



BioBench Fermentation

Vision



We offer total solutions

Open relation with the customer/
partner/suppliers and Employee's

Keep customer satisfied

Application fields



Food & Biobased



Algae



Cell culture

Type of Cells

All type of micro organisms
Fungi, yeast
Plant Cells
Solid state



Applications

Process development,
optimization and characterization
Scale-up and scale-down studies
Small scale production

Process Modes

Batch
Fed-batch
Continuous
Perfusion

Industries

Biopharmaceuticals
Vaccines
Cell therapies
Industrial biotechnology
Basic research
Education

BIOSTREAM

Range of Bioreactors



BioCompact multiple reactor



BioBench Twin



BioBench



BioPilot



BioTwin
Single vessel

BioTwin
Double vessel

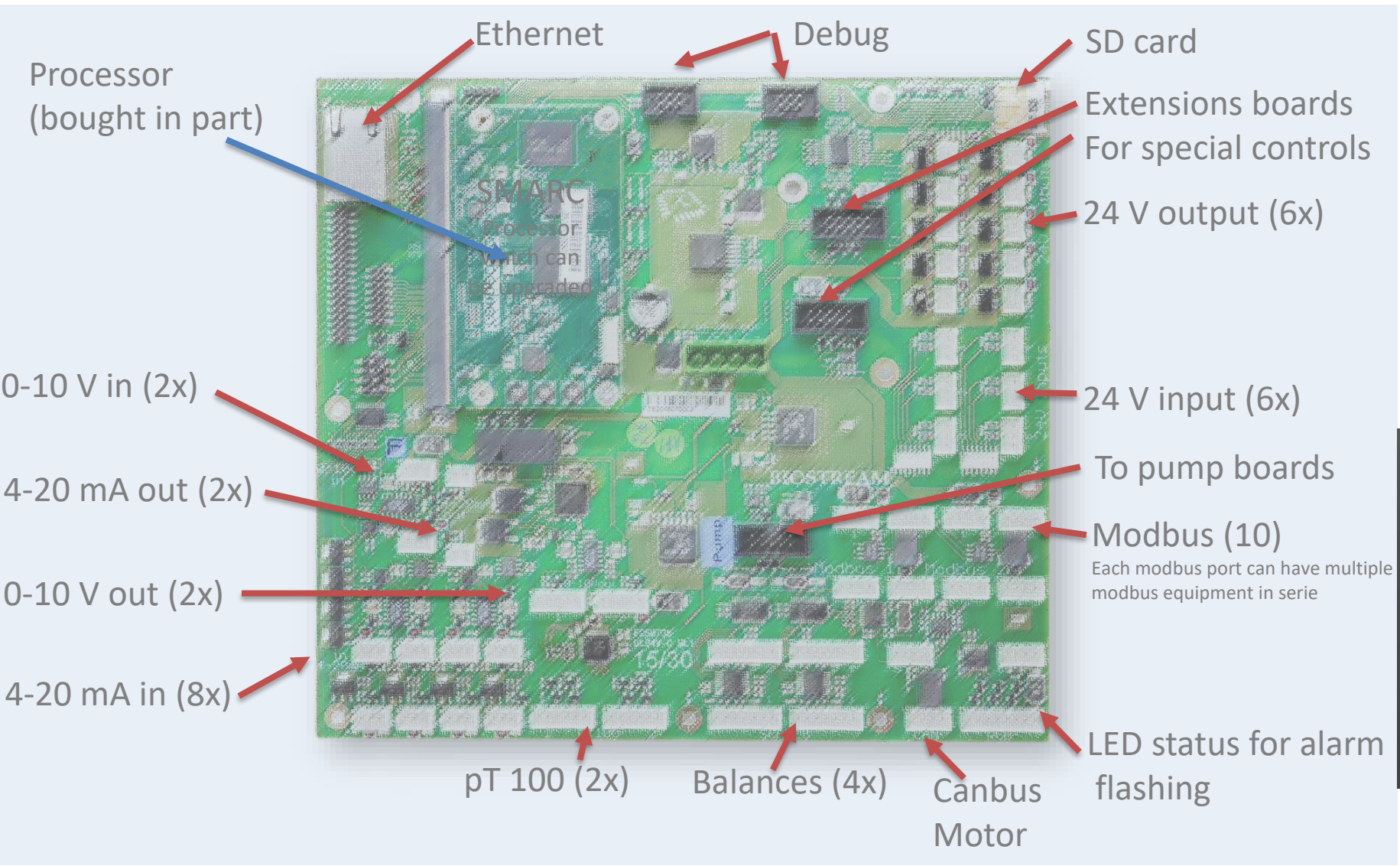


Bioproject



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Basic control print

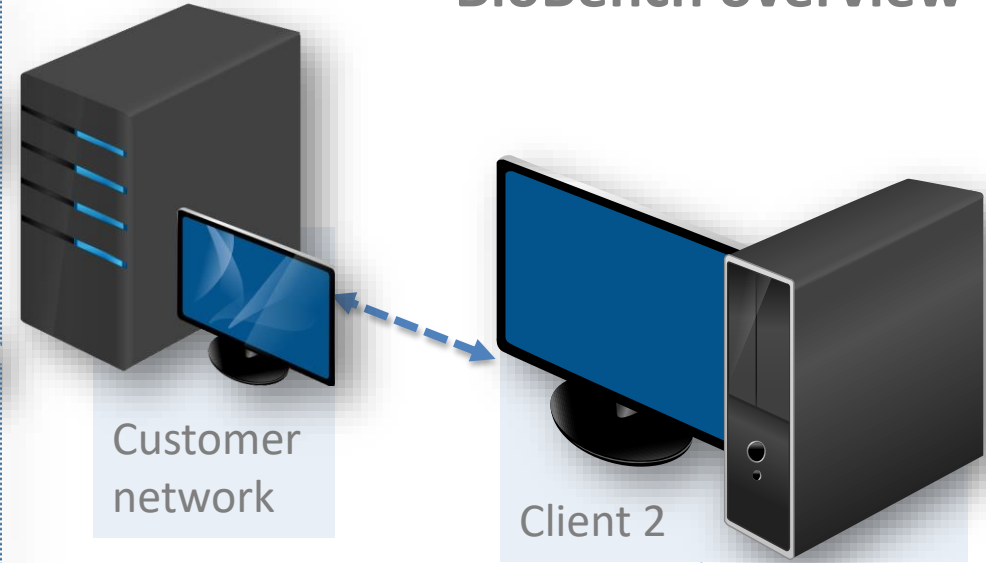
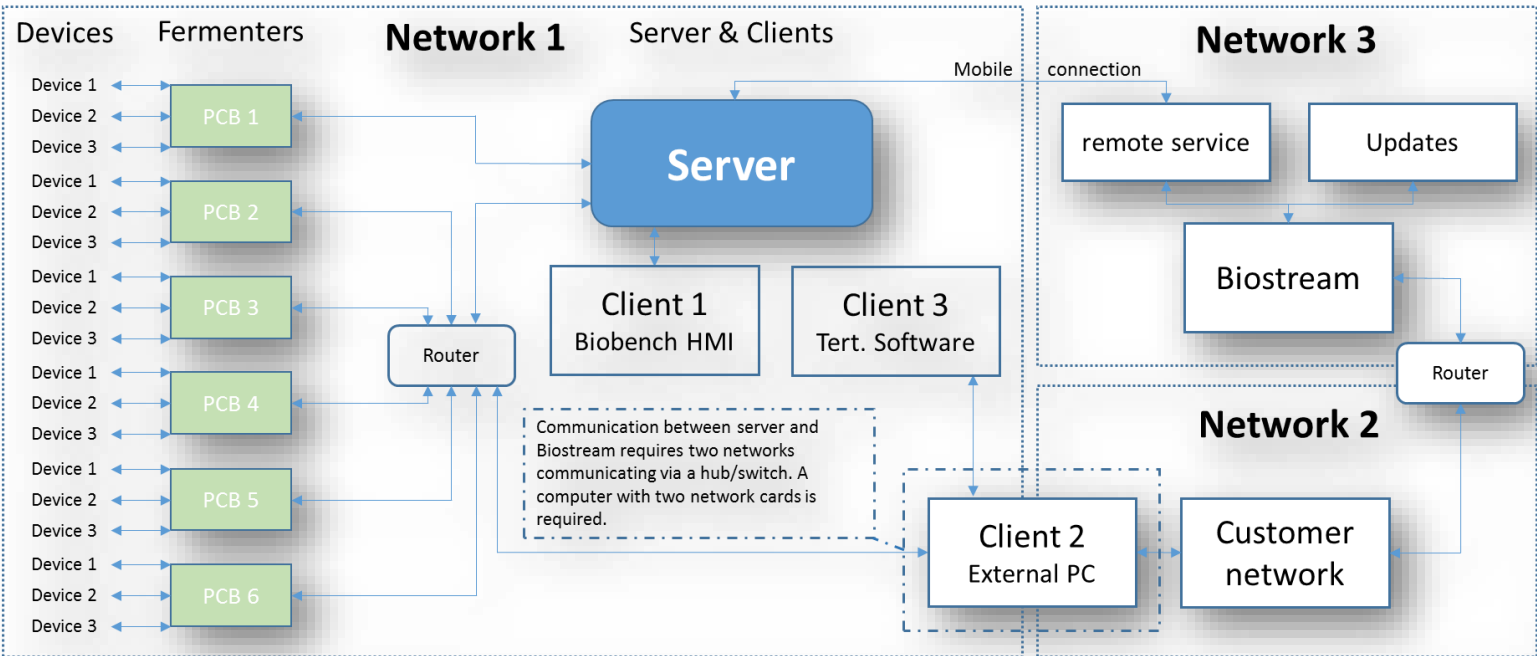


- Extension board possibilities**
- Extra I/O channels
 - Valve boards
 - Connection of old equipment
 - Custom made options



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BioBench overview



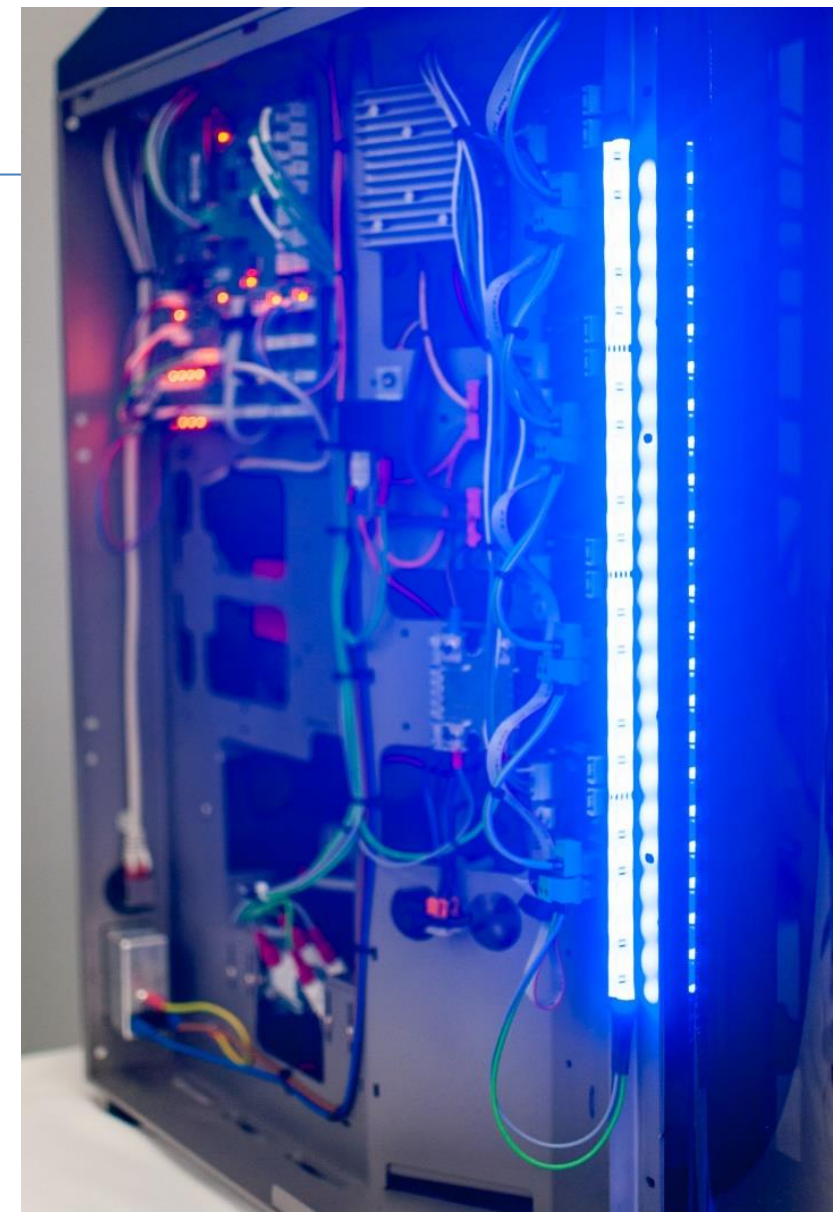
Customer needs to give access to a VPN connection for Biostream if this is allowed
Possible to have Wi-Fi & Bluetooth connection or call in via mobile connection



Integration of Sensors, actuators and PID control loops in a standard BioBench

Setting	Number	Type of sensor&actuator
Modbus	64	For pO ₂ , pH, MFC, Off gas and other digital sensors
0-10 V Output	2	For pumps, LED, pressure, gasmix
0-10 V input	2	Redox-sensor, Gas-sensor, OD, Pressure, load cells and more
4-20 mA output	4	For pumps, LED, pressure, gasmix
4-20 mA Input	4	Redox-sensor, Gas-sensor, OD, Pressure, load cells and more
24 volt Output	10	Valves, solid state relais, pumps
24 volt Input	6	Others
CAN Bus	1	Digital motor control
RS-232	4	Balances
PT-100 config	2	pT100 sensor
Connection to pump boards	5	Only for integrated pumps in the Biobench
RGB1		For alarming and camera option
Extension boards	2	

Extension boards can be used to get more I/O signals on the control board



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Connections of external equipment



Internal/
External pumps



Biomass/ OD



CO2/O2 Off gas



Mass flow controllers
& Gas mixers



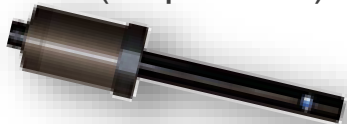
CO2 in-line



Balances



pH and Do sensors
(disposable)



valves



Example:
Adapter for Applikon vessel

All kind of motors
with adapter

Chillers



Some Examples are shown in this overview

**All measurement devices and actuators with
an in- or output can be connected**

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Parameter	Value	Unit	Setpoint	Output	Gauge	Active	Settings
Air_flow			not set			Off	Settings
antifoam	0	V	10		0.0	Off	Settings
Balance 1		kg	not set			Off	Settings
Balance 2		kg	not set			On	Settings
CO2_flow			not set			Off	Settings
feed	0		not set		0.0	Off	Settings
feed 2	0		not set		0.0	On	Settings
internal temp		°C	100			Off	Settings
O2_flow			0			Off	Settings
pH	30		14		30.2	Off	Settings
pO2			not set			Off	Settings
stirrer	0		not set		0.0	Off	Settings
temp	19	°C	not set		18.7	Off	Settings

Navigation: Main, Preparation, Controls, Trends, System, Information

BOS Controlling & Logging Software

Possible to use BOS software via Touch screen, tablet or via computer.

App available for Mobile phones.

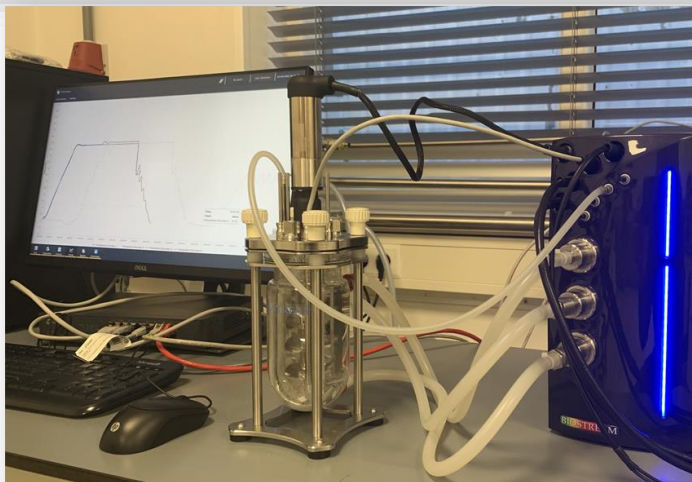
Easy and free installation on PC.

Simple and intuitive use.

No license needed for more users.

Control via OPC UA/XML-DA.

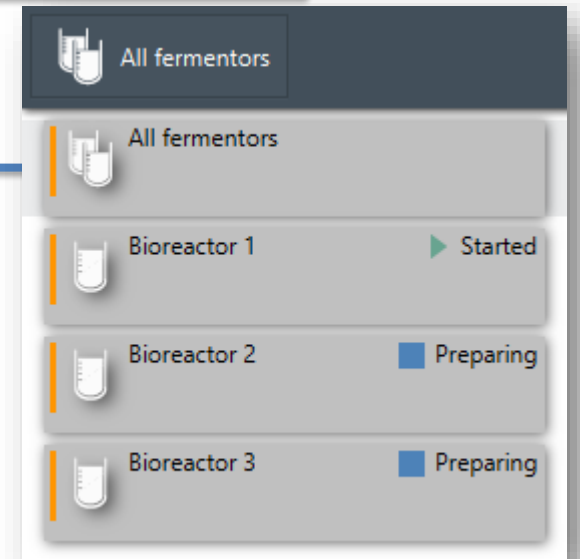
FREE upgrades of software. Each 2 months there is a release of new features. This can be downloaded and can be upgraded by yourself.



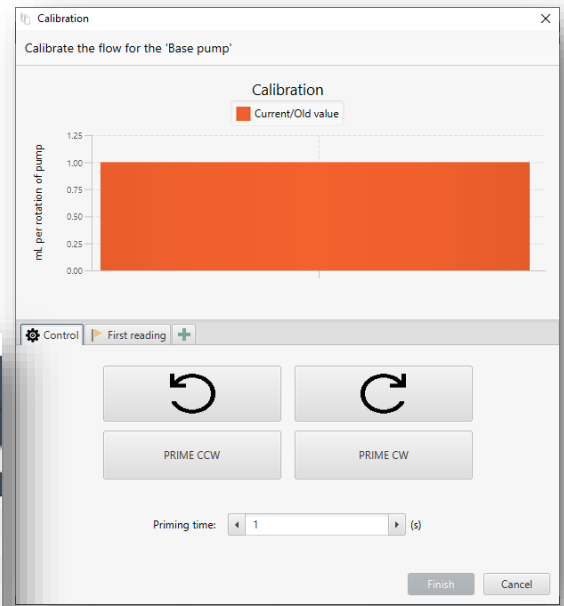
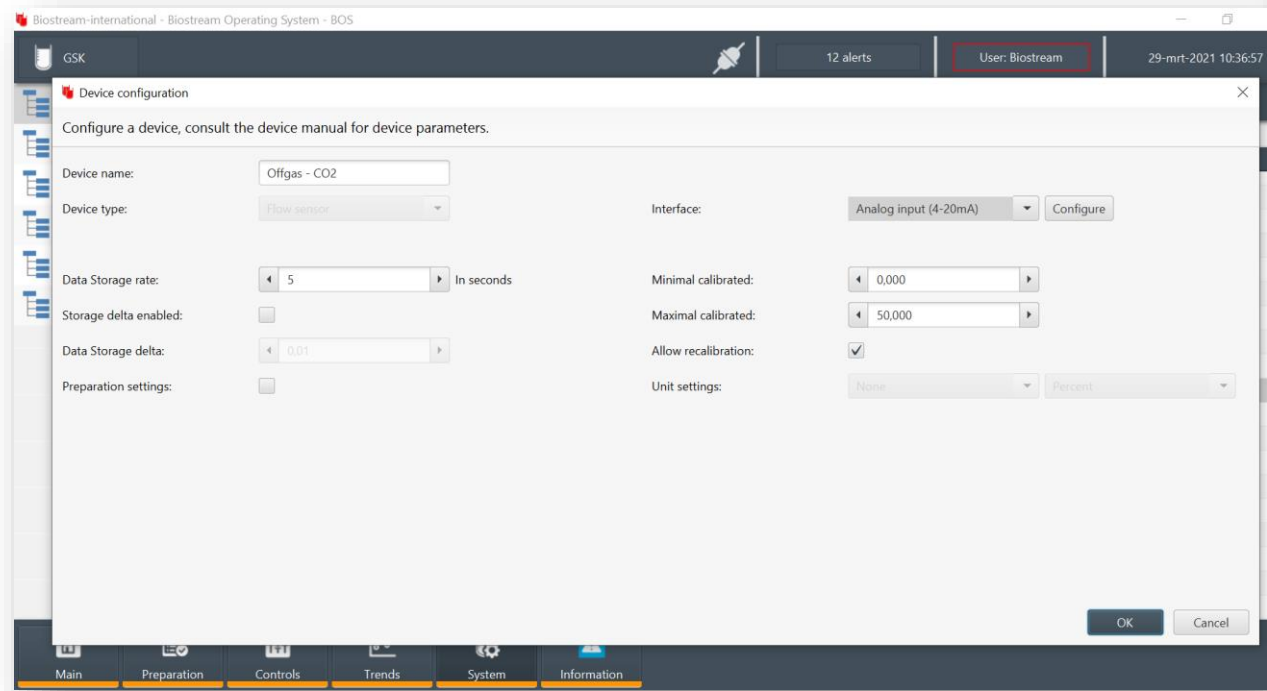
Selecting all the bioreactors or a specific one.

Easy addition of new bioreactors.

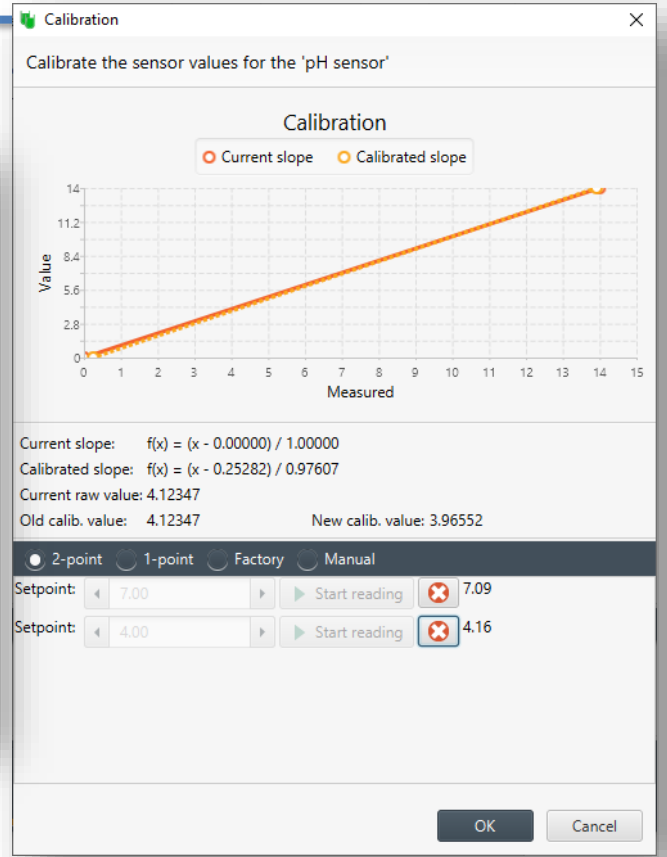
Adding new computers in the network where you can work the same as the local HMI.



Easy one & two point calibration with graphical view and raw data for all sensors and pumps.
Multiple calibrations available for pumps to get a higher accuracy.
Maintenance information sensors.
Priming and control direction of the pumps.



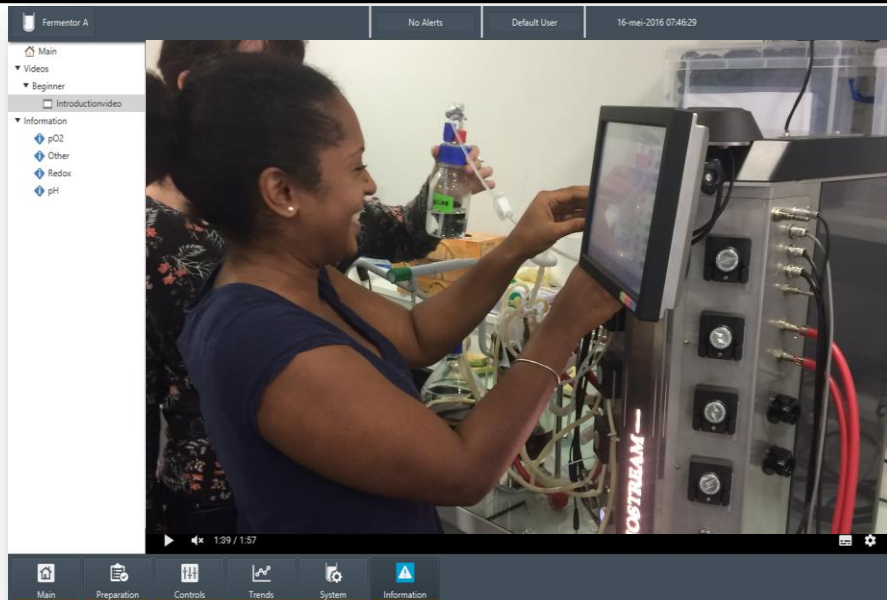
Example: Pump calibration.



Example: Sensor calibration.

Adding external devices like sensors, pumps and valves yourself.
Design your own parameter control loops.
Parameters can be P&ID controlled

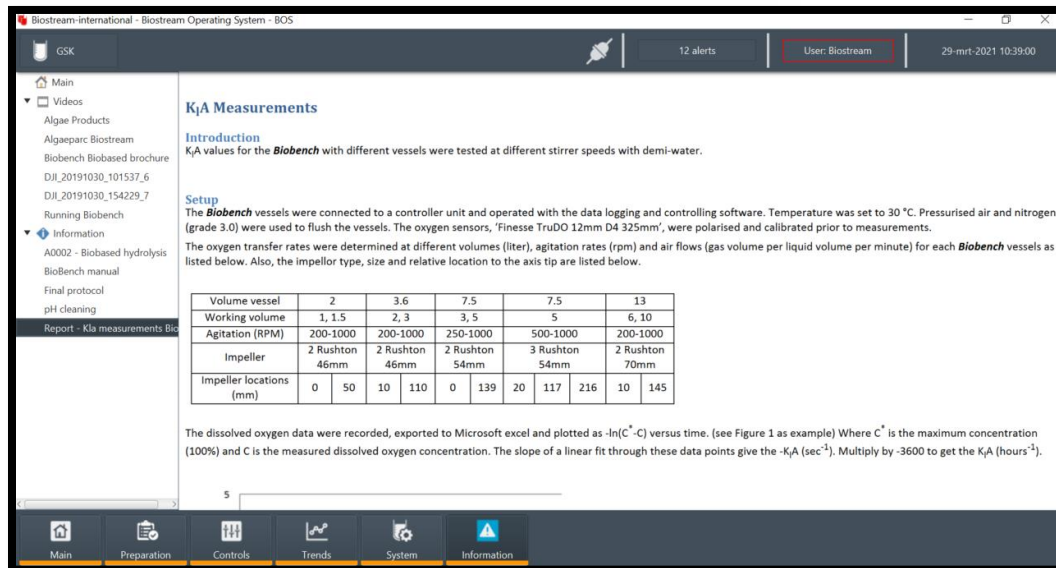
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Multimedia integration like movies from phone & tablets in the HMI.

BOS Controlling & Logging Software

- Own defined multiple graphs.
- Comparison with on-line and historical data.
- Change graph settings during the run.
- Store different graphs per user.
- Take a snap shots of graphs.
- Running with one year of data
- For each parameter can be set a logging rate and logging on a change of value



Integration of your own protocols (SOPs) in the HMI.



Cascading and automation possibilities

Recipes

Independent automatic control of parameters and also simultaneously.
 Unlimited numbers of programs.
 All kinds of programming possible.



Recipe System

Name:

Evaluation time (s):

After last sequence:

Sequences

Seq.	Name	Action
1	Check feed > 50%	Wait for Condition
2	Setpoint AF = 4	Run for set time
3	Check feed < 50%	Wait for Condition
4	Setpoint AF = 2	Run for set time

Buttons: + Add, Edit, Remove, Move Up, Move Down, OK, Cancel

Example: Program block

Cascade

Configure a cascade.

Reset

- Offgas analyzer
- Offline Sample
- Antifoam
- pH
- pO₂
- Stirrer
- Temperature
- Feed 1

Drag and drop interface showing pH, pO₂, and Stirrer blocks. Includes dashed boxes labeled "Drag here" and a green box labeled "Drag here".

Buttons: OK, Cancel

Example: Drag and drop blocks for cascading possibilities

Recipes

Search...

Buttons: Add, View, Start, Stop

Name	Status	Sequence	Runtime
SAFETY: Headspace > 5% O ₂	Running	1: Wait for O ₂ > 5%	00:00:26
Level Control	Running	1: No Level	00:00:23
Feed up	Running	1: wait 5 min	00:00:20
Setpoint AF	Running	1: Check feed > 50%	00:00:17
Check Temp	Running	1: Temp > 20 C	00:00:10

Example: Different automation protocols

Cascading with P&ID

All kind of positive and negative cascades possible.
 Selection of simple cascading or with P&ID.

pO₂

Active:

PID cascade:

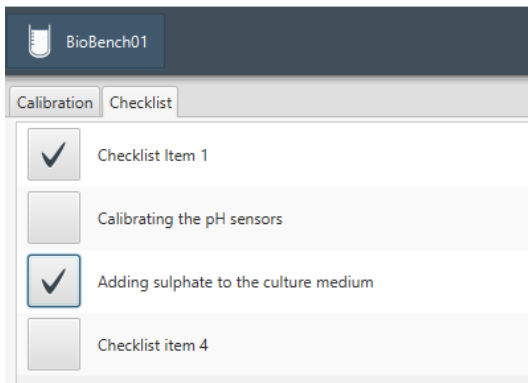
Deadband: pO₂

Deadband evaluation time: Seconds

Example: Switch between normal and P&ID cascading

BOS Controlling & Logging Software

Create your own simple check list for starting up a bioreactor



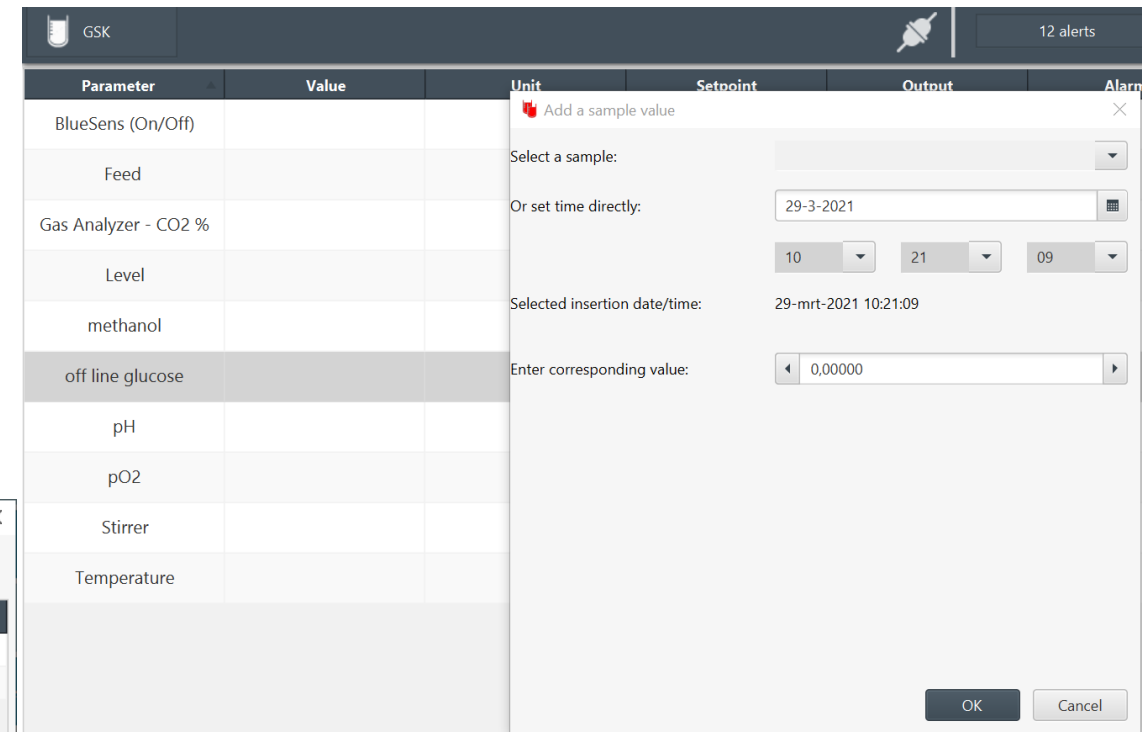
Sample overview

Search description

Sample date	Description	mL
15-Sep-2020 09:29:38	Sample 1	23
15-Sep-2020 09:29:47	Sample 2	16

Sample tracking

With possible volume correction on total Volume to change feeding protocols

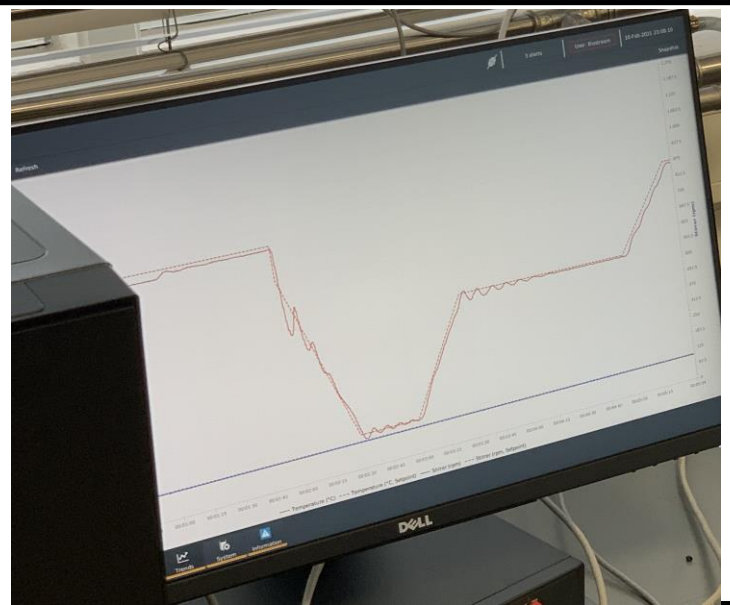


Off-line measurement input



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BOS Controlling & Logging Software parallel functions



#	Name	Status	Started	Inoculated	Stopped	Select
0	DTU Yellow	Stopped	18-nov-2020 12:10:34	-	-	<input type="checkbox"/>
1	DTU 7.75 liter	Stopped	18-nov-2020 12:10:34	-	18-nov-2020 12:57:09	<input type="checkbox"/>
2	CIP	Stopped	04-nov-2020 14:38:24	-	04-nov-2020 14:38:35	<input type="checkbox"/>
3	holiform	Stopped	04-nov-2020 14:38:25	-	04-nov-2020 14:38:35	<input type="checkbox"/>
4	VTT (DEMO)	Started	19-nov-2020 11:29:03	-	-	<input type="checkbox"/>

Buttons: Fill Jackets, Start, Inoculate, Stop selected, Select All, Select None, Stop all

Parallel starting and inoculation
 Parallel calibration of pumps
 Overview control of bioreactors
 Parallel graphs with existing data and historical data.

Biostream-international - Biostream Operating System - BOS

GSK						CIP					
Parameter	Value	Unit	Setpoint	Output	Alarms	Parameter	Value	Unit	Setpoint	Output	Alarms
Gas Analyzer ...		%				pH		pH			
pH		pH	4.00			pO2		-			
pO2		%				Stirrer		rpm			
Stirrer		rpm	1200	100%		Temperature		°C			
Temperature		°C	20.00								

Merck

Parameter	Value	Unit	Setpoint	Output	Alarms
pO2					

DSM

Parameter	Value	Unit

Please select one or more pa

Select All Select None

Select	Name	Input/Raw	Old Slope	Old Offset	Old Value	First meas.	Sec. meas.	New Slope	New Offset	New Value
<input checked="" type="checkbox"/>	DTU	Invalid	1.00000	0.00000	Invalid	-	-	Invalid	Invalid	Invalid
<input checked="" type="checkbox"/>	GSK	Invalid	1.00000	0.00000	Invalid	-	-	Invalid	Invalid	Invalid
<input checked="" type="checkbox"/>	CIP	Invalid	1.00000	0.00000	Invalid	-	-	Invalid	Invalid	Invalid
<input checked="" type="checkbox"/>	Merck	Invalid	1.00000	0.00000	Invalid	-	-	Invalid	Invalid	Invalid

● 2-point ○ 1-point ○ Factory ○ Manual

Setpoint: 100.00 Start reading

Setpoint: 100.00 Start reading

REQUEST a demo for testing

On-line service and validation purpose

21 CFR part 11 compliance.

With user login and tracking user actions.

Logging of confirmed alarm overview by user.

Service tools for distance service and assisting.

Advanced options:

Filtering of parameters like OD raw value

pH temperature correction

Confirmation to inform users before starting a run

Force check list for completion

Auto log on/off

Auto calibration of pumps

Date/Time	Fermentor	User	Action
16-Sep-2020 09:18:33	BioBench01	Biostream	The user "Biostream" set the recipe state of recipe "StabTest3" to: Started
16-Sep-2020 09:18:31	BioBench01	Biostream	The user "Biostream" set the recipe state of recipe "StabTest2" to: Started
16-Sep-2020 09:18:28	BioBench01	Biostream	The user "Biostream" set the recipe state of recipe "StabTest1" to: Started
16-Sep-2020 09:18:21	BioBench01	Biostream	The user "Biostream" set the fermentation state of
16-Sep-2020 09:18:12	BioBench01	Biostream	The user "Biostream" set the fermentation state of
15-Sep-2020 21:03:54	BioBench01	Biostream	The user "Biostream" set the fermentation state of
15-Sep-2020 15:29:56	N/A	Biostream	The user "Biostream" made changes to the user "C
15-Sep-2020 15:28:06	N/A	Biostream	The user "Biostream" made changes to the user "C
15-Sep-2020 13:02:45	BioBench01	Unknown	An unknown user set the recipe state of recipe "St
15-Sep-2020 13:02:29	BioBench01	Unknown	An unknown user set the recipe state of recipe "St
15-Sep-2020 13:01:56	BioBench01	Unknown	An unknown user set the fermentation state of fe
14-Sep-2020 17:20:56	BioBench01	Biostream	The user "Biostream" set the fermentation state of
14-Sep-2020 17:18:39	BioBench01	Biostream	The user "Biostream" changed the setpoint of the
14-Sep-2020 17:18:08	BioBench01	Biostream	The user "Biostream" made changes to the param
14-Sep-2020 17:17:02	BioBench01	Biostream	The user "Biostream" changed the setpoint of the
14-Sep-2020 17:15:59	BioBench01	Biostream	The user "Biostream" made changes to the param
14-Sep-2020 17:10:58	BioBench01	Biostream	The user "Biostream" made changes to the param
14-Sep-2020 17:10:15	BioBench01	Biostream	The user "Biostream" made changes to the param
14-Sep-2020 17:08:35	BioBench01	Biostream	The user "Biostream" made changes to the param
14-Sep-2020 17:07:07	BioBench01	Biostream	The user "Biostream" made changes to the param

User actions

Advanced options

Biostream System Settings

Sterilization settings

- Allow fermentation start after sterilization:
- Show sample valve sterilization:
- Show harvest valve sterilization:
- Show pressure test:

Custom confirmation messages (keep empty for no warning)

Waterjacket start:

Fermentation start:

Inoculate:

Fermentation stop:

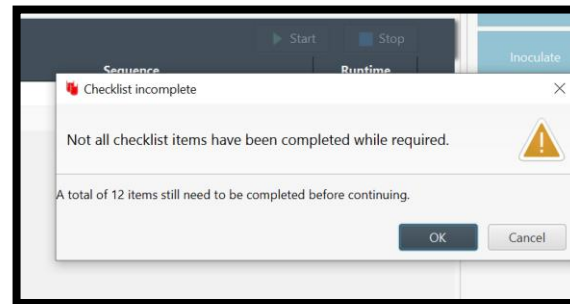
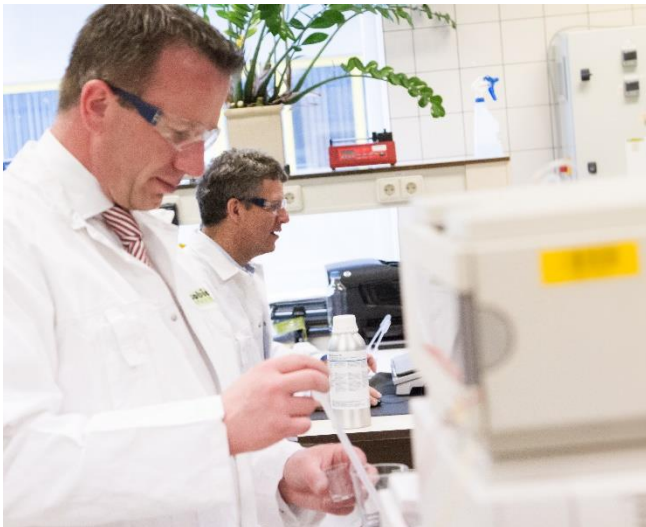
Fermentation stop all:

Sterilization start:

Sterilization stop:

Sample valve steril. start:

Harvest valve steril. start:



Start bioreactor not allowed before check list if finished

GSK Checklist

- Clean vessel with detergents
- Connect all the parts on the vessel
- Start pH calibration see procedure pH calibration
- Put pH sensor in the vessel and cover the head with aluminium foil
- Connect all addition bottles and clamp of the tubing between the vessel and bottle
- Cover filter on the bottle with Aluminium foil
- Put filter on the sparger and on the condenser
- Clamp tubing between filter and sparger

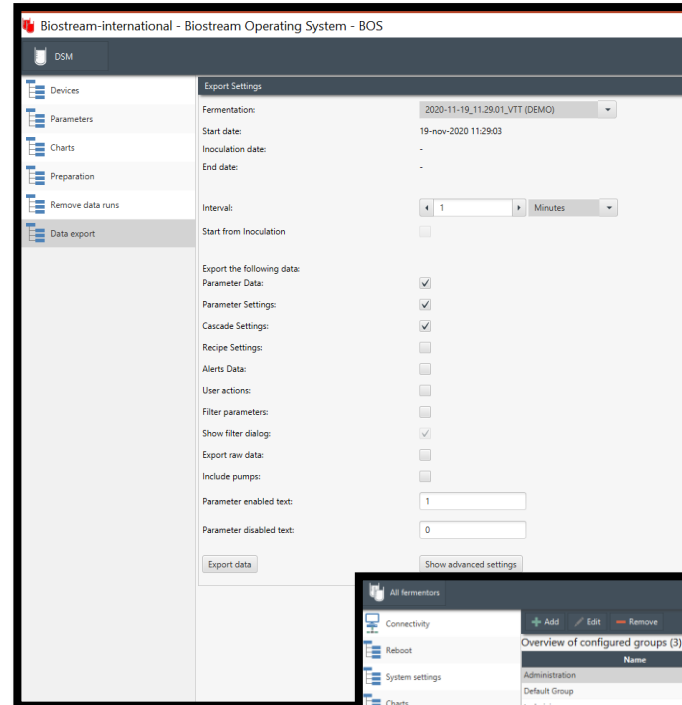
Checklist

Export data and backup

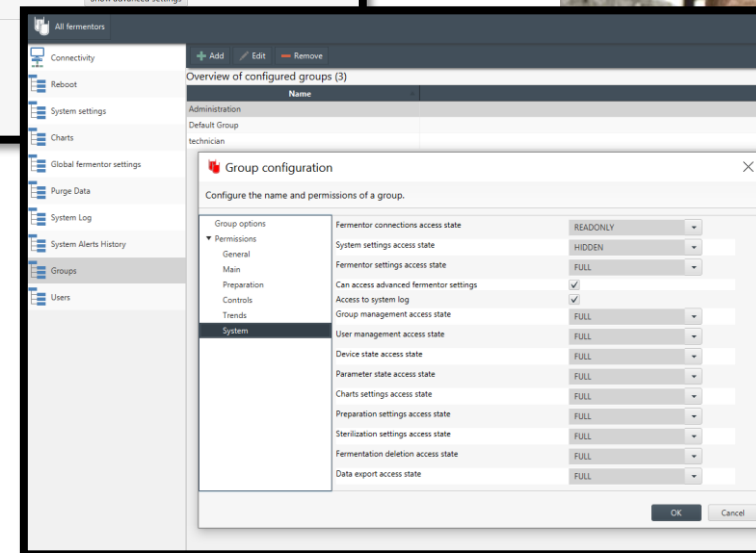
Data export function to excel or csv files
All the information which is stored can be exported

Database back up can also be automatically done
On your network

Connection to tertiary programs.
like Lucullus, Matlab, python or even
mathematical & prediction software via OPC



Data export



User management



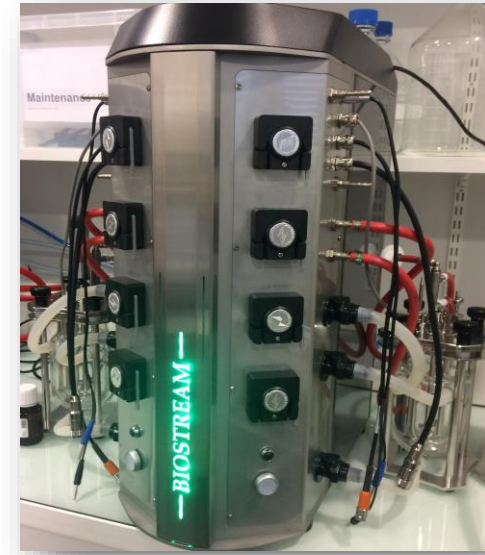
User management system to give access to options.
User should only see the bioreactor and options which are
Allowed to see.

Different setups



BioBench Single vessel

Different type of Bioreactors in one network
Maximum of 32 controllers



BioBench Twin vessel



- 9 inch touch screen computer
- Twistable arm and can be fixed in each position

Specifications touch screen









- 2Ghz processor
- 256 GB SSD
- 1333 Mhz DDR3, 8 Gb internal memory
- Linux operating system

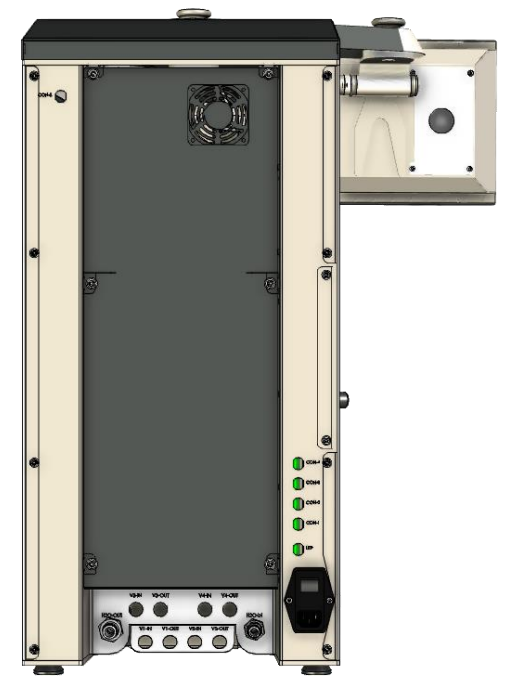


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Internal room Biobench

Integrations in the unit

-  Motor holder
-  Gas mix
-  4 Mass flow controllers
-  3 rotameters
-  Drip pan for leakage pump tubing.
-  Network connections
-  Room for gas analyzers or other sensors
-  5 on/off or analog pumps



Back plate can be dismantled

Define your own Gas mix

Option for more gas mixing strategies



and more gasses

With flow meters:



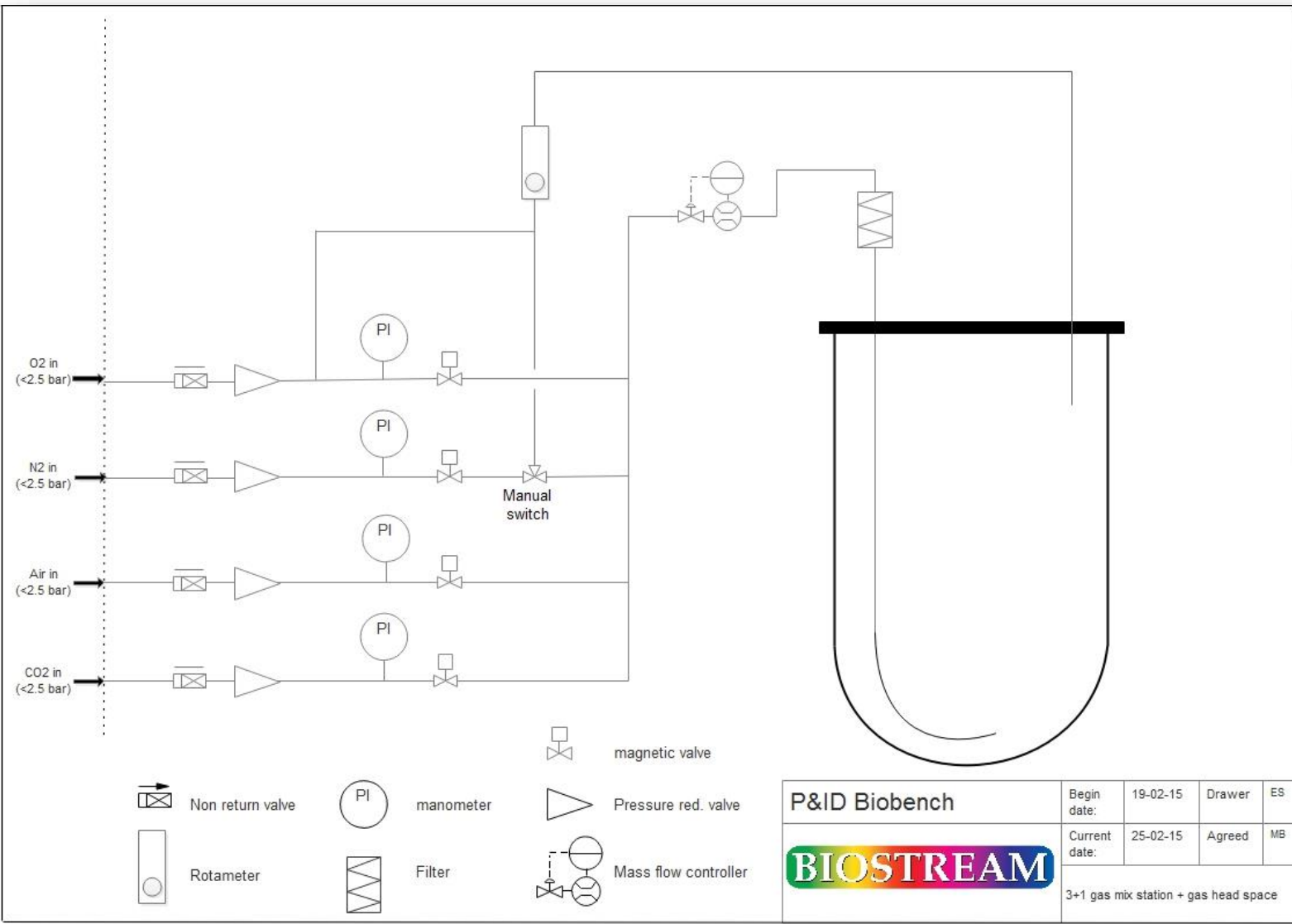
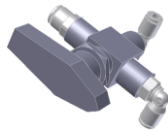
Rotameter

Mass flow controller

With valves



Manual switches for flexibility



Example: 3+1 gasmix with MFC



Pumps (also other pumps integration possible)

Free configurable for feed, base, acid, antifoam and more

Maximum 5 pumps in the cabinet. More pumps can be connected separate

Analog and On/off Pumps



Pump possibilities:



Acid



Base



Anti foam



Feed 1



Feed 2

Watson Marlow pumps (also other pumps integration possible)

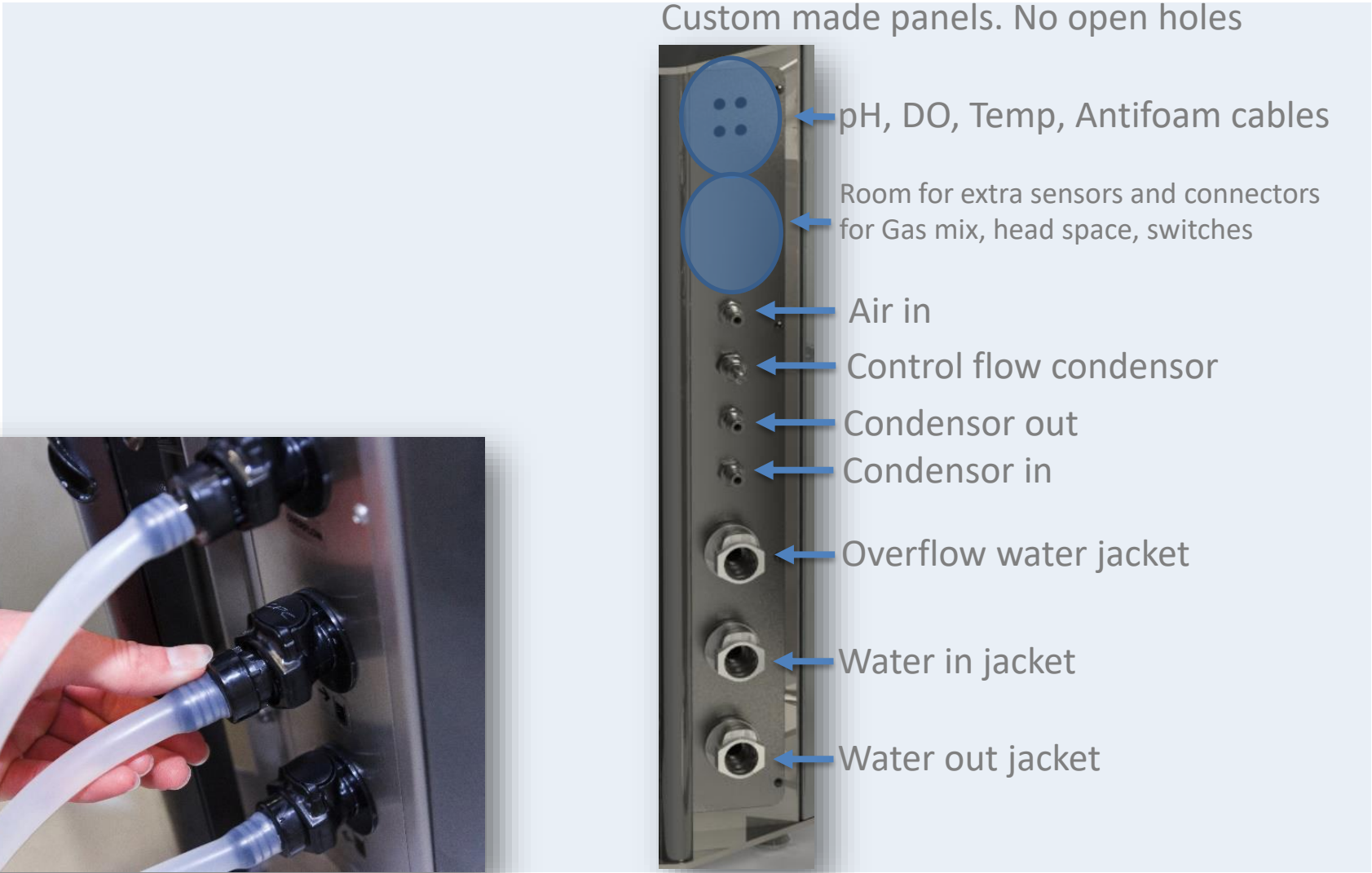
Free configurable for feed, base, acid, antifoam and more

Maximum 5 pumps in the cabinet. More pumps can be connected separate

- Feed back if the pump is running.
- Direction control via touch screen
- When pump is running the pump will be lighted with LED

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Connection to vessels

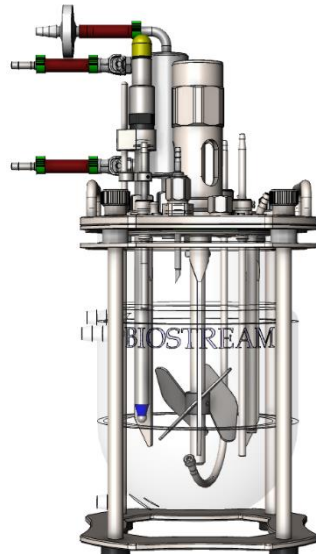


Universal Vessels

Linear scale up and down based on the same vessel dimensions.
Direct and magnetic drive systems.
Special designed for small autoclaves
Pitched blade, Marine, Spin filter, Cell lift or other mixing system
3D vessel will be available at delivery for easy finding parts



750 ml



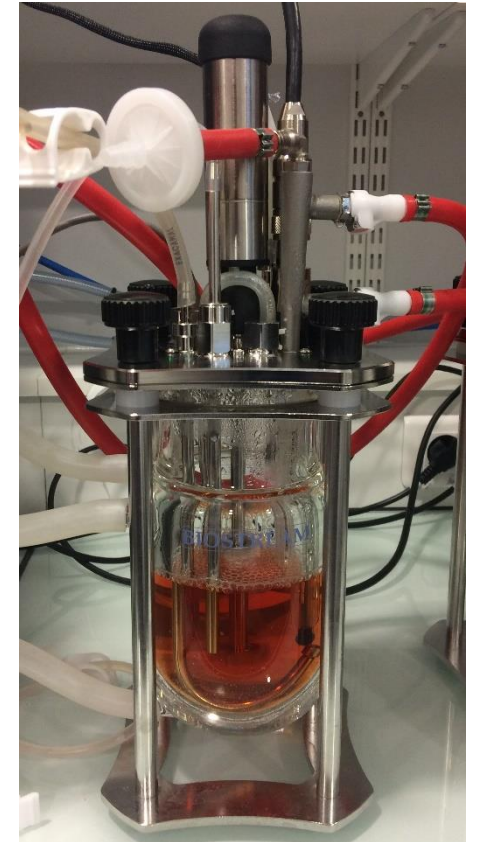
2 Liter



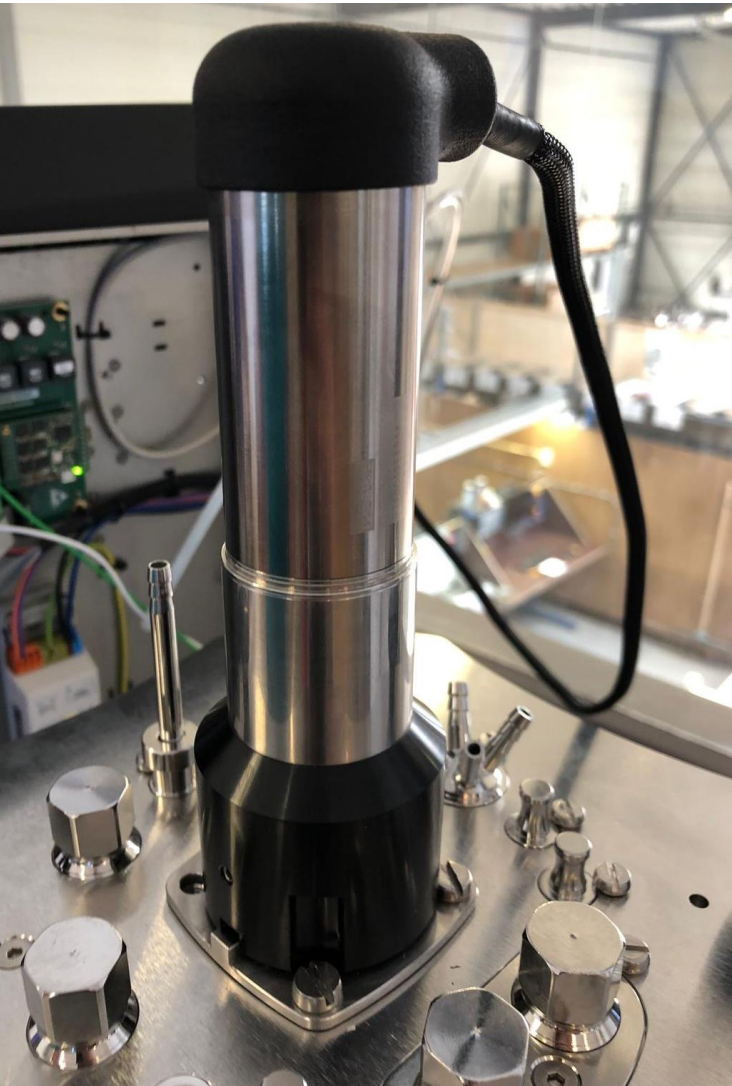
5 Liter



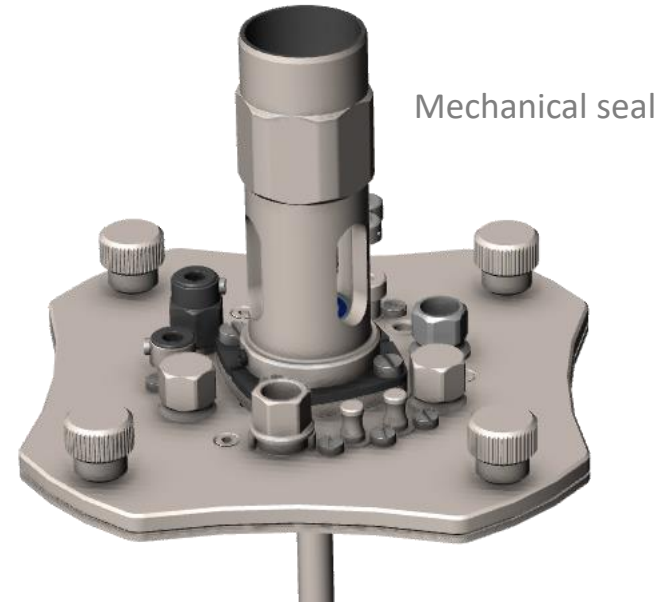
13/15 Liter



Drive systems



Magnetic drive



Mechanical seal



Glass vessel specifications

Glass vessel for cell culture Total Volume

	750 ml	1L	2 L	3,6 L	5 L	7,5 L	10 L	13 L
Working volume	180-500 ml	180 –800 ml	0,4 - 1,3 L	0,5 - 2,3 L	0,5 - 3,4 L	1,5 - 5 L	2,5 - 7 L	2,5 - 10,5 L
All type of vessels can be requested.								

Type op ports (standard)

8 mm	4	4	-	-	-	-	-	-
10 mm	4	4	5	4	4	5	5	5
12 mm (PG13,5),	5	5	5	6	6	8	8	8
18 mm	-	-	1	1	1	1	1	1

Head plate is free configurable with more ports

Cell culture:

Marine blade upflow impeller 0,5 ID	1	1	1	1	2	2	2	2
-------------------------------------	---	---	---	---	---	---	---	---

Vessel type: Round bottom and dished bottom
Single walled vessel and water-jacket vessel

Different impellers or other parts are possible at request



Marine impeller



Adapted impellers



Heater blanket

Standard controller specifications

1 Controller

Design Multi touch 7 inch screen with advanced control (optional) or a separate PC
Capable of communicating with 32 utility stations each a separate vessel.

Function Monitoring (data storage) and control

2 Agitation

Drive Depends on vessel
Mechanical and magnetic

Stirrer speed:
Mechanical: adjustable between 50-1500 RPM.
Magnetic: adjustable between 50-800 RPM.

Control PID control.

3 Temperature:

Range Water jacket vessel
5-8 ° C above coolant (>0°C) from around 5°C above room temp to 70 °C.

Sensor Pt-100 sensor (vessel and water system)
Delta temperature control possible

Accuracy +/- 0.1°C in range +10° to +60°C in fluids.

Control PID control with cooling valve and water jacket heater

Tempe. security Automatic safety thermostat

4 pH

Range 2 - 14

Control PID. Base and Acid (or CO2 gas) addition to control pH.
Setting of dead band

Accuracy +/- 0.01

Sensor Intelligent pH probe with calibration data, runs and more (depends on brand)



- 1 DO**
Range 0 – 150 %
Control PID
Sensor Intelligent DO probe with calibration data, runs and more (depends on brand)
- 2 Exhaust**
Filter Standard 0,2 µm absolute filter (also other options available)
Condenser Optional: High condensation and can be dismantled completely.
- 3 Integrated Pumps**
5 corrective reagent and Substrate pumps possible.
Standard 3 on/off (base, acid, foam) and 2 analog (feed)
Easy adjustable from analog ↻ digital
Additional integrated and external pumps possible.
Free configurable with a block at the back
Range from 0.001 to 347 ml/min with different tubings
- 4 Gas mix**
Free configurable. See other pages
- 5 Utilities**
2 bar oil free gasses
0,5 - 3 bar water (normal tap water pressure)
The Biobench itself has pressure regulation internally for safety issues.
- 6 Aux. equipment** All kinds of external measurements can be integrated in the touch screen.

Standard controller specifications

✓ assistance of our lab technicians.



2 years and is extendable



BIOSTREAM

overview projects in 3D

Do you know if the new bioreactors fit in your lab or production room?
We make a copy of your lab in 3D and look if the Bioreactors will fit in the room

