

# BIOSTREAM

## Technical specifications

## BioBench

Microbial /Cell Culture



# BIOSTREAM

## Vision



We offer total solutions

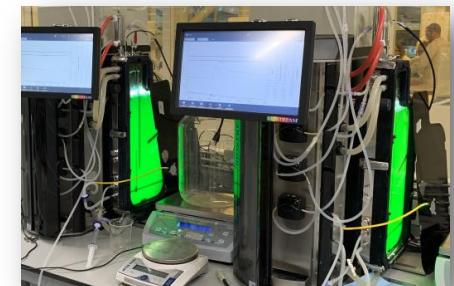
Open relation with the customer/  
partner/suppliers and Employee's

Keep customer satisfied

## Application fields



Food & Biobased



Algae



Cell culture

## Type of Cells

All type of micro organisms  
Fungi, yeast  
Plant Cells  
Solid state  
Insect cells  
Animal & human cells

## Process Modes

Batch  
Fed-batch  
Continuous  
Perfusion



## Applications

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

## Industries

Biopharmaceuticals  
Vaccines  
Cell therapies  
Industrial biotechnology  
Basic research  
Education

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BioCompact multiple reactor



BioBench Twin



BioBench



BioPilot

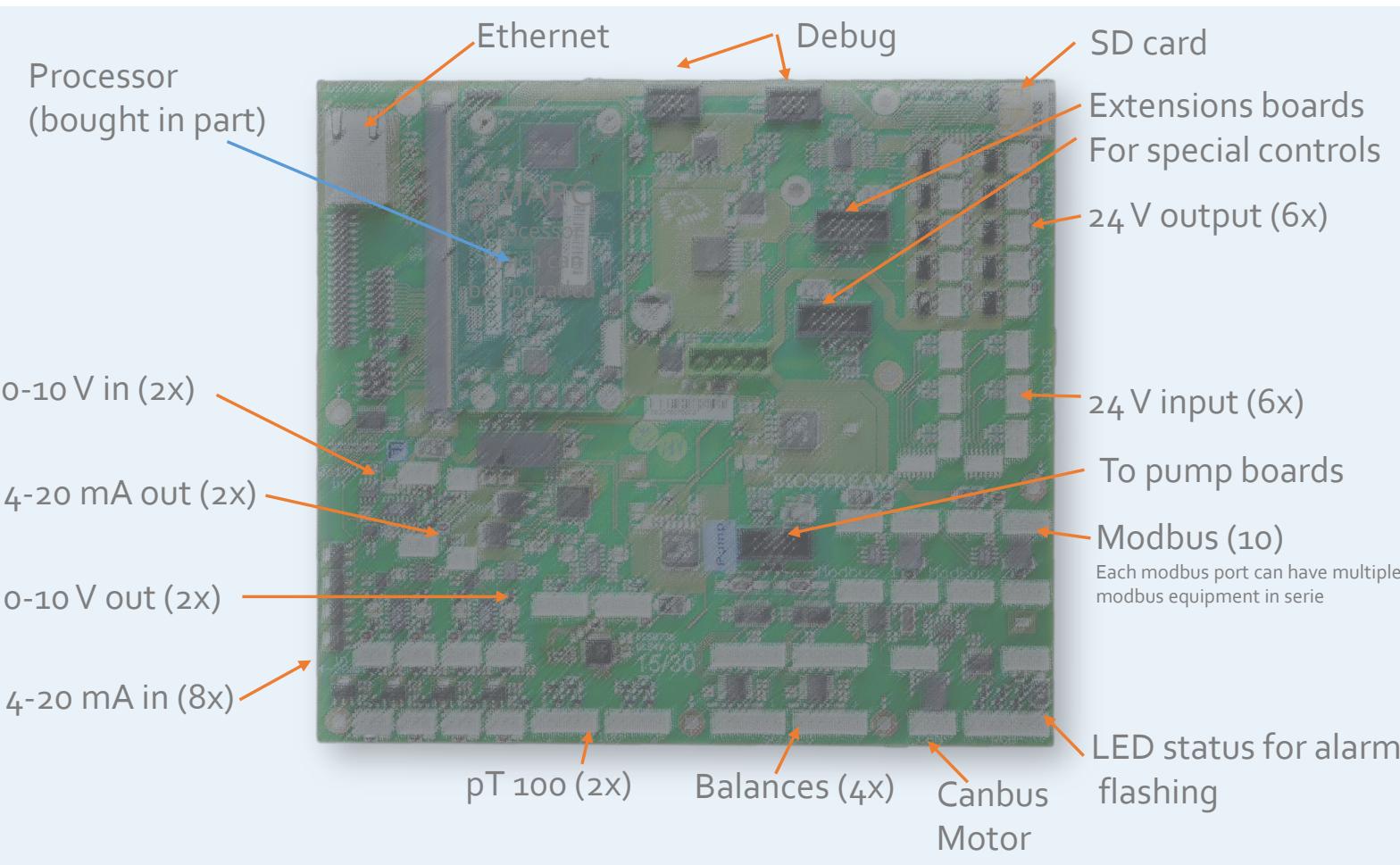


BioTwin  
Single vessel



Bioproject

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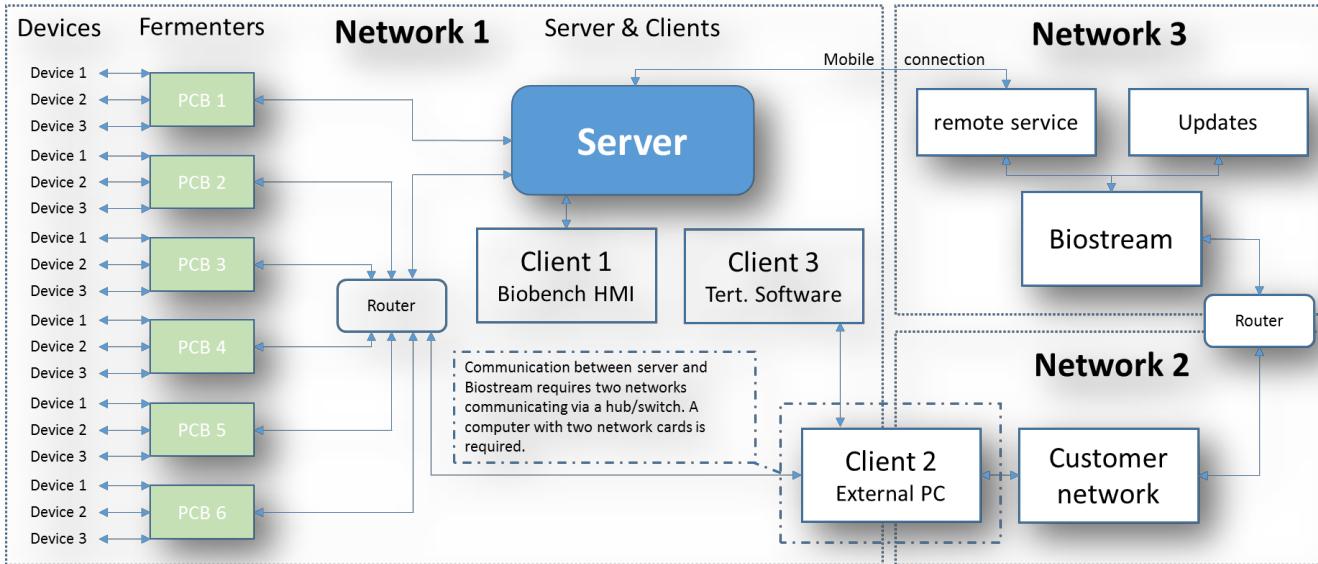
## Basic control print

### Extension board possibilities

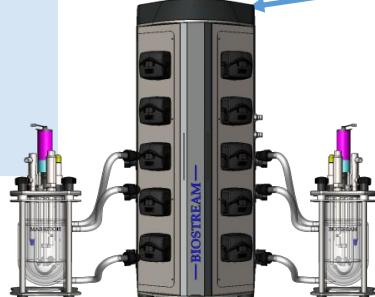
- Extra I/O channels
- Valve boards
- Connection of old equipment
- Custom made options



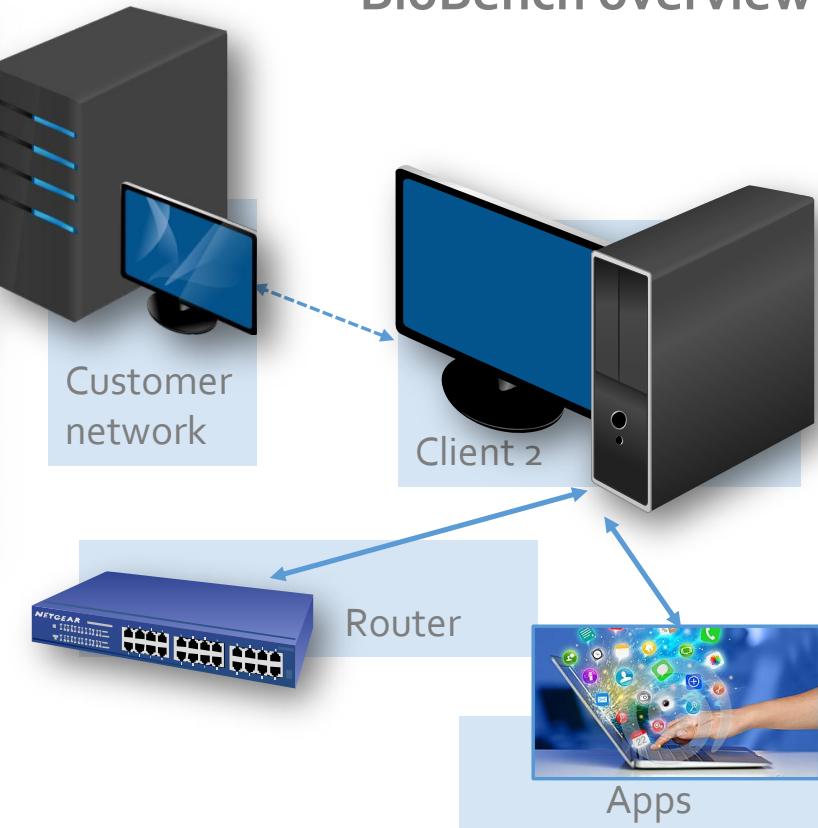
# BIOSTREAM



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



## BioBench overview



Expandable to 32 fermentors and more

# BIOSTREAM

## 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



All kind of motors  
with adapter



Chillers

Example:  
Adapter for Applikon vessel

Some Examples are shown in this overview

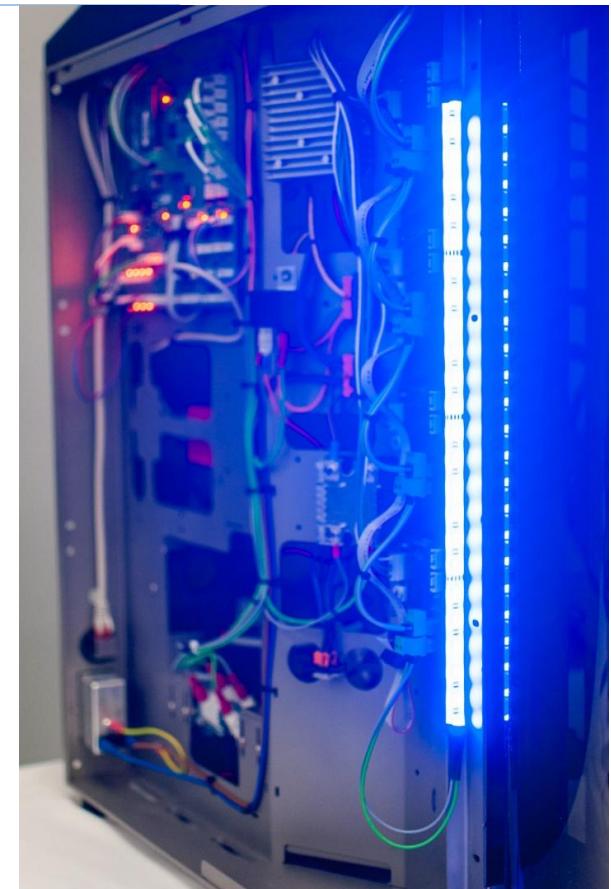
All measurement devices and actuators with  
an in- or output can be connected

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

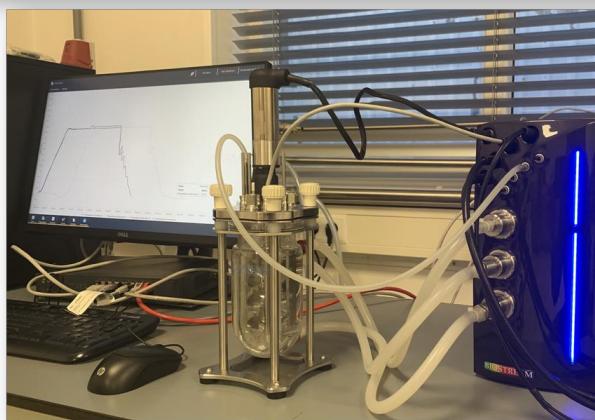
| Setting                   | Number | Type of sensor&actuator  |
|---------------------------|--------|--|
| Modbus                    | 64     | For pO <sub>2</sub> , pH, MFC, Off gas and other digital sensors |
| 0-10 V Output             | 2      | For pumps, LED, pressure, gasmix                                 |
| 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                        |
| RGB option                | 1      | For alarming and camera  |
| Extension boards          | 2      |  |

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



# BIOSTREAM

| Fermentor A   |       |      | No Alerts |        | Default User |        | 08-me-2016 08:12:56 |  |
|---------------|-------|------|-----------|--------|--------------|--------|---------------------|--|
| 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            |  |



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.

## 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.

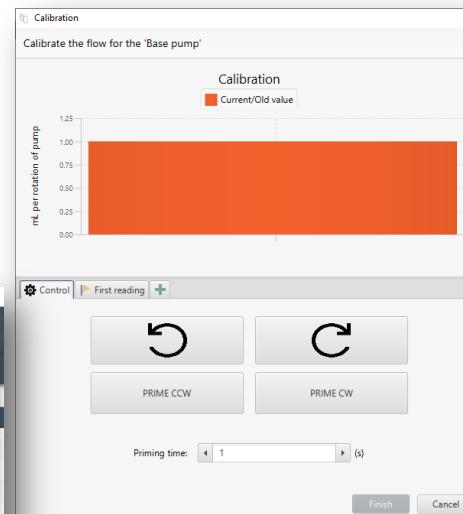
**FREE upgrades** of software. Each 2 months there is a release of new features. This can be downloaded and can be upgraded by yourself.

| All fermentors |                |           |
|----------------|----------------|-----------|
|                | All fermentors |           |
|                | Bioreactor 1   | Started   |
|                | Bioreactor 2   | Preparing |
|                | Bioreactor 3   | Preparing |

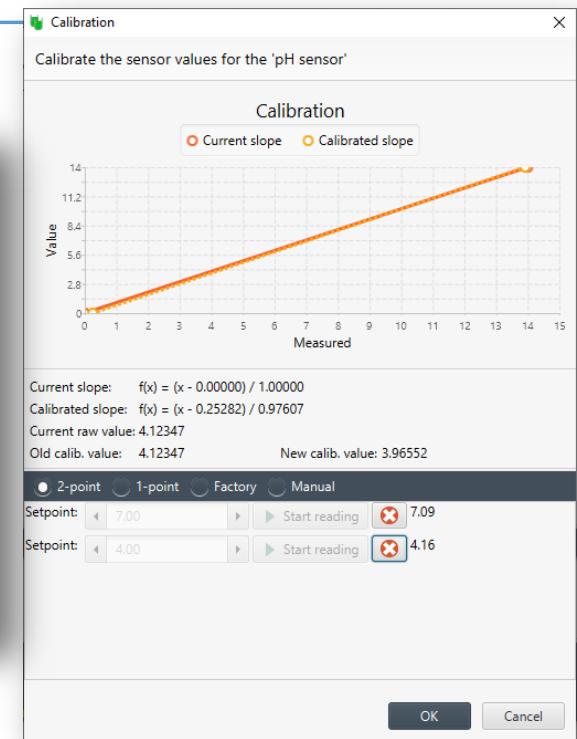
# BIOSTREAM

## BOS Controlling & Logging Software

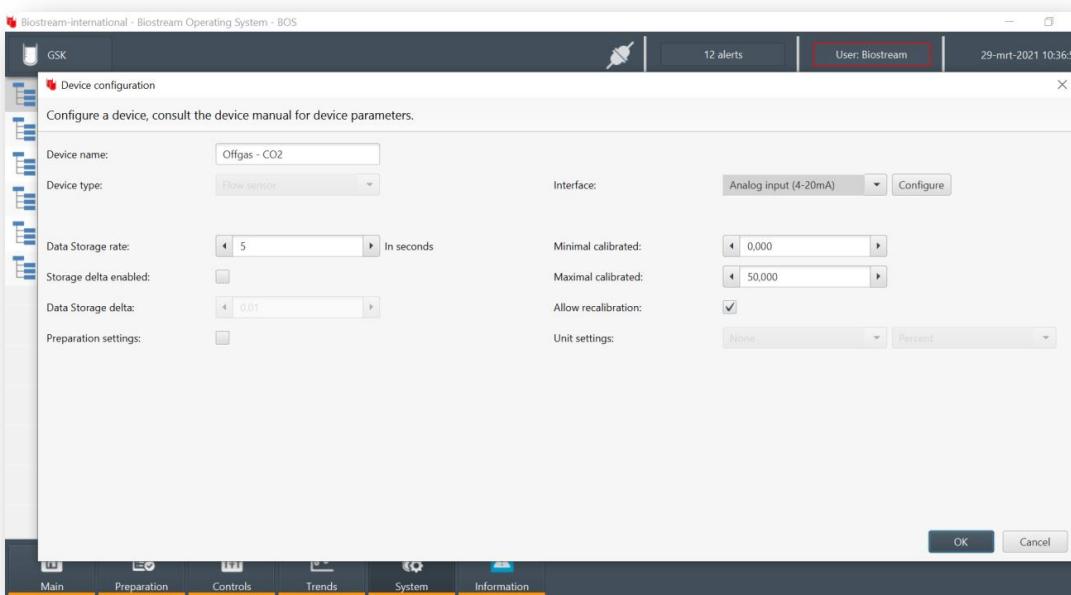
Easy one & two point calibration with graphical view and raw data for all sensors and pumps.  
Multiple calibrations available for pumps to get a higher accuracy.  
Maintenance information sensors.  
Priming and control direction of the pumps.



Example: Pump calibration.



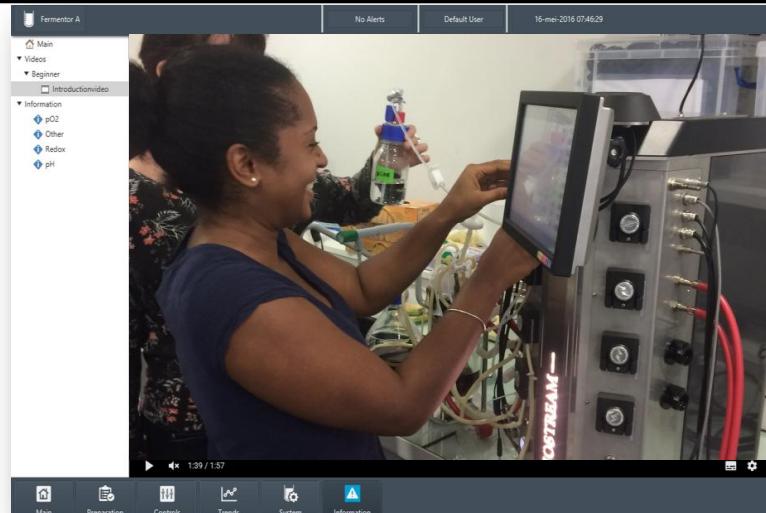
Example: Sensor calibration.



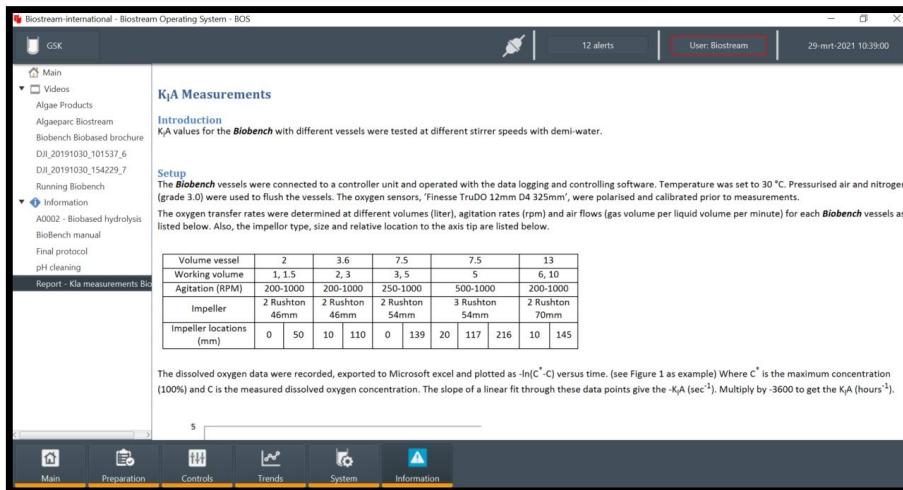
Adding external devices like sensors,  
pumps and valves yourself.  
Design your own parameter control  
loops.

Parameters can be P&ID controlled

# BIOSTREAM



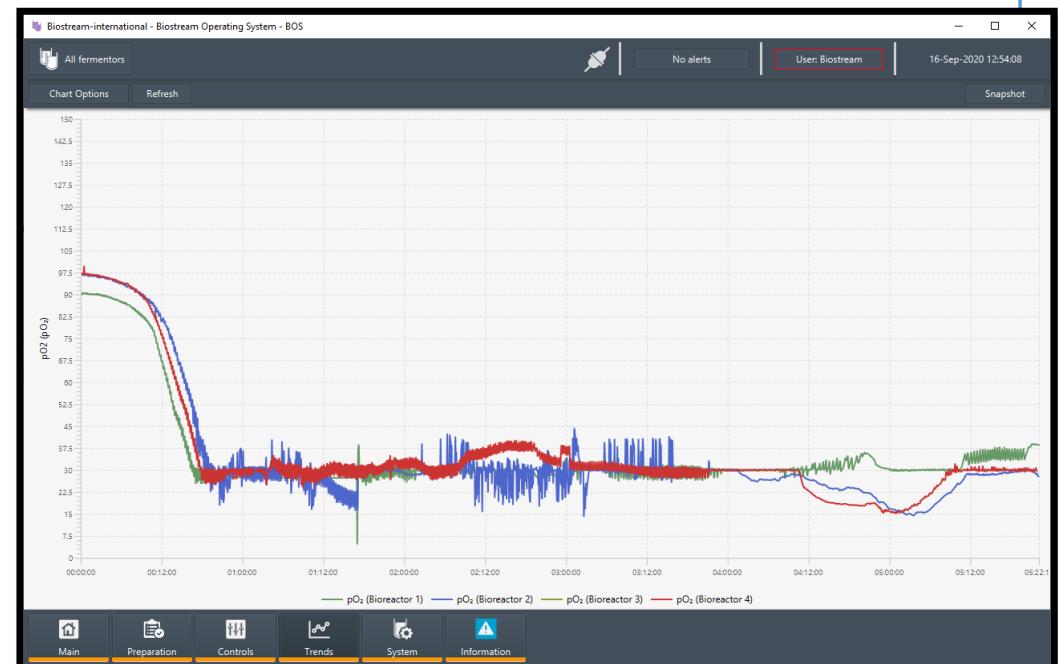
Multimedia integration like movies from phone & tablets in the HMI.



Integration of your own protocols (SOPs) 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



# BIOSTREAM

## Cascading and automation possibilities

### Recipes

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

Recipes

Search...

Add View Start Stop

| Name                                  | Status  | Sequence                        | Runtime  |
|---------------------------------------|---------|---------------------------------|----------|
| SAFETY: Headspace > 5% O <sub>2</sub> | Running | 1: Wait for O <sub>2</sub> > 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.

pO<sub>2</sub>

Active:

PID cascade:

Deadband: 0.000 pO<sub>2</sub>

Deadband evaluation time: 1 Seconds

Example: Switch between normal and P&ID cascading



Recipe System

Name: Setpoint AF  
Evaluation time (s): 1  
After last sequence: Loop back to first 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   |

OK Cancel

Example: Program block

Cascade

Configure a cascade.

Offgas analyzer

Offline Sample

Antifoam

pH

pO<sub>2</sub>

Stirrer

Temperature

Feed 1

pH

pO<sub>2</sub>

Stirrer

Drag here

Drag here

OK Cancel

Example: Drag and drop blocks for cascading possibilities

# BIOSTREAM

## BOS Controlling & Logging Software

Create your own simple check list for starting up a bioreactor

The screenshot shows a software interface with a dark header bar. Below it, a main window titled 'BioBench01' contains a 'Calibration' tab and a 'Checklist' tab. The 'Checklist' tab is active, displaying a list of items with checkboxes:

- Checklist Item 1 (checked)
- Calibrating the pH sensors (unchecked)
- Adding sulphate to the culture medium (checked)
- Checklist item 4 (unchecked)

### Sample tracking

With possible volume correction on total  
Volume to change feeding protocols

The screenshot shows a 'Sample overview' dialog box with a search bar. Below it is a table with columns: Sample date, Description, and mL. The data is as follows:

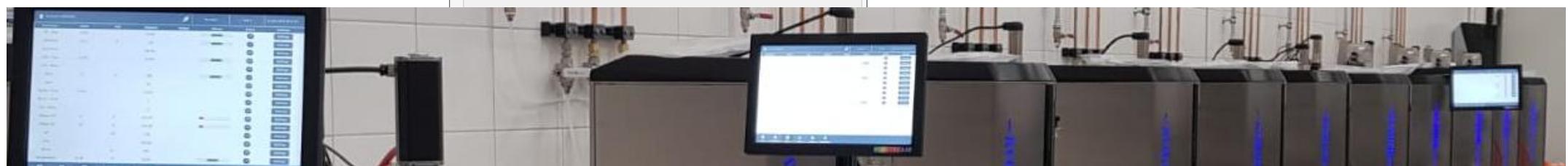
| Sample date          | Description | mL |
|----------------------|-------------|----|
| 15-Sep-2020 09:29:38 | Sample 1    | 23 |
| 15-Sep-2020 09:29:47 | Sample 2    | 16 |

The screenshot shows a dialog box titled 'GSK' with a table of parameters and their values. The table includes:

| Parameter            | Value | Unit | Setpoint | Output | Alarms |
|----------------------|-------|------|----------|--------|--------|
| BlueSens (On/Off)    |       |      |          |        |        |
| Feed                 |       |      |          |        |        |
| Gas Analyzer - CO2 % |       |      |          |        |        |
| Level                |       |      |          |        |        |
| methanol             |       |      |          |        |        |
| off line glucose     |       |      |          |        |        |
| pH                   |       |      |          |        |        |
| pO2                  |       |      |          |        |        |
| Stirrer              |       |      |          |        |        |
| Temperature          |       |      |          |        |        |

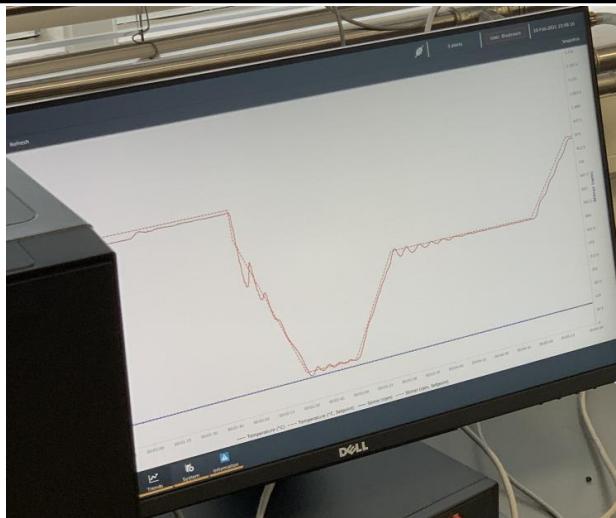
Below the table, there are input fields for 'Add a sample value', 'Select a sample', 'Or set time directly', 'Selected insertion date/time', and 'Enter corresponding value'. Buttons for 'OK' and 'Cancel' are at the bottom right.

Off-line measurement input



# BIOSTREAM

## BOS Controlling & Logging Software parallel functions



Biostream-international - Biostream Operating System - BOS

All fermentors

12

GSK

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

Merck

| Parameter | Value | Unit | Setpoint | Output | Alarms |
|-----------|-------|------|----------|--------|--------|
| pO2       |       |      |          |        |        |

CIP

| Parameter   | Value | Unit | Setpoint | Output | Alarms |
|-------------|-------|------|----------|--------|--------|
| pH          | pH    |      |          |        |        |
| pO2         |       | -    |          |        |        |
| Stirrer     |       | rpm  |          |        |        |
| Temperature |       | °C   |          |        |        |

DSM

| Parameter                            | Value | Unit |
|--------------------------------------|-------|------|
| Please select one or more parameters |       |      |

Main Preparation Controls Trends System Information

All fermentors

2 alerts

Log in

07-mrt-2021 16:24:08

| # | Name          | Status  | Started              | Inoculated | Stopped              | Select                   |
|---|---------------|---------|----------------------|------------|----------------------|--------------------------|
| 0 | DTU Yellow    | Stopped | 18-nov-2020 12:10:34 | -          | -                    | <input type="checkbox"/> |
| 1 | DTU 7.5 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 | holiferm      | Stopped | 04-nov-2020 14:38:25 | -          | 04-nov-2020 14:38:35 | <input type="checkbox"/> |
| 4 | VIT (DEMO)    | Started | 19-nov-2020 11:29:03 | -          | -                    | <input type="checkbox"/> |

Fill jackets Start Inoculate Stop selected Select All Select None Stop all

Main Preparation Controls Trends System Information

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

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

REQUEST a demo for testing

# BIOSTREAM

## BOS Controlling & Logging Software

### 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

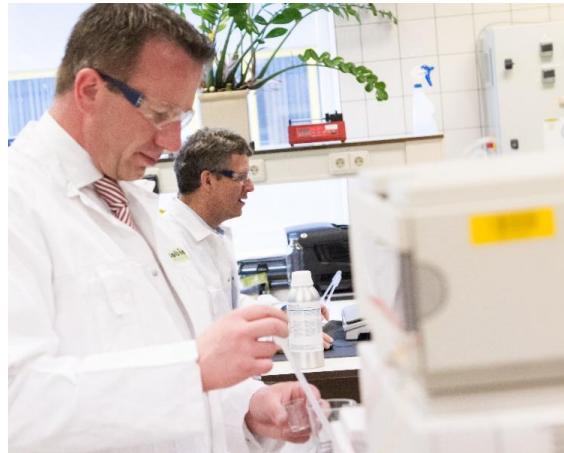
pH temperature correction

Confirmation to inform users before starting a run

Force check list for completion

Auto log on/off

Auto calibration of pumps



**User actions**

Biostream-international - Biostream Operating System - BOS

Actions

Date/Time Fermentor User Action

| Date/Time            | Fermentor  | User      | Action  |
|----------------------|------------|-----------|---|
| 16-Sep-2020 09:18:33 | BioBench01 | Biostream | The user "Biostream" set the recipe state of recipe "StabTest1" 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 the fermentor to: Started  |
| 16-Sep-2020 09:18:12 | BioBench01 | Biostream | The user "Biostream" set the fermentation state of the fermentor to: Started  |
| 15-Sep-2020 21:03:54 | BioBench01 | Biostream | The user "Biostream" set the fermentation state of the fermentor to: Started  |
| 15-Sep-2020 15:29:56 | N/A        | Biostream | The user "Biostream" changed the fermentation state of the fermentor to: Started  |
| 15-Sep-2020 15:28:06 | N/A        | Biostream | The user "Biostream" made changes to the user "Biostream":<br>- The group was changed from "TestGroup" to "OpGroup".<br>- The password was changed. |
| 15-Sep-2020 13:02:45 | BioBench01 | Unknown   | An unknown user set the recipe state of recipe "StabTest1" to: Started  |
| 15-Sep-2020 13:02:29 | BioBench01 | Unknown   | An unknown user set the recipe state of recipe "StabTest2" to: Started  |
| 15-Sep-2020 13:01:56 | BioBench01 | Unknown   | An unknown user set the fermentation state of the fermentor to: Started   |
| 14-Sep-2020 17:20:56 | BioBench01 | Biostream | The user "Biostream" set the fermentation state of the fermentor to: Started  |
| 14-Sep-2020 17:18:39 | BioBench01 | Biostream | The user "Biostream" changed the setpoint of the fermentor to: 10.0   |
| 14-Sep-2020 17:18:08 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 10.0 to 5.0                           |
| 14-Sep-2020 17:17:02 | BioBench01 | Biostream | The user "Biostream" changed the setpoint of the fermentor to: 10.0   |
| 14-Sep-2020 17:15:59 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 10.0 to 5.0                           |
| 14-Sep-2020 17:10:58 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 5.0 to 10.0                           |
| 14-Sep-2020 17:10:15 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 1.0 to 10.0                           |
| 14-Sep-2020 17:08:35 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 5.0 to 10.0                           |
| 14-Sep-2020 17:07:07 | BioBench01 | Biostream | The user "Biostream" made changes to the parameter "Maximum Output":<br>- The Maximum Output was changed from 5.0 to 10.0                           |

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: First watch movie

Fermentation start:

Inoculate:

Fermentation stop:

Sterilization start:

Sterilization stop:

Sample valve steril. start:

Harvest valve steril. start:

**Start bioreactor not allowed before check list if finished**

Sequence Runtime

Start Stop Inoculate

Checklist incomplete

Not all checklist items have been completed while required.

A total of 12 items still need to be completed before continuing.

OK Cancel

**Checklist**

Calibration 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

# BIOSTREAM

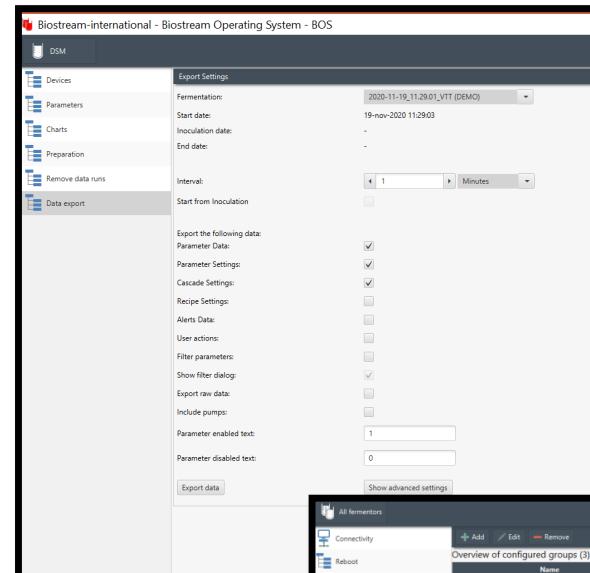
## BOS Controlling & Logging Software

### Export data and backup

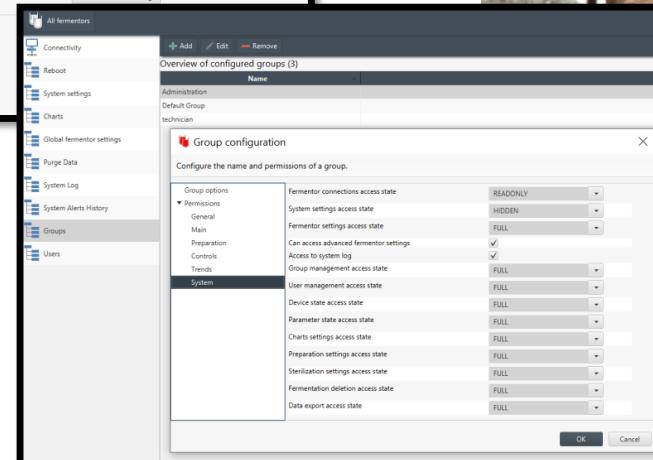
Data export function to excel or csv files  
All the information which is stored can be exported

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

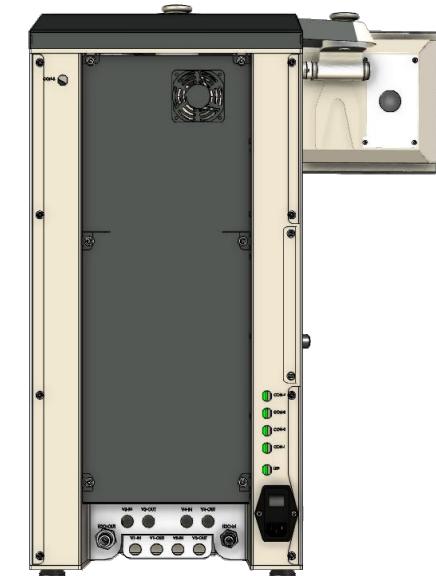


## Integrations in the standard base unit

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



## Internal room Biobench



Back plate can be dismantled

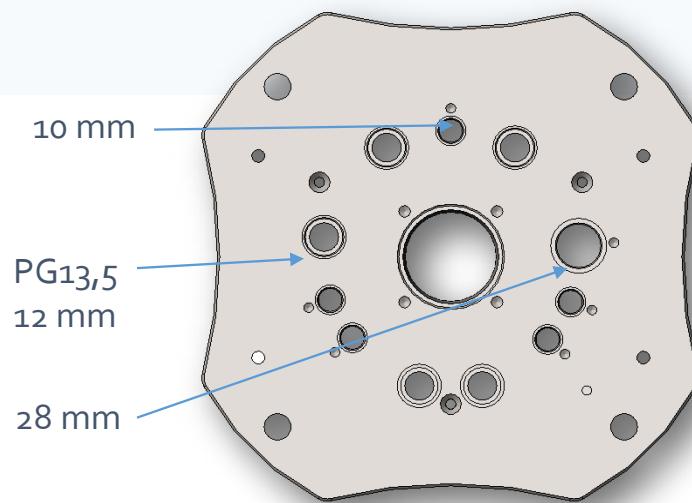
## Vessel specifications

# BIOSTREAM

| Total Volume                                   | 250 ml       | 500 ml    | 750 ml    | 1.5L   | 2 L      | 3L     | 4L       | 5L     | 7.5L   | 13L     | 15L     |
|--|--------------|-----------|-----------|--------|----------|--------|----------|--------|--------|---------|---------|
| Working volume                                 | 50-250ml     | 100-300ml | 100-500ml | 0,2-1L | 0,4-1,5L | 0,4-2L | 0,5-3,4L | 0,5-4L | 0,5-5L | 0,5-10L | 0,5-13L |
| <b>Head plate</b>                              |              |           |           |        |          |        |          |        |        |         |         |
| Type op ports (standard)                       |              |           |           |        |          |        |          |        |        |         |         |
| 8 mm   | -            | -         | 4         | -      | -        | -      | -        | -      | -      | -       | -       |
| 9 mm   | 8            | 9         | -         | 4      | -        | -      | -        | -      | -      | -       | -       |
| 10 mm  | -            | -         | 4         | 4      | 5        | 5      | 5        | 5      | 5      | 5       | 5       |
| 12 mm (PG13,5),<br>28 mm (for four way needle) | 3            | 3         | 4         | 4      | 5        | 5      | 5        | 5      | 5      | 8       | 8       |
| Half moon addition                             | -            | -         | -         | -      | 1        | 1      | 1        | 1      | 1      | 1       | 1       |
| Impellers Marine (0,5ID)                       | 1            | 1         | 1         | 1      | 1        | 2      | 2        | 2      | 2      | 2       | 2       |
| Vessel type:                                   | Round bottom |           |           |        |          |        |          |        |        |         |         |



Pitched blade impeller

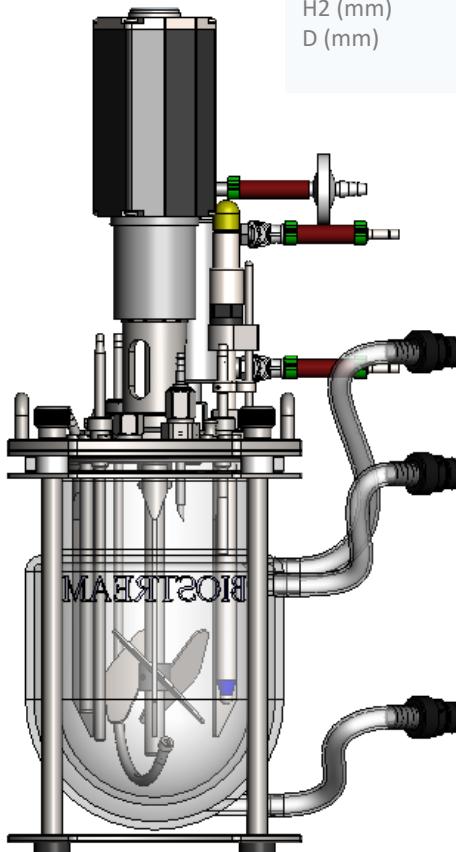


Vessel head plate from 2 to 7.5 L

# BIOSTREAM

## Universal water jacketed vessel

| Total Volume | 250 ml | 500 ml | 750 ml | 1.5L | 2 L | 3L  | 4L  | 5L  | 7.5L | 13L | 15L |
|--------------|--------|--------|--------|------|-----|-----|-----|-----|------|-----|-----|
| Dimensions   |        |        |        |      |     |     |     |     |      |     |     |
| H1 (mm)      | 199    | 242    | 269    | 373  | 254 | 345 | 309 | 309 | 496  | 605 | 715 |
| H2 (mm)      | 307    | 351    | 378    | 482  | 377 | 467 | 434 | 434 | 660  | 666 | 859 |
| D (mm)       | 158    | 158    | 158    | 174  | 208 | 201 | 194 | 194 | 169  | 290 | 290 |

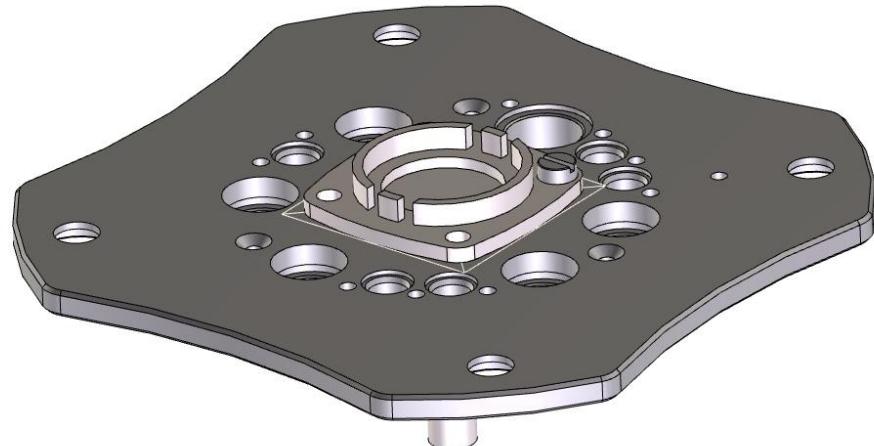


Linear scale up and down based on the same vessel dimensions.  
Direct and magnetic drive systems.  
Special designed for small autoclaves  
Pitched blade, Marine, Spin filter, Cell lift or other mixing system  
3D vessel will be available at delivery for easy finding parts



# BIOSTREAM

## Mechanical drive system



To maximum 700 rpm

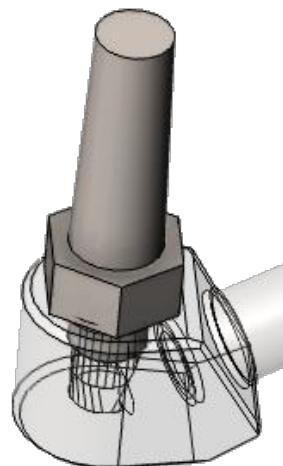


## Sintered sparger

Sintered Sparger 5L Cell 15µm

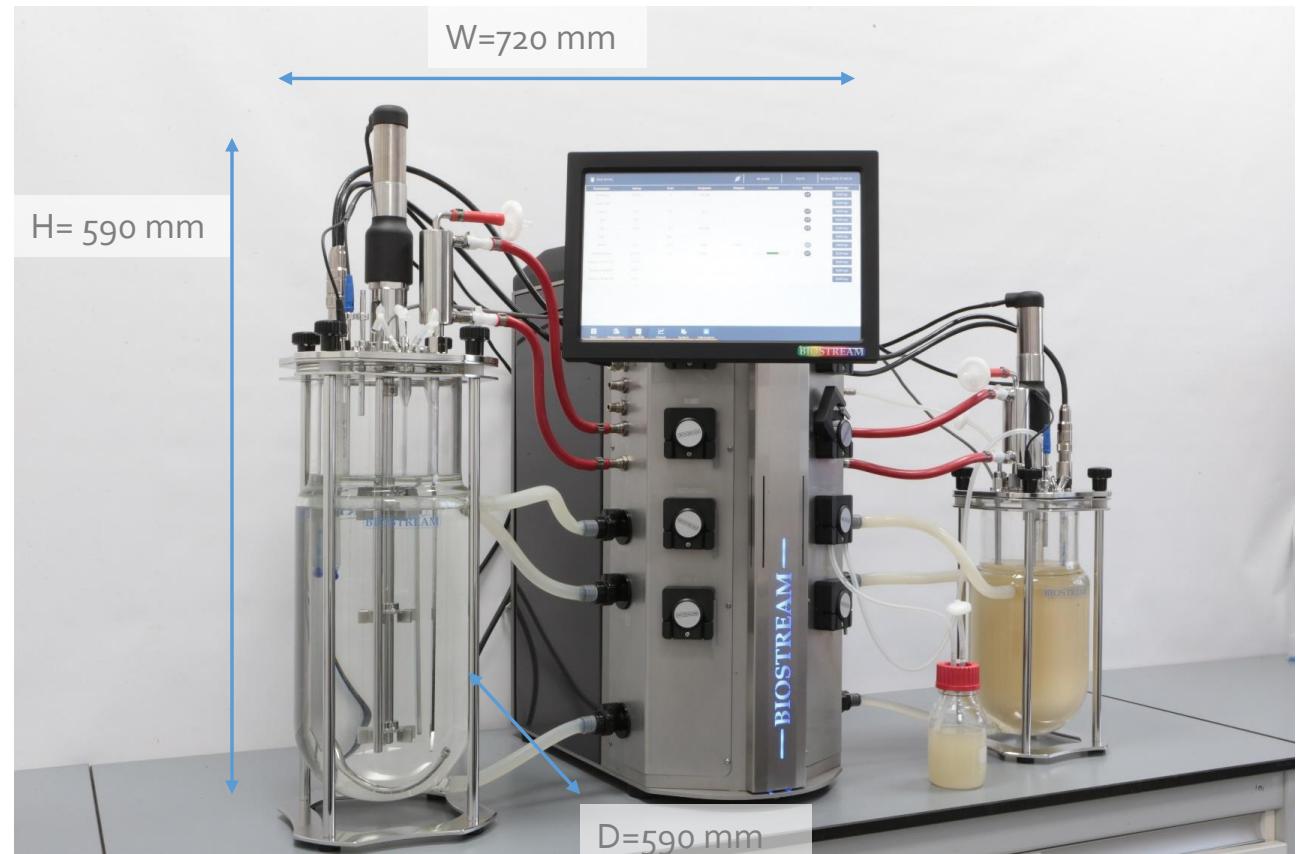
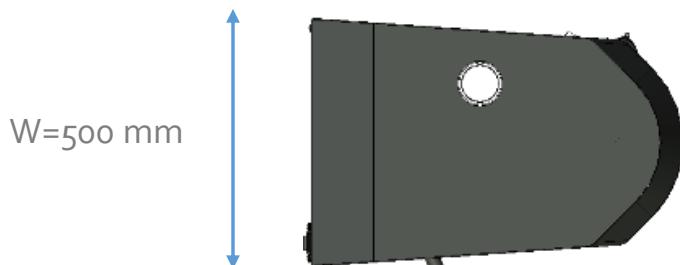
Specifications:

Tube OD/ID: 8 mm/ 4 mm



# BIOSTREAM

Dimensions base unit





## 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:

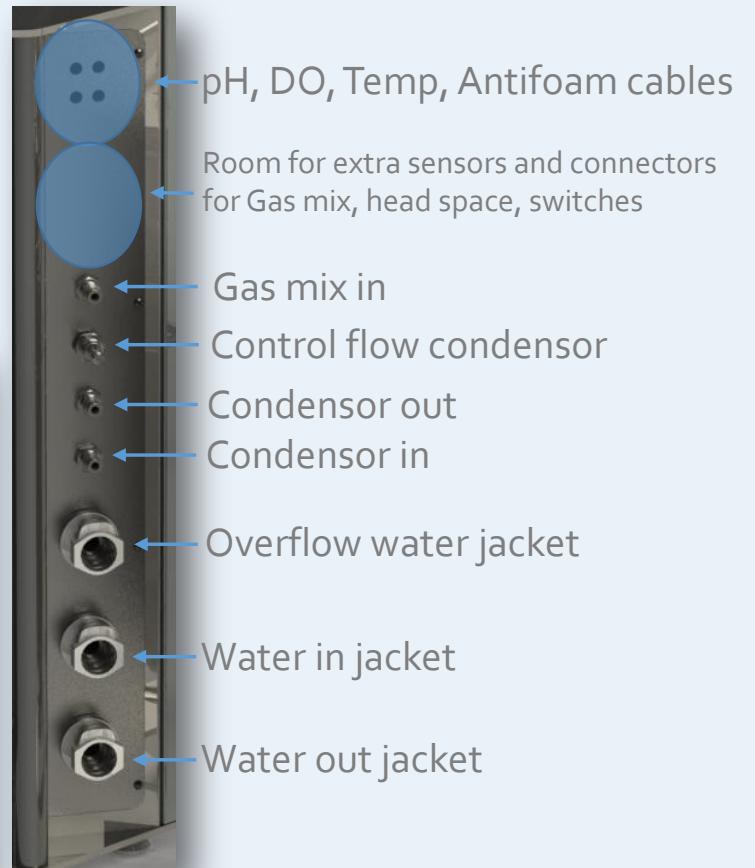
-  Acid
-  Base
-  Foam & Level
-  Feed 1
-  Feed 2

# BIOSTREAM

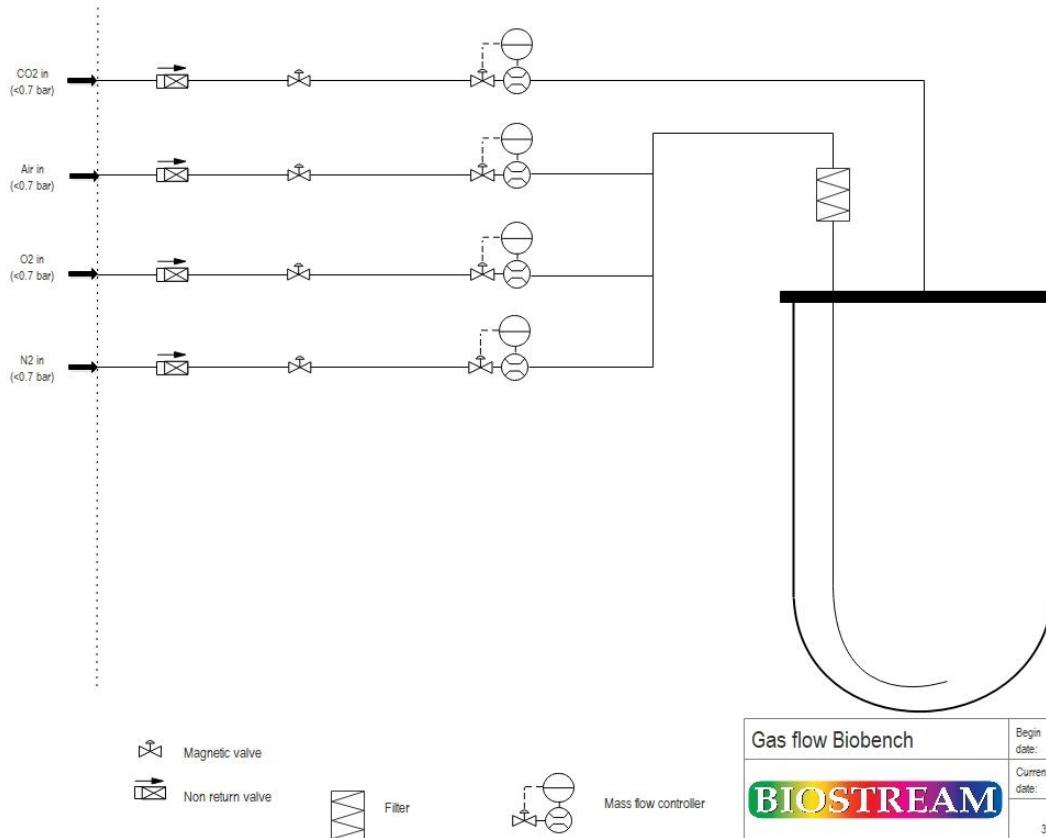
## Connections to vessel



Custom made panels. No open holes



# BIOSTREAM



| Gas flow Biobench |  |        |  |
|-------------------|--|--------|--|
| BIOSTREAM         |  |        |  |
| Begin date:       |  | Drawer |  |
| Current date:     |  | Agreed |  |

3 MFCs with 1 MFC head space including gasmixing with valves

Gas mix can be adapted and you can use the gasses for head space and sparging

Define your own Gas mix

Option for more gas mixing strategies

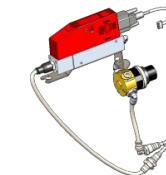


and more gasses

With flow meters:



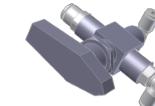
Rotameter



Mass flow controller



Manual switches for flexibility



# BIOSTREAM

## Controller specifications

### 1 Controller

|          |  |
|----------|--|
| Design   | Multi touch 9 inch screen with advanced control or a separate PC<br>Capable of communicating optimal with 6 utility stations<br>Total 32 controllers possible. |
| Function | Monitoring (data storage) and control  |

### 2 Agitation

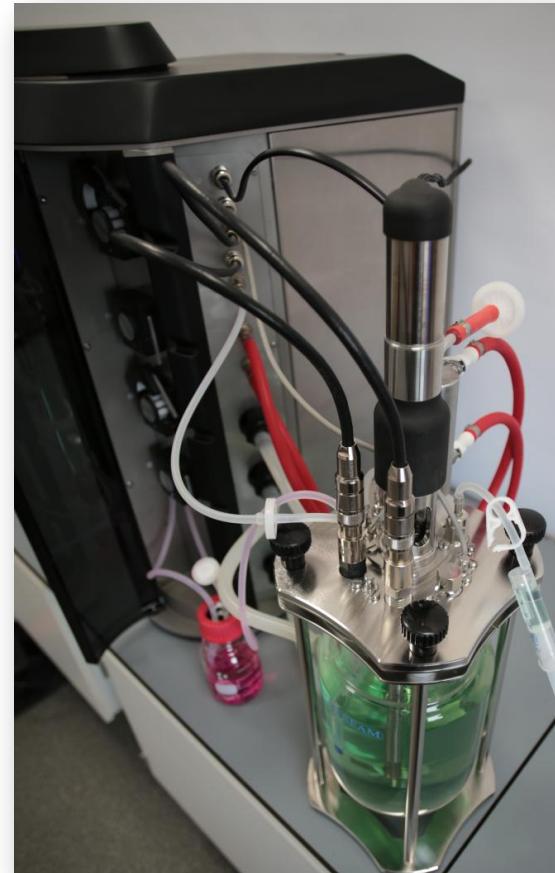
|               |  |
|---------------|--|
| Drive         | magnetic or mechanical                     |
| Stirrer speed | Speed is adjustable between up to 700 RPM. |
| Control       | PID control.                               |

### 3 Temperature:

|                |  |
|----------------|--|
| Range          | Water jacket vessel<br>5-8 °C above coolant (>0°C) from around 5°C above room temp to 85 °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                                       |
| Temp. 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 |
| Sensor  | Intelligent pH probe with calibration data, runs and more (depends on brand) |



# BIOSTREAM

## Controller specifications



DO

Range  
Sensor

0 – 200 %  
Intelligent DO probe with calibration data, runs and more (depends on brand)



Exhaust

Filter  
Condenser

Standard 0,2 µm absolute filter (also other options available)  
High condensation and can be dismantled completely.



Integrated Pumps

5 corrective reagent and Substrate pumps.  
Standard 2 on/off (base, acid, foam) and 2 analog (feed in and out)  
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



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.



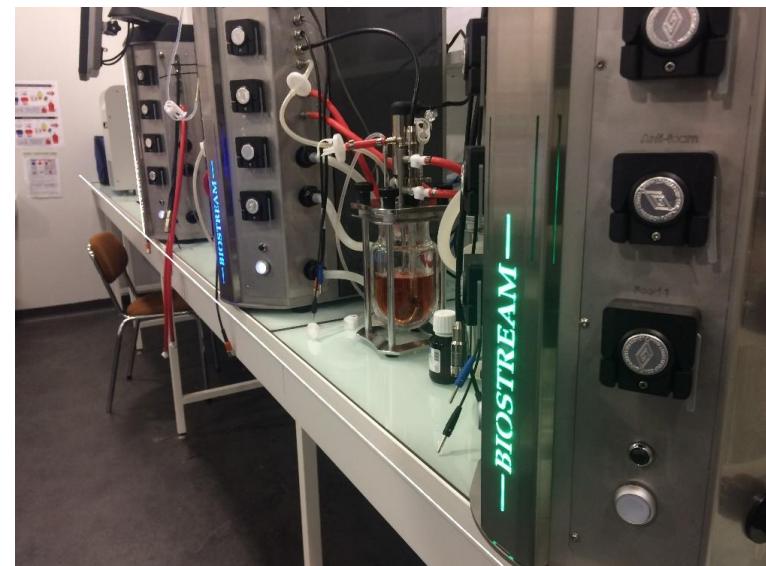
Aux. equipment

All kinds of external measurements can be integrated in the touch screen.



Electrical requir.

230V; 5 Amp (others also available)



## Hamilton Digital DO sensor

### DO Arc-sensor 12 mm

The VisiFerm DO Arc is the first optical oxygen sensor with integrated opto-electronics, having the full functionality of a measuring device with self diagnostics. It is steam sterilizable, autoclavable and CIP compatible. The VisiFerm requires less maintenance than a classical oxygen sensor as it does not have a mechanically sensitive membrane or a corrosive electrolyte.

#### Advantages:

- No electrolyte or polarization is necessary.
- Quality of the sensor
- Calibration data available
- Re-calibration of the sensor during the run.
- Cascade possibilities with Stirrer, Flow, Gasmix and O<sub>2</sub>

|   |   |
|---|---|
| a-length                                      | 120 mm  |
| Accuracy at 25 °C                             | 1 ± 0.05 %-vol; 21± 0.2 %-vol; 50 ± 0.5 %-vol             |
| Analog Interface 1                            | 4-20 mA for DO, programmable                              |
| Analog Interface 1 and 2                      | galvanically not isolated; pulse width modulation 3.5 kHz |
| ATEX Approval                                 | No  |
| Autoclavable                                  | Yes   |
| Baud Rate                                     | 4800, 9600, 19200, 38400, 57600, 115200 bd                |
| Certificate                                   | Yes, with parameter settings and materials used           |
| CIP   | Yes   |
| Diameter                                      | 12 mm   |
| Digital RS485 Interface:                      | Modbus RTU, max 31 addresses                              |
| Drift at Room Temp. under Constant Conditions | < 1 % per week  |
| Electrical Connector                          | VP 8  |
| Electrolyte                                   | None  |



# BIOSTREAM

## Hamilton digital pH-sensor

The EasyFerm Plus sensors are designed to withstand demanding applications in pharmaceutical, biotechnology, and food & beverages industries. It is also suitable for harsh chemical processes. It withstands steam sterilization, autoclavation and cleaning in place (CIP). The electrolyte of the EasyFerm sensors is pre-pressurized to prevent the diffusion of sample into the sensor. The Everef-F reference cartridge ensures that the reference electrolyte remains free of silver and precipitation of proteins.

Advantages:

- Wide range of applications
- Ceramic diaphragm is an improved barrier of the electrode
- Highly reliable measurements after steam sterilization, autoclavation and CIP cleanings
- Drift-free measurement

EasyFerm Bio specifically designed for applications in Pharma and Biotechnology (EHEDG, Biocompatibility)

Pre-pressurized reference electrolyte ensures a clog-free diaphragm

### Specifications

|                                      |   |
|--------------------------------------|---|
| Measuring range                      | 0 – 14 pH   |
| Process temperature                  | 0 – 140 °C (Arc: analog 0 – 110 °C, digital 0 – 140 °C) |
| Pressure range (relative to ambient) | 0 – 6 bar (pressurized)                                 |
| Hygienic aspects                     | Autoclavable, SIP, CIP                                  |
| pH glass                             | PHI   |
| Electrolyte                          | Phermlyte   |
| Reference system                     | Everef-F  |
| Diaphragm                            | HP Coatramic  |
| Temperature sensor                   | Pt100 in VP version<br>Pt1000 in LEVP version           |



# BIOSTREAM

Option: Touch screen

- Touch screen computer
- Twistable arm and can be fixed in each position

