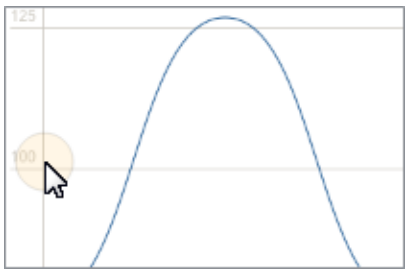
> Click on the cursor of the scroll bar in the LINE SIZE option and move it to the right (thicker) or to the left (thinner) in order to change the line size.

> The specific parameter appears with the new line size.

Any change in parameter appearance has immediate effect and is visualised live in the background on the chart display.

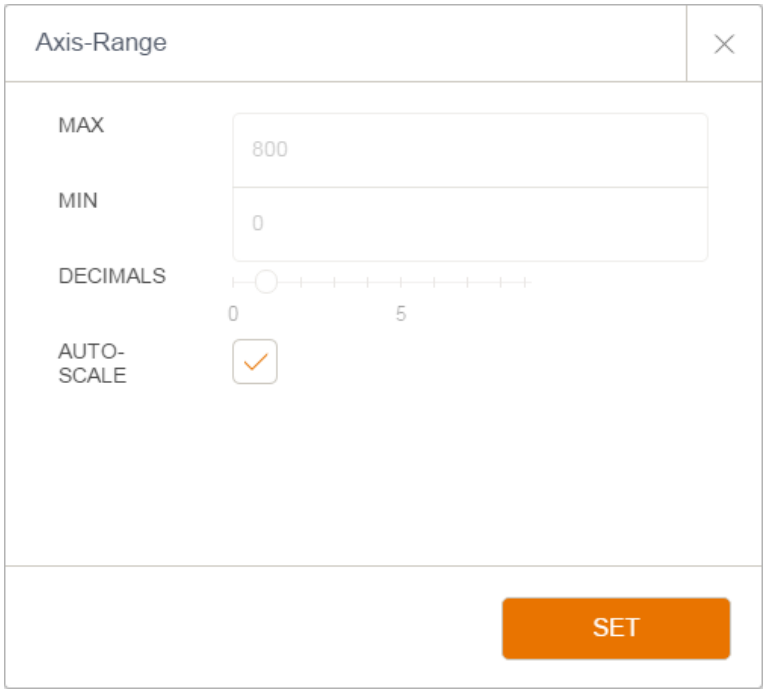
5.2.3 Axis scale

Each axis scale can be configured individually. In order to change the axis scale proceed as follows:



> Click on any number on the axis in order to change the scale of the axis.

> The AXIS SCALE pop-up screen appears.



5.2.3.1 Change min. and max. value

By default all the axis have the AUTO-SCALE option activated. In order to change the axis scale you have to uncheck this option.

> Click on the auto-scale check box in the AUTO SCALE option.

> The entry field for min. and max. value is activated.

> Enter a new value for the min. and max. value.

> Click the [SET] button at the bottom of the pop-up screen.

> The configured axis scale appears on the chart display.

5.2.3.2 Change decimals of the axis scale:

> Click on the cursor of the scroll bar in the DECIMALS option and move it to the right or to the left in order to change the amount of decimals.

> Click the [SET] button at the bottom of the pop-up screen.

> The changed decimals of the axis scale appears on the chart display.

Each parameter has a set number of decimals. In order to change the decimals for the entire system you have to configure the specific device parameter (see "Edit device" on page 156).

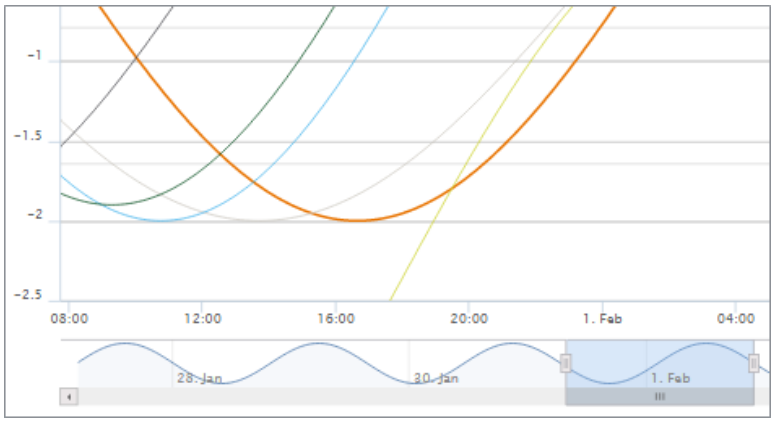
5.2.4 Time scale and zoom

Depending on how long a batch process is running, either batch time in hours or a date/time format time scale may be more convenient. In addition, enlargement of a specific area can help to differentiate a behaviour of a specific parameter.

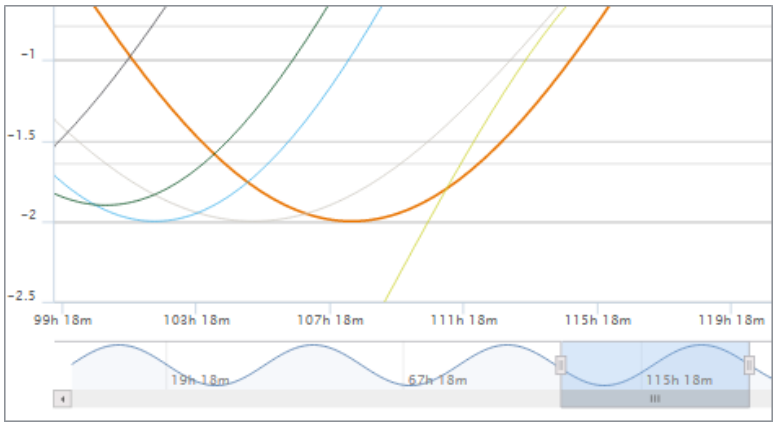
5.2.4.1 Change time scale

> Click directly on a time point on the x-axis in order to change the time format.

> The scale of the x-axis changes.



– An example of a date/time format time scale.

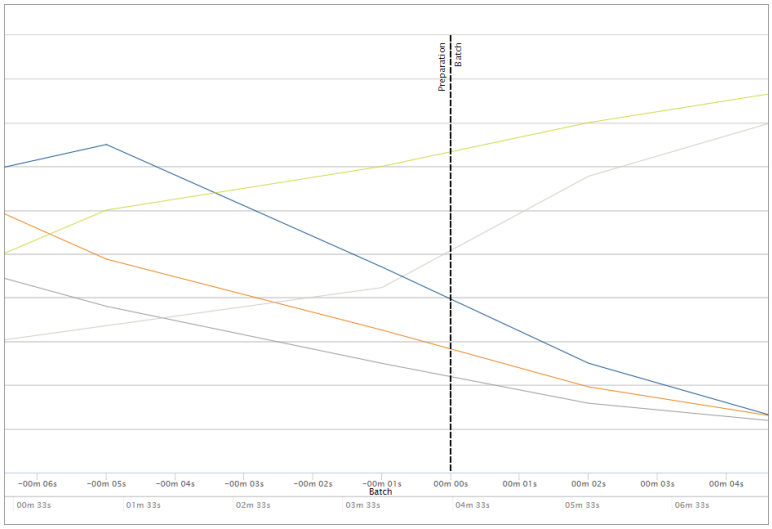


– An example of a batch time in hours.

5.2.4.2 Change time since inoculation

During the monitoring the chart can be configured that the hours before the inoculation are negative and the zero point shifts towards the incoulation timepoint:

> Click the icon to switch from total batch time to batch time since inoculation.

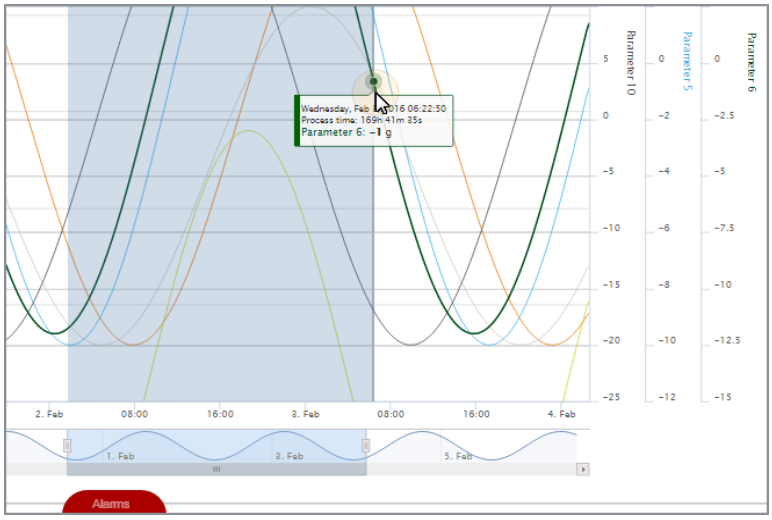


> The batch time (since inoc.) is displayed next to the clock icon ( ) as well as on the axis itself (zero point is moved towards the inoculation line).

5.2.4.3 Zoom navigation:

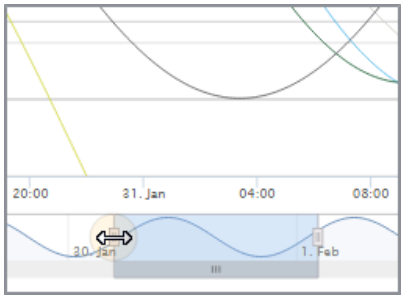
> Click (and hold) anywhere on the chart display and drag the mouse pointer to the time point where you want to end the zoom.

> The area where the zoom is applied to gets a pale blue background.



Navigation of the zoom window:

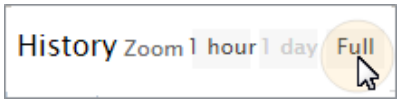
At the bottom of the chart display a quick navigation toolbar is available. As soon as any zoom is applied to an area on the chart display the quick navigation toolbar can be used for navigation. In order to scroll on the time scale with the selected zoom window, proceed as follows:

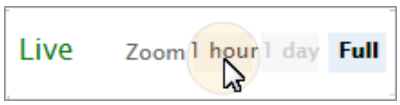


> Drag on the edges of the pale blue zoom window at the bottom of the chart display or click directly into the area an drag it to a specific time point.

> The selected zoom area is applied to the chart display.

Reset the zoom:





> Click on the [FULL] button at the top left-hand side of the chart display.

> The chart display immediately shows the full screen mode.

> Click the 1 hour - or 1 day - zoom button in order to zoom exactly 1 hour or 1 day.

The very top left of the chart displays if the data is "Live" (running process) or "History" (past).

5.2.5 Tool tip mode

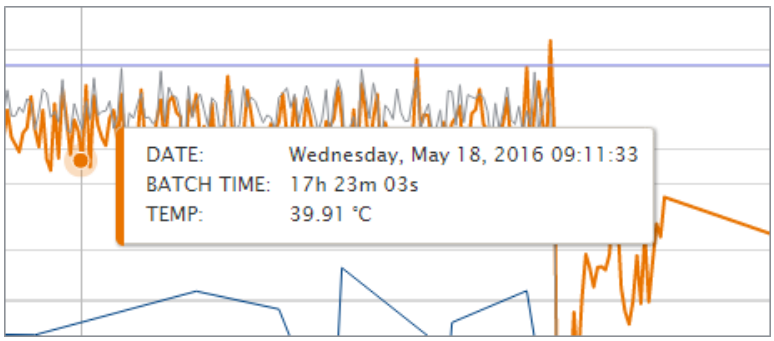
Two different tool tip modes are available. In order to change the tool tip mode proceed as follows:

> Click the ⚙ icon on the right-hand side of the chart display.

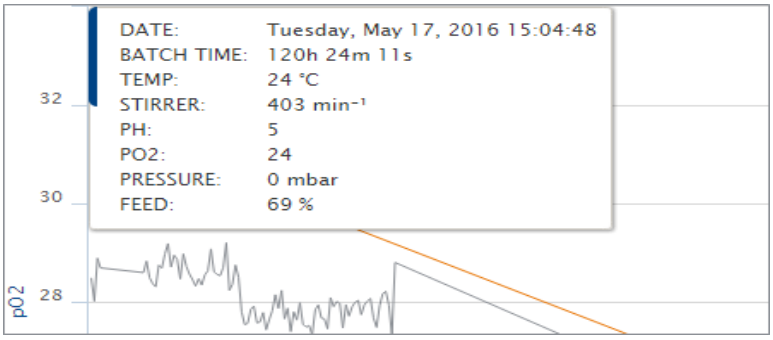
> A menu with setting options for the chart display appears.

> Click the CHANGE TOOL TIP MODE option.

> The appearance of the tool tip mode changes.



– Example of the default tool tip mode.



– Example of the second tool tip mode in the upper left corner of the chart display.

5.2.6 Refresh rate

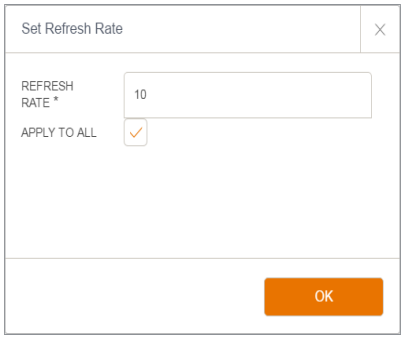
The refresh rate is a setting which defines how often the recorded parameters are refreshed on the chart display.

> Click the ⚙ icon on the right-hand side of the chart display.

> A menu with setting options for the chart display appears.

> Click the SET REFRESH RATE option.

> The REFRESH RATE POP-UP screen appears.



> Enter a new value for the refresh rate.

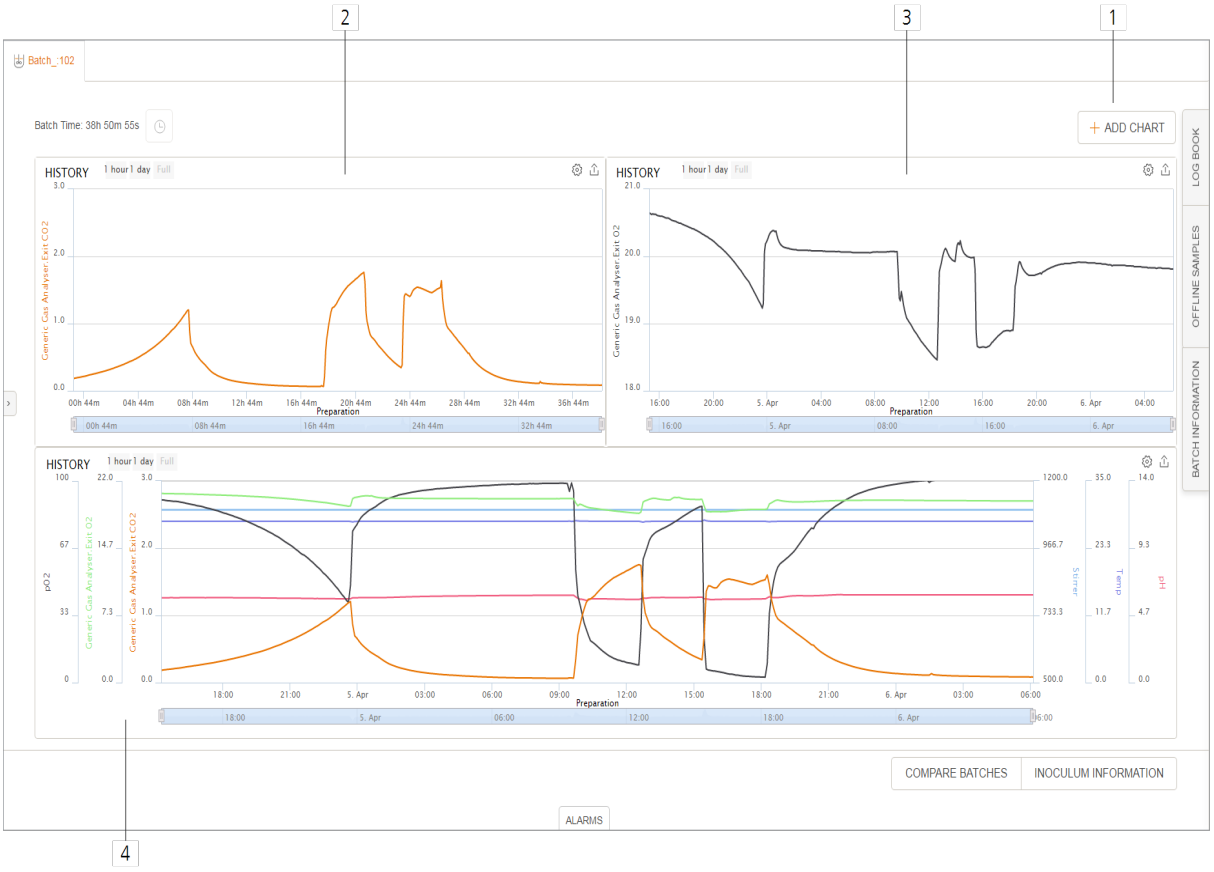
> Click the [OK] button to save your settings.

> The newly entered refresh rate is set to the chart display.

Depending on if the "apply to all" option is active or not, the refresh rate is applied to a single chart display or to all the chart displays on the monitor. Furthermore, the refresh rate is always saved in the templates.

5.3 Chart windows management

The chart display screen is capable of visualising up to 4 charts. Each of the charts can be configured, positioned and scaled individually.



Number	Meaning
1	Add chart button to position and scale the charts
2	First chart display with one parameter
3	Second chart display with one parameter
4	Third chart display with several parameters

5.3.1 Add additional charts

> Click the [ADD CHART] button on the top right-hand side of the chart display.

> A new chart is added and the chart display appears in split screen.

You can add up to four charts by clicking on the [ADD CHART] button.

5.4 Chart templates

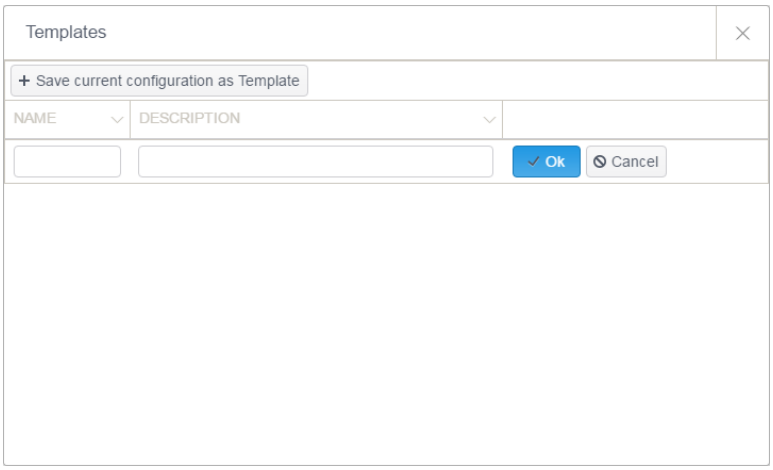
The entire configuration of a chart display can be saved as a template. The saved templates are stored (user specific) and always accessible for the current user. In order to save a template of the chart configuration proceed as follows:

> Click the ⚙ icon on the right-hand side of the chart display.

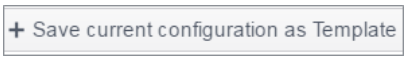
> A menu with setting options for the chart display appears.

> Click the SAVE AND LOAD TEMPLATE option

> The template pop-up screen appears.



5.4.1 Save a chart template



> Click the [SAVE CURRENT CONFIGURATION AS TEMPLATE] button in the template pop-up screen.

> A new input entry field appears where the name and a description of the template can be specified.

> Enter any name for the template.

> Enter any description for the template (optional).

> Click the [OK] button in order to save the template.

> The template is saved and can now be used.

5.4.2 Apply a chart template

> Click the [APPLY] button on the right-hand side of the template pop-up screen.

> The selected template is applied to the specific chart display.

5.4.3 Delete a chart template

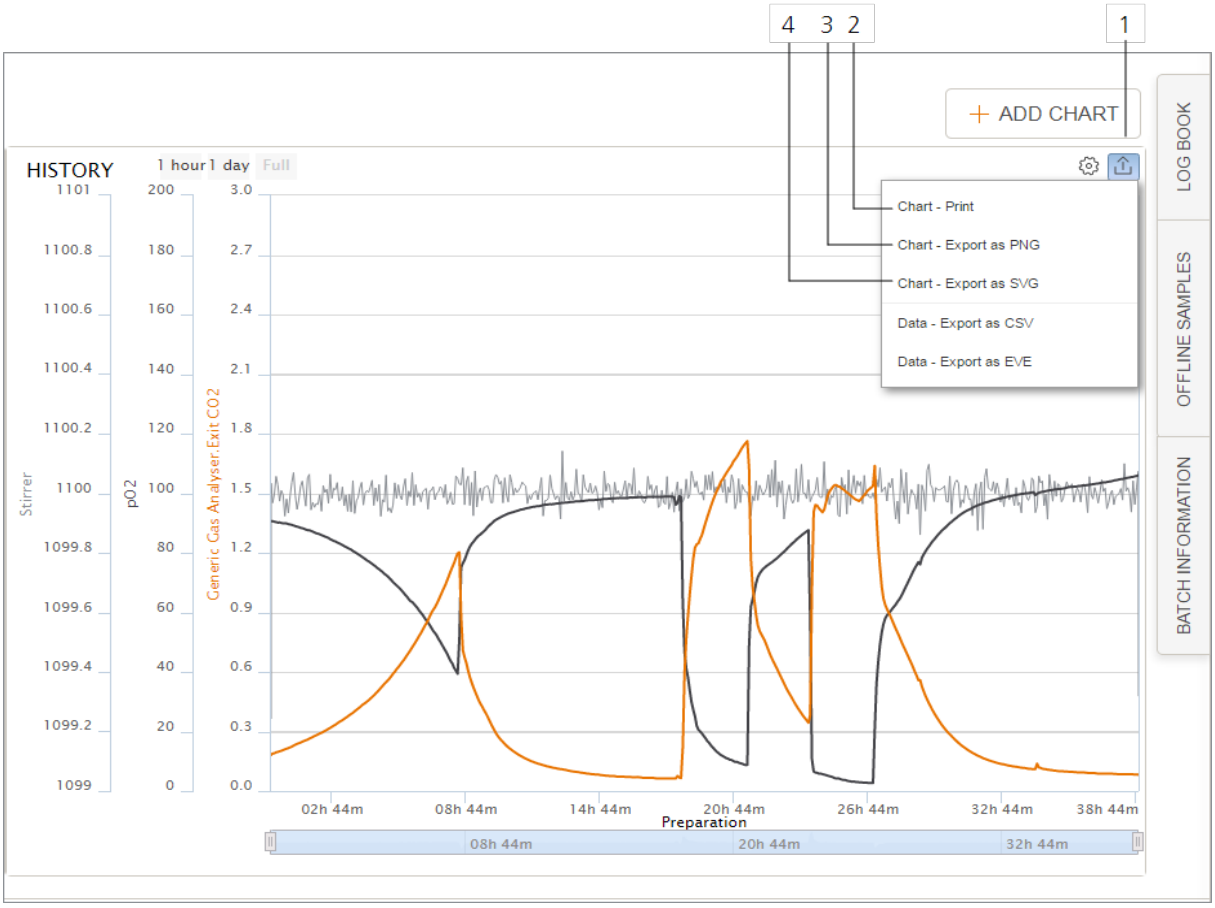
> Click the [DELETE] button on the right-hand side of the template pop-up screen.

> Confirm the deletion of the selected template.

> The selected template is deleted.

5.5 Chart export

Each chart display can be printed or exported as a pdf (print) or raw csv format.



Number	Function
1	Icon for export settings
2	Option for print chart display and/or download as pdf file
3	Option to export raw data as csv

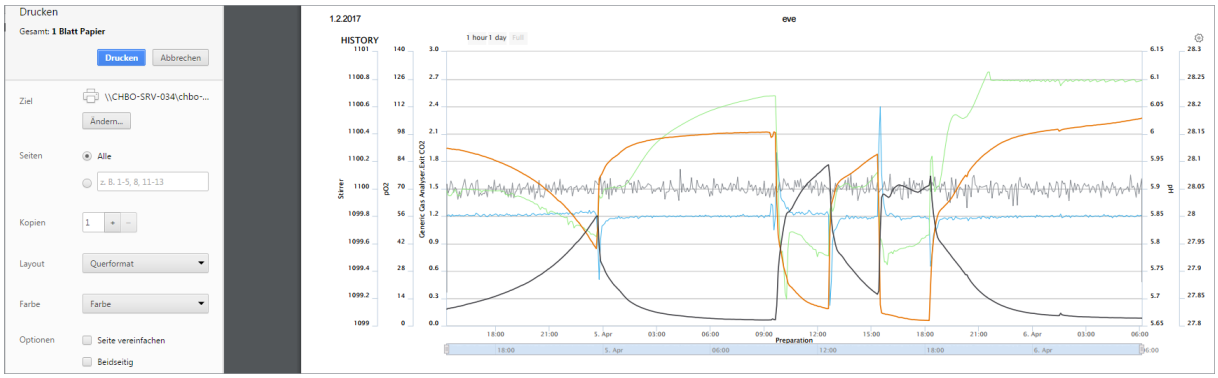
5.5.1 Print chart

> Click the icon on the right-hand side of the chart display.

> A menu with export options for the chart display appears.

> Click the PRINT CHART option.

> The print option screen of your running system appears.



> Click the [PRINT] button on the left-hand side of the print screen.

> The chart display is printed.

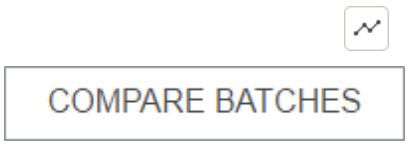
Depending on the operating system installed, the standard print option screen may look different.

5.6 Batch comparison

The batch comparison function is a very powerful tool to compare several batch processes independent of the origin of the data i.e. historical (stored) or live data (running batch). The compare function can always be accessed from the monitor chart display.

5.6.1 Select batch processes

In order to compare several batch processes proceed as follows:



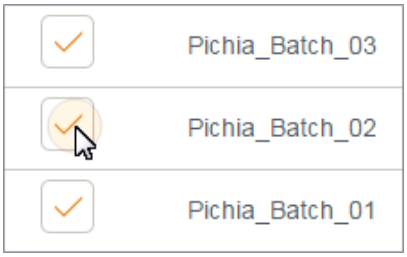
> Open any batch process either a live running batch process or a closed batch process from the library (see " Monitor a batch process" on page 74).

> The chart display of the specific batch process appears.

> Click the [COMPARE BATCHES] button at the bottom right-hand side of the chart display.

> A new table with all completed and running batch processes appears.

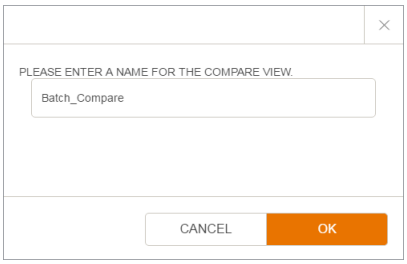
	NAME	STATE	DEVICE	OWNER	STARTED	ENDED	PROJECT	EXPERIMENT
☐	Pichia_Batch_03	Completed	Multifors 2 / D	Service	4/4/2016 3:16:22 PM	4/5/2016 7:38:30 AM		Pichia_Batch_03
☐	Pichia_Batch_02	Completed	Multifors 2 / F	Service	4/4/2016 3:15:59 PM	4/5/2016 7:23:42 AM		Pichia_Batch_02
☑	Pichia_Batch_01	Completed	Multifors 2 / A	Service	4/4/2016 3:15:39 PM	4/5/2016 7:34:37 AM		Pichia_Batch_01
☐	Screening01.03	Completed	Multifors 2 / E	Service	4/22/2016 4:57:05 PM	4/29/2016 10:24:01 AM		Screening01
☐	E_coli_Culture_Media.03	Running	Multifors 2 / C	Service	5/17/2016 2:04:10 PM		Screening 954	E_coli_Culture_Media



> Select the batch processes for the comparison by clicking on the check box on the left-hand side of the table.

> Click the [COMPARE] button on the bottom right-hand side of the table.

> A pop-up screen appears where you have to define a new name for the batch process comparison.



> Enter a new name for the batch process comparison.

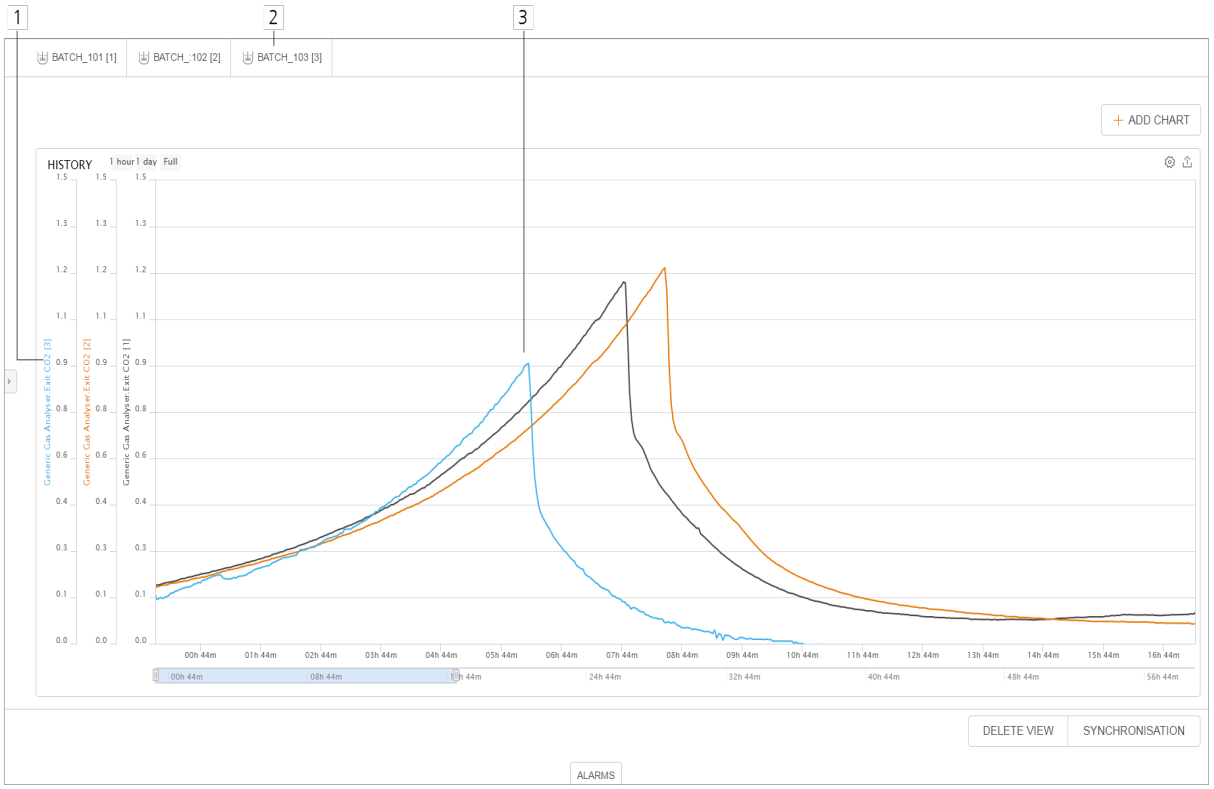
> Click the [OK] button.

> The chart display of all the compared batch processes appears.

5.6.2 Compare batch processes

In order to compare parameters from several batch processes the same chart display configuration as for a single batch process can be applied (see "Axis configuration" on page 79).

If the same parameter is compared from several batch processes each parameter gets a small number in square brackets next to its parameter name (axis caption) and batch process name in the tabs.



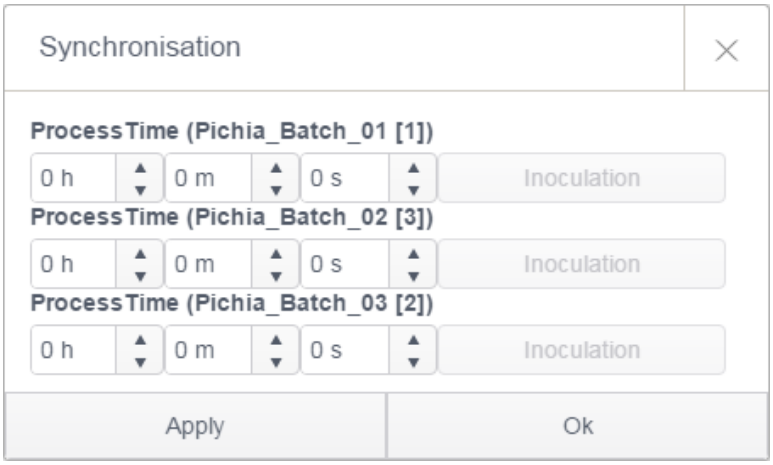
Number	Function
1	CO_2 axis caption of batch number 3
2	Batch process tab number 3
3	CO_2signal of batch number 3

5.6.3 Synchronise batch processes

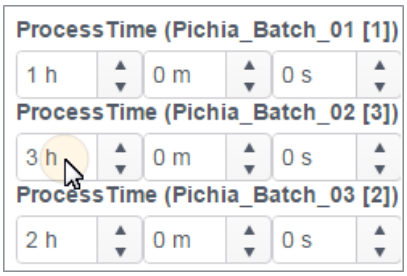
In order to overlay parameter signals exactly or to synchronise the time scale from several batch processes proceed as follows:

> Click the [SYNCHRONISATION] button at the bottom right-hand side of the compare chart display.

> The SYNCHRONISATION pop-up screen appears.



> If the batch processes are inoculated (see "Inoculate batch process" on page 102) a synchronisation at the time point where inoculation happend is also possible.



> Enter the exact time point at the specific batch process where the synchronisation should be applied to.

> Click the [APPLY] button to see the entire parameter signal move in the background of the compare chart display.

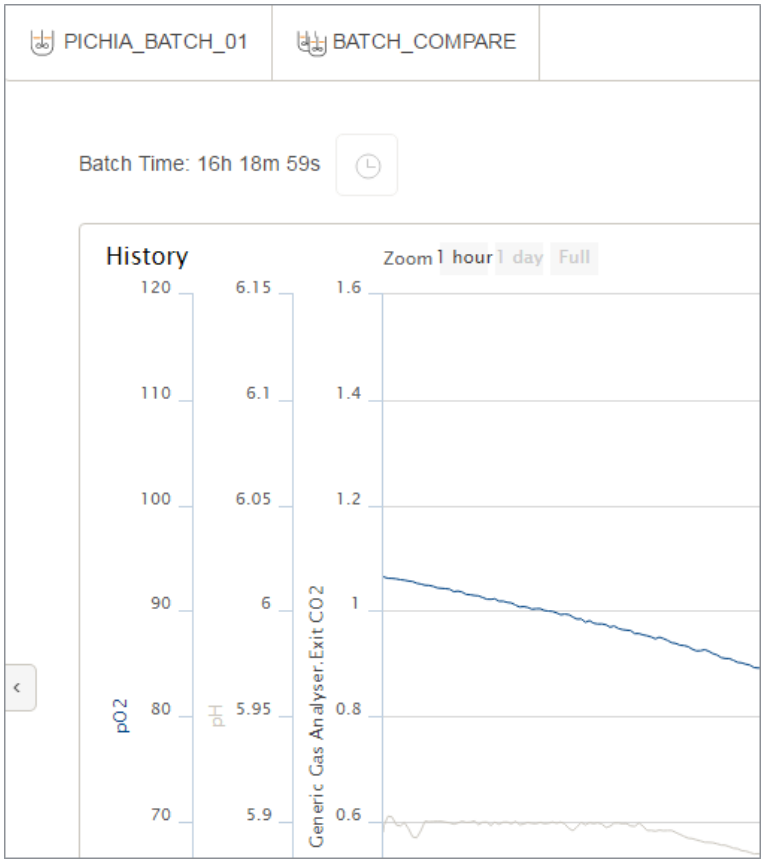
> Click the [OK] button to save your synchronisation settings.

5.6.4 Switch between compared batch processes

The compare chart display shows all the compared batch processes as a tab at the top of the chart display. In order to switch to a single batch process proceed as follows:

> Click on any tab of the compared batch processes which are listed as a tab at the top of the chart display.

> The chart display of the select single batch process appears.

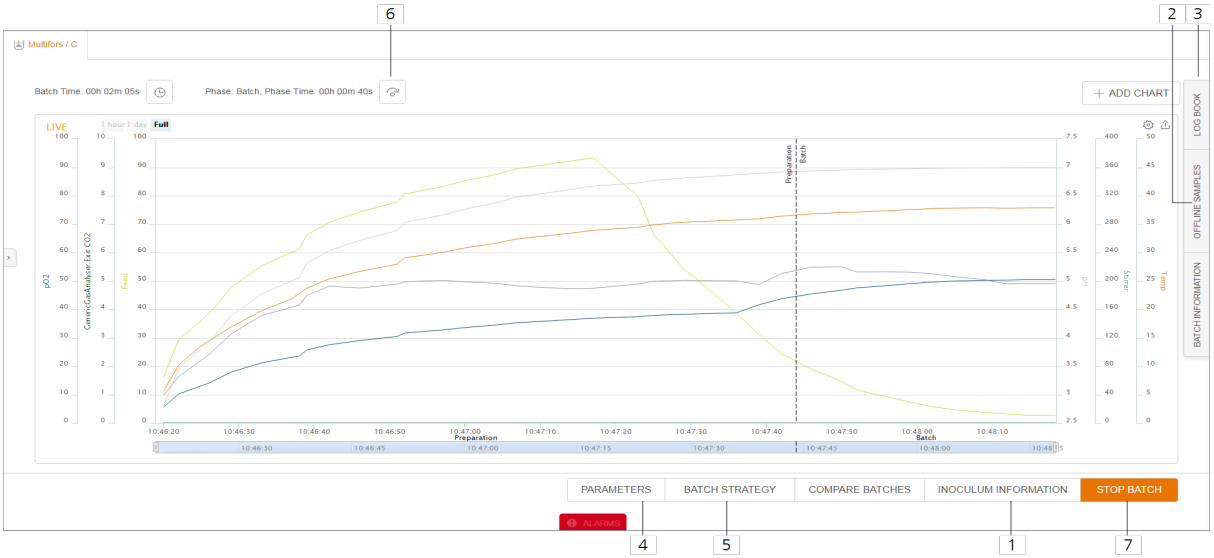


> Click on the compare view tab (name of your compare view) to get back to the compare view (batch_compare in this case).

> The chart display of the compare view appears.

5.7 Operator-mediated batch adjustments

When a certain batch process is monitored different operator-mediated batch adjustments can be applied.



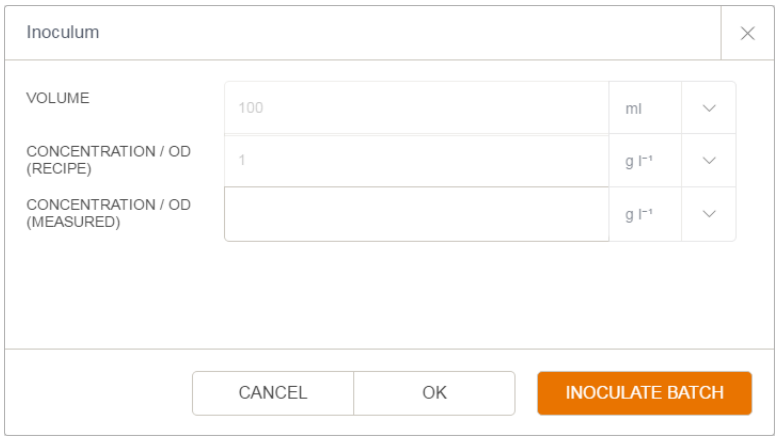
Number	Meaning
1	Inoculate button for inoculum information and inoculation
2	Offline samples where a measured sample can be entered with the according time stamp
3	Log book entry where at any time point a comment can be entered
4	Parameters button to access the list of parameter values
5	Strategy button to access the strategy
6	Skip phase manually button
7	Stop batch button

5.7.1 Inoculate batch process

INOCULATE

> Click the [INOCULATE] button at the bottom of the chart display.

> The INOCULUM pop-up screen appears.



> If available, enter the measured value of your inoculum concentration into the CONCENTRATION entry field.

The inoculum volume and inoculum concentration (from the recipe) are pre filled if this information was provided in the organism work flow (see "Organism information" on page 36).

INOCULATE BATCH

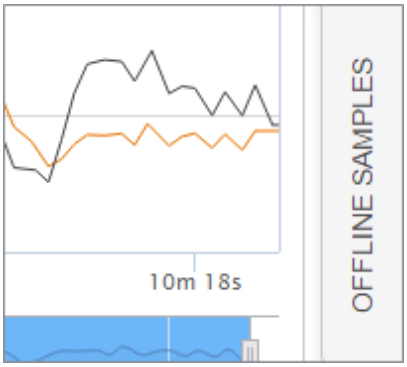
> Click the inoculate batch button at the bottom of the INOCULUM pop-up screen.

> Click the [OK] button next to the [INOCULATE BATCH] button.

> The batch process is inoculated and a red line at the inoculation time point appears on the chart display.

Once a batch process is inoculated the inoculum information (i.e. inoculum time point, inoculum volume and inoculum concentration) can always be accessed by the [INOCULUM INFORMATION] button on the bottom of the chart display.

5.7.2 Offline samples

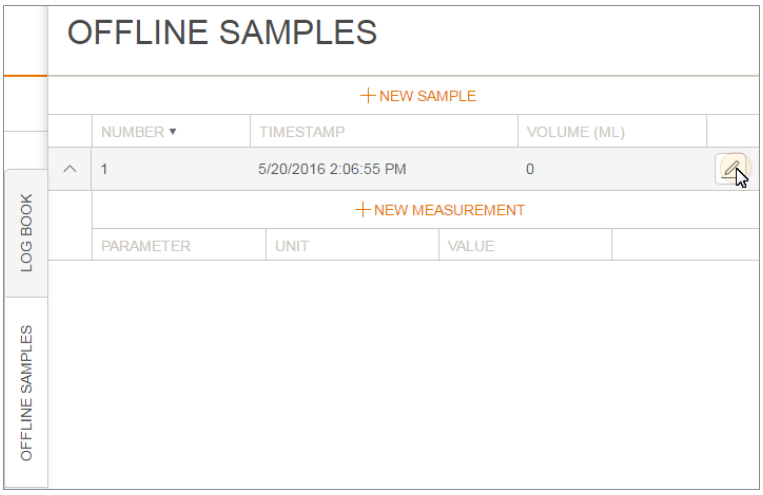


> Click the offline samples tab on the right hand side of the chart display.

> The OFFLINE SAMPLES screen appears.

> Click the new [SAMPLE BUTTON] on the top of the OFFLINE SAMPLES screen.

> The new sample appears in the offline sample list with the corresponding time stamp.



> Click the icon on the right hand side of the sample entry in order to define the offline sample volume.

> Enter any value for the offline sample volume and click to [OK] button to save your setting

> Click the [NEW MEASUREMENT] button in order to add any measurement to this offline sample.

> A new entry field with the configured offline parameter appears.

> Select the appropriate offline parameter from the drop down list.

> Enter any value for the offline parameter measurement and click the [SUBMIT] button to save your value (termporary).

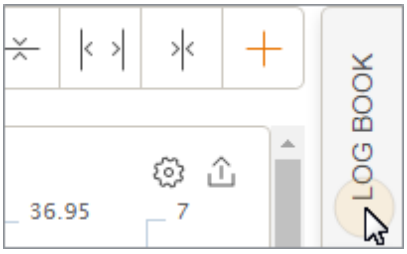
The submit button allows to save the offline parameter value in a temporary mode (the value can be edited with the [EDIT] button). However, to save the offline parameter permanently you have to confirm the valvue with the [CONFIRM] button.

> The entered value for the offline parameter measurement is saved to the offline sample.

> Click the [CONFIRM] button to save the offline parameter value.

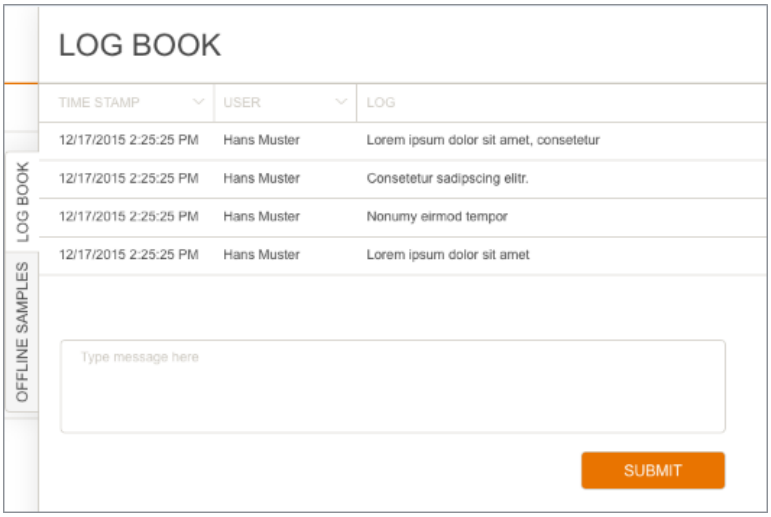
By clicking again on the [NEW MEASUREMENT] button you can add as much measurements as you want to one single offline sample.

5.7.3 Logbook entry



> Click the [LOG BOOK] tab on the top right-hand side of the chart display

> The LOG BOOK screen appears.



> Enter any comment in the message field.

> Click the [SUBMIT] button.

> The entered comment is saved in the log book and appears in the log book list with the according time stamp.

> Click the LOG BOOK tag again to close the log book.

5.7.4 Parameter set points

> Click the [PARAMETERS] button at the bottom of the chart display.

> A new pop-up window with the list of all recorded parameters appears.

Device Parameters

NAME	VALUE	SETPOINT	LOWER ALARM	UPPER ALARM	ALARM TYPE	DECIMALS
Temp	40 °C	40 °C	35 °C	50 °C	fixed	0
Stirrer	427 min⁻¹	444 min⁻¹	444 min⁻¹	444 min⁻¹	fixed	0
pH	6		2	12	fixed	0
pO2	30 %	30 %	30 %	30 %	fixed	0
Antifoam	0		0	100	fixed	0
Level	0		0	100	fixed	0

> In order to change any parameter set point or parameter alarm proceed with the steps as for parameter configuration (see "Parameter configuration" on page 29).

The parameter set point window is a window, which can be displayed independently on screen to always have full access to parameter set points.

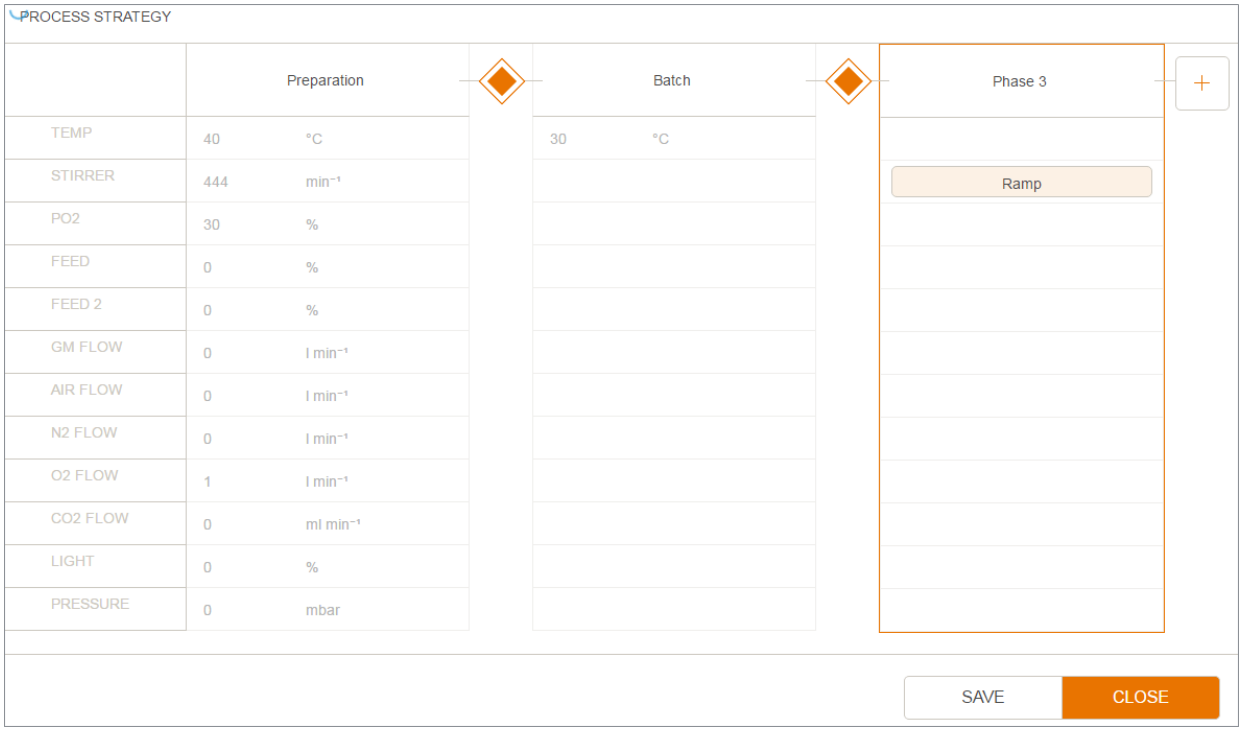
5.7.5 Change strategy

During a running batch process the entire strategy can be changed. In order to change the strategy in a running batch process proceed as follows:

STRATEGY

> Click the [STRATEGY] button at the bottom of the chart display.

> A new pop-up window with the strategy screen appears where the active phase is marked with an orange rectangle.



> In order to change or add a phase, transition or parameter function follow the procedure in strategy for a single batch (see "Batch strategy" on page 44).

> Click the save button in order to save your settings.

> The new strategy settings are saved.

> Click the close button in order to get back to the chart display.

5.7.6 Skip phase manually

In addition to time-, event- or parameter-based transition triggers at the top of the chart display a manual phase trigger button is

available. In order to skip a phase in the strategy proceed as follows:

> Click the icon at the top of the chart display.
> A confirmation pop-up screen appears.
> Confirm the action by clicking the [OK] button in order to skip the current phase.
> The next phase is active immediately and displayed in the chart display.

5.7.7 Stop batch

> Click the [STOP BATCH] button at the bottom of the chart display
> A confirmation pop-up screen appears.
> Confirm the action by clicking the [OK] button in order to stop the batch process.
> The batch process is stopped and saved in the experiment library.

6 Libraries

Libraries are a storage place for all different kinds of data and a very powerful tool to structure and link process information. The library menu includes the following sub-menus and allows you to store and prepare any batch process in the appropriate way:

– Import and export batches (see "Batches" on the next page)
– Access recipes (see "Recipe" on page 117)
– Create and edit new organisms (see "Organism" on page 120)
– Create and edit new culture media (see "Culture media" on page 123)
– Create and edit soft-sensors (see "Soft-sensors" on page 131)

In order to access the libraries proceed as follows:

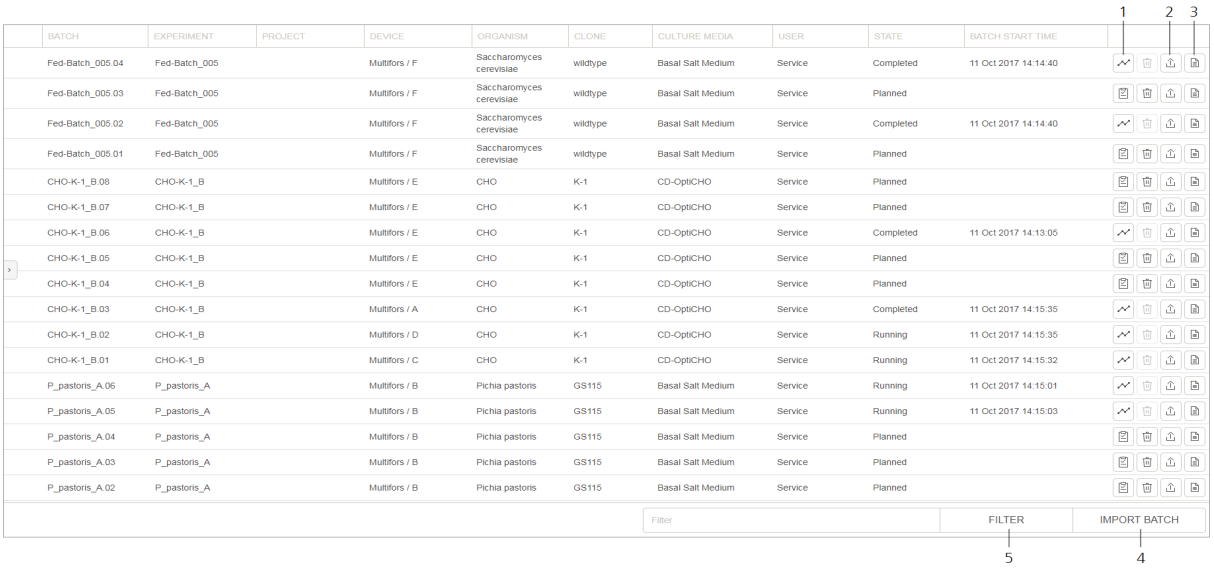
> Click the [LIBRARIES] button on the left-hand side of the screen.
> All the sub-menus of the libraries appear.

6.1 Batches

In order to access the library of all planned, closed and running experiment proceed as follows:

> Click the [BATCHES] button on the left-hand side of the LIBRARIES menu.

> A list of all planned, running and closed batches appears.



Number	Function
1	Open (chart) closed or running batch
2	Export batch button
3	Report batch button
4	Import batch button
5	Advanced filter function

6.1.1 Archive data

Every completed batch process can be archived. To archive a batch process, proceed as follows:

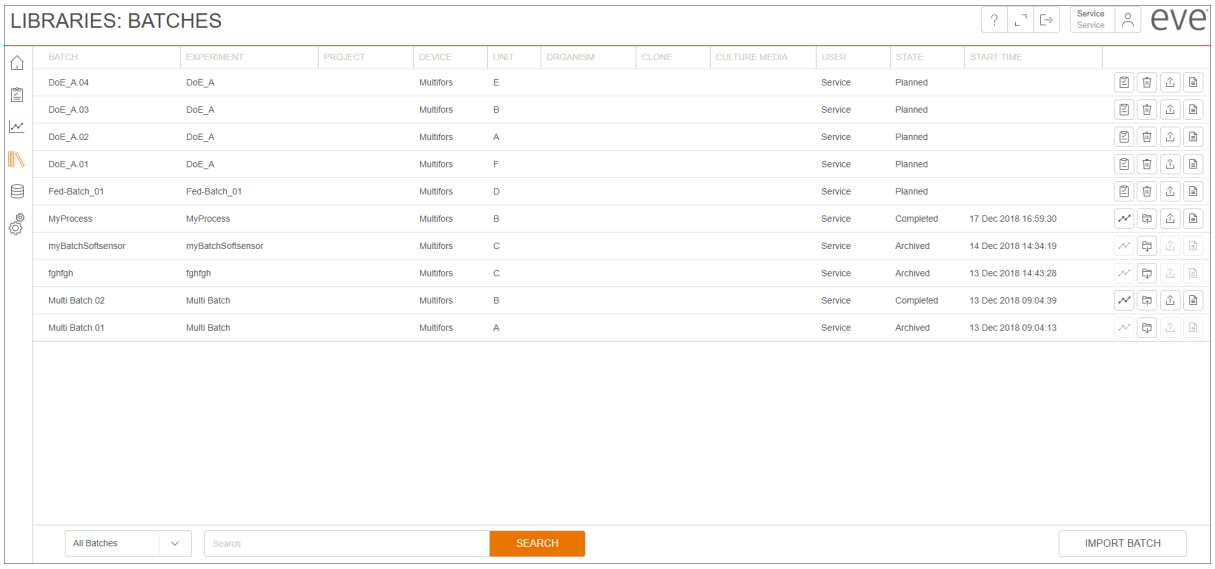
> Click the icon on the right-hand side of the experiments library.

> The selected batch is archived.

If you would like to see all batch process inclusive the archived ones, proceed as follows:

> Select the "All Batches" option at left bottom of the batch library page.

> The batch library list will show all batch process inclusive the archived ones.



To unarchive a batch process, proceed as follows:

> Click the icon on the right-hand side of the experiments library.

> The selected batch process in unarchived.

6.1.2 Import data

The following file formats for the import of any batch data are supported:

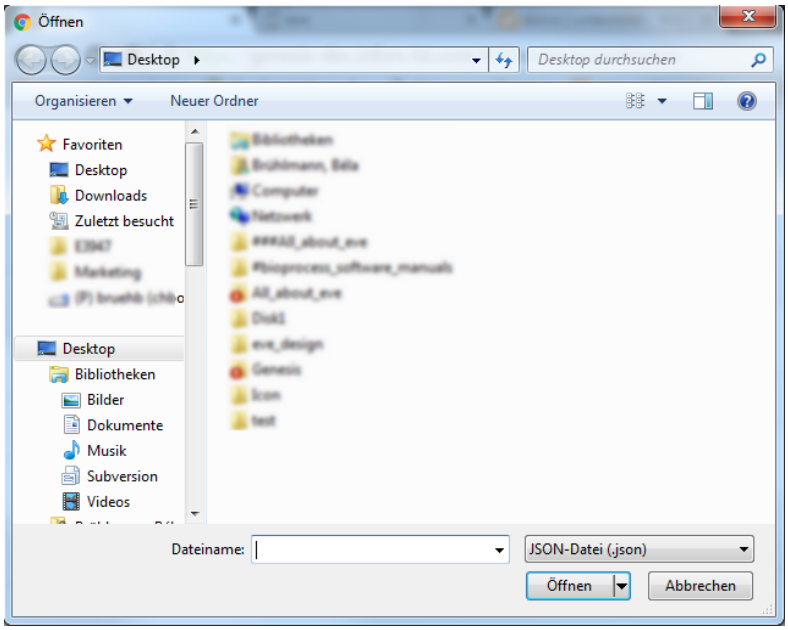
– eve files
– Iris files
– .csv files
– Excel files

In order to import batch data, proceed as follows:

IMPORT BATCH

> Click the import button at the bottom of the experiments screen.
> The import batch data pop-up screen appears.

> Click the corresponding import button depending on your file format.
> A windows browse pop-up screen appears in order to browse your batch data on the computer.



> Select your batch data file and click the [OPEN] button at the bottom of the windows browse pop-up screen.

> Your selected batch data file is saved in the experiment library.

In order to import an excel or .csv file you have to make sure that this file was created by eve or at least has the exactly same data structure and order.

6.1.3 Export data

Every batch process can be exported as an eve or .csv file. If a batch process is not yet completed you can create a recipe out of it (see "Recipe" on page 117). To export a batch process proceed as follows:

> Click the icon on the right-hand side of the experiments library.

> The export batch pop-up screen appears.

> Click the corresponding export button depending on what kind of batch data file you want to create.

> The exported batch data file appears as downloaded file at the bottom of your web browser.

If you want to display the exported .csv in Microsoft Excel do not open the .csv file directly but import the file via the built in Excel import function - otherwise the format of the displayed data is wrong.

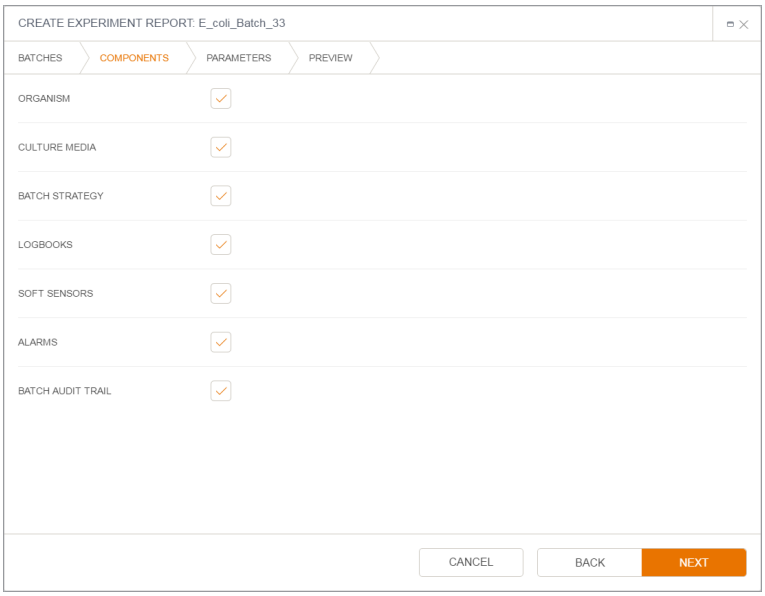
Depending on which web browser you are using, the download is displayed at the bottom of the web browser (download folder) or a pop-up appears where you have to specify the download directory.

6.1.4 Report

Reports can be created both for completed, running and planned batches and document all relevant batch information in a digital record (e.g. pdf, ppt etc.) automatically. To create a report of an experiment (or single batch) proceed as follows:

> Click the icon on the right-hand side of the experiments library.

> The report batch pop-up screen (COMPONENTS) appears.



If a report is created from a multiple batch experiment the first step of the work flow starts with "BATCHES". This step allows to select all the batch processes which will be included in the report.

Report components:

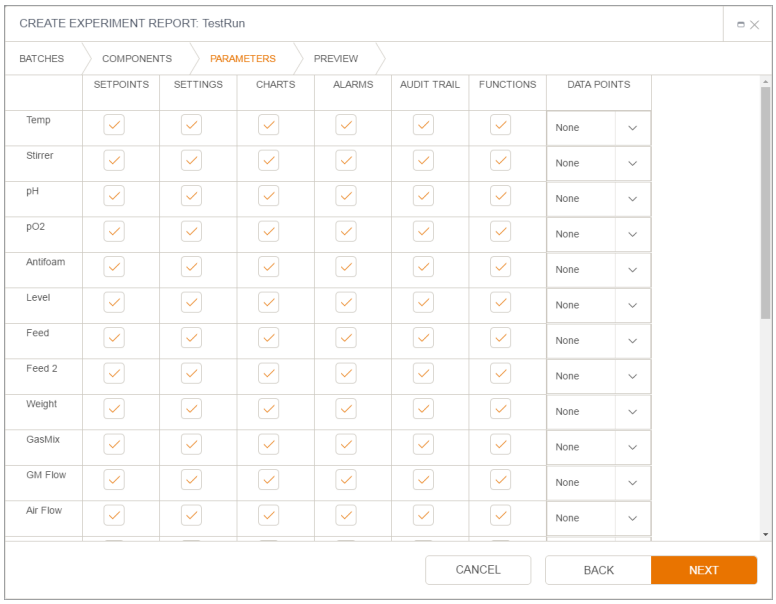
Report components are defined modules with specific information for the report (such as organism or culture medium information). By default all the components are selected and activated. A description of the components is listed below:

Components	Description
ORGANISM	Information about the selected organism
CULTURE MEDIA	Information about the selected culture media
BATCH STRATEGY	Complete description of the batch strategy
LOGBOOKS	All logbook entries of the batch
SOFT-SENSORS	Complete description of the soft-sensors
BATCH ALARMS	All alarms which occurred during the batch
BATCH AUDIT TRAIL	All actions (user/device) related to the batch

> Select/deselect your desired components for the report.

> Click the [NEXT] button.

> The PARAMETER matrix appears.



Report parameters:

For every monitored parameter different parameter specific information can be displayed. A description of the parameter options is listed below:

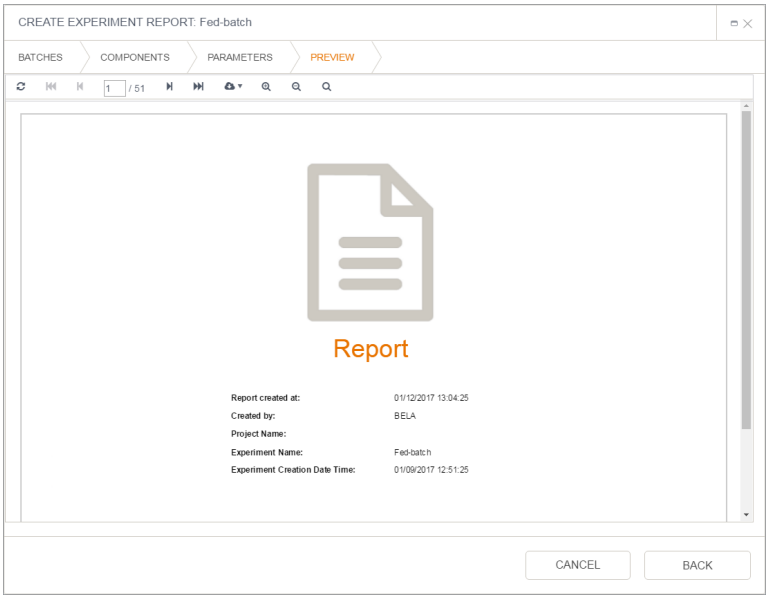
Parameter option	Description
SETPOINT	Lists in a table the setpoint configuration of the parameter
SETTINGS	Lists in a table the alarm configuration of the parameter
CHARTS	Displays a chart of the parameter with trend, standard deviation (blue) and min./max. value (orange).
ALARMS	Lists in a table the alarm events of the parameter
AUDIT TRAIL	Lists in a table all the audit trail entries of the parameter
FUNCTIONS	Lists in a table all relevant information about the functions of the parameter
DATA POINTS	Allows to display the data points in a averaged (every 30 data point) or raw (every second) way

> Select/deselct your desired parameters and parameter options for the report.

The selection of the parameters and parameter options can be executed for every row and column by clicking on the name of the parameter (e.g. Temp) or parameter option (SETPOINTS). If you want to deselect or select all parameters and parameter options click in the empty cell of the upper left corner.

> Click the [NEXT] button.

> The PREVIEW screen appears.



Report preview:

The preview creates the report. After creation, the report can be browsed and downloaded (different types of data formats). Depending on what kind of report components were selected, the report consists of different parts. However, the following module are included in every report.

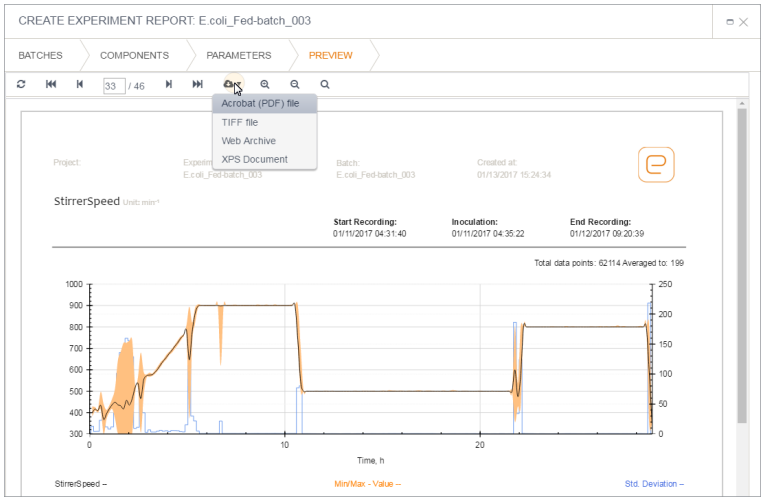
Report module	Description
Title page	Title page of the report with: Creation date/-time, creator (user), project name, experiment name, experiment creation date/time
Index	Index (clickable) of all modules within this report
Batch overview	Information about: Project, experiment, batch, state, device, batch time and inoculation time
Header	Unique identifier of the report on every report page

To browse through the created report and download it afterwords, proceed as follows:

> Click on the small arrows at the top of the preview pop-up screen.

> The next page (index) of the report appears.

> Click the download icon in order to download and save the report of the experiment/batch.



> Select the appropriate file format (e.g. pdf).

> The report is saved and downloaded and can be open with any program which can read pdf files.

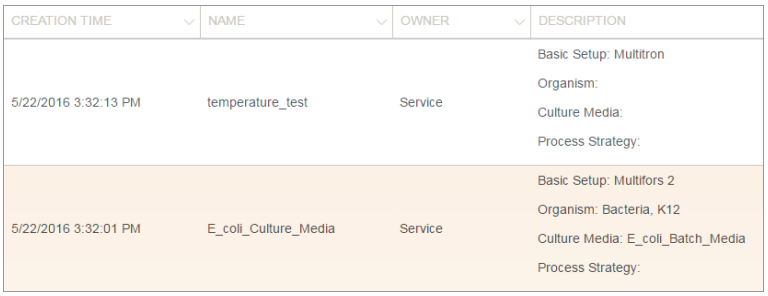
For default batch report settings please configure the batch report in global settings (see "Global" on page 173)

6.2 Recipe

Recipes are defined configurations of a batch process involving elements such as equipments, organisms, culture media, soft-sensors, setpoints and strategies. In order to access the library of created recipes proceed as follows:

> Click the [RECIPES] button on the left-hand side of the LIBRARIES menu.

> The recipes library list appears.



CREATION TIME	NAME	OWNER	DESCRIPTION
5/22/2016 3:32:13 PM	temperature_test	Service	Basic Setup: Multitron Organism: Culture Media: Process Strategy:
5/22/2016 3:32:01 PM	E_coli_Culture_Media	Service	Basic Setup: Multifors 2 Organism: Bacteria, K12 Culture Media: E_coli_Batch_Media Process Strategy:

6.2.1 Create new recipe

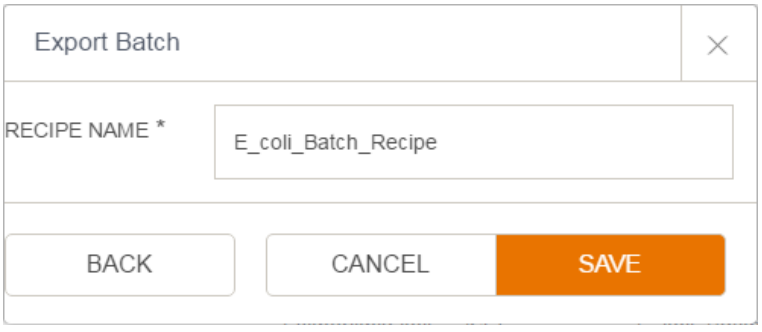
Every batch process can be exported as a recipe. In order to export a batch process as a recipe proceed as follows:

> Click the icon on the right hand side of the experiments library (see "Batches" on page 109).

> The export batch pop-up screen appears.

> Click the [RECIPE] button.

> A new pop-up screen appears where you have to enter a name for the recipe.



> Enter a name for you recipe and click the [SAVE] button.

> The recipe is saved and stored in the recipe library.

6.2.2 Apply recipes

In order to apply a recipe to a specific batch process follow the instruction for single batch process (see "Load and apply recipe" on page 28).

Recipes can also be applied to a reference batch for a multiple batch experiment and that can save a lot of planing time.

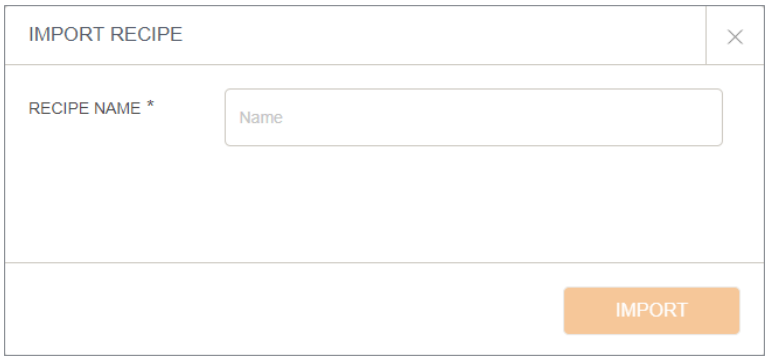
6.2.3 Import Recipes

Recipes can be imported into eve and applied to any batch process (see "Load and apply recipe" on page 28) To import a recipe proceed as follows:

IMPORT RECIPE

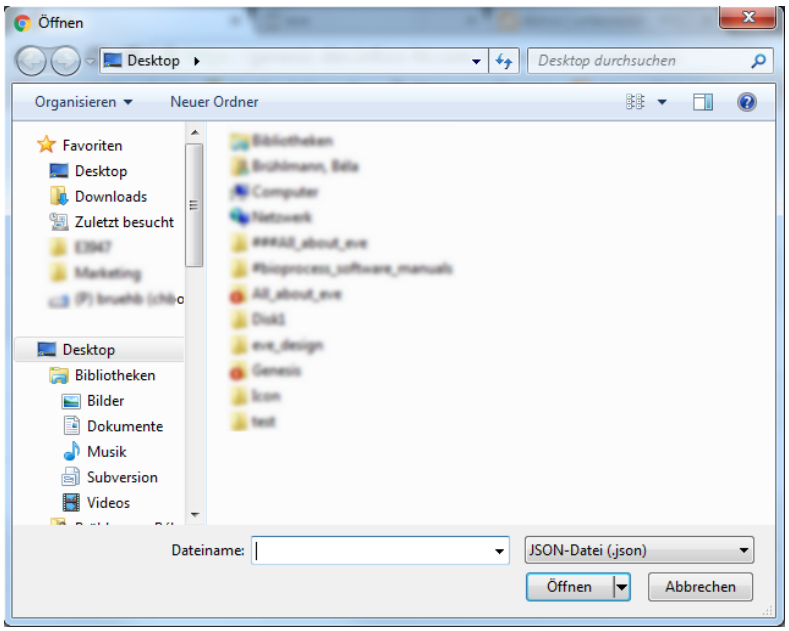
> Click the import button at the bottom of the recipe screen.

> The import recipe pop-up screen appears.



> Define a new name for the recipe and click the [IMPORT] button.

> A windows browse pop-up screen appears in order to browse your batch data on the computer.



> Select your recipe data file (.json) and click the [OPEN] button at the bottom of the windows browse pop-up screen.

> Your selected recipe file is saved in the recipe library.

6.2.4 Export Recipes

Recipes can be exported and shared with other users. An exported recipe can also be imported at a later time point (see "Import Recipes" on the previous page). To export a recipe proceed as follows:

> Click the ⇧ icon on the right-hand side of the recippe library.

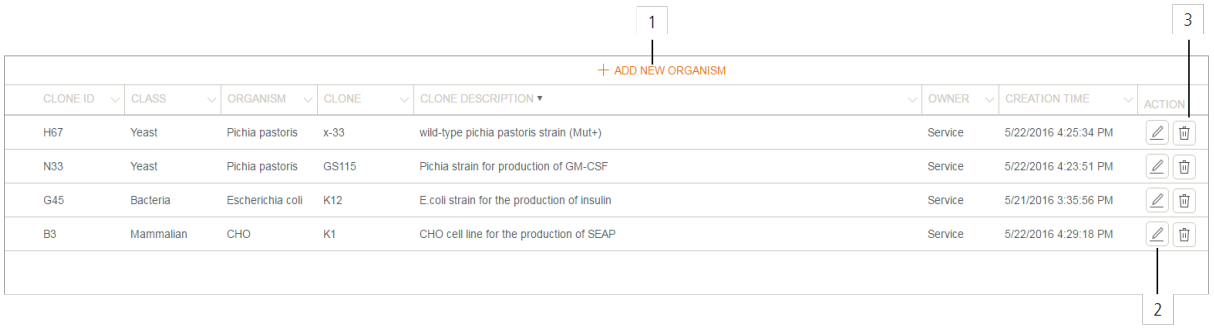
> The recipe is immediately downloaded and saved.

6.3 Organism

Organisms are defined by the cell type and the clone. The organism library enables the opportunity to store all relevant information together about a specific organism and access the data any time.
In order to access the library of created organisms proceed as follows:

> Click the [ORGANISMS] button on the left-hand side of the LIBRARIES menu.

> The organism library list appears.



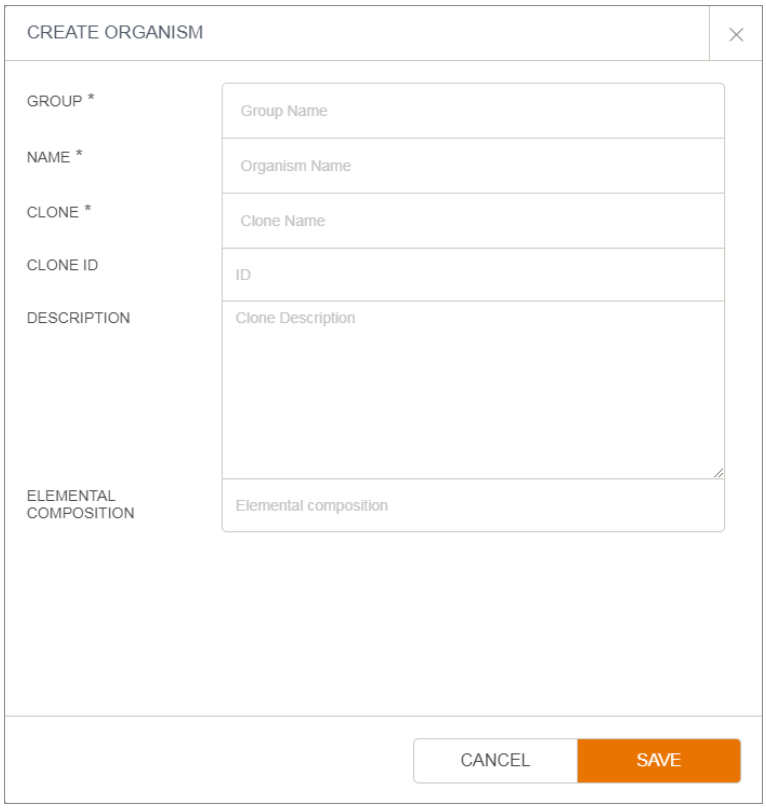
Number	Function
1	Add new organism to the library
2	Edit existing organism in the library
3	Delete organism from the library

6.3.1 Add new organism

In order to add a new organism to the organism library proceed as follows:

> Click the [ADD NEW ORGANISM] button at the top of the organism library.

> The create organism pop-up screen appears.



> Enter the corresponding information into the mandatory fields, indicated by a * after the name.

> Enter the corresponding information into the optional fields.

Pichia pastoris organism example:
Group: Yeast
Name: *Pichia pastoris*
Clone: GS115
Clone ID: A12
Description: P.pastoris strain for the production of recombinant inuslin (Mut+)

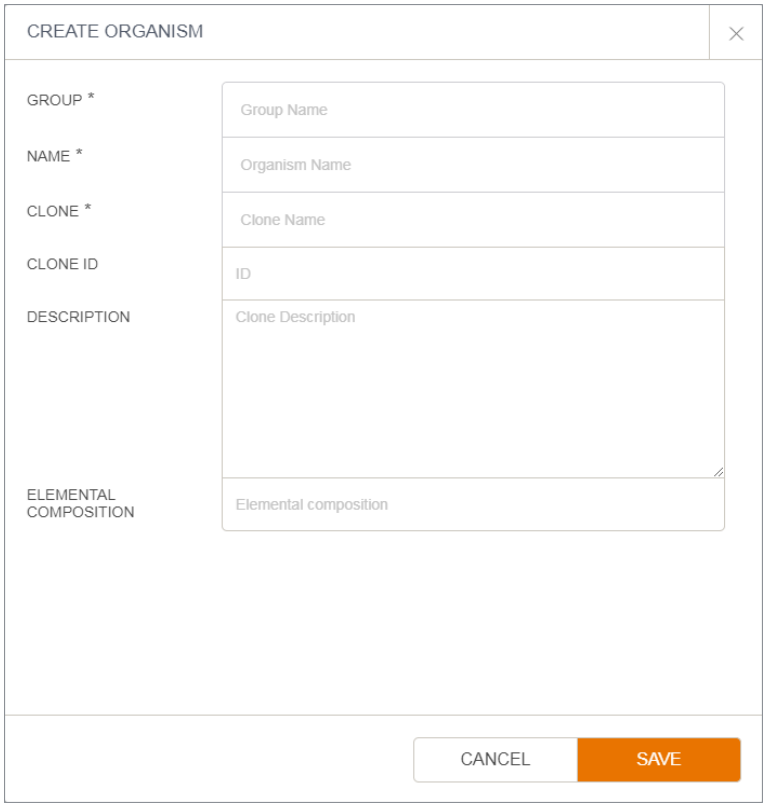
> Click the [SAVE] button at the bottom of the create organism pop-up screen.

> The new organism is added to the organism library list.

6.3.2 Edit organism

> Click the icon on the right-hand side of an organism entry in the organism library list.

> The edit organism pop-up screen appears.



> Edit any information of the organism.

> Click the [SAVE] button at the bottom of the edit organism pop-up screen.

> The changed organism information is saved to the organism and stored in the organism library list.

6.3.3 Delete an organism

> Click the icon on the right-hand side of an organism entry in the organism library list.

> Confirm the deletion of the selected organism.

> The selected organism is deleted from the organism library list.

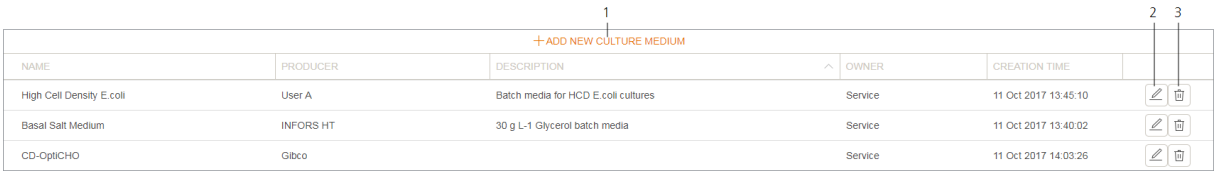
6.4 Culture media

The culture media library allows to create culture media that can be used and documented for batches and recipes. In order to access the library of culture media, proceed as follows:

CULTURE MEDIA

> Click the [CULTURE MEDIA] button on the left-hand side of the LIBRARIES menu.

> The culture media library list appears.



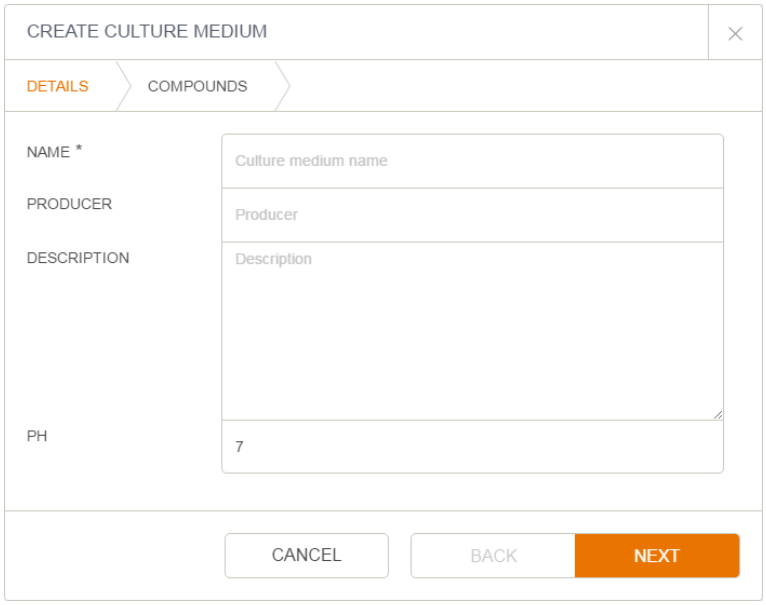
Number	Function
1	Add new culture media to the library
2	Edit existing culture media in the library
3	Delete culture media from the library

6.4.1 Add new culture medium

In order to add a new culture medium to the culture media library list proceed as follows:

> Click the [ADD NEW CULTURE MEDIUM] button at the top of the culture media library list.

> The CREATE CULTURE MEDIUM pop-up screen appears with a predefined work flow to create a new culture medium. It starts with basic details about the culture medium.

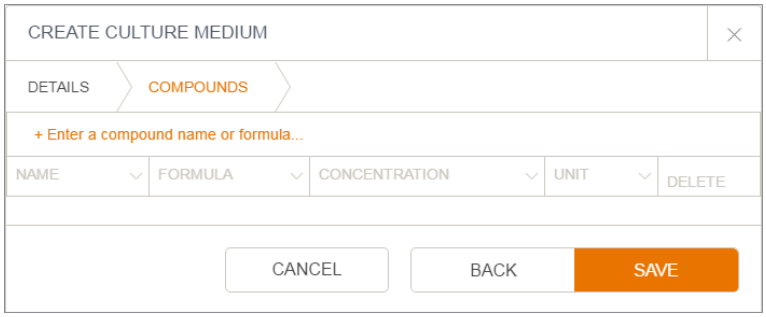


> Enter a name for the culture medium (mandatory).

> Enter additional information into the optional fields.

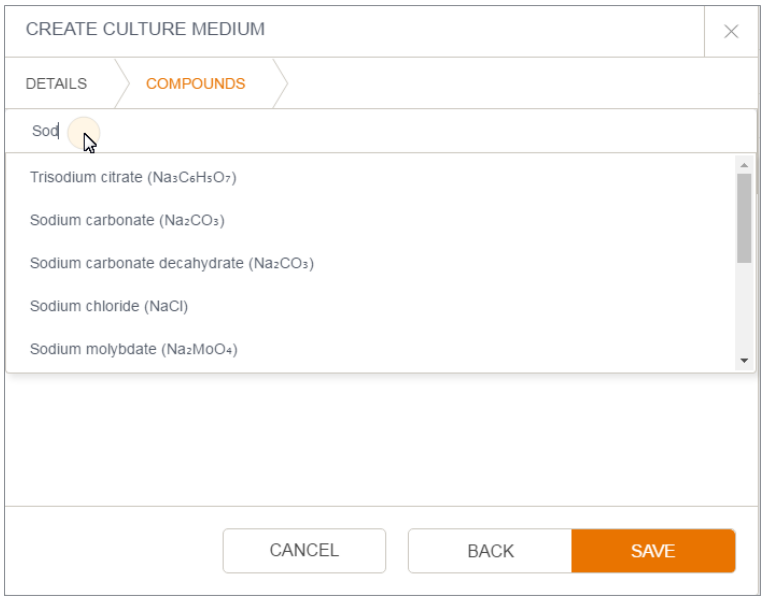
> Click the [NEXT] button to define the compounds of the newly-created culture medium.

> The predefined work flow continues with the compound list of the culture medium.



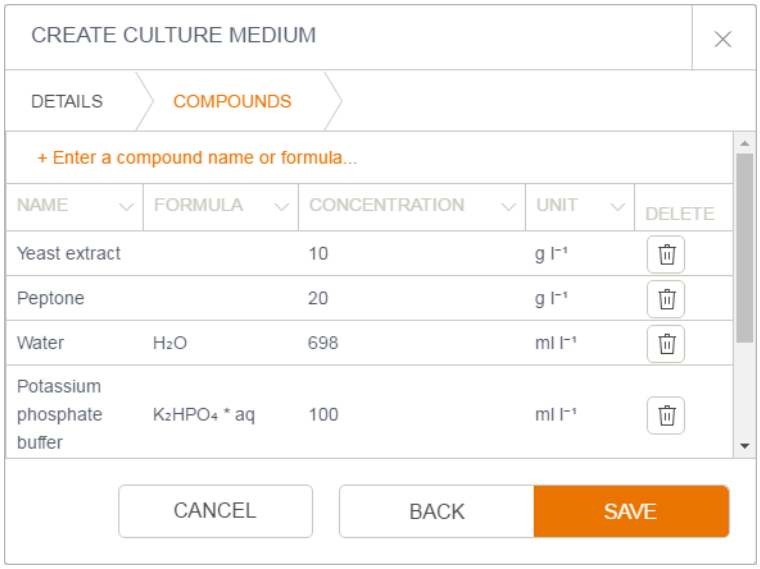
> Click into the *enter a compound name or formula* field in order to add a compound to your culture media.

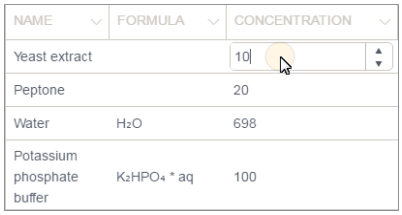
> As soon as you start to type a compound name or compound formula a selection of your stored compounds is proposed.

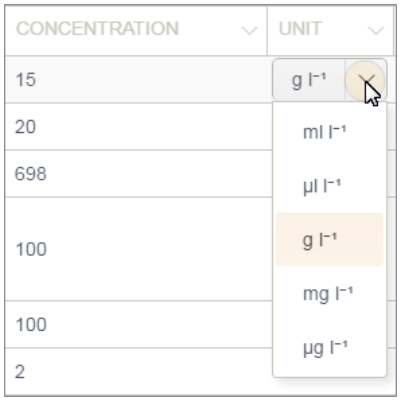


> Click on the chosen compound.

> The compound is added to your culture media compound list.







> Click into any concentration compound field in order to change the concentration of the compound.

> Click on any unit compound field in order to change the unit of the compound.

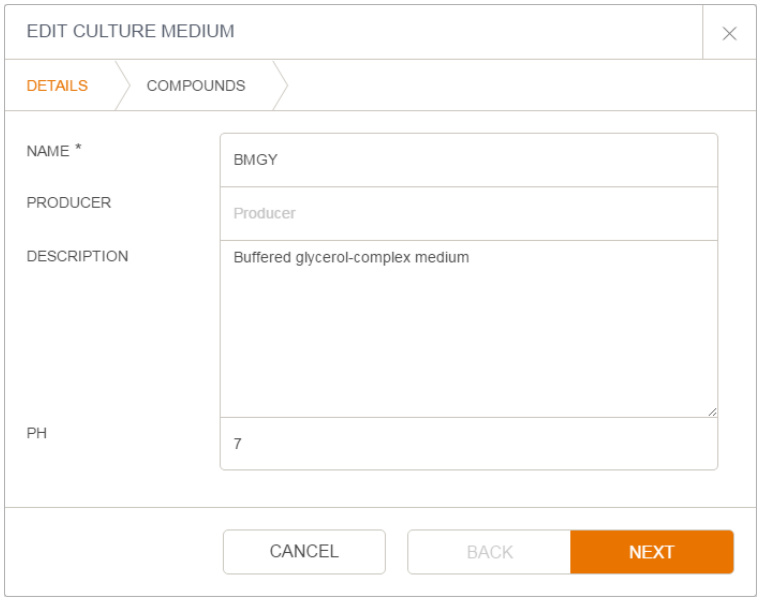
> Click the [SAVE] button at the bottom of the CREATE CULTURE MEDIUM pop-up screen.

> The new culture medium is added to the culture media library list.

6.4.2 Edit culture medium

> Click the icon on the right-hand side of a culture media entry in the culture media library list.

> The edit culture medium pop-up screen appears.



> Edit any information of the culture medium either in the details section or the compounds section.

> Click the [SAVE] button at the bottom of the EDIT CULTURE MEDIUM pop-up screen.

> The changed culture medium is saved and stored in the culture media library list.

6.4.3 Delete culture media

> Click the icon on the right-hand side of a culture medium entry in the culture media library list.

> Confirm the deletion of the selected culture medium.

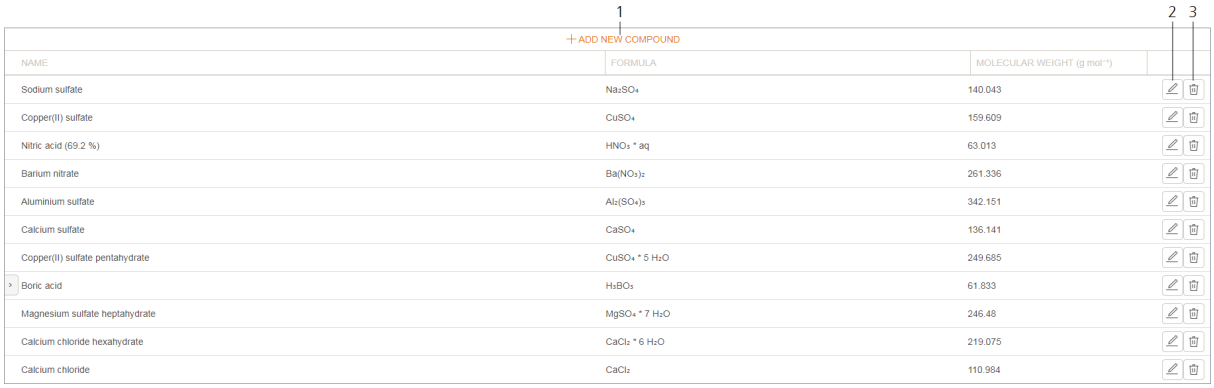
> The selected culture medium is deleted from the culture media library list.

6.5 Compounds

The compounds library lists all compounds that are available for the creation of culture media. eve already provides a comprehensive amount of standard culture media compounds However, in order to access the culture media compounds library, proceed as follows:

> Click the [COMPOUNDS] button on the left-hand side of the LIBRARIES menu.

> The compounds library list appears.

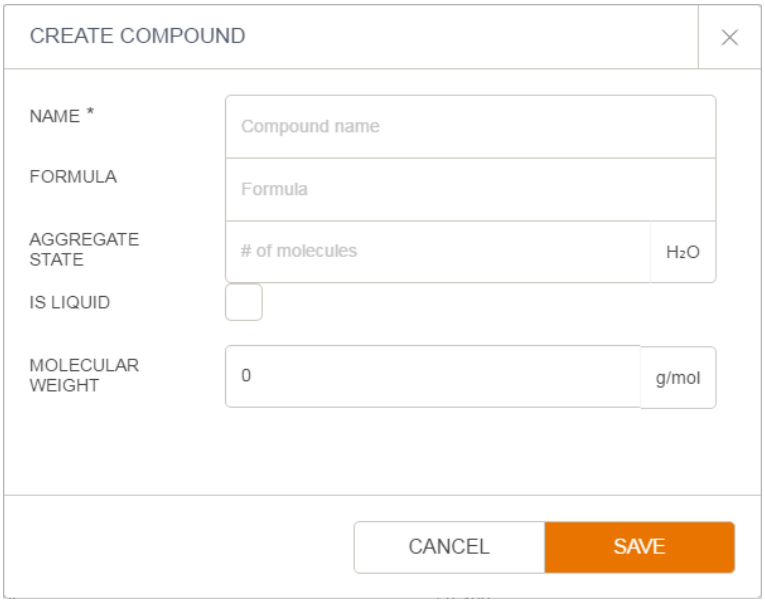


6.5.1 Add new compound

To add a new compound to the culture media compounds library, proceed as follows:

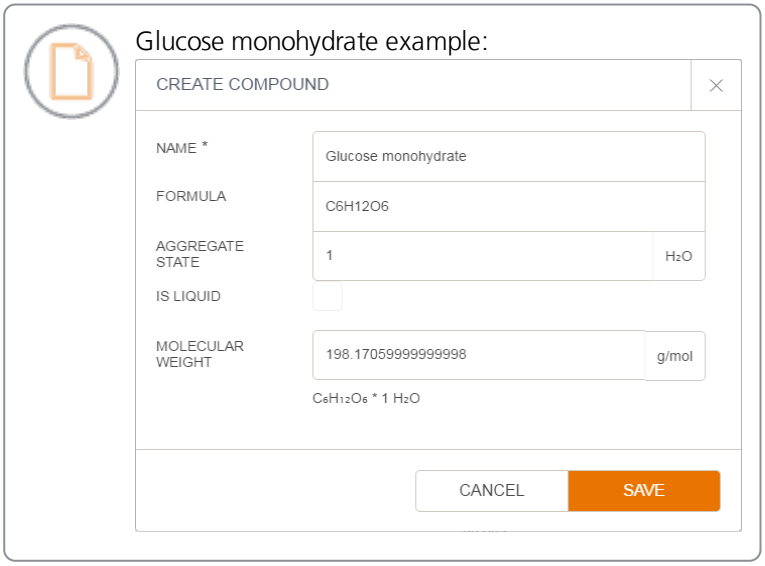
> Click the [ADD NEW COMPOUNDS] button at the top of the compounds library list.

> The create compound pop-up screen appears.



> Enter a name for the compound (mandatory).

> Enter additional information into the optional fields.



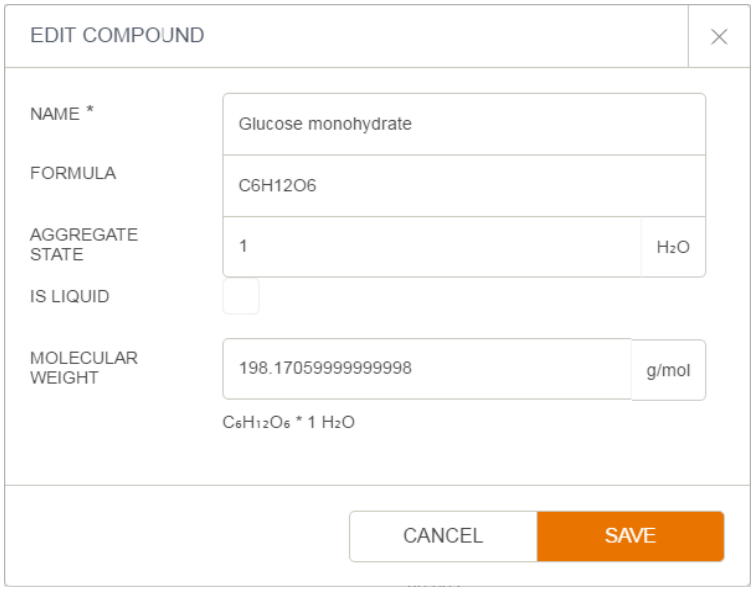
> Click the [SAVE] button at the bottom of the CREATE COMPOUND pop-up screen.

> The new compound is added to the compound library list.

6.5.2 Edit compound

> Click the icon on the right-hand side of a compound entry in the compound library list.

> The EDIT COMPOUND pop-up screen appears.



> Edit any information of the specific compound.

> Click the [SAVE] button at the bottom of the EDIT COMPOUND pop-up screen.

> The changed compound is saved and stored in the compound library list.

6.5.3 Delete compound

> Click the icon on the right-hand side of a compound entry in the compound library list.

> Confirm the deletion of the selected compound.

> The selected compound is deleted from the compound library list.

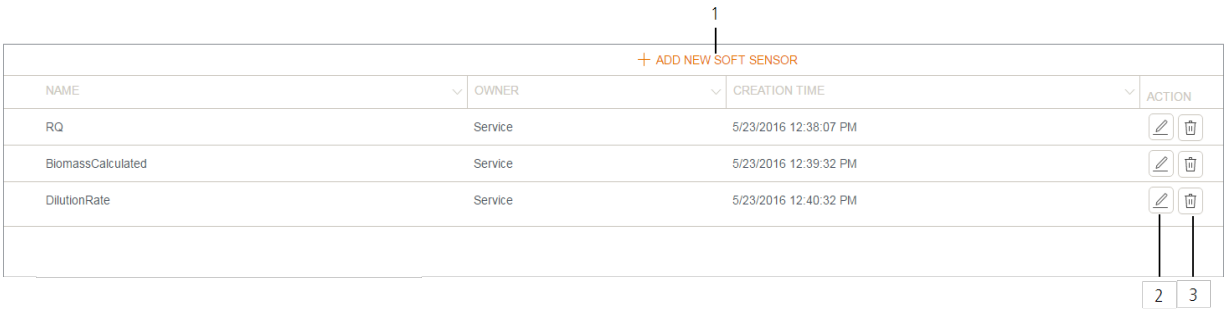
6.6 Soft-sensors

Soft-sensors are defined algorithms providing calculated values and information which cannot be easily obtained from an in-process sensor e.g. batch biomass prediction. In order to access library of soft-sensors proceed as follows:

SOFT-SENSORS

> Click the [SOFT-SENSORS] button on the left-hand side of the LIBRARIES menu.

> The soft-sensors library list appears.



Number	Function
1	Navigation button to access the next page
2	Add new soft-sensor to the library
3	Edit existing soft-sensor in the library
4	Delete soft-sensor from the library

6.6.1 Soft-sensor basics

The scripts are based on C# (C sharp) scripting language (CS-Script), which has a compiler built into every windows computer. Standard library classes and methods are used, where appropriate, along with specific methods added relating to the bioreactor parameters. A syntax checker provides help in creating usable scripts and notification of the successful saving of a script is always provided.

Access properties of any input parameter:

Name	Description
input1.Value	Current value of a parameter, read only
input1.Setpoint	Current value of a parameter, read only for inputs but writeable for output parameters
input1.MinimalValue	Minimal value of a parameter, read only
input1.MaximalValue	Maximal value of a parameter, read only

Access properties of any output parameter:

Name	Description
output1.Value	Current value of a parameter, read only

Existing process variables:

Name	Type	Description
process.ProcessTime	TimeSpan	Gets the elapsed time of the process.
process.TimeSinceInoculation	TimeSpan	Gets the elapsed time of the process since inoculation.
process.CurrentPhaseName	string	Gets the name of the current phase.
process.CurrentPhaseTime	TimeSpan	Gets the elapsed time of the current phase
process.IsInoculated	bool	Gets the value if the process has been inoculated.
process.IsStopped	bool	Gets the value if the process has been stopped.

Boolean and mathematical operators:

Operator	Description
&&	AND
|| ("pipe" character)	OR
!	NOT
+, -, /, *, <, >, >=, <=, =	Classical mathematical operators
==	Test equality
!=	Test inequality
++	Increment variable values by one
--	Decrement variable values by one
%	Modus or MOD
Math.exp	Exponential function
Math.Log	Natural log to base e
Math.Log10	Log to base 10 of a number
Math.Abs	Absolute value of a decimal or double precision number
Math.Sin	Sine of a number
Math.Cos	Cosine of a number
Math.Pow	Raises a number to a specific power
A full list is available at: https://msdn.microsoft.com/en-us/library/system.math_methods(v=vs.110).aspx	

Decisions and loops:

Name	Description

Simple IF (Then)	if(x Boolean y);
	{
	statement is executed if the conditions are met e.g. output = 30;
	}

Simple IF (Then) ELSE	if(x Boolean y);
	{
	statement is executed if the conditions are met e.g. output =30;
	}
	else
	{
	statement which is executed if the condition is false
	}

Examples

Monitoring a setpoint of a parameter:

```
// Assuming the setpoint of temperature has to be monitored:

// Input: temp
// Output: tempSP

tempSP.Value = temp.Setpoint;
```

Basic Respiratory quotient (RQ) calculation:

```
// Inputs: ExitO2, ExitCO2, AirFlow
// Outputs: RQ, OUR, CER

//Culture volume
var Wvol = 1.0;

// Specific rate
var specRate = AirFlow.Value / Wvol;

// Carbon Dioxide Evolution Rate
CER.Value = (ExitCO2.Value - 0.038) * specRate;

// Oxygen Uptake Rate
OUR.Value = (20.95 - ExitO2.Value) * specRate;

// RQ Value
RQ.Value = CER.Value / OUR.Value;
```

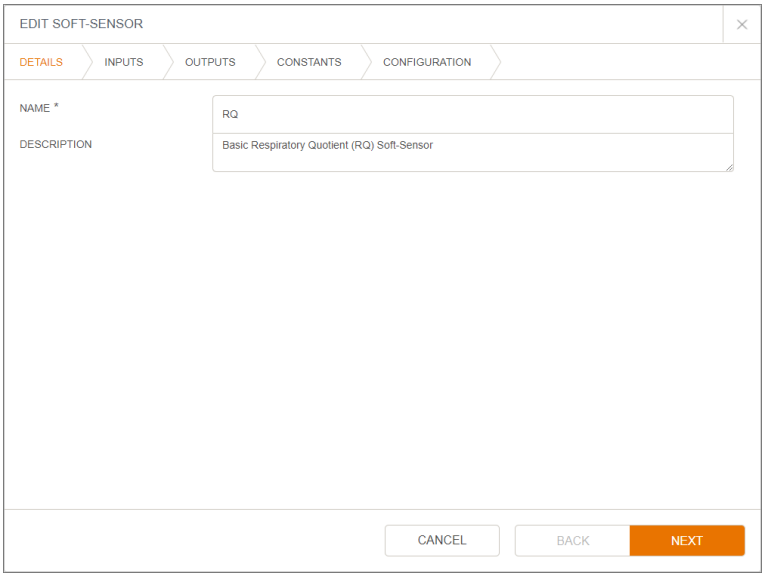
Fore a more comprehensive description about the scripting in eve®, please ask for the eve® scripting guide.

6.6.2 Add new soft-sensor

In order to add a new soft-sensor to the soft-sensor library proceed as follows:

> Click the [ADD NEW SOFT-SENSOR] button at the top of the soft-sensor library list.

> The create soft-sensor pop-up screen appears which has a pre-defined work flow to create a new soft-sensor and starts with the basic details of the soft-sensor.



> Enter a name for the soft-sensor (mandatory).

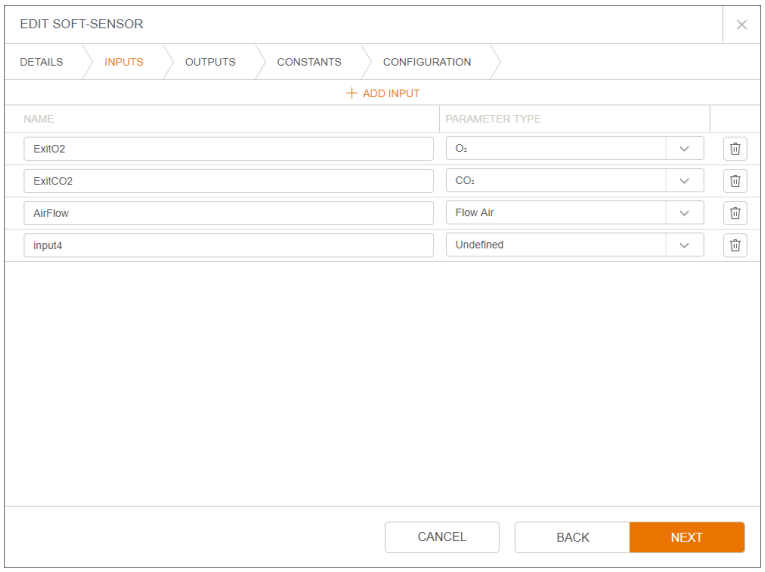
> Enter any description about the soft-sensor (optional).

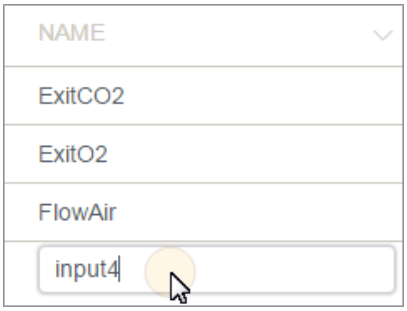
> Click the [NEXT] button in order to define the mandatory inputs of the soft-sensor.

> The predefined work flow continues with the input list.

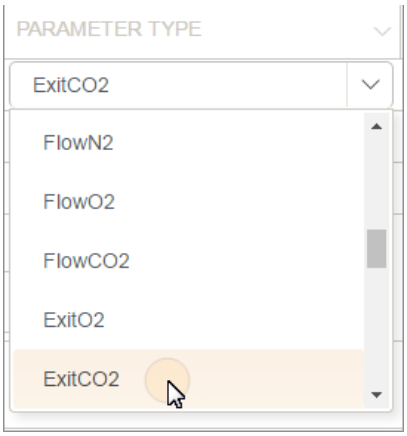
> Click the [ADD INPUT] button at the top of the input list.

> A new input is added to the input list.





> Click the input name field in order to change the name of a specific input.



> Click the parameter type field in order to change the parameter type of a specific input.

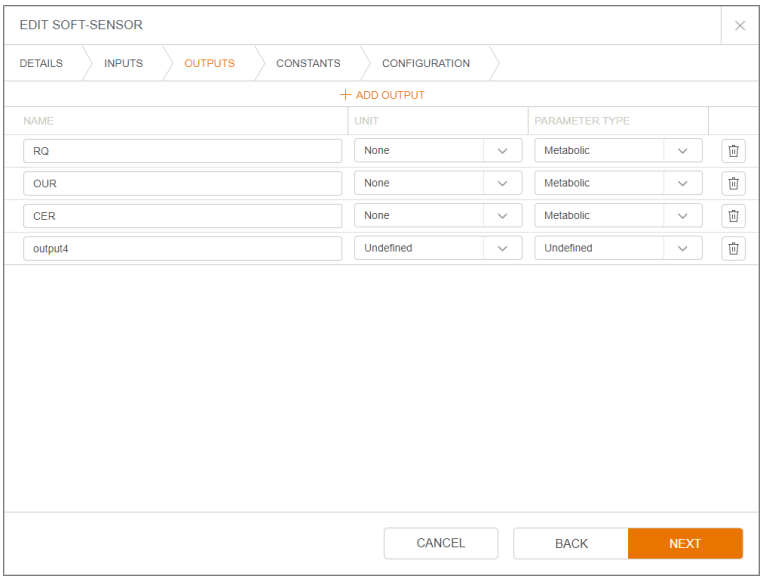
> The configured input appears in the input list.

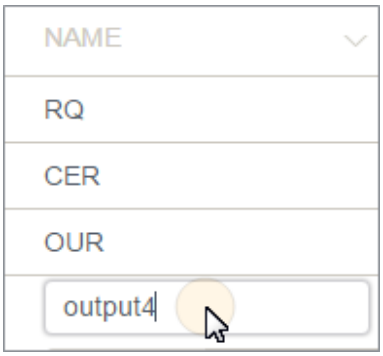
> Click the [NEXT] button in order to define the outputs of the soft-sensor.

> The predefined work flow continues with the output list.

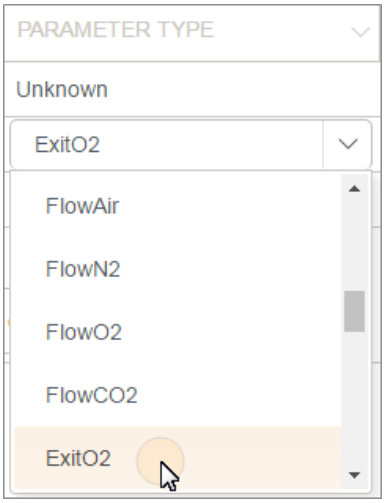
> Click the [ADD OUTPUT] button at the top of the output list.

> A new output is added to the output list.

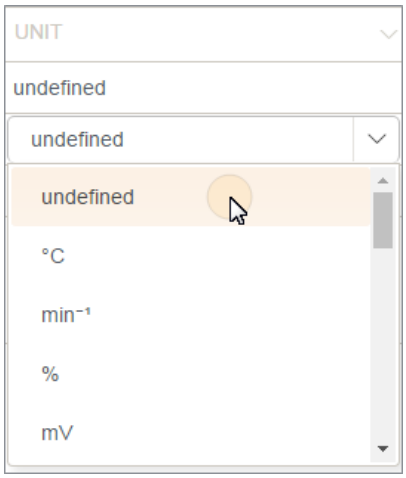




> Click the output name field in order to change the name of a specific output.



> Click the parameter type field in order to change the parameter type of a specific output.



> Click the unit field in order to change the unit of a specific output.

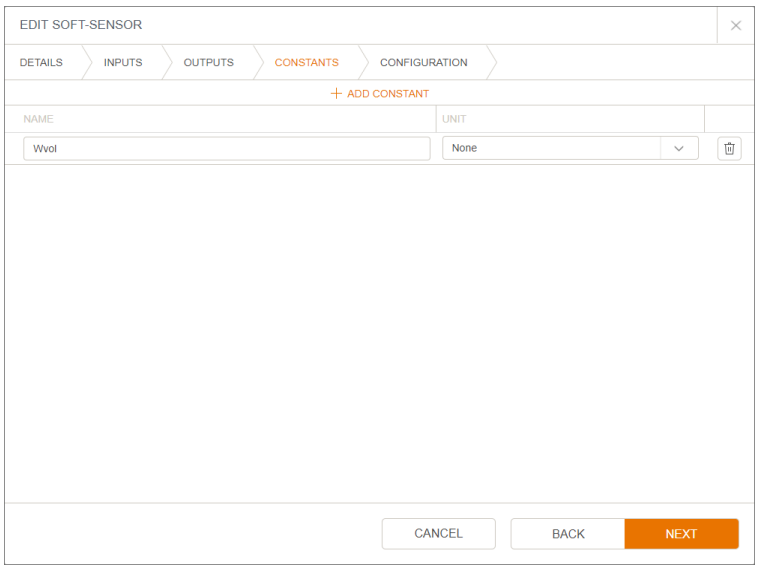
> The configured output appears in the output list.

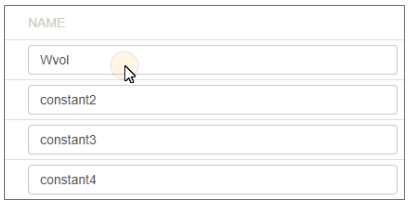
> Click the [NEXT] button in order to define the constants of the soft-sensor.

> The predefined work flow continues with the constants of the soft-sensor.

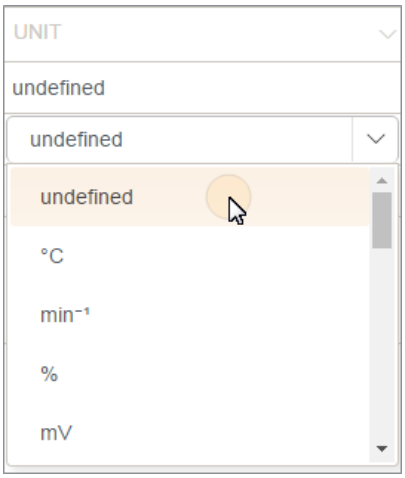
> Click the [ADD CONSTANT] button at the top of the constant list.

> A new constant is added to the constant list.





> Click the constant name field in order to change the name of a specific constant.



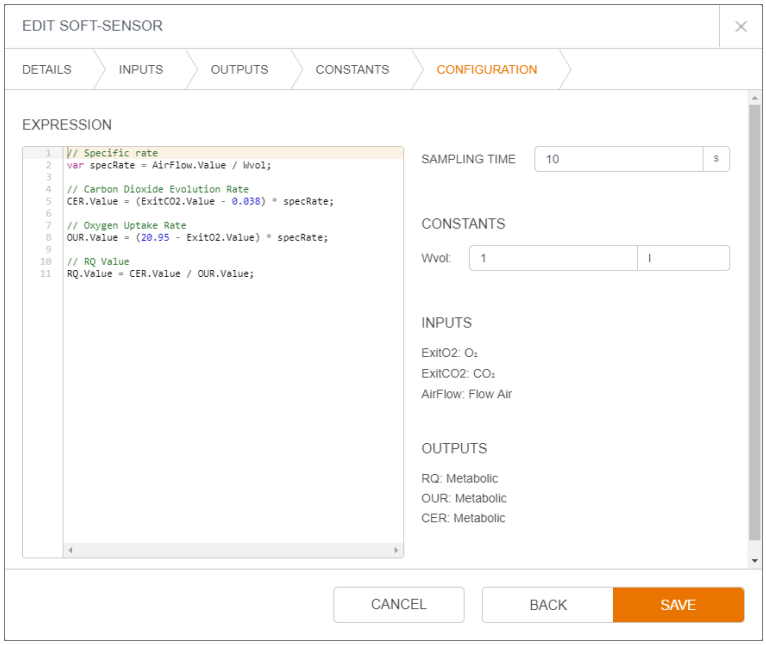
> Click the unit field in order to change the unit of a specific constant.

> Click the [NEXT] button in order to define the expression of the soft-sensor.

> The predefined work flow continues with the expression of the soft-sensor.

> Enter any script either directly into the box or copy/paste from a text file.

> Any errors will be noticed and a description plus location of the error will be given at the top of the script entry window. If no errors appear the [SAVE] button is activated.



> Define the sampling time (calculation time) of the soft-sensor.

> Define the values of the constants.

> Click the [SAVE] button at the bottom of the CREATE SOFT-SENSOR pop-up screen.

> The soft-sensor is added to the soft-sensor library list.

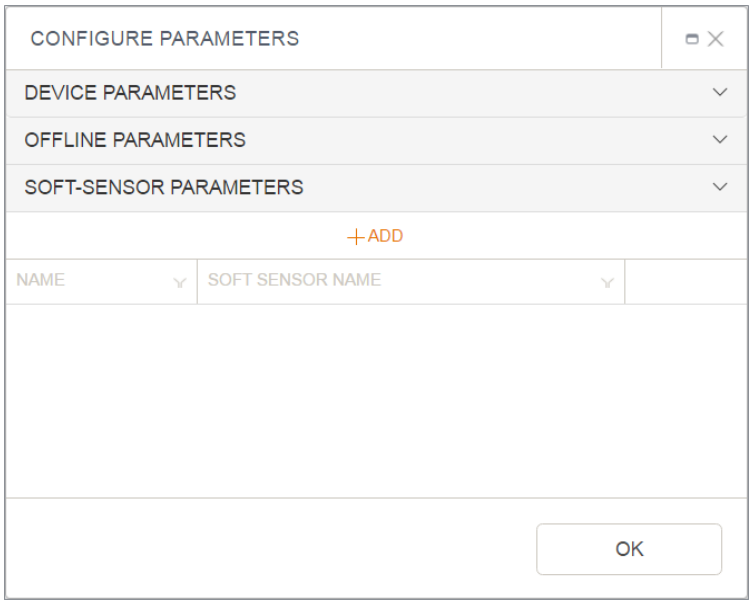
6.6.3 Apply soft-sensor

Soft-sensors can be applied to running and completed batch processes. To use a soft-sensors in running and completed batch processes, proceed as follows:

6.6.3.1 Running batch

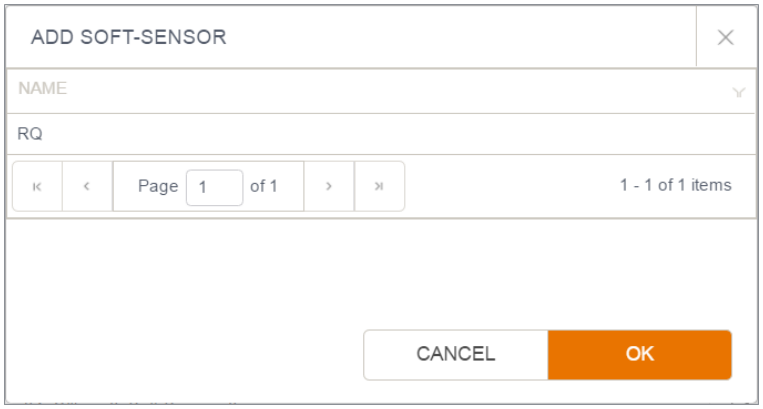
To select a soft-sensor for your batch proceed as follows:

> Click the [SOFT SENSOR PARAMETERS] button in the CONFIGURE PARAMETERS section.



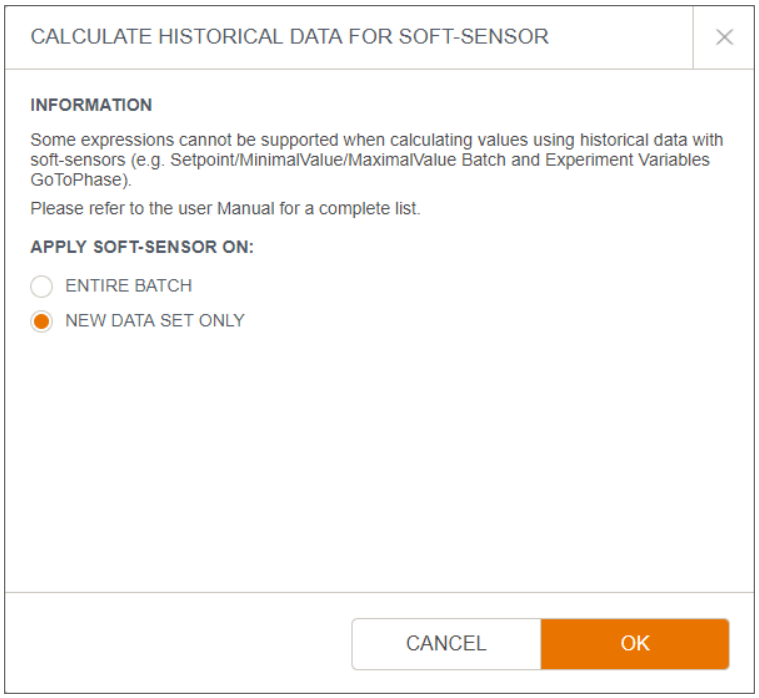
> Click the [ADD] button at the top of the soft-sensor parameters list.

> A new window ADD A SOFT-SENSOR appears.



> Click on the soft-sensor from your soft-sensor library.

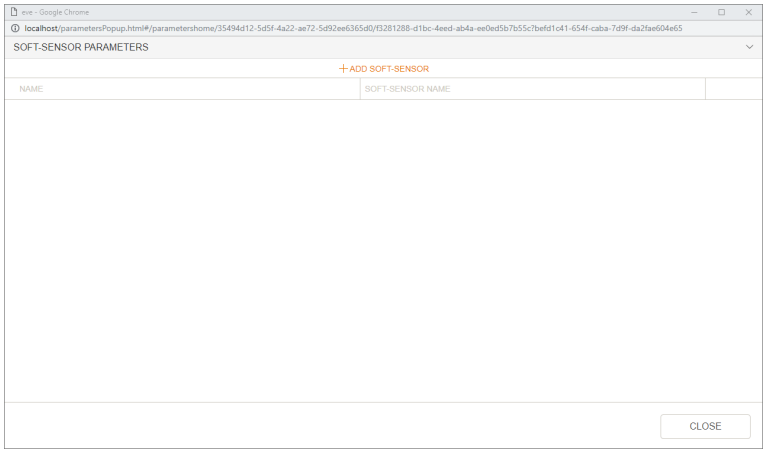
> Select which data should be used for the soft-sensor caluclation.



> Click the edit button to change the constant values if necessary.
> Click the [OK]button to save your selected soft-sensorparameter.
> The selected soft-sensors are displayed in the parameter list.

6.6.3.2 Completed batch

> Open chart view of the completed batch (see " Monitor a batch process" on page 74).
> The chart view of the batch appers.
> Click the [PARAMETERS] button at the bottom of the chart.
> The device parameter window appears.



> Click the [ADD SOFT-SENSOR] button at the top of the window.
> Select the soft-sensor from your soft-sensor library list.

> The calculated parameters from the soft-sensor can now be displayed in the chart view.

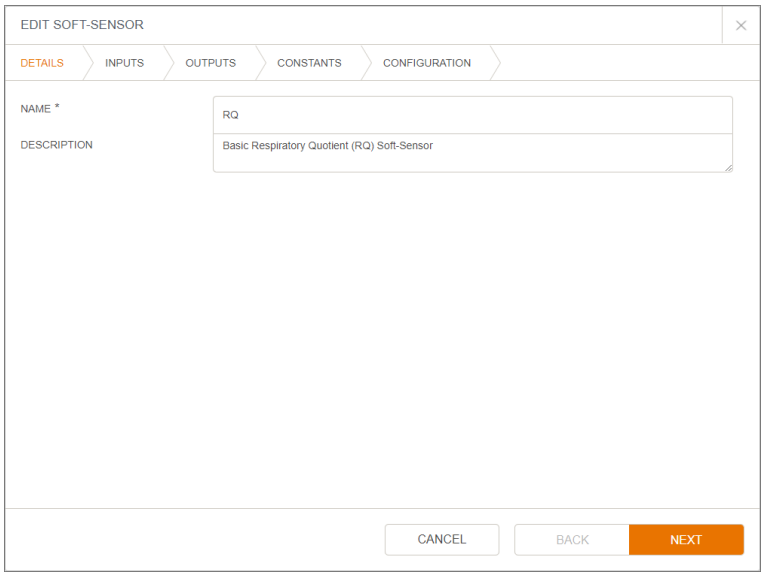
6.6.4 Edit a soft-sensor

Soft-sensors can be edited during the planing of a batch, in a batch or in the soft-sensor library itself.

Edit a soft-sensor in the library:

> Click the ✎ icon on the right-hand side of a soft-sensor entry in the soft-sensor library list.

> The edit soft-sensor pop-up screen appears.



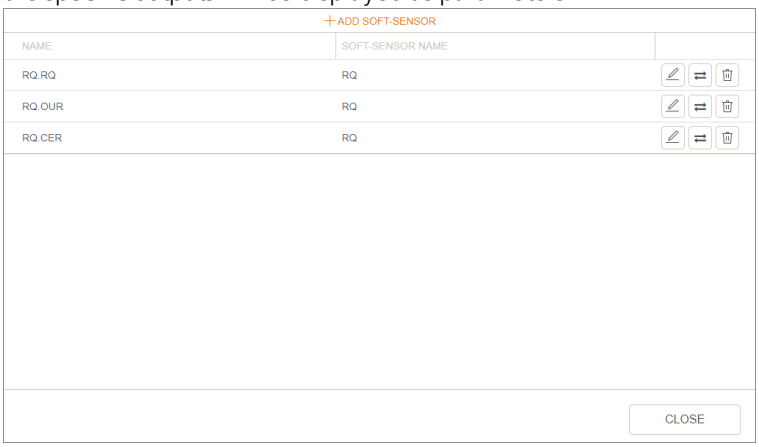
> Edit any information of the specific soft-sensor in one of the sections (details, input, outputs, constants or expression).

> Click the [SAVE] button at the bottom of the EDIT SOFT-SENSOR pop-up screen.

> The changed soft-sensor is saved and stored in the soft-sensor library list.

Edit a soft-sensor in a planned batch:

As soon as the soft-sensor is selected from the soft-sensor library list the specific outputs will be displayed as parameters:



> Click the icon on the right-hand side of a soft-sensor output.

> The EDIT SOFT-SENSOR pop-up screen appears where in the configuration tab the soft-sensor can be edited (e.g. constants or sampling time).

> Click the icon to redo the soft-senor input binding.

> The BIND SOFT-SENSOR INPUTS pop-up screen appears where inputs can be binded to specific parameters.

6.6.5 Delete a soft-sensor

> Click the icon on the right-hand side of a soft-sensor entry in the soft-sensor library list.

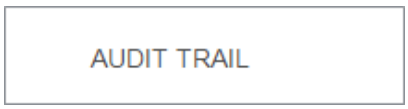
> Confirm the deletion of the selected soft-sensor.

> The selected soft-sensor is deleted from the soft-sensor library list.

If soft-sensors are applied on completed batches they can be deleted as well directly from the parameter list.

6.7 Audit trail

The audit trail logs every user management and batch related actions of the users. The audit trail cannot be turned off due to security reasons. In order to access the library of the audit trail proceed as follows:



> Click the [AUDIT TRAIL] button on the left-hand side of the LIBRARIES menu.

> The audit trail library appears.

EVENT TIME	USER	EVENT TYPE	ACTION	PROJECT	EXPERIMENT	BATCH	DEVICE	IP ADDRESS
1/16/2017 10:04:35 AM	Service	ParameterAlarmAcknowledged	Stirrer: 87 min⁻¹		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 10:04:22 AM	System: Multifors / D	ParameterAlarmInactive	Stirrer: 114.38459 min⁻¹ -> Within alarm range		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 10:04:03 AM	System: Multifors / D	ParameterAlarmOutOfRange	Stirrer: 87.058296 min⁻¹		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 10:03:49 AM	Service	SetpointChange	Stirrer: 500 min⁻¹ -> 100 min⁻¹		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 10:03:16 AM	Service	LogOn						127.0.0.1
1/16/2017 10:03:09 AM	BELA	LogOff						127.0.0.1
1/16/2017 9:53:51 AM	BELA	UserDeactivated	Eric has been deactivated					127.0.0.1
1/16/2017 9:53:28 AM	BELA	SetpointChange	pH: 7 -> 6		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:52:38 AM	BELA	UpperAlarmChange	Stirrer: 1250 min⁻¹ -> 1000 min⁻¹		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:13 AM	System: eve ®	SetpointChange	pH: 8 -> 7		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:12 AM	System: eve ®	SetpointChange	Stirrer: 729 min⁻¹ -> 500 min⁻¹		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:12 AM	System: eve ®	SetpointChange	Temp: 35 °C -> 30 °C		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:12 AM	System: eve ®	FunctionStop	Batch / pH / Custom		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:12 AM	System: eve ®	FunctionStop	Batch / Stirrer / Custom		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1
1/16/2017 9:51:12 AM	System: eve ®	FunctionStop	Batch / Temp / Custom		E_COLI_CULTUR...	E_COLI_CULTUR...	Multifors / D	127.0.0.1

The audit trail comprises entries in the following categories:

Name	Description
EVENT TIME	Timestamp of the logged action
USER	The user ID of the (logged) user responsible for this action
EVENT TYPE	What kind of action of the user has executed
ACTION	Detailed description of the action (if required)
PROJECT	Project associated to the action
EXPERIMENT	Experiment associated to the action
BATCH	Batch associated to the action
DEVICE	Device associated to the action
IP ADDRESS	The address of the device, the action was executed from (see "Global" on page 173)

In the following list, all types of ACTIONS or EVENT TYPES allowed in eve® are listed. For a more comprehensive description of each audit trail entry, see the eve® functional specification document.

– AlarmActivated
– AlarmDeactivated
– AlarmRangeChange
– AlarmyTypeSwitch
– BackupCreated
– BasicSetupMetadataCreated
– BasicSetupMetadataDeleted
– BatchArchived
– BatchCreated
– BatchDeleted
– BatchEmailAlarmSubscribed
– BatchEmailAlarmUnsubscribed
– BatchUnarchived
– CommuncationLost
– CommunicationRestored
– ControlActivated
– ControlDeactivated
– CultureMediaMetadataCreated
– CultureMediaMetadataDeleted
– DefaultBatchReportSettingsEdited
– DeviceAdded
– DeviceAlarmAcknowledged
– DeviceNameChanged
– DeviceRemoved
– EmailServerActivated
– EmailServerChanged
– EmailServerDeactivated
– FunctionChanged
– FunctionCreate
– FunctionDelete
– FunctionStart
– FunctionStop
– Inoculate
– InstallerBackupDeleted
– LogOff
– LogOn
– LogOnFailed

– LowerAlarmChange
– LowerAlarmRangeChange
– MultiExperimentCreated
– MultiExperimentDeleted
– OfflineParameterCreated
– OfflineParameterValueConfirmed
– OfflineParameterValueSubmitted
– OfflineSpampleTaken
– OrganismMetadataCreated
– OrganismMetadataDeleted
– ParameterAlarmAcknowledged
– ParameterAlarmInactive
– ParamererAlarmOutOfRange
– ParameterNameChanged
– PasswordChanged
– PhaseSkipped
– RecipeCreated
– RecipeDeleted
– RecipeExported
– RecipeImported
– RefreshRateChanged
– ReportGenerated
– RestApiActivated
– RestApiDeactivated
– RestoreFromBackup
– SetpointChange
– SettingsChaged
– SoftSensorAdded
– SoftSensorAddedInRunningBatch
– SoftSensorBindingChanged
– SoftSensorChanged
– SoftSensorRemoved
– Start
– Stop
– UpperAlarmChange
– UpperAlarmRangeChange
– UserActivated
– UserDeactivated
– UserEmailAlarmNotificationActivated
– UserEmailAlarmNotificationDeactivated

– UserEmailChanged

– UserRoleChanged

6.7.1 Export

All audit trail entries can be exported. To export the audit trail entries proceed as follows:

EXPORT

> Click the [EXPORT] button at the right bottom corner of the page.

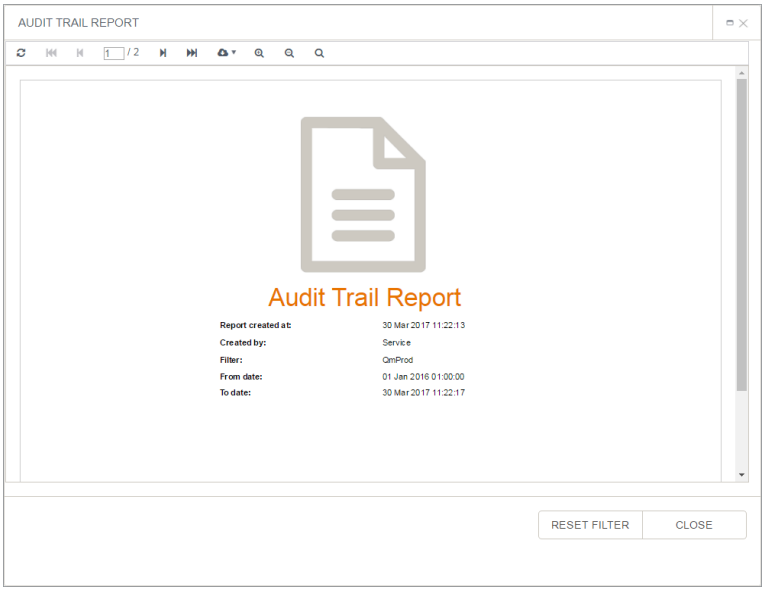
> The AUDIT TRAIL REPORT pop-up screen appears.

In the AUDIT TRAIL REPORT audit trail entries from a specific time period and/or a specific person, device, project etc. can be selected (filtered).

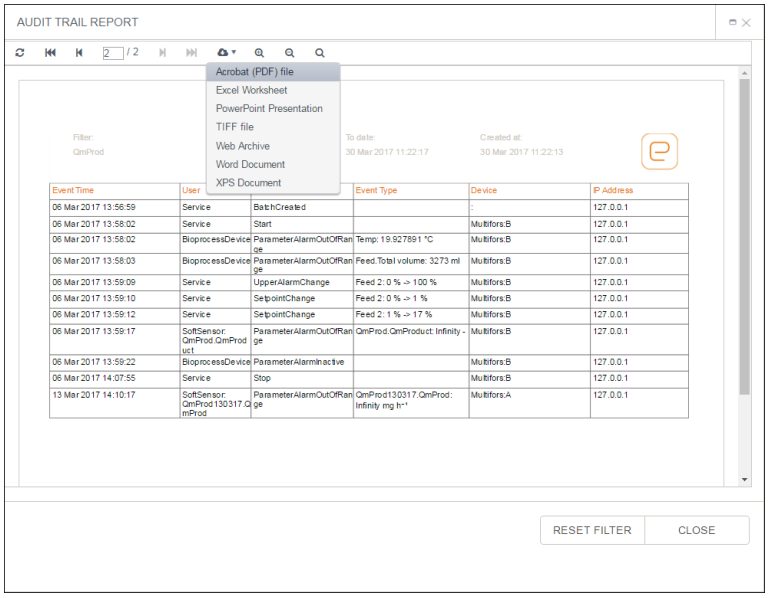
The filter can be set to include only audit trail entries containing a specific combination of signs or words (upper and lower case sensitive; syntax symbols used: + – AND operation, |– OR operation, - – negates a single token, " – wraps a number of tokens to signify a phrase for searching, * at the end of a term – prefix query).

> Click the [PREVIEW]button.

> The PREVIEW screen appears.



> Click the download icon in order to download and save the report of the selected audit trail entries.



> Select the appropriate file format (e.g. pdf).

> The report is saved and downloaded and can be open with any program which can read pdf files.

7 Resources

The RESOURCESmenu covers the binding of equipment and devices, the creation of projects and user management. The following three sub-menus are available:

– Equipment (see "Equipment" below)
– Projects (see "Projects" on page 162)
– User administration (see "User administration" on page 164)

In order to manage the resources proceed as follows:

> Click the [RESOURCES] button on the left-hand side of the screen.
> The sub-menus of RESOURCES appears.

7.1 Equipment

eve the bioprocess platform software embraces incubator shakers and bioreactors of all sizes and types, and lets you connect and manage your equipments in a convenient way.

You can access the overview of the connected equipment as fallows:

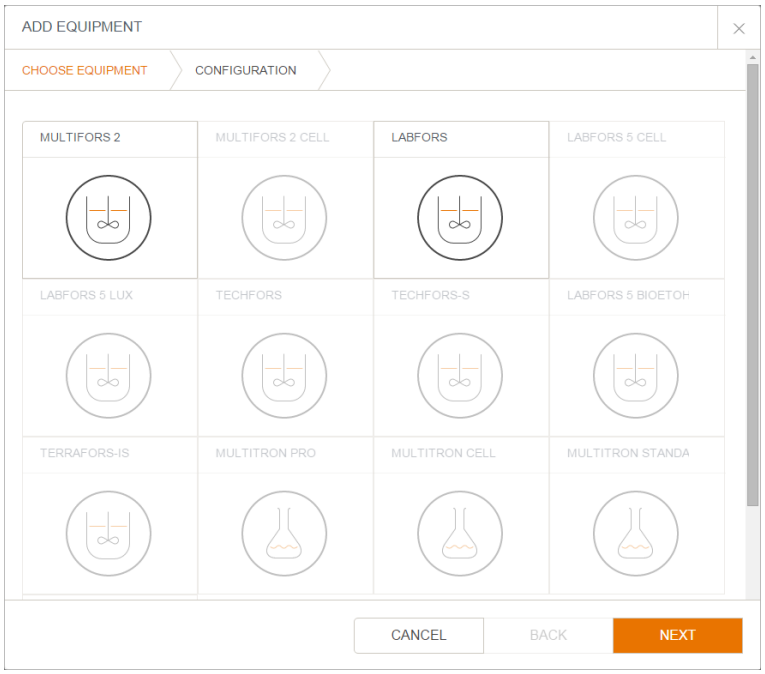
> Click the [EQUIPMENT] button on the left-hand side of the RESOURCES menu.
> The overview page of the connected equipment appears.

If you connect an item of equipment to eve the first time, the equipment overview is the landing page as soon as you want to start a batch process.

7.1.1 Add new equipment

New equipment or upgrades can be added easily by the [ADD NEW EQUIPMENT] button on the EQUIPMENT OVERVIEW page.

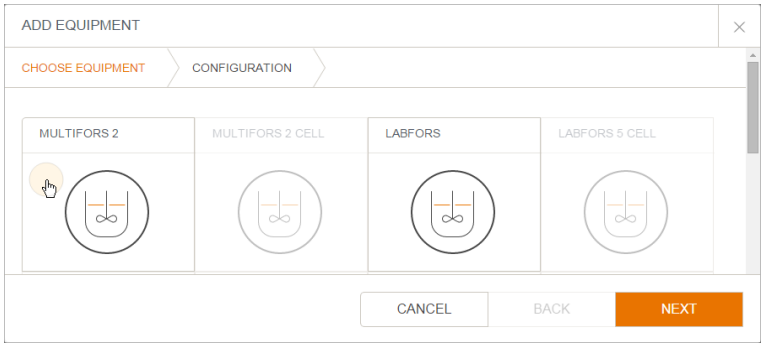
> Click the [ADD NEW EQUIPMENT] button on the top of the page.
> The ADD EQUIPMENT pop-up screen appears where the selection of all different kinds of bioreactors and shakers is possible.



7.1.1.1 Select equipment

To select a bioreactor or shaker simply click on one of the corresponding icons which appear in the ADD EQUIPMENT pop-up screen.

> Click on the icon of your corresponding equipment.



> You will be forwarded automatically to the CONFIGURATION step of the ADD EQUIPMENT pop-up screen.

7.1.1.2 Configure Equipment

The equipment configuration needs only three pieces of information for a complete connection of all devices:

– Name of the equipment
– IP Address
– Port

In order to connect the equipment proceed as follows:

> Enter any name for the equipment.

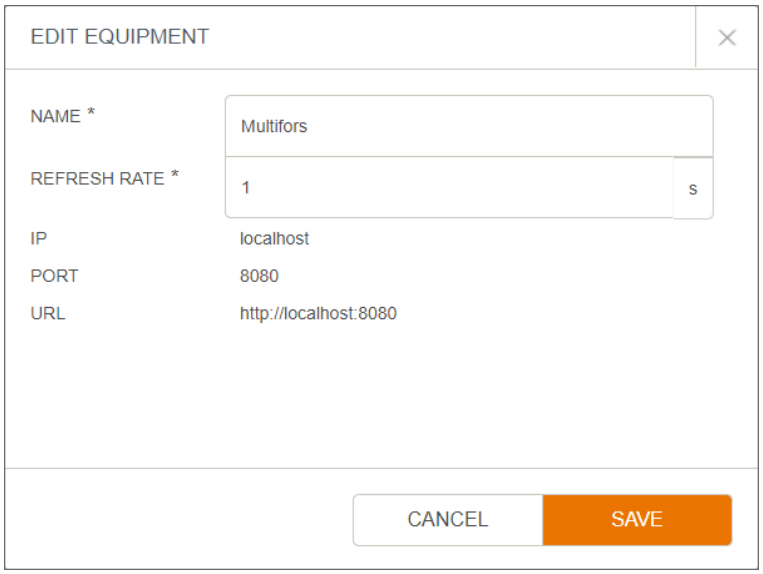
> Enter the IP address of the specific equipment.
> Enter the corresponding port (usual 8080).
> Click the [SAVE] button at the bottom of the ADD EQUIPMENT pop-up screen.
> The new equipment is added to the EQUIPMENT OVERVIEW.

The standard configuration for any INFORS HT equipment communicates via port 8080.

7.1.1.3 Edit equipment

A connected equipment can be renamed and/or the refresh rate can be changed. To rename the equipment and/or change the refresh rate, proceed as follows:

> Click the settings icon on the right hand-side of the equipment name.
> The EDIT EQUIPMENT pop-up screen appears.



> The name and the refresh rate of the entire equipment can be changed.

> Click the [SAVE] button at the bottom of the EDIT EQUIPMENT pop-up screen.

By changing the refresh rate the entire communication with the equipment is configured.

7.1.2 Bind device to existing equipment

External equipment such as balances, pumps or any other device (e.g. HPLC, mass spectrometer etc.) can be linked to an existing equipment (e.g. bioreactor).

To add an external device/equipment eve provides different drivers for that, namely:

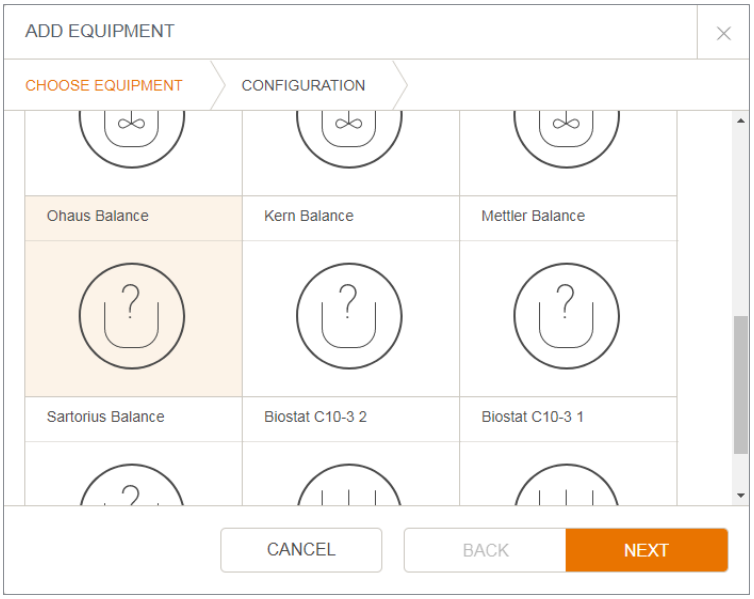
– Balances (Ohaus, Mettler Toledo, Kern, Sartorius)

– OPC (XML-DA and DA)

After successful installation of the driver the device can be added to the eve equipment list (see "Add new equipment" on page 149). To bind an external device/equipment to an existing one proceed as follows:

> Click the [ADD NEW EQUIPMENT] button on the top of the page.

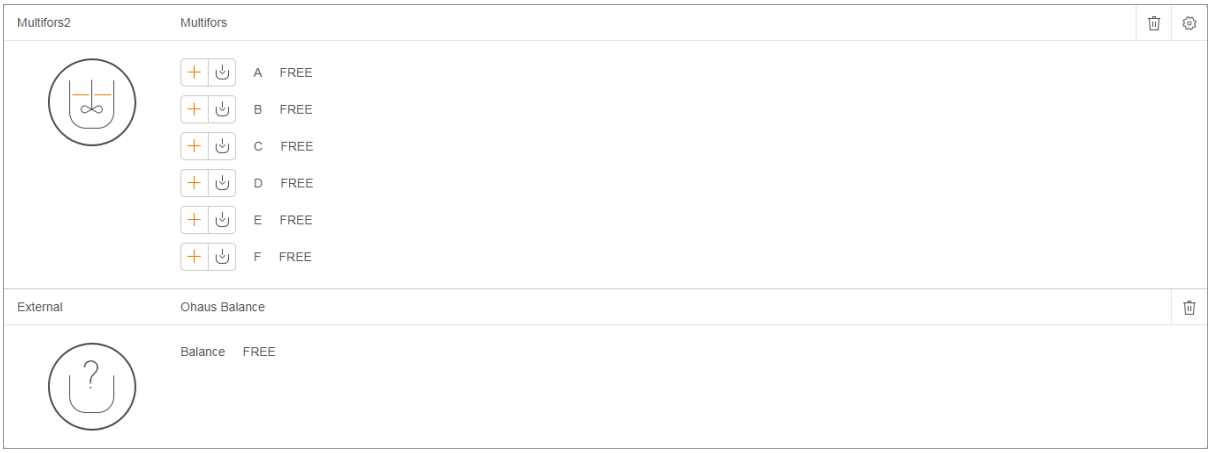
> The ADD EQUIPMENT pop-up screen appears where the selection of all the equipment is possible.

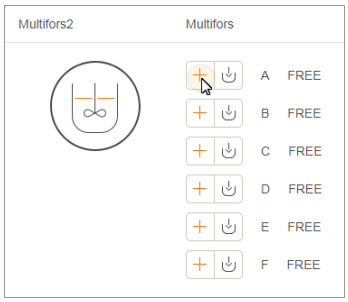


> Select the external device/equipment (e.g. Ohaus Balance).

> Enter the IP address of the specific equipment (see "Configure Equipment" on page 1).

> The external device appears in the equipment list.

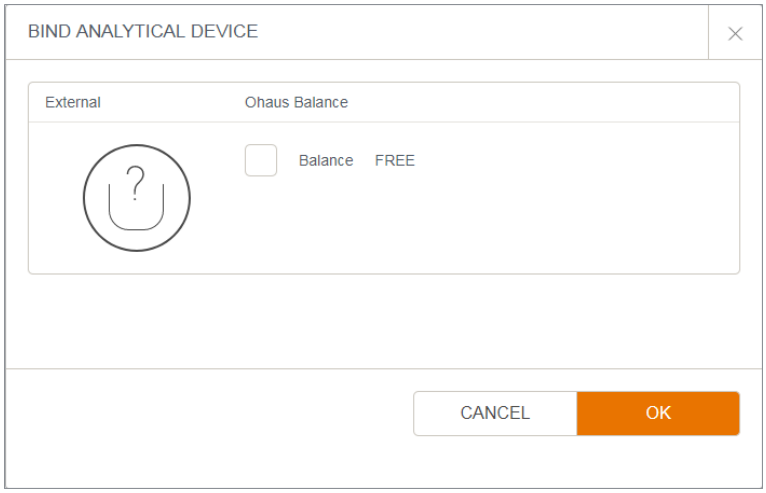




> Click the plus icon of any bioreactor vessel in order to open the bind analytical device page.

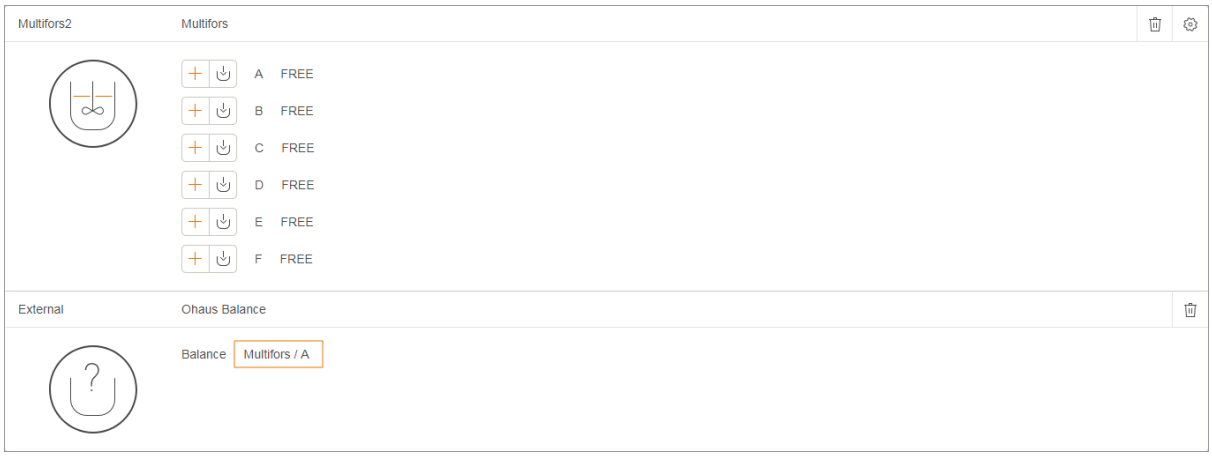
> The bind analytical device page appers.

> The bind analytical device page appers.



> Select the external device/equipment by clicking the checkbox.

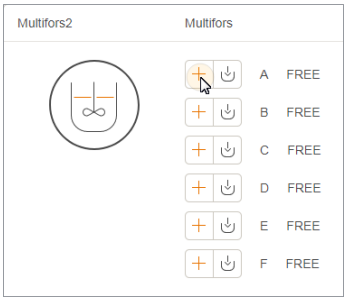
> Click the [OK] button to save the configuration.



> The selected external device/equipment is binded to the specific bioreactor vessel. This linkage is displayed next to the type of the external device.

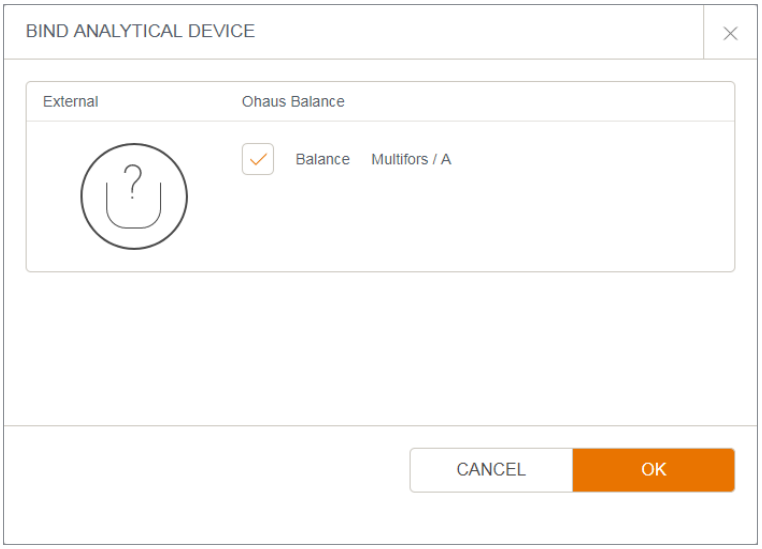
7.1.3 Delete device from existing equipment

To delete a linkage of an external device from an equipment proceed as follows:



> Click the plus icon of the bioreactor vessel in order to open the bind analytical device page.

> The bind analytical device page appears.

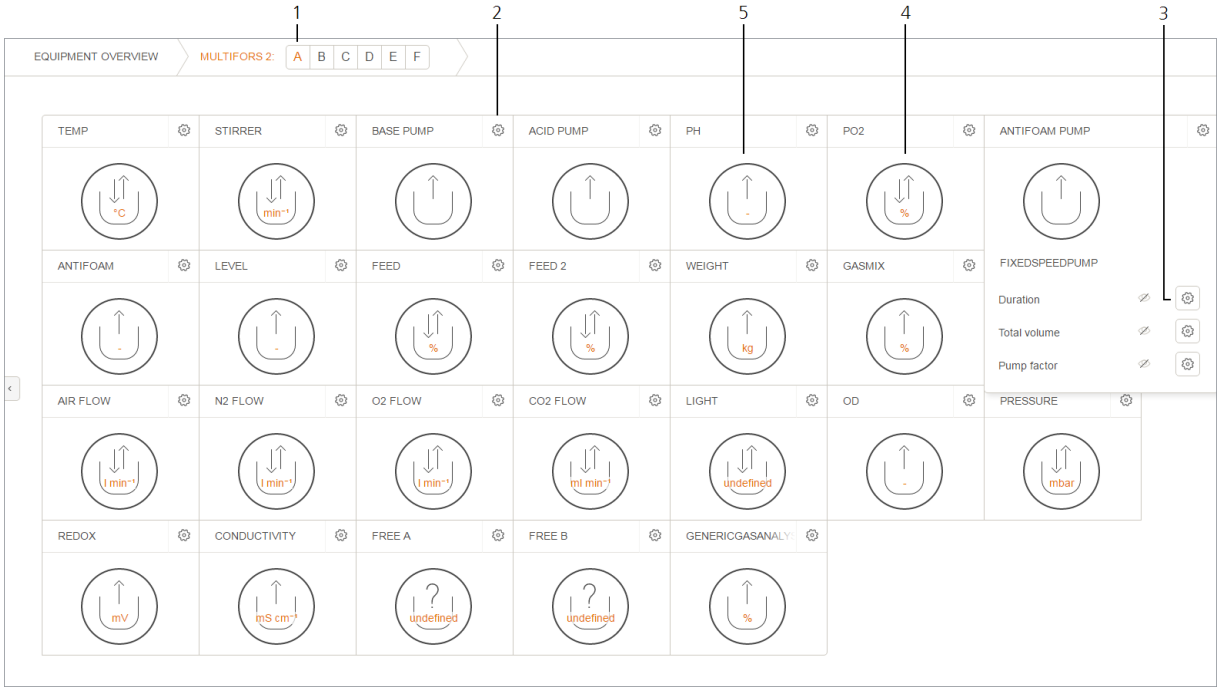


7.1.4 Edit device

In order to edit the characteristics of a device, proceed as follows:

> Click directly on the device icon of the equipment.

> The overview screen of the devices is displayed.



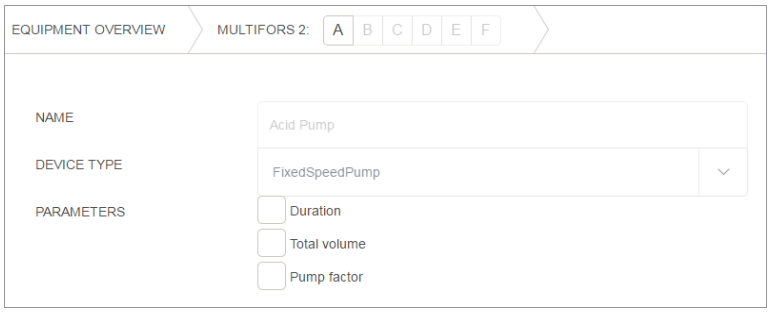
Number	Function
1	Device list of the specific vessel
2	Edit device parameter appearance
3	Edit device parameter settings
4	Sensor device
5	Actor device

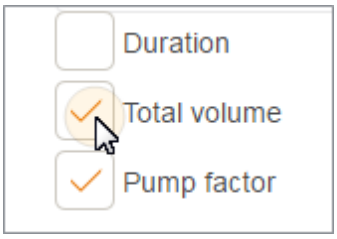
7.1.4.1 Additional parameter information

Some device parameters (e.g. pumps) can have several parameter information. In order to display or hide the additional parameters, proceed as follows:

> Click the ⚙ icon at the top of a device.

> The device parameter appearance screen appears.

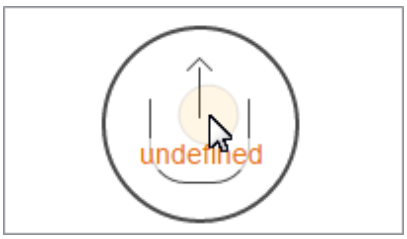




> Click on the parameters (check boxes) which should appear for the specific device.

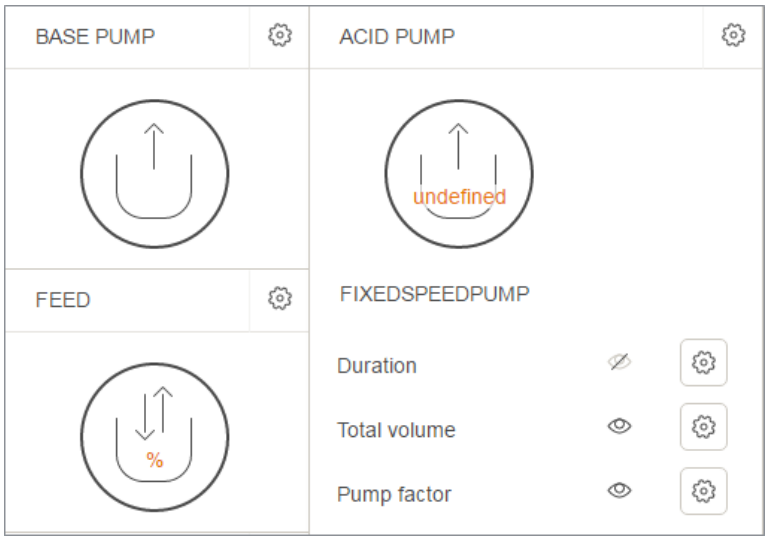
> Click the [SAVE] button at the bottom of the screen.

> The overview screen of the devices is displayed.



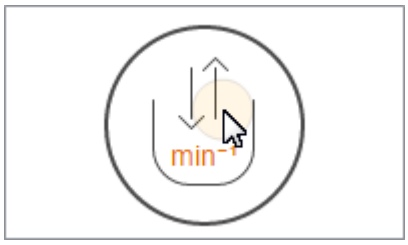
> Click directly on the icon of the changed device in order to see the parameter appearance.

> The corresponding device parameters appear in hidden or visible mode.



7.1.4.2 Change device parameter settings

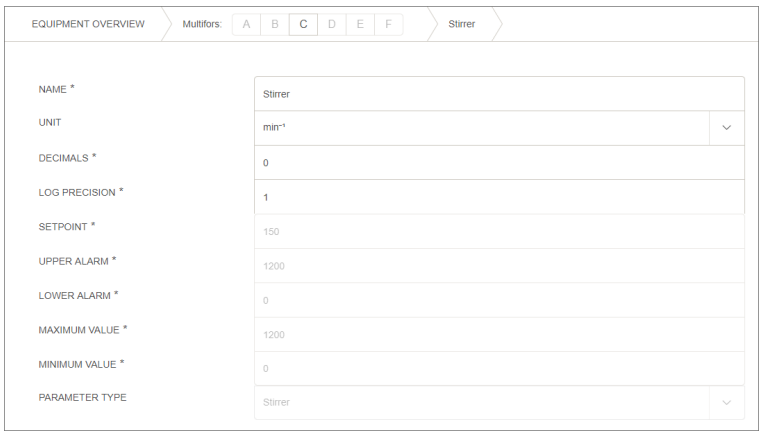
In the device parameter settings the name, unit, decimals and the log precision can be configured. To change the settings of a device parameter, proceed as follows:



> Click directly on the icon of the specific device.

> Click the ⚙ icon next to the specific device parameter.

> The specific device parameter settings screen appears.



> To change any settings of the specific device parameter enter a value into the field and click the [SAVE] button at the bottom of the screen.

> The new settings are saved to this specific device parameter on the specific equipment vessel.

The option decimals defines how many decimals are displayed of the specific parameter.

Log precision:

The log precision defines the number of decimals which are saved into the database for the configured parameter. The system writes a new value into the database as soon as a value is within the specified decimals.

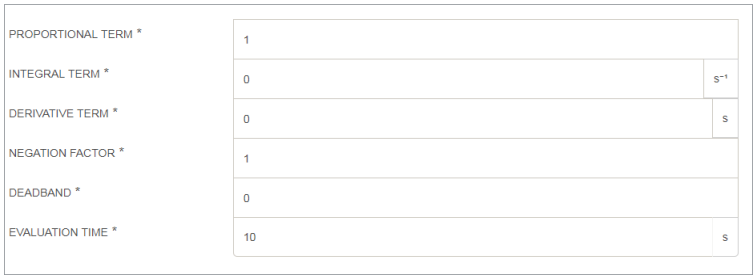
> The number of decimals is by default 0 for each parameter. The entered value for the decimals must be between 0 and 8.

PID settings:

PID controllers (Proportional Integral Derivative controller) are used for some of the parameters. The PID function is based on a generic fomrula and where the individual terms can be described as:

– P = proportional factor, proportional response to an error, used to reach a setpoint. The bigger the value, the sharper the control.
– I = integral factor, integration of the error in 1/second. A typical integral factor is < 0.05.
– D = differential quotient, derviative of the error, set in seconds (mostly to 0).

PID settings can be accessed in the device parameter settings and in custom functions (see eve scripting guide).



term	description
P (P_{Term})	Proportional factor: The greater the discrepancy between the set-point value and the actual value the greater the controller output.
I (I_{Term}, s^{-1})	The integral factor aggregates all errors over the time. If the setpoint is not achieved using the proportional factor, the integral factor adjusts the output successively until the setpoint value is achieved. An integral factor set too high will lead to oscillation of the control loop.
D (D_{Term}, s)	The differential quotient calculates the change in the actual value over the time and counteracts this change to limit any overshoot.
Negative Factor	The negative factor can be used to add weighting to two-sided control (+100 to -100 %) (e.g. heavy acid, light alkali). In the process 1 is the balance and 0.5 or 2 equate to the half or double the controller output accordingly. Example: Nitrogen influences the pO 2 value less

	than oxygen, thus a negative factor of 2 can compensate for the reaction of the controller.
Deadband	If a dead band is entered, no control is implemented within this value at either side of the setpoint value (symmetrically, + / -). I.e. the controller output is = 0. The dead band is used for pH control.
I Limit (Integ. Limit, %)	The integral influence is used to ensure that the integral factor cannot increase over an indefinite period. This limits erroneous accumulation. The integral influence is set between 0 and 100 % of the controller output.
Evaluation Time	The evaluation time determines the intervals in seconds at which the PID value is recalculated. The controller speed is defined this way. A scanning time of 10 seconds is a good average value.

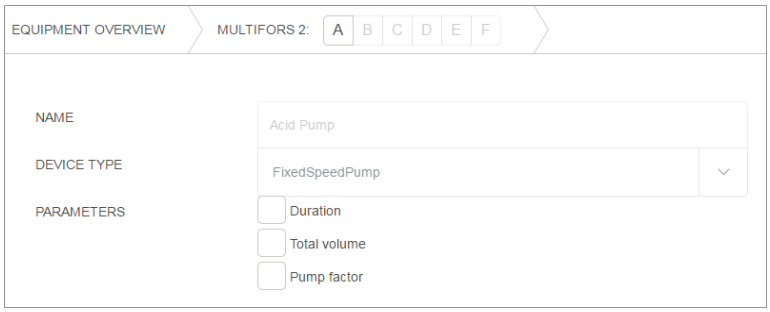
Inappropriate changes to the PID settings may have a negative effect on the batch or the device. Only change the PID settings, if you are fully aware of the consequences or after consulting the manufacturer.

7.1.4.3 Configure unknown device parameter

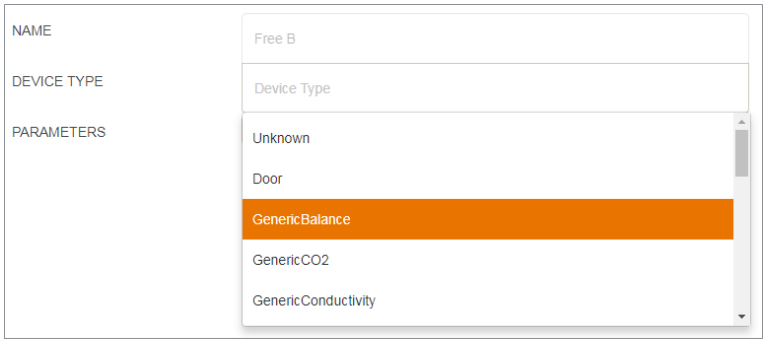
Some device parameters are not recognized instantly and marked with a question mark. Such parameters have to be configured in order to define the specific behaviour (i.e. actor/sensor, units, default setpoints etc.).

> Click the ⚙ icon next to the specific device parameter.

> The device parameter appearance screen appears.



> Select the device type from the dropdown list (e.g. GenericBalance for any balance).



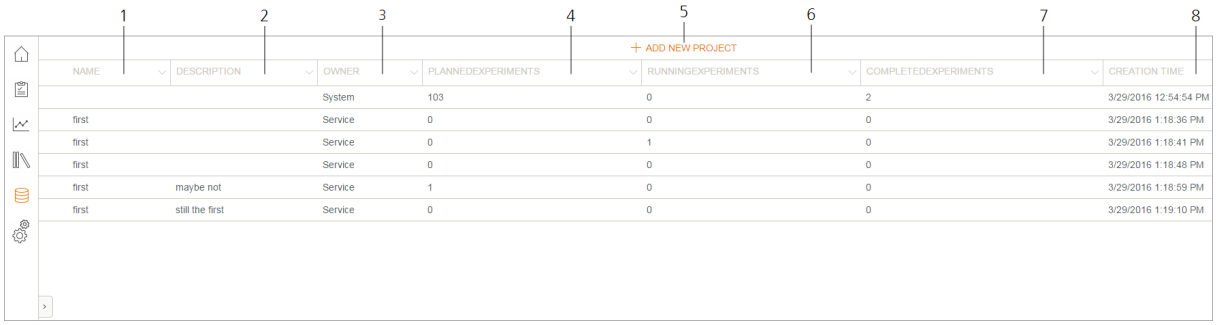
> The settings of the unknown parameter will be changed according to the selected device type. If any specific settings need to be configured (e.g. unit change, log precision rate etc.) please follow the steps above (see "Change device parameter settings" on page 158)

7.2 Projects

Projects are the top level of the experiment structure. A project can consist of several experiments with several batches.

> Click the [PROJECT] button on the left-hand side of the RESOURCES menu.

> The PROJECT screen appears.

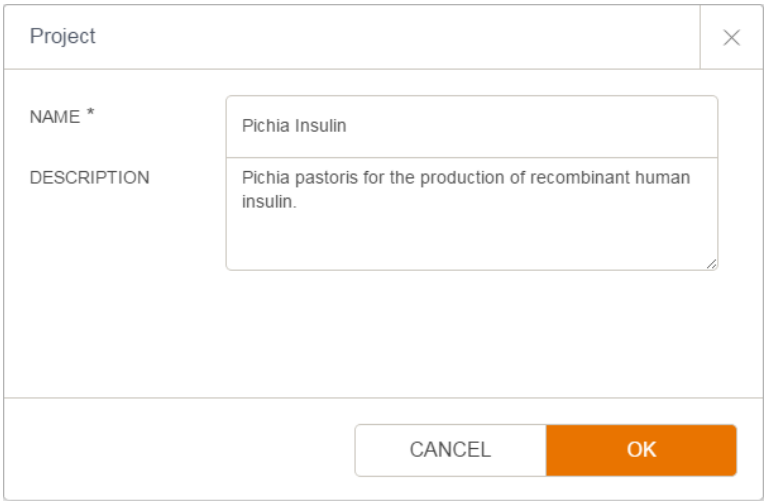


Number	Function
1	Name (unique) of the project
2	Description of the project which cannot be longer than 500 characters
3	Owner of the project
4	Number of planned experiments within the project
5	Add button for new project
6	Number of running experiments within the project
7	Number of completed experiments within the project
8	Creation date of the project

7.2.1 Create new project

> Click the [ADD NEW PROJECT] button at the bottom of the project list.

> A pop-up screen appears where the new project can be defined.



> Enter a project name for the project.

> Enter a description to your project (optional).

> Click the [OK] button at the bottom of the pop-up screen.

> The project is created and listed in the project list.

7.3 User administration

The user administration enables the organisation of users and their dedicated user roles. The following five user roles are available:

– System administrator
– Manager
– User
– Technician
– Operator
– Guest

The system administrator has the right to add and edit an user, connect equipment and activate licenses (IT role). The user has access to all the features in eve® the bioprocess platform software except for the above mentioned. The additional user roles are described in the table below.

	Equipment management	User administration	System settings	License management	Batch configuration	Batch execution	Batch access
System Administrator	x	x	x	x			
Manager	x	x	x	x	x	x	x
User	(x)				x	x	x
Technician						x	x
Operator						(x)	x
Guest*							x

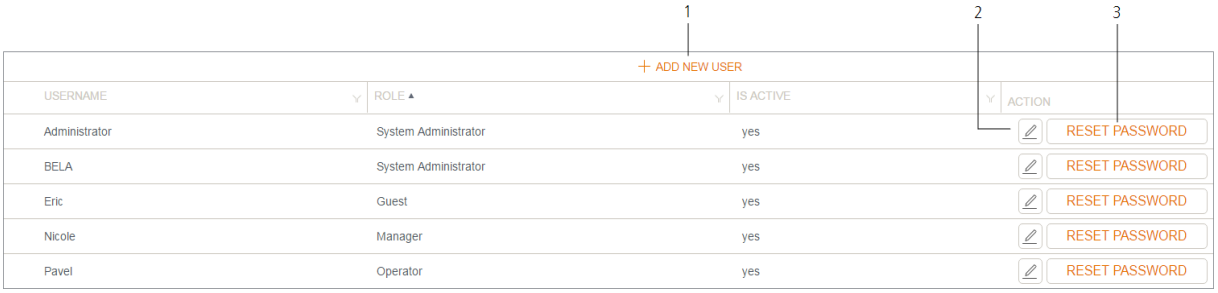
x Full rights
(x) Partial rights
*Guest account has "read only" access and can expire after a certain time.

To access the user administration proceed as follows.

USER ADMINISTRATION

> Click the [USER ADMINISTRATION] button on the left-hand side of the RESOURCES menu.

> A list of all created users appears.

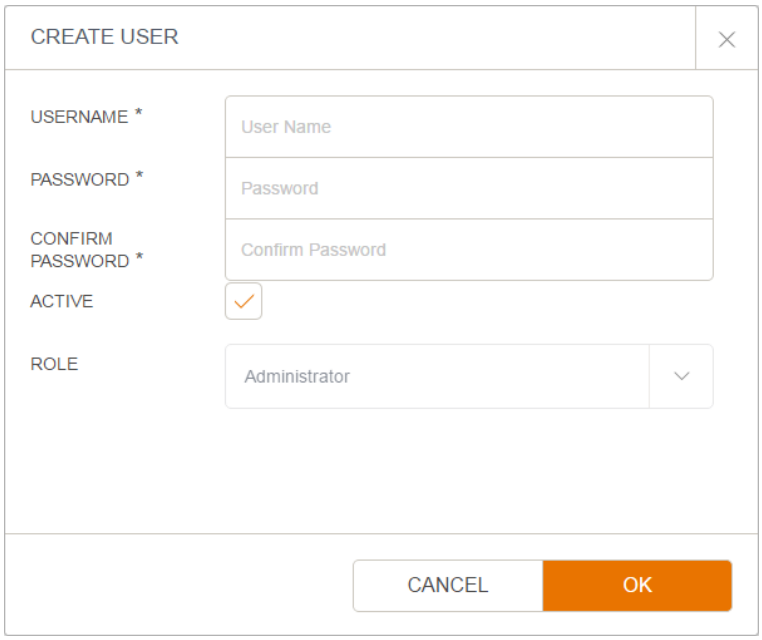


Number	Function
1	Create new user
2	Edit existing user
3	Reset password for the user

7.3.1 Add new user

> Click the add new user button at the top of the user list.

> A pop-up screen appears where the new user can be defined.



> Enter an unique username for the user.

> Enter a password for the user.

> Confirm the password by entering the same password a second time.

> If not already selected, select the active option for this specific user account.

> Specify the corresponding user role (e.g. system administrator or user).

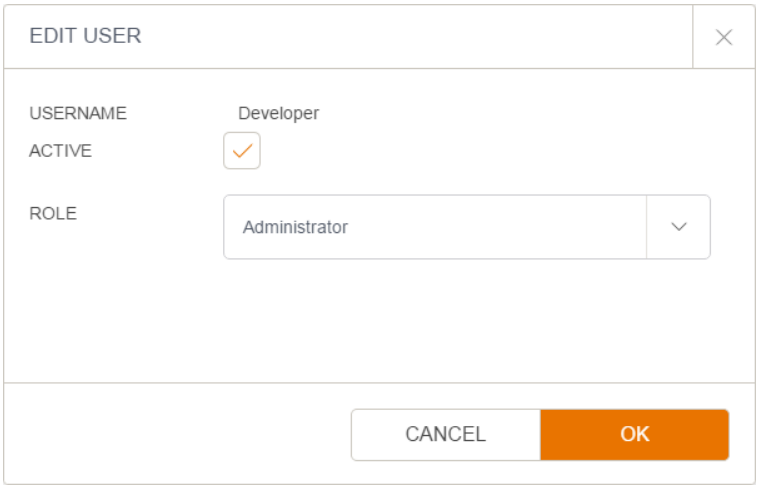
> Click the [OK] button at the bottom of the pop-up screen.

> The new user is created and listed in the user list.

7.3.2 Edit user

> Click the ✎ on the right-hand side of an user account entry in the user account list.

> The edit user pop-up screen appears.



7.3.2.1 Activate/inactivate user

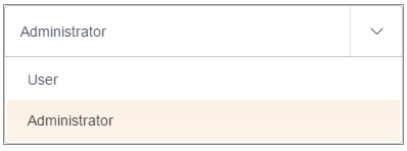
eve allows you to inactivate an user profile. The complete deletion of any user profile is not permitted. In order to activate or inactive an user profile proceed as follows:

> Select or deselect the check box in order to activate or inactive an user profile.

> Click the [OK] button at the bottom of the pop-up screen.

> The user profile is activated or deactivated.

7.3.2.2 Define user role

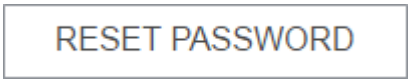


> Select the corresponding user role for the specific user profile.

> Click the [OK] button at the bottom of the pop-up screen.

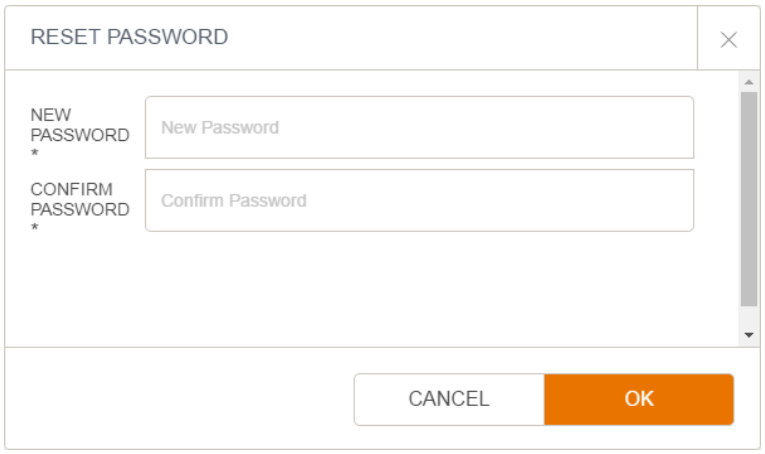
> The user profile gets the corresponding user role.

7.3.2.3 Reset password



> Click the reset [PASSWORD BUTTON] on the right-hand side of an user account.

> The edit password pop-up screen appears.



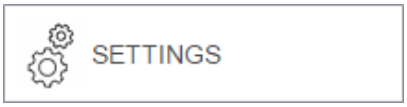
> Enter the new password for the specific user account.
> Confirm the new password for the specific user account.
> Click the [OK] button at the bottom of the pop-up screen.
> The new password is saved.

8 Settings

In the SETTINGS menu user specific and global options are available which enables the customisation of each user. The following four sub-menus are available:

– My profile settings (see "My Profile" below)
– Gloabal settings (see "Global" on page 173)
– Licenses (see "License" on page 188)
– About (see "About" on page 187)

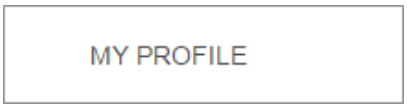
In order to access the settings proceed as follows:



> Click the [SETTINGS] button on the left-hand side of the screen.
> The sub-menus of SETTINGS appear.

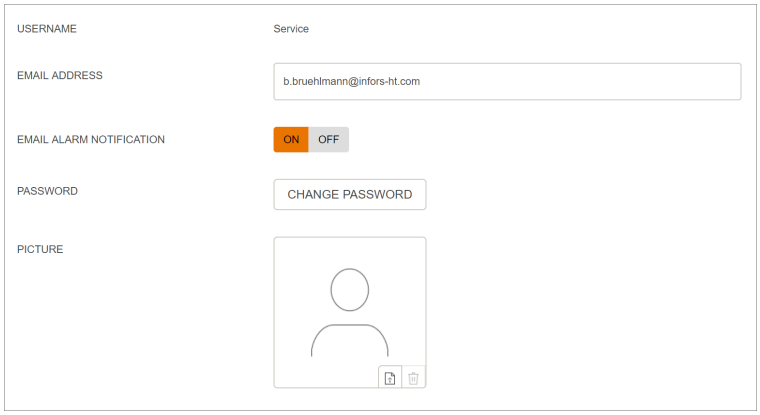
8.1 My Profile

In the MY PROFILE menu you can change the password and profile picture of your account.

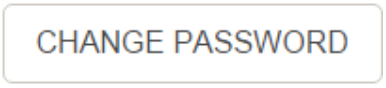


> Click the [MY PROFILE] button on the left-hand side of the SETTINGS menu.

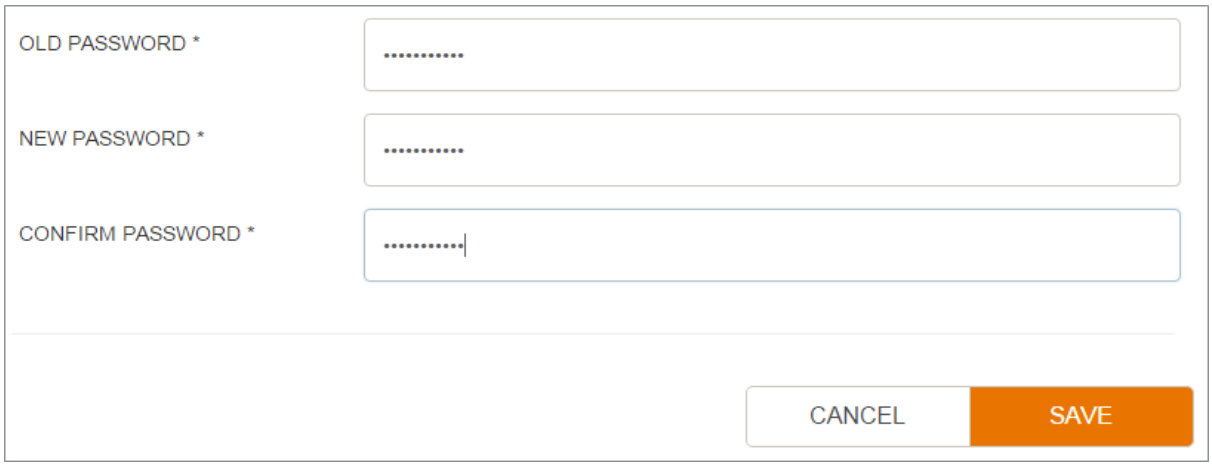
> The MY PROFILE screen appears.



8.1.1 Change Password

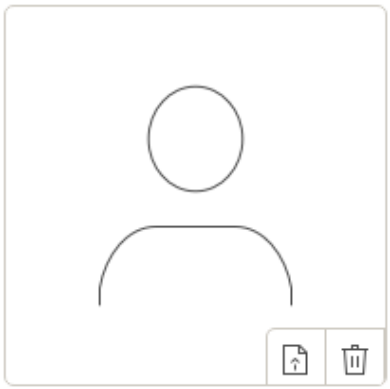


> Click the [CHANGE PASSWORD] button.
> The CHANGE PASSWORD pop-up screen appears.



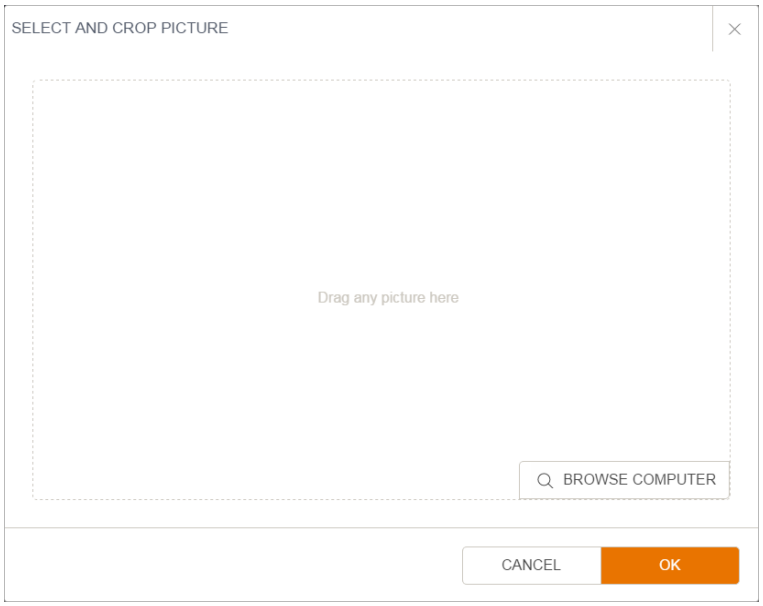
> Enter the old and new passwords in the corresponding fields.
> Confirm the new password by entering it in the corresponding field.
> Click the[SAVE] button at the bottom of the pop-up screen.
> The new password has been saved successfully.

8.1.2 Change profile picture



> Click the icon to change the profile picture.

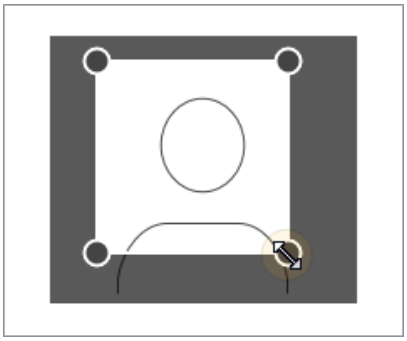
> The SELECT AND CROP PICTURE pop-up screen appears.



> Click the [BROWSE COMPUTER] button at the bottom right-hand side of the pop-up screen.

> The explorer window of your operating system appears.

> Select your preferred profile picture.



> Select the specific area of your profile picture by dragging the square with the mouse.

> Click the [OK] button in order to save the cropped profile picture.

> The profile picture has been saved successfully.

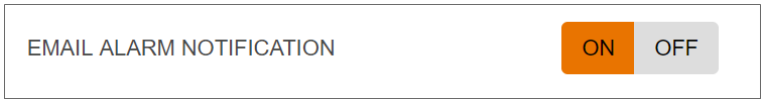
If you want to delete a profile picture click the icon and the profile picture will be deleted permanently.

8.1.3 Enable e-mail alarm notification

As soon as the e-mail server is configured correctly (see "Global" on the next page) the e-mail address can be specified and the notification can be enabled.

> Enter a valid e-mail address to received e-mail alarm notifications.

> Click the toggle button to enable the e-mail notification.



> The e-mail alarm notification is enabled for the specified e-mail address.

By default, any batch process that is started with the user that enabled the e-mail alarm notification is subscribed to the self-created batches.

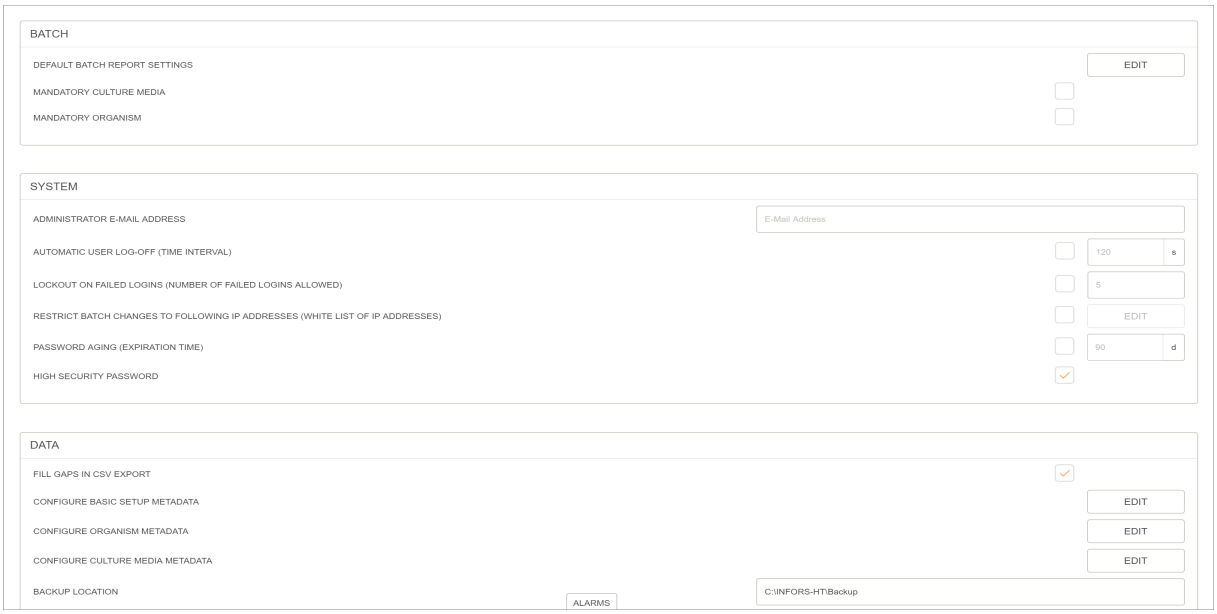
8.2 Global

In the GLOBAL settings menu, the System administrator e-mail address, the data export behaviour, system settings and backups can be configured. Furthermore, settings of user and password/security behaviour can be configured, as well as the default report settings and custom meta data:

– Default batch report settings (see "Default batch report settings" on the facing page)
– Mandatory batch information (see "Mandatory information" on page 175)
– Automatic user log-off (see "Automatic user log-off" on page 184)
– User blocking after failed log-in (see "User blocking after failed log-in" on page 184)
– Password aging (see "Password aging" on page 185)
– IP white-list (see "IP white-list" on page 185)
– High security password (see "High security password" on page 185)
– Custom metadata (see "Data settings" on page 176)

> Click the [GLOBAL] button on the left-hand side of the SETTINGS menu.

> The GLOBAL screen appears.



Depending on your active packages, features of the batch, system and data settings can not be configured.

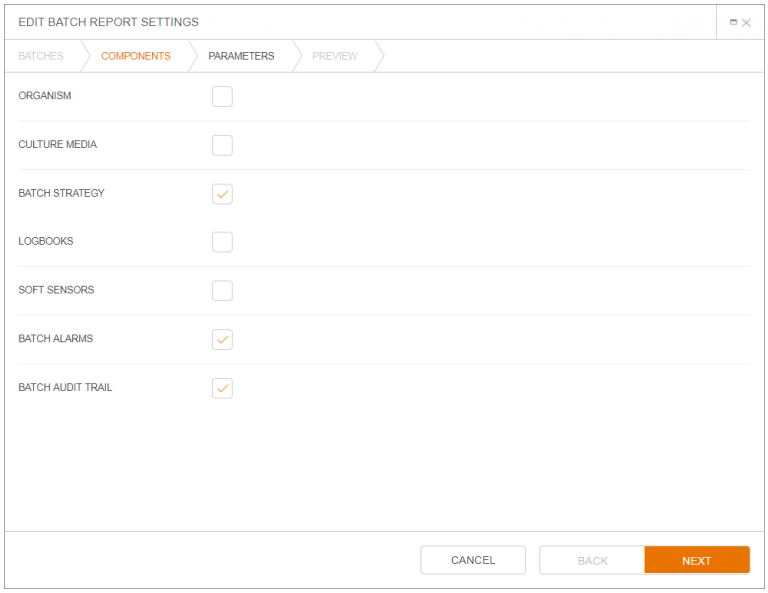
8.2.1 Batch settings

8.2.1.1 Default batch report settings

To configure a default batch report setting (applies to the entire eve system) proceed as follows:

> Click the [EDIT] button next to the default batch report settings.

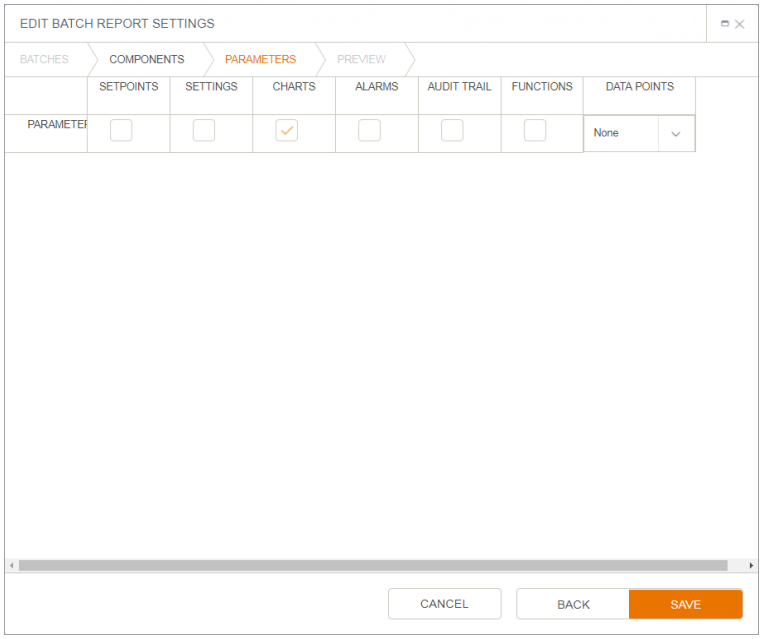
> The batch report settings wizard appears.



> Select all component check boxes which should be selected by default for every report.

> Click the [NEXT] button.

> The parameter option screen appears.



> Select all parameter option check boxes which should be selected by default for all parameter.

> Click the [SAVE] button to save your default batch reporting settings.

> The default batch report settings are applied to the entire eve system.

8.2.1.2 Mandatory information

Mandatory culture media and organism information can be selected to force the users to select at least one culture media and/or organism. To configure that the user must select the information during the planning of batch proceed as follows:

> Select the MANDATORY CULTURE MEDIA/ORGANISM option.

> The settings of the mandatory information are saved.

If a user wants to start a batch without filling out the necessary information the execution is blocked.

8.2.2 Data settings

8.2.2.1 .csv export settings

If you export recorded batch data as .csv two different export options are available. By default, the exported batch data for a specific parameter (e.g. temperature, °C) are only recorded when a change in the signal value is measurable. This can lead to gaps in the parameter time series (see example below).

If you want to change the behaviour of data export and fill the data gaps, proceed as follows:

> Select the fill gaps in csv export option.

> The settings for the csv export are saved.

As an example, the table below shows how the two different settings influence the csv data export of temperature time series.

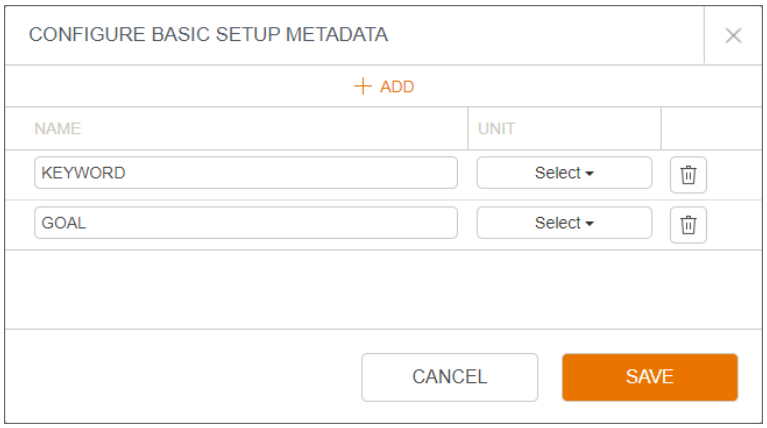
process time **h**	**no fill of gaps in csv** temperature, °C	**fill of gaps in csv** temperature, °C
0	29.37	29.37
0.2	29.62	29.62
0.4	29.90	29.90
0.6	30.03	30.03
0.8		30.03
1.0		30.03
1.2		30.03
1.4		30.03
1.6		30.03
1.8	31.21	31.21
2.0	31.19	31.19

8.2.2.2 Custom basic setup metadata

Custom basic setup metadata can be created to extend the information of the basic setup in planning a batch. If you want to add, change or delete any of the basic setup metadata, proceed as follows:

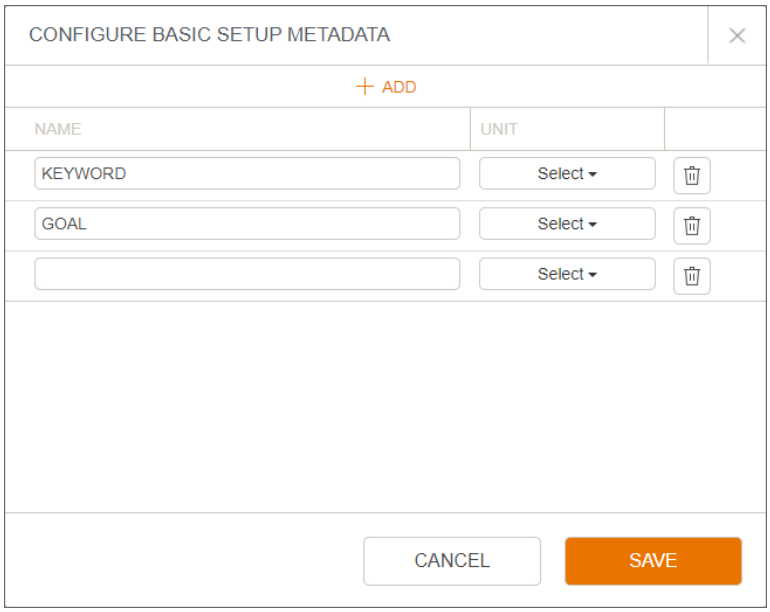
> Click the [EDIT] button next to the configure basic setup metadata settings.

> The CONFIGURE BASIC SETUP METADATA pop-up screen appears.



> Click the [ADD] button to add a new metadata information.

> A new line is added to the custom organism metadata list.



> Enter the name of your metadata information and select the units. Click the [SAVE] button in order to save your configuration.

If you do not select a unit and the metadeta information has "select" under unit, the unit will be not required for entering the information.

The custom basic setup metadata are available in the organism library as soon as a new organism is created or an existing one is edited (see "Add new organism" on page 120)

8.2.2.3 Custom organism metadata

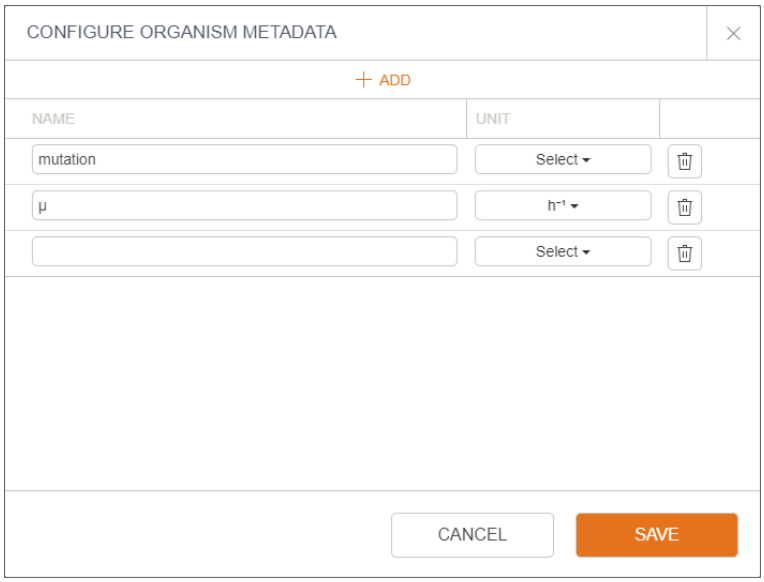
Custom organism metadata can be created to extend the information of the organisms in the organism library (see "Add new organism" on page 120). If you want to add, change or delete any of the organism metadata, proceed as follows:

> Click the [EDIT] button next to the configure organism metadata settings.

> The CONFIGURE ORGANISM METADATA pop-up screen appears.

> Click the [ADD] button to add a new metadata information.

> A new line is added to the custom organism metadata list.



> Enter the name of your metadata information and select the units. Click the [SAVE] button in order to save your configuration.

If you do not select a unit and the metadata information has "select" under unit, the unit will be not required for entering the information.

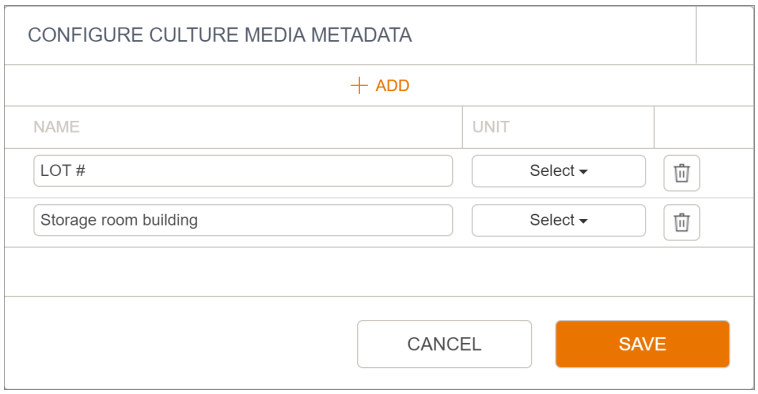
The custom organism metadata are available in the organism library as soon as a new organism is created or an existing one is edited (see "Add new organism" on page 120)

8.2.2.4 Custom culture media metadata

Custom culture media metadata can be created to extend the information of the culture media in the culture media library (see "Culture media" on page 123). If you want to add, change or delete any of the culture media metadata, proceed as follows:

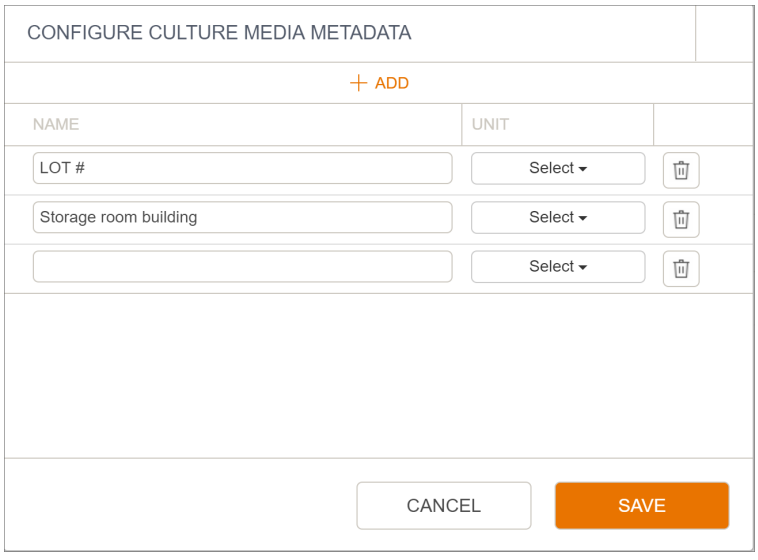
> Click the [EDIT] button next to the configure culture media metadata settings.

> The CONFIGURE CUTLURE MEDIA METADATA pop-up screen appears.



> Click the [ADD] button to add a new metadata information.

> A new line is added to the custom organism metadata list.



> Enter the name of your metadata information and select the units. Click the [SAVE] button in order to save your configuration.

If you do not select a unit and the metadeta information has "select" under unit, the unit will be not required for entering the information.

The custom culture media metadata are available in the culture media library as soon as a new culture media is created or an existing one is edited (see "Culture media" on page 123)

8.2.2.5 Backup

eve® allows to create backups of the database with all entered and acquired data at a specific date and time. The backup can be used to restore the database at a later time. This action will overwrite all the data in the database at the moment of restoring.

Create backup:

> Click the [CREATE BACKUP] button.

> A backup has been created and is stored under C:\INFORS-HT\Backup. The file name consists of the date and time of the backup in the following format: yyyymmdd-hhmmss.

The system allows you to create backups of the complete database at any date and time if no batch is running.

Change backup path:

By default the backup (and restore) path (see "Restore backup:" below) is set to C:\INFORS-HT\backup. However, the location of the backup can be changed manually to a local or network drive. To change the location of the backup proceed as follows:

> Click into the BACKUP LOCATION Field and enter the path of the backup location (e.g. C:\MyeveBackup).

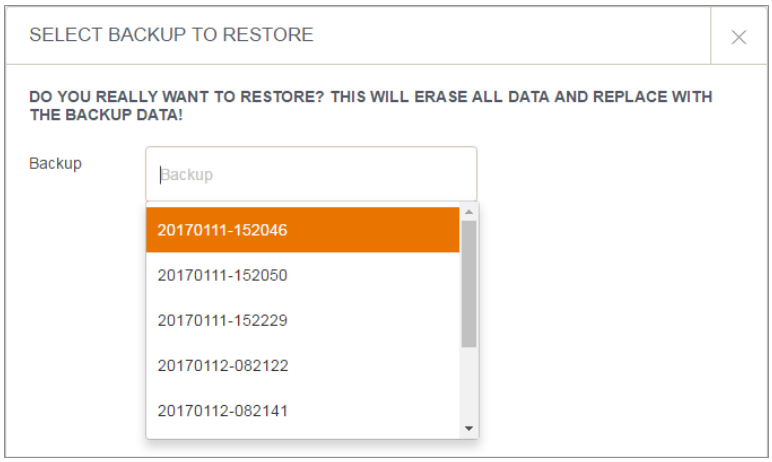
> The new patch is saved automatically and will be used for further backups.

When a new backup path is entered the corresponding path and folder must be available.

Restore backup:

> Click the [RESTORE] button.

> The SELECT BACKUP TO RESTORE pop-up screen appears.



> Select the backup file from the dropdown list.
> Click the [RESTORE]button at the bottom of the pop-up screen.
> Confirm the action by clicking the [OK] button.
> The backup has been restored.

Restore a backup will erase all current data in the database and replaced by the backup data. This cannot be undone!

Backup cleanup:

Due to safety reasons eve creates an automatic backup during the update of the system. This backups can occupy large volume of disk space. To delete and clean this backups proceed as follows:

> Click the [CLEANUP] button.
> Click the [OKAY] button to verify your cleanup.
> The automatic backups are now deleted from the drive.

Using the cleanup function does not influence the backups that were created manually.

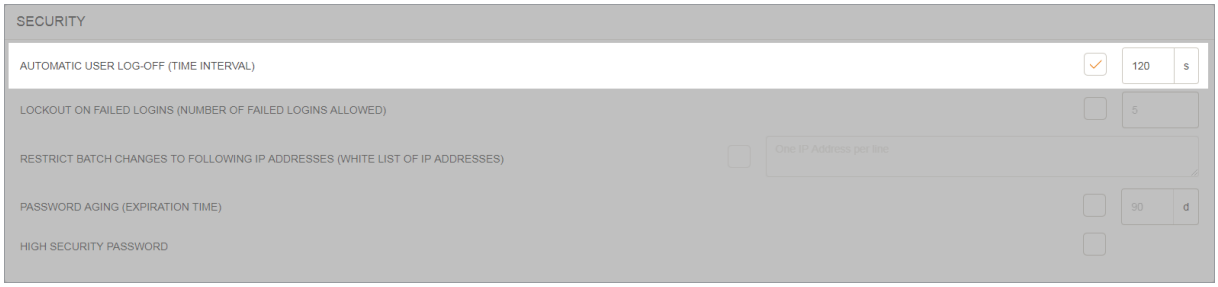
8.2.3 System settings

8.2.3.1 Automatic user log-off

Activation of automatic user log-off allows the automatic log-off of any user after a configurable period of inactivity. With this feature activated, every user is logged off from the software after a defined time of inactivity.

> Select the activate automatic user log-off check box.

> Enter a time interval in seconds for the automatic log-off.



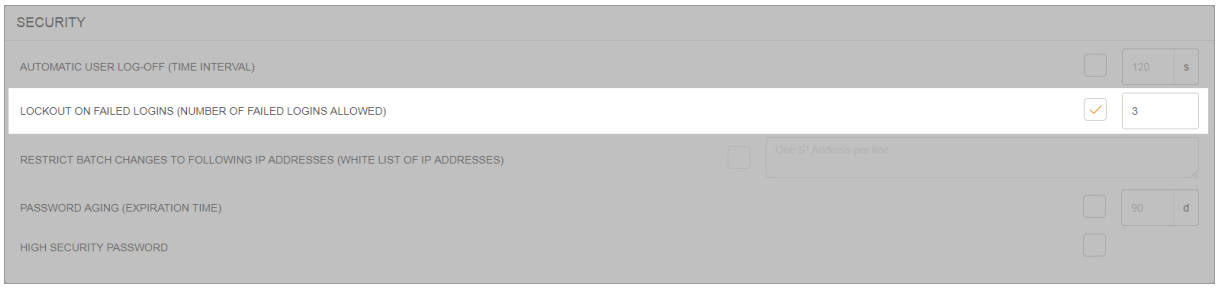
> The settings for the automatic user log-off are saved.

8.2.3.2 User blocking after failed log-in

Activation of complete lockout from the software after a configurable number of failed logins represents another password security feature. Any attempt to use the software in an unauthorized manner by guessing the password of a user using iterative procedures is prevented by this feature. Once a user has been locked out, a system administrator or a manager can activate the user account again.

> Select the activate blocking user after failed log-in check box.

> Enter the number of failed log-in before blocking the user.



> The settings for the user blocking are saved.

8.2.3.3 IP white-list

It is possible to control from which device(s) changes within a batch can be executed via the restriction to specific IP addresses. If this feature is activated no device with an IP address other than those on the white list can be used to make any change within the batch.

> Select the restrict batch changes to IP addresses check box.

> Enter the IP adresses which are not restricted to batch changes (e.g. 192.168.1.15; 192.168.1.16).

> The settings for the high security password are saved.

8.2.3.4 Password aging

For the security of passwords, it is important to control that users are regularly changing their password. If activated, the PASSWORD AGING feature ensures that the users are forced to change their passwords after a configurable period.

> Select the password aging check box.

> Enter the expiration time in days.

> The settings for the password aging are saved.

8.2.3.5 High security password

With the activation of the feature HIGH SECURITY PASSWORD the requirements concerning password security according to current standards are met. Each new password created after activation of the feature has to be composed of:

– At least 8 characters

– At least one upper and one lower case character

– At least one non-alpha numerical or numerical character

> Select the high security password check box.

> The new passwords will need high security characters.

> The settings for the high security password are saved.

8.2.3.6 E-Mail server configuration

To configure the e-mail server (e-mail alarm notification) the configuration setup should be tested first. After successful testing, each user can enable the e-mail notification by themself and subscribe to specific batches (see "Alarms" on page 75)

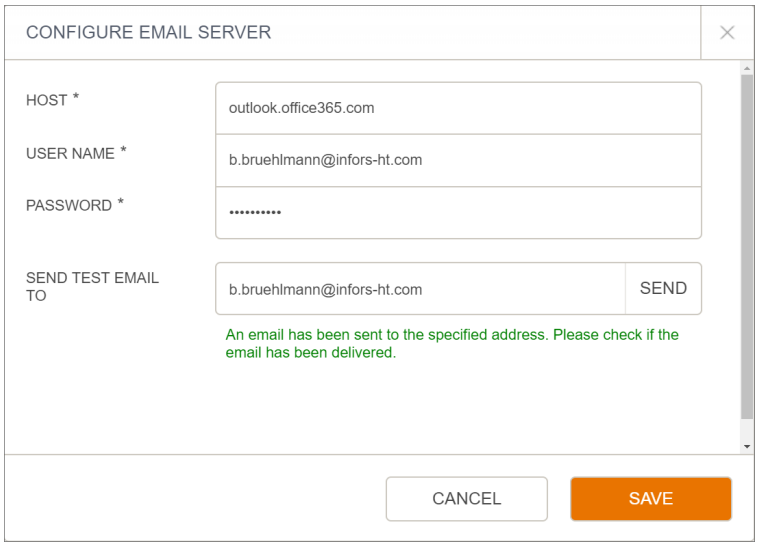
To configure the e-mail server proceed as follows:

> Select the configure e-mail server check box.

> The [EDIT] button of the e-mail server is activate.

> Click the [EDIT] button to setup the e-mail server configuration.

> The CONFIGURE E-MAIL SERVER pop-up screen appears



> Enter the host of your e-mail server (e.g. outlook.office365.com)

> Enter your e-mail user account credentials and the password.

> Enter a valid e-mail address to test the entered settings.

> Click the [SEND] button.

> After successful configuration an e-mail is sent to the specified address.

Please consider the General Data Protection Regulation (GDPR) according to the EU law when entering personal data (i.e. e-mail address).

8.2.3.7 REST API access

The REST API option activates an interface that allows to exchange data with other softwares (e.g. Matlab or LIMS). Further information about the REST API documentation can be found directly in the software (info button).

To activate the REST API, proceed as follows:

> Select the enable 3rd party software access to eve (REST API) checkbox.

> The [REST API] access is activate. Further information about the interface can be found when clicking on the [INFO] button.

8.3 About

The ABOUT menu displays the current version of eve the bioprocess platform software and further contact information of INFORS HT. eve the bioprocess platform software is a member of the "swiss made software" product family.

Whenever you have to contact any service and support please specify the eve version.

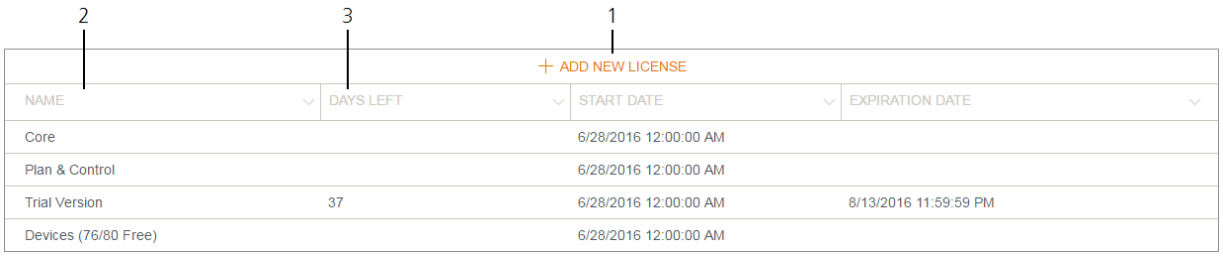
8.4 License

The license settings enables the activation of packages (i.e. additional features), devices and the Software Support & Assurance option. Each package can be activated by an activation ID which either can be perpetual or subscription. After a successful purchase of eve or any additional package of eve you will receive an activation ID for the corresponding license.

To activate your licenses proceed as follows.

> Click the [LICENSE] button on the left-hand side of the SETTINGS menu.

> The license screen appears.

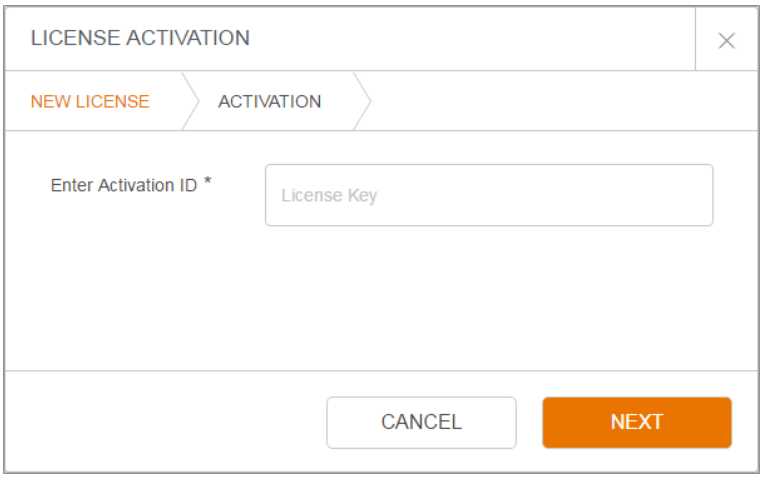


Number	Function
1	Add new license (activation ID) to the system
2	Type of license
3	Type of pricing mode and amount of days left

8.4.1 Activate license online

> Click the [ADD NEW LICENSE] button at the top of the screen.

> The LICENSE ACTIVATION pop-up screen appears.

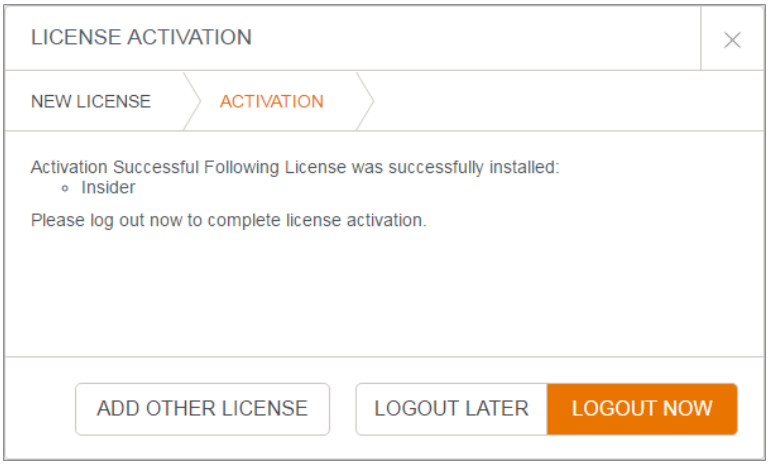


> Enter the activation ID from the e-mail or pdf-file (copy and paste) into the enter activation ID field.

> Click the [NEXT]button at the bottom of the pop-up screen.

> The activation ID is validated automatically by the system.

> Follow the procedure in the license activation pop-up screen.

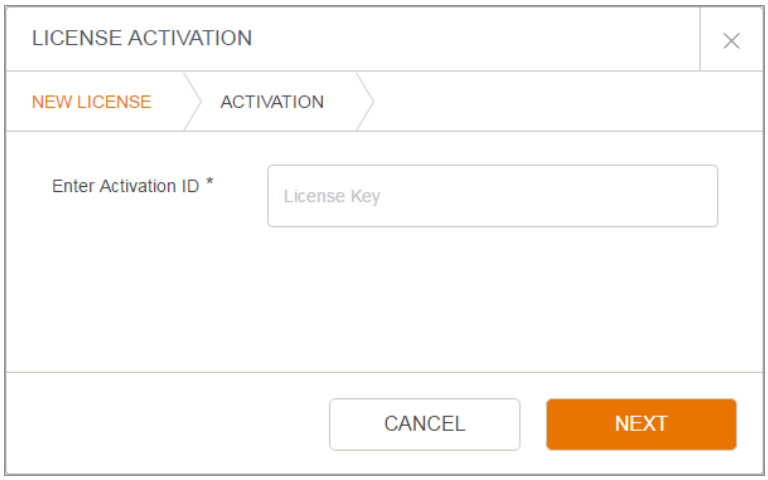


> After the logout the new features will be activated with the next login.

8.4.2 Activate license offline

> Click the [ADD NEW LICENSE] button at the top of the screen.

> The LICENSE ACTIVATION pop-up screen appears.

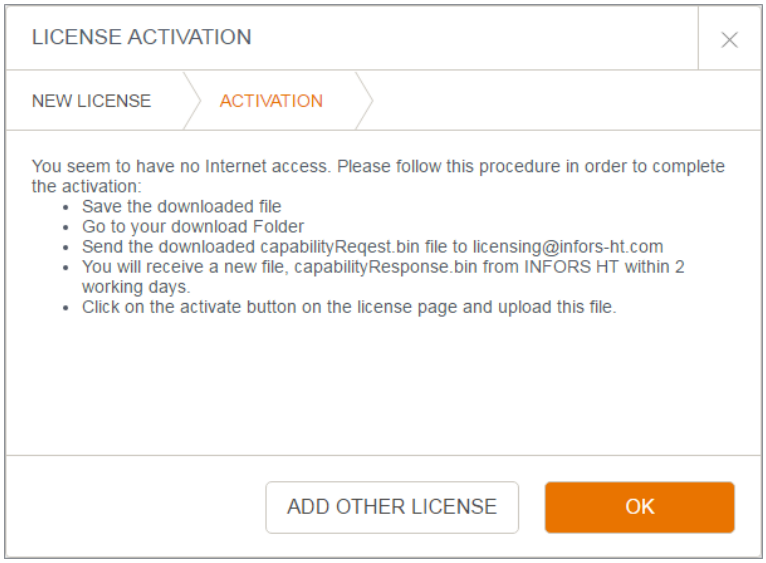


> Enter the activation ID from the e-mail or pdf-file (copy and paste) into the enter activation ID filed.

> Click the [NEXT]button at the bottom of the pop-up screen.

> The activation ID is validated automatically by the system.

> Follow the procedure in the license activation pop-up screen.

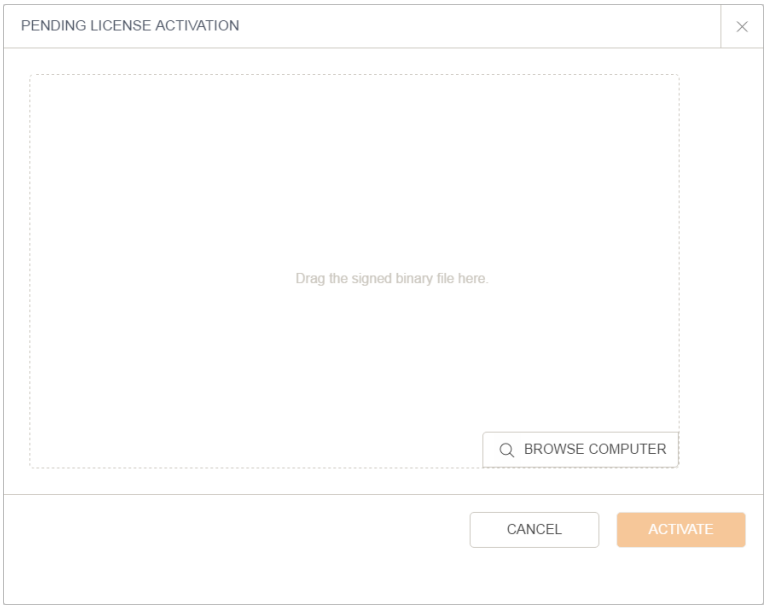


> Send the file that has been created to **licensing@infors-ht.com**.

> As soon as you receive the validated file you can continue with the offline activation process.

> Click the [ACTIVATION] button at the bottom of the LICENSE screen.

> The PENDING LICENSE ACTIVATION pop-up screen appears.



> Click either the [BROWSE COMPUTER] button and select the received file from the e-mail or drag and drop the received file directly into the pop-up screen.

> The selected file appears in the PENDING LICENSE ACTIVATION pop-up screen.

> Click the activate button at the bottom of the PENDING LICENSE ACTIVATION pop-up screen.

> After the logout the new features will be activated with the next login.

9 Glossary

A

Alarm
: Alarms are caused by parameter values that are out of scope. The scope is defined by upper and lower critical values which can be fixed or dynamic.

Audit Trail
: Logs every user action and allows a complete record of what was done (e.g. create, start and stop batch, log-in, log-out etc.)

B

Batch
: An individual bioprocess configured in an experiment and assigned to a bioreactor.

Batch strategy
: Batch strategy is a series of defined phases intend to provide process control, including changing and shifiting setpoints of process parameters, transition conditions and functions.

C

Chart
: Chart display enables to visualise and monitor a batch process and its parameters.

Compounds
: Ingredients of culture media (e.g. NaCl, KOH etc.)

D

Device
: A device delivers data to the software and can be a measurement or control element of an individual bioreactor (or peripheral instrument assigned to that bioreactor) or the bioreactor/shaker itself.

Device type
: Defines the type of the device (e.g. PT100, Stirre, pO2, etc.)

E

Equipment
: A hypernym for all connected devices.

Experiment
: The configuration of planned processes to which individual batches can be assigned and run.

F

Function
: A function is an algorithm that can be either in a phase or a soft-sensor and which defines its behaviour.

I

Input
: Input variables (also called independent variable) are the inputs to functions and can be any rational number.

L

Licenses
: Can be activated by activation IDs and enable the activation of additional packages.

O

Offline parameter
: An offline parameter is a parameter which value is delivered by a device that is not connected to the software. The value is therefor entered manually by the user.

Output
: Output variables (also called dependent variable) are the output of functions and can be any rational number.

P

Packages
: Packages consist of certain features (e.g. batch comparision in plan and control) and can be added anytime.

Parameter
: A discrete measured and/or controlled element of a batch process e.g. temperature °C.

Parameter type
: The parameter type represents a device and can generate multiple parameters (e.g. Exit Gas analyser which generates the parameter Offgas O2 and Offgas CO2)

Phase
: A phase is a parameter dependent process condition and consists of functions (1 function per parameter, consecutive phases can have the same function for the same parameter).

Project
: A project is a higher-ranked description/acronym of the main goal/product and can consist of several experiments.

Q

Quickstart
: A function which allows the user to start a batch process quickly without any advanced configuration.

R

Recipe
: A user-defined configuration of a process involving elements such as bioreactor, organism, culture medium, set points, phases and control strategies etc.

Refresh rate
: Defines how often the system updates the data on the chart display.

S

Setpoint
: The target value which the control system will aim to reach.

Soft-sensor
: A soft sensor is a common name for software sensor where several measurements are processed together. The signals are used for calculating additional actual process information based on a specific algorithm. It is used for process monitoring, fault diagnosis, as well as control applications.

T

Transition
: Phase transition defines the transition from one phase to the other. It can have several conditions (e.g. time-dependent, parameter/signal-dependent).

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