

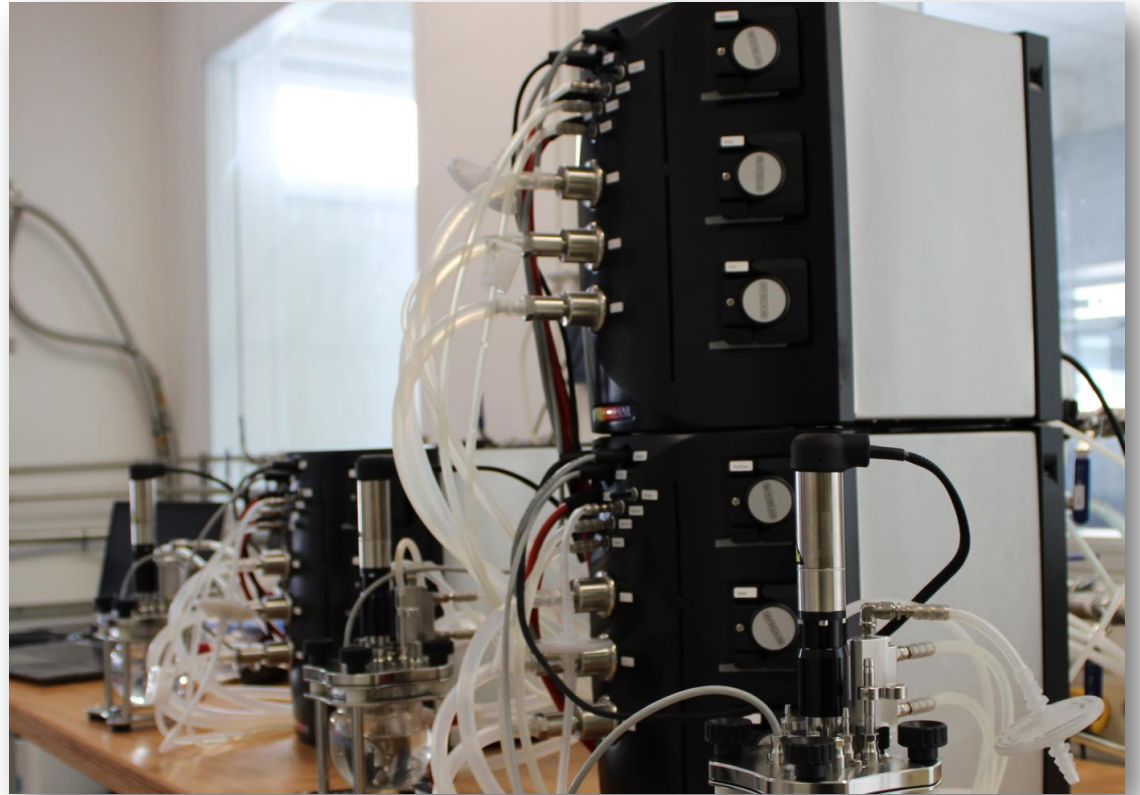
# BIOSTREAM



Technical specifications

## BioCompact

Autoclavable Borosilicate Jacketed / Non jacketed Vessel  
Volume range: 0.2 L to 7.0 L



# 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

# BIOSTREAM

## All Type of Cells

Mammalian  
Insect  
micro-organism  
like bacteria, yeast and fungi

## Process Modes

Batch  
Fed-batch  
Continuous  
Perfusion



## Applications

Process development,  
optimization and characterization  
Scale-up and scale-down studies  
Seed expansion and small scale production  
Cell bank production  
Protein supply

## Industries

Biopharmaceuticals  
Vaccines  
Cell therapies  
Industrial biotechnology  
Basic research  
Education



# BIOSTREAM



BioCompact multiple reactor



BioBench Twin



BioBench



Biopilot



BioTwin  
Single vessel

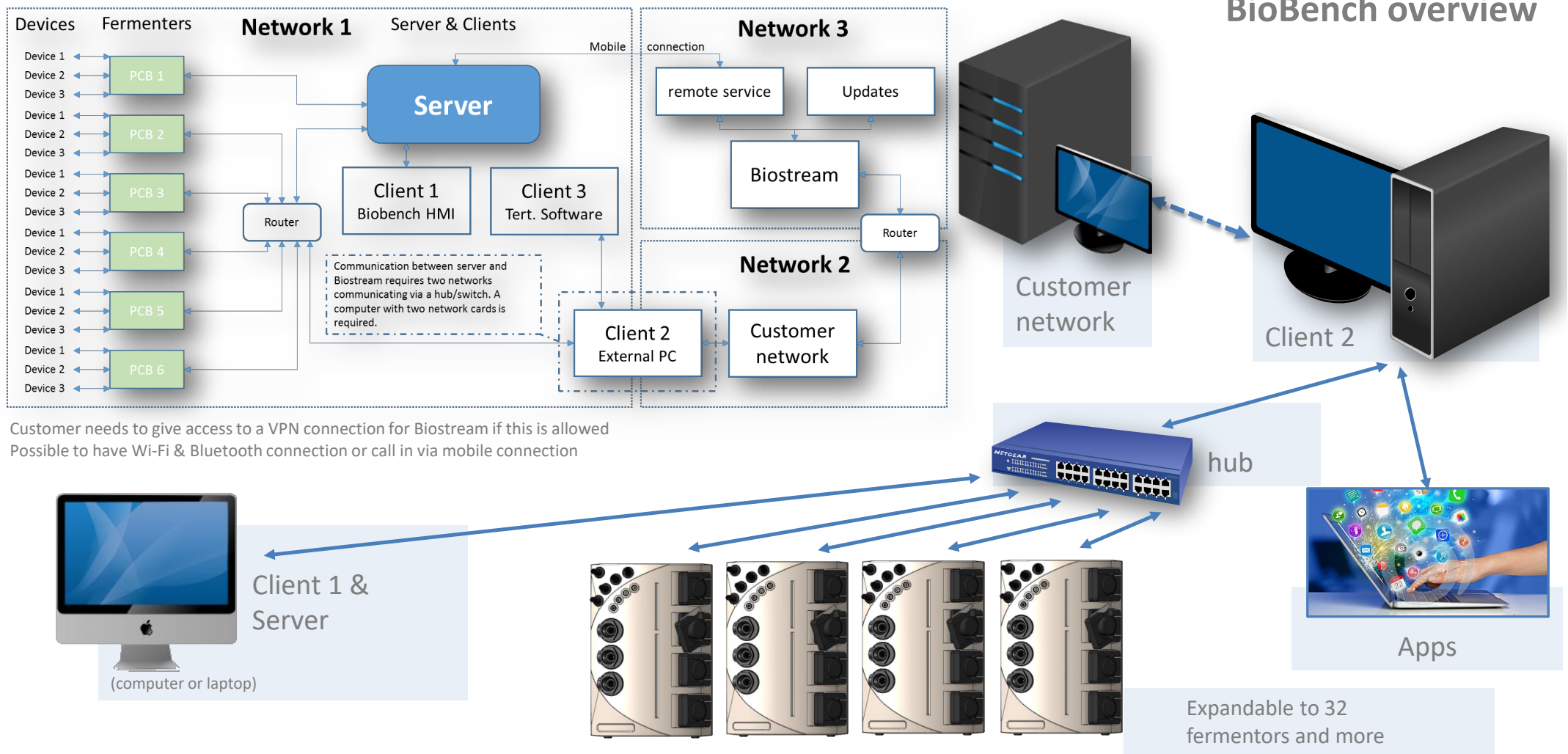
BioTwin  
Double vessel



Bioproject

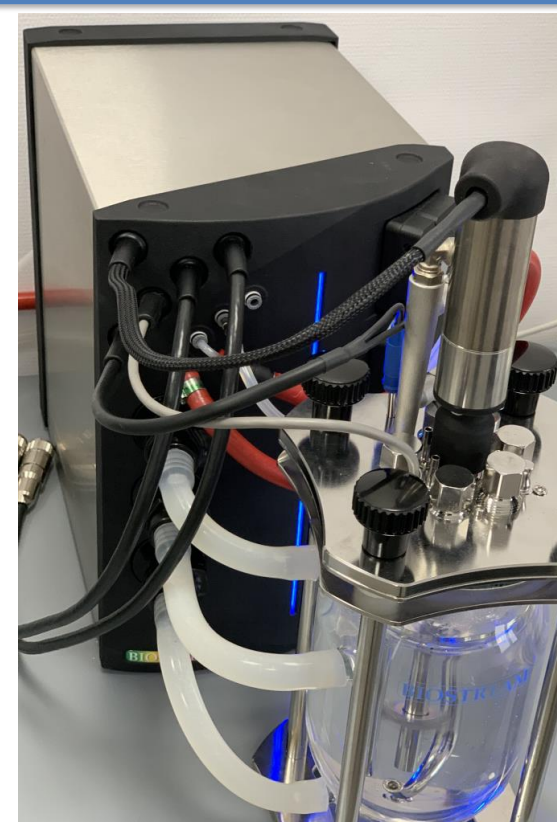


# BIOSTREAM



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

| Setting                   | Nr. connections | Type of sensor&actuator                                     |
|---------------------------|-----------------|---|
| <b>Modbus</b>             | <b>64</b>       | <b>For pO2, pH, MFC, Off gas and other digital sensors</b>  |
| 0-10 V Output             | 4               | For pumps, LED, pressure, gasmix                            |
| 0-10 V input              | 4               | 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 relays, 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                       | 1               | For alarming and camera option                              |



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## Connections of external equipment



Internal/  
External pumps



Biomass/ OD



CO2/O2 Off gas



Mass flow controllers  
& Gas mixers



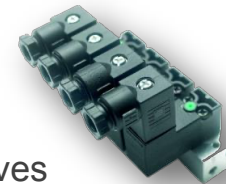
CO2 in-line



Balances



pH and Do sensors  
(disposable)



valves



All kind of motors  
with adapter



Chillers

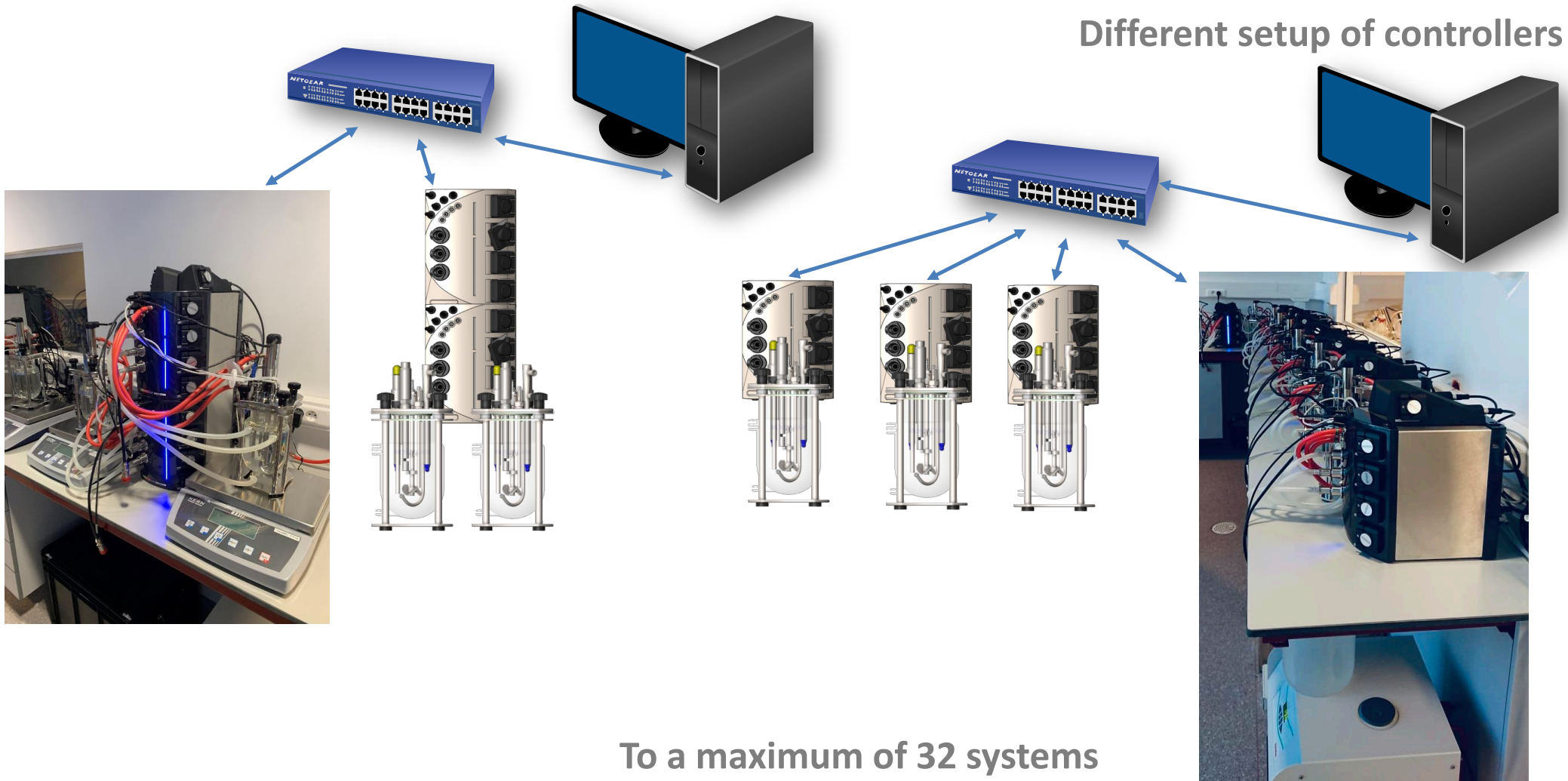
**Some Examples are shown in this overview**

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



# BIOSTREAM

Different setup of controllers



# BIOSTREAM

| Fermentor A   |       | No Alerts |          | Default User |       | 08-mei-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 |

## BOS Controlling & Logging Software

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

App available for Mobile phones.

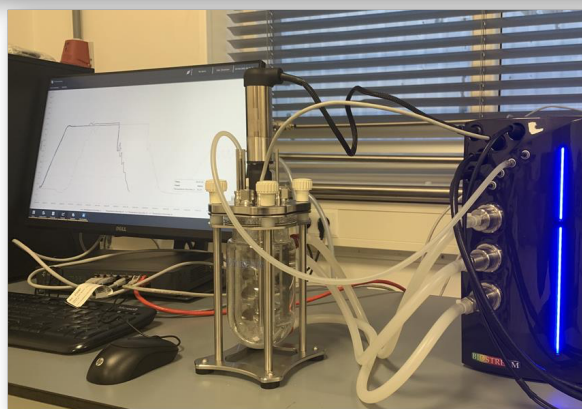
Easy and free installation on PC.

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.



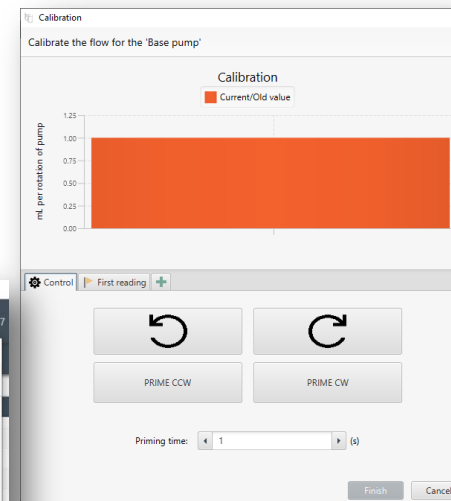
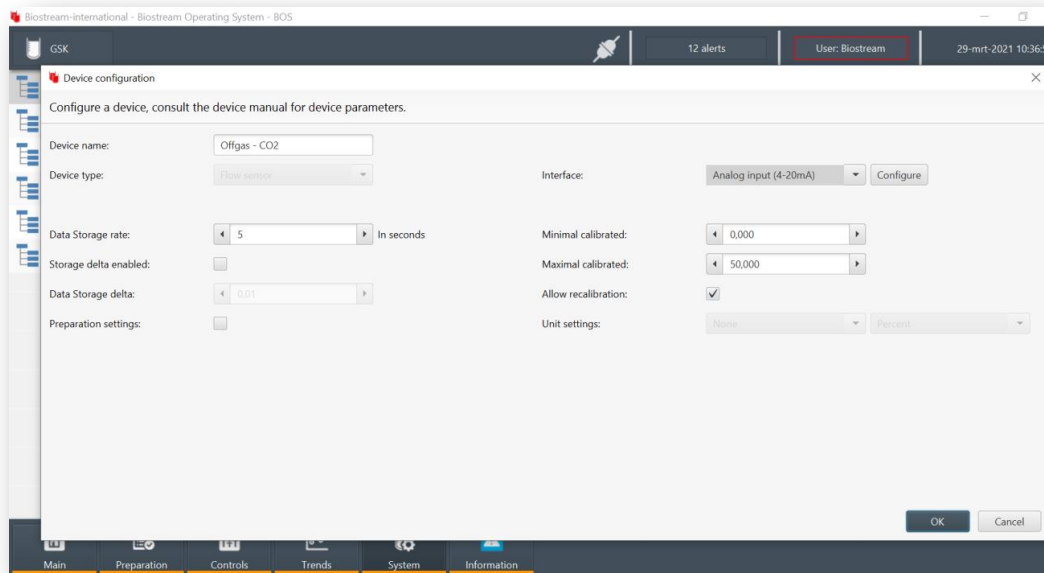
Selecting all the bioreactors or a specific one.  
Easy addition of new bioreactors.  
Adding new computers in the network where you can Work the same as the local HMI.

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

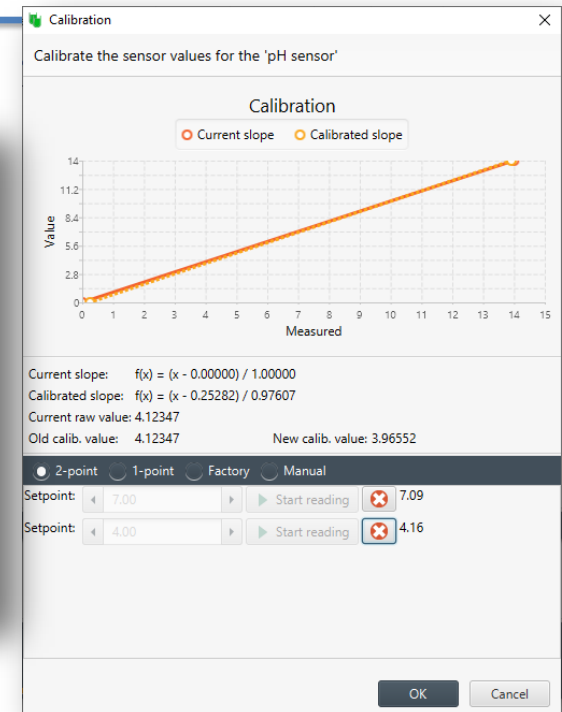
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## BOS Controlling & Logging Software

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.

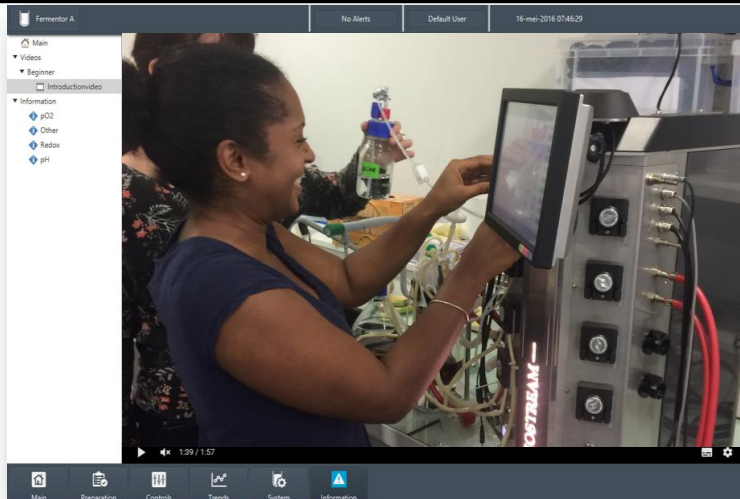


Example: Sensor calibration.

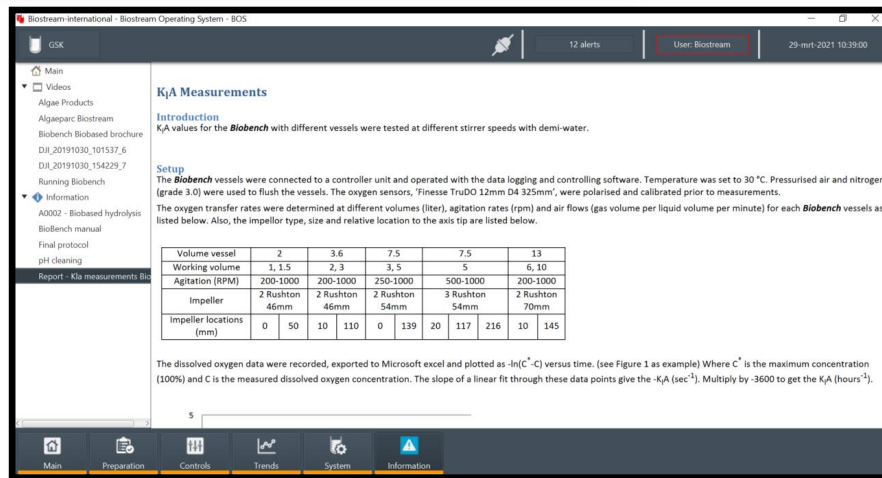
Adding external devices like sensors, pumps and valves yourself.  
Design your own parameter control loops.  
Parameters can be P&ID controlled



# BIOSTREAM



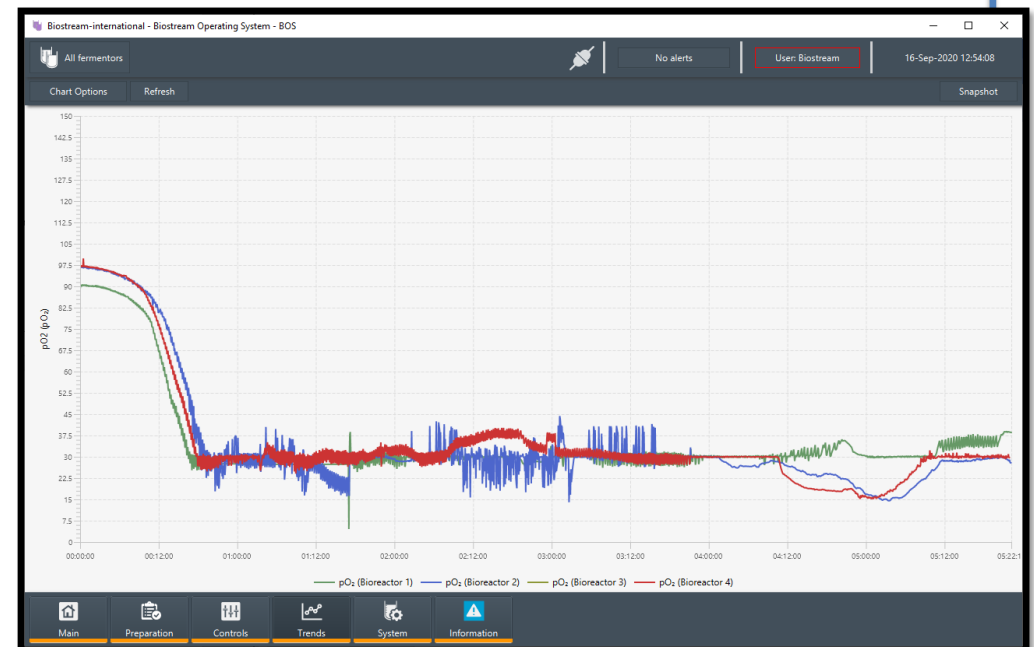
Multimedia integration like movies from phone & tablets in the HMI.



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

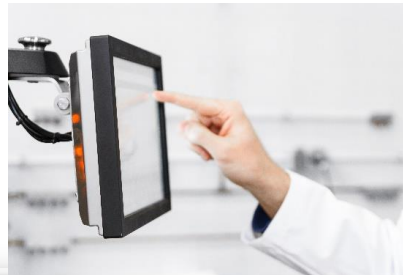


# BIOSTREAM

## Cascading and automation possibilities

### Recipes

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



| Recipes   |         |                     |          |  |
|---|---------|---------------------|----------|--|
| Search...   |         |                     |          |  |
| <div><div> Add</div><div> View</div></div> <div><div>▶ Start</div><div>■ Stop</div></div> |         |                     |          |  |
| Name  | Status  | Sequence            | Runtime  |  |
| SAFETY: Headspace > 5% O2   | Running | 1: Wait for O2 > 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:  pO<sub>2</sub>

Deadband evaluation time:  Seconds

Example: Switch between normal and P&ID cascading

**Recipe System**

Name:

Evaluation time (s):

After last sequence:

Sequences

Add Edit Remove Move Up Move Down

| 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.

Reset

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

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 |

OK

### Sample tracking

With possible volume correction on total  
Volume to change feeding protocols

GSK 12 alerts

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

Add a sample value

Select a sample:

Or set time directly: 29-3-2021

Selected insertion date/time: 29-mrt-2021 10:21:09

Enter corresponding value: 0,00000

OK Cancel

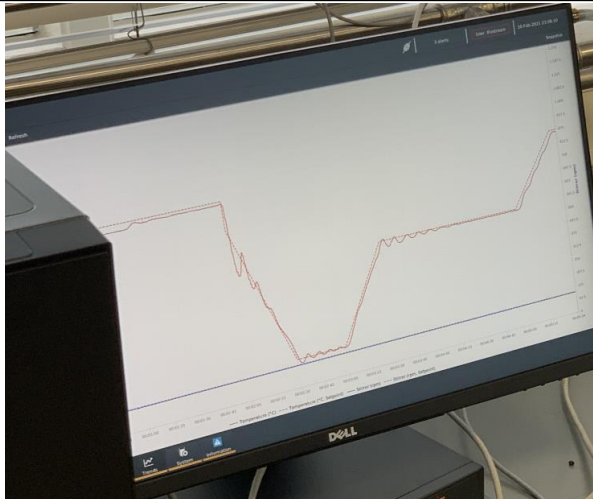
### Off-line measurement input





# BIOSTREAM

## BOS Controlling & Logging Software parallel functions



| All fermentors |                 |         |                      |            |                      |                          |
|----------------|-----------------|---------|----------------------|------------|----------------------|--------------------------|
|                |                 |         | 2 alerts             | Log in     | 07-mai-2021 18:24:08 |                          |
| #              | Name            | Status  | Started              | Inoculated | Stopped              | Select                   |
| 0              | DTU Yellow      | Stopped | 18-nov-2020 12:10:34 | -          | -                    | <input type="checkbox"/> |
| 1              | DTU 7-7.5 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"/> |

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

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

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

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

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

Please select one or more parameters

| 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:

Setpoint:

# 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

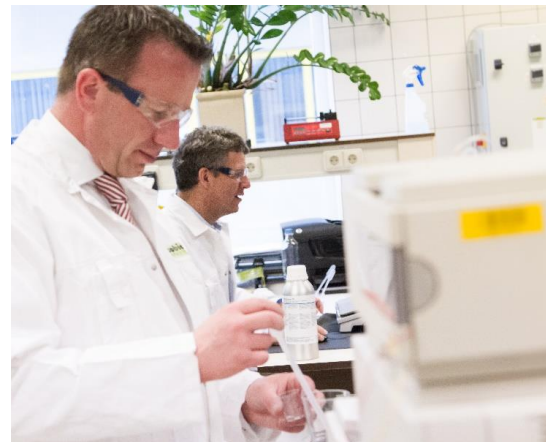
pH temperature correction

Confirmation to inform users before starting a run

Force check list for completion

Auto log on/off

Auto calibration of pumps



Biostream-international - Biostream Operating System - BOS

No alerts | User: Biostream | 16-Sep-2020 14:57:32

|                           | Date/Time            | Fermentor  | User      | Action   |
|---------------------------|----------------------|------------|-----------|--|
| Connectivity              | 16-Sep-2020 09:18:23 | BioBench01 | Biostream | The user "Biostream" set the recipe state of recipe "StabTest2" to: Started                      |
| Reboot                    | 16-Sep-2020 09:18:31 | BioBench01 | Biostream | The user "Biostream" set the recipe state of recipe "StabTest2" to: Started                      |
| System settings           | 16-Sep-2020 09:18:21 | BioBench01 | Biostream | The user "Biostream" set the fermentation state of   |
| Charts                    | 16-Sep-2020 09:18:12 | BioBench01 | Biostream | The user "Biostream" set the fermentation state of   |
| Global fermentor settings | 15-Sep-2020 21:03:54 | BioBench01 | Biostream | The user "Biostream" made changes to the user "C" - The group was changed from TestGroup to Open |
| Purge Data                | 15-Sep-2020 15:29:56 | N/A        | Biostream | The user "Biostream" made changes to the user "C" - The password was changed.                    |
| System Log                | 15-Sep-2020 13:02:45 | BioBench01 | Unknown   | An unknown user set the recipe state of recipe "StabTest2" to: Started                           |
| System Alerts History     | 15-Sep-2020 13:02:29 | BioBench01 | Unknown   | An unknown user set the recipe state of recipe "StabTest2" to: Started                           |
| Groups                    | 15-Sep-2020 13:01:56 | BioBench01 | Unknown   | An unknown user set the fermentation state of fer  |
| Users                     | 14-Sep-2020 17:30:56 | 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 paramet   |
|                           | 14-Sep-2020 17:17:02 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |
|                           | 14-Sep-2020 17:15:59 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |
|                           | 14-Sep-2020 17:10:58 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |
|                           | 14-Sep-2020 17:10:15 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |
|                           | 14-Sep-2020 17:08:35 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |
|                           | 14-Sep-2020 17:07:07 | BioBench01 | Biostream | The user "Biostream" made changes to the paramet   |

Main Preparation Controls Trends System Information

User actions

Biostream-international - Biostream Operating System - BOS

12 alerts

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:

Fermentation stop all:

Sterilization start:

Sterilization stop:

Sample valve steril. start:

Harvest valve steril. start:

Advanced options

### Create your own simple check list for starting up a bioreactor

BioBench01

Calibration Checklist

☒ Checklist Item 1

☐ Calibrating the pH sensors

☒ Adding sulphate to the culture medium

☐ Checklist item 4

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

Start bioreactor not allowed before check list if finished

# BIOSTREAM

## BOS Controlling & Logging Software

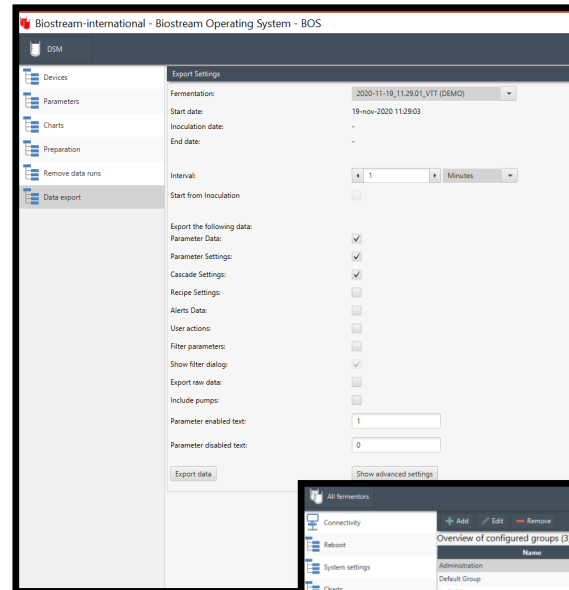
### Export data and backup

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

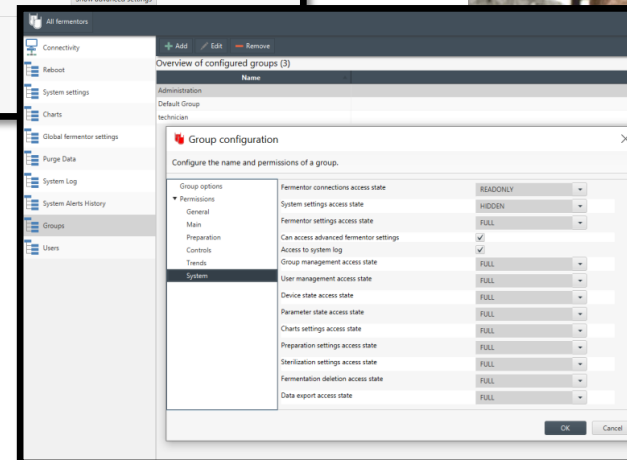
Database back up can also be automatically done  
On your network

### Connection to tertiary programs.

like Lucullus, Matlab, python or even  
mathematical & prediction software via OPC



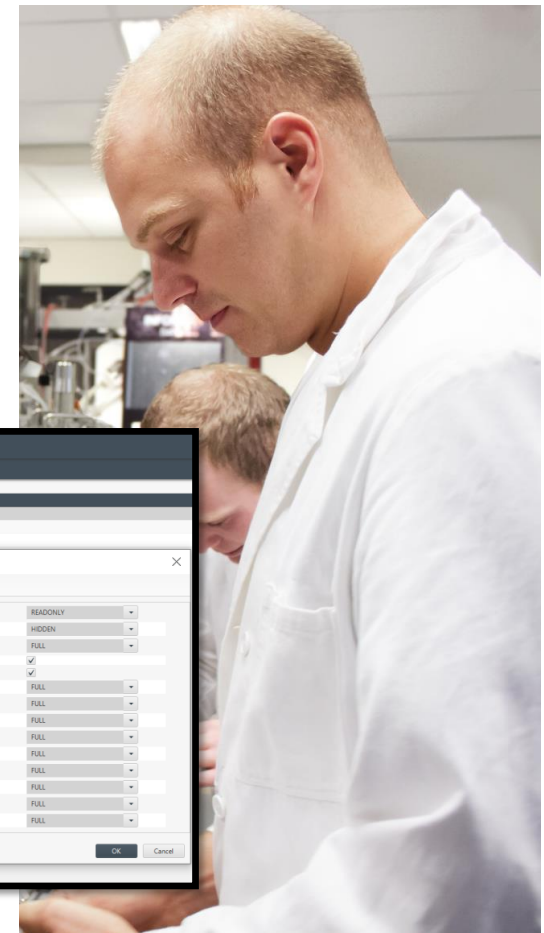
Data export



User management

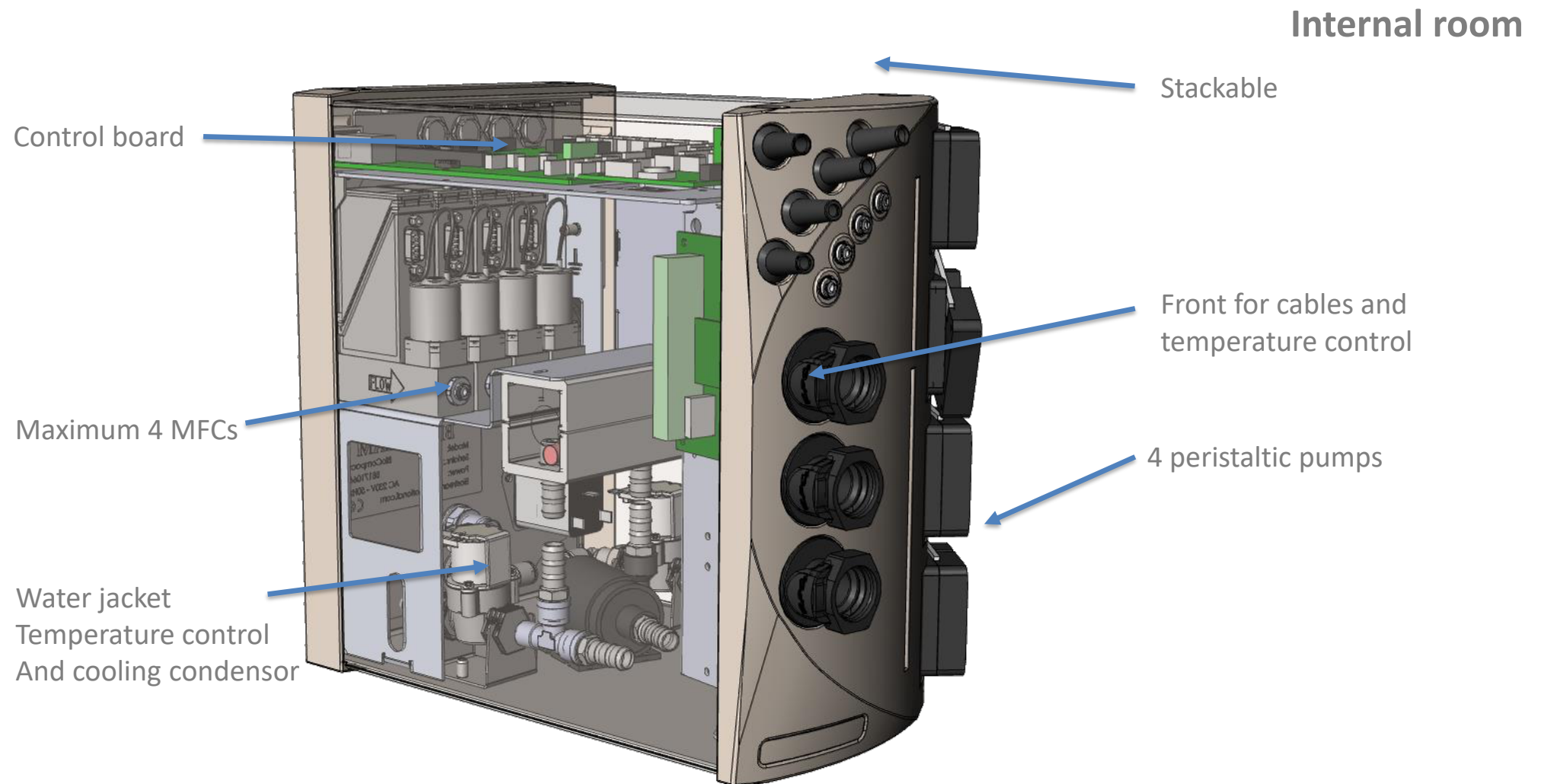
User management system to give access to options.

User should only see the bioreactor and options which are  
Allowed to see.



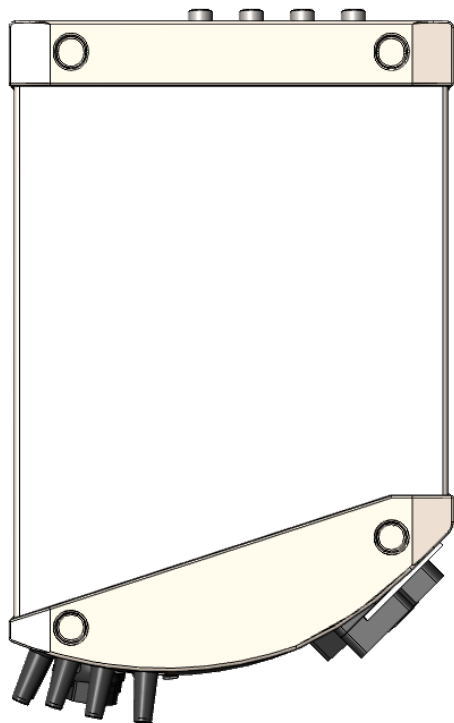


# BIOSTREAM



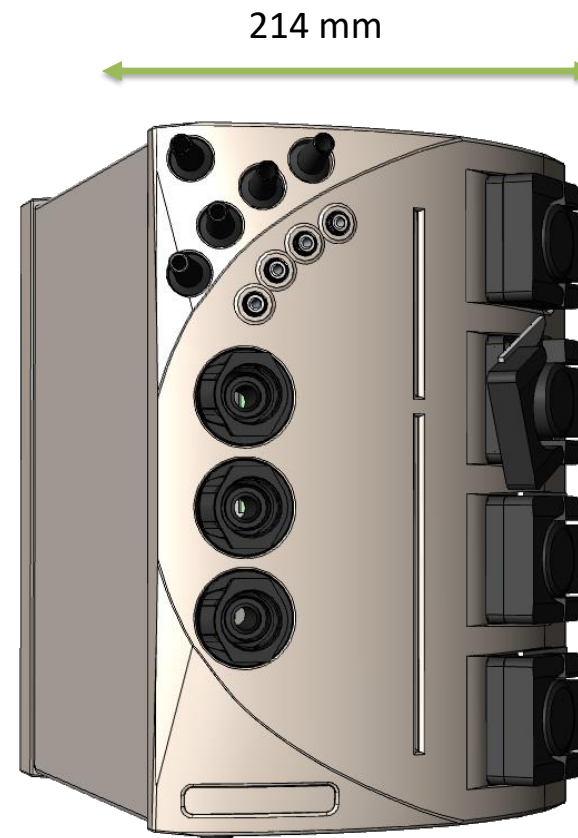
# BIOSTREAM

Dimensions base unit



297 mm

288,5 mm



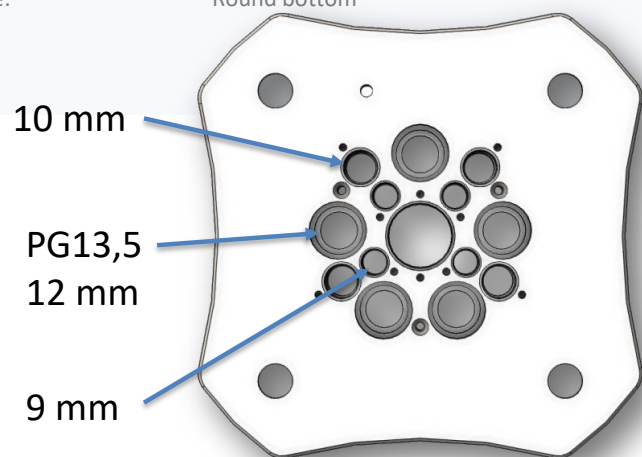
214 mm

# BIOSTREAM

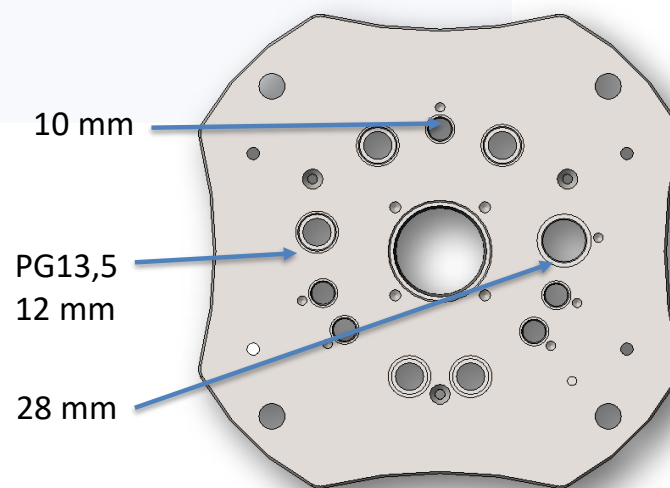
| Total Volume                | 250 ml   | 500 ml    | 750 ml    | 1.5L   | 2 L      | 3L     | 4L       | 5L     | 7.5L   |
|-----------------------------|----------|-----------|-----------|--------|----------|--------|----------|--------|--------|
| Working volume              | 50-250ml | 100-300ml | 100-500ml | 0,2-1L | 0,4-1,5L | 0,4-2L | 0,5-3,4L | 0,5-4L | 0,5-5L |
| <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      |
| 12 mm (PG13,5),             | 3        | 3         | 4         | 4      | 5        | 5      | 5        | 5      | 5      |
| 28 mm (for four way needle) | -        | -         | -         | -      | 1        | 1      | 1        | 1      | 5      |
| Half moon addition          | -        | -         | -         | -      | -        | -      | 1        | 1      | 1      |
| Impellers Rushton (0,33 ID) | 2        | 2         | 2         | 2      | 2        | 2      | 2        | 3      | 3      |

Vessel type:

Round bottom

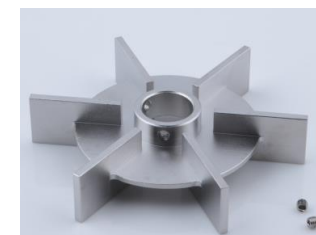


Vessel head plate from up to 1.5 L



Vessel head plate from 2 to 7.5 L

## Vessel specifications

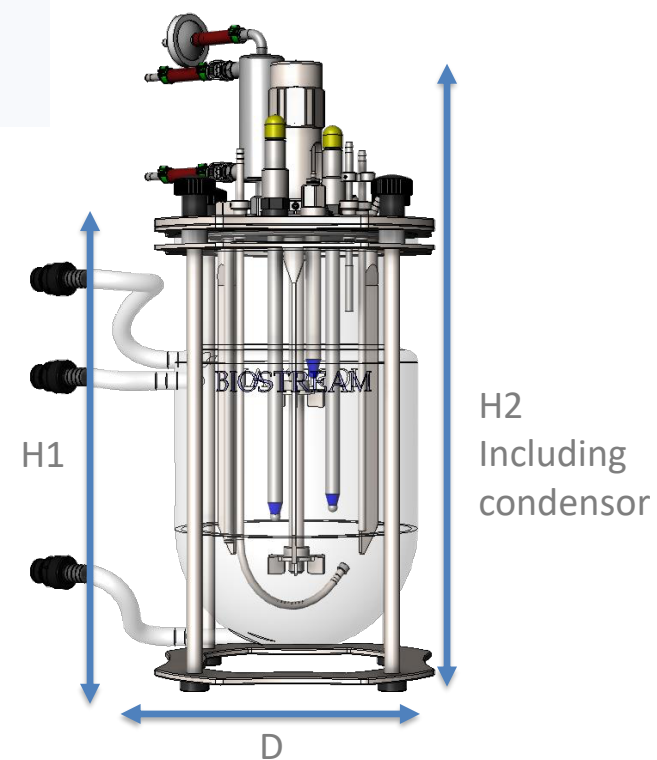
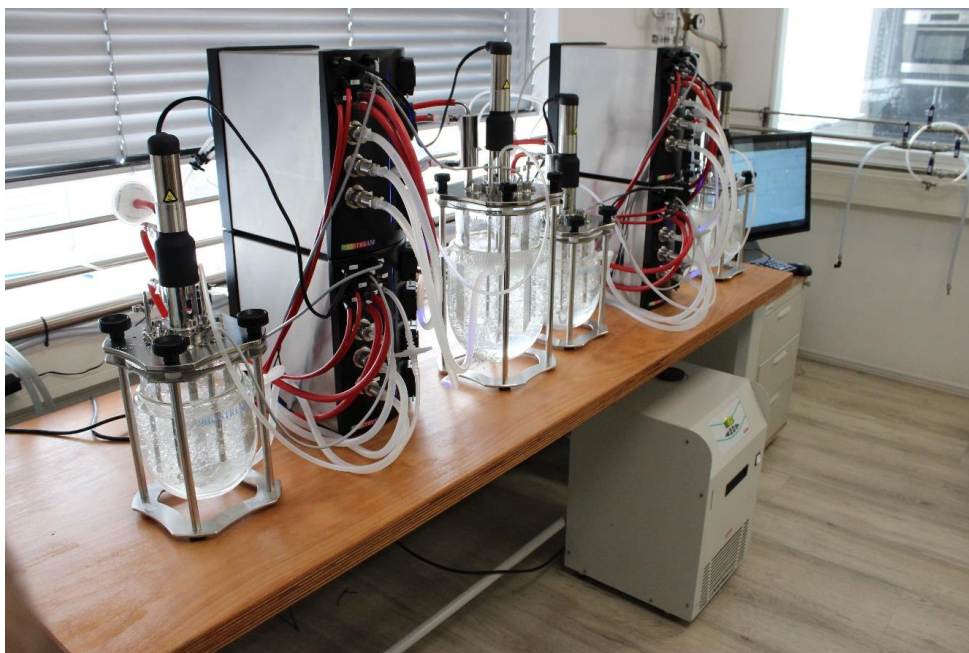


Rushton

# BIOSTREAM

## Universal water jacketed vessel

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





# BIOSTREAM

## Mechanical drive system



Drive system to maximum 1200 rpm



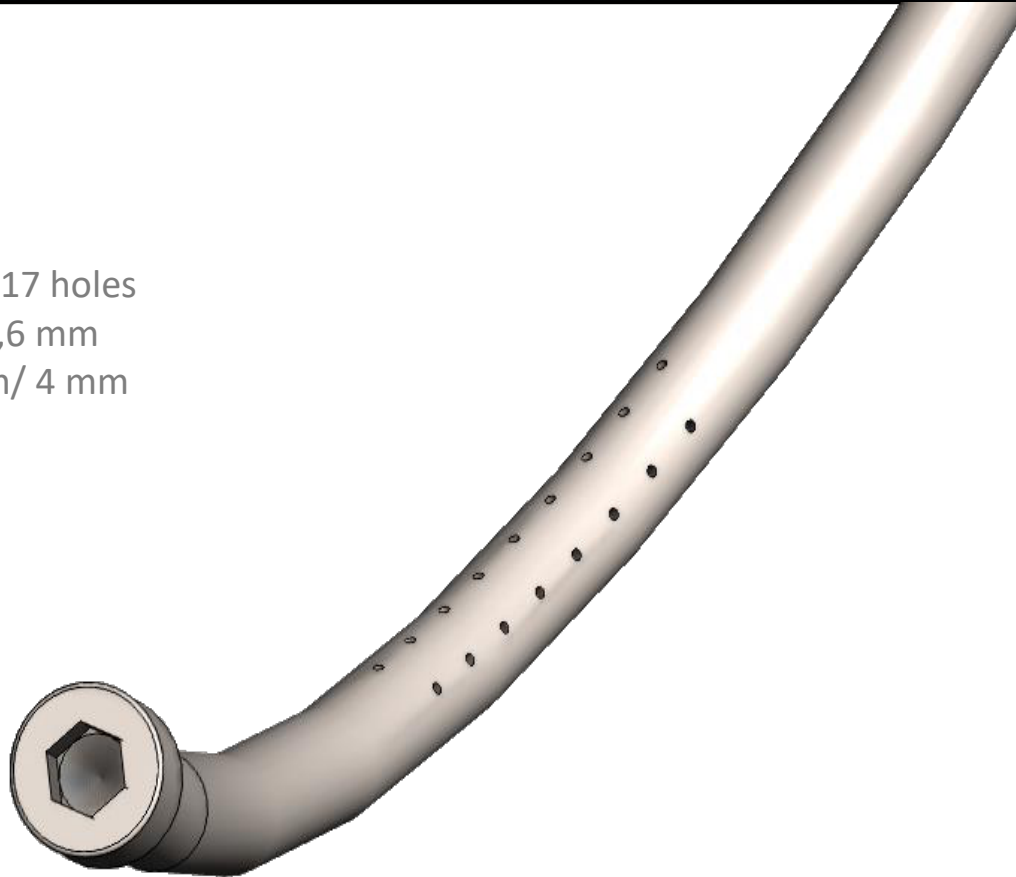
## J-sparger

Specifications:

Number of holes: 17 holes

Diameter holes: 0,6 mm

Tube OD/ID: 6 mm/ 4 mm



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## Pumps

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

Analog and On/off Pumps (own brand)

Pump possibilities:



Acid



Base



Anti foam

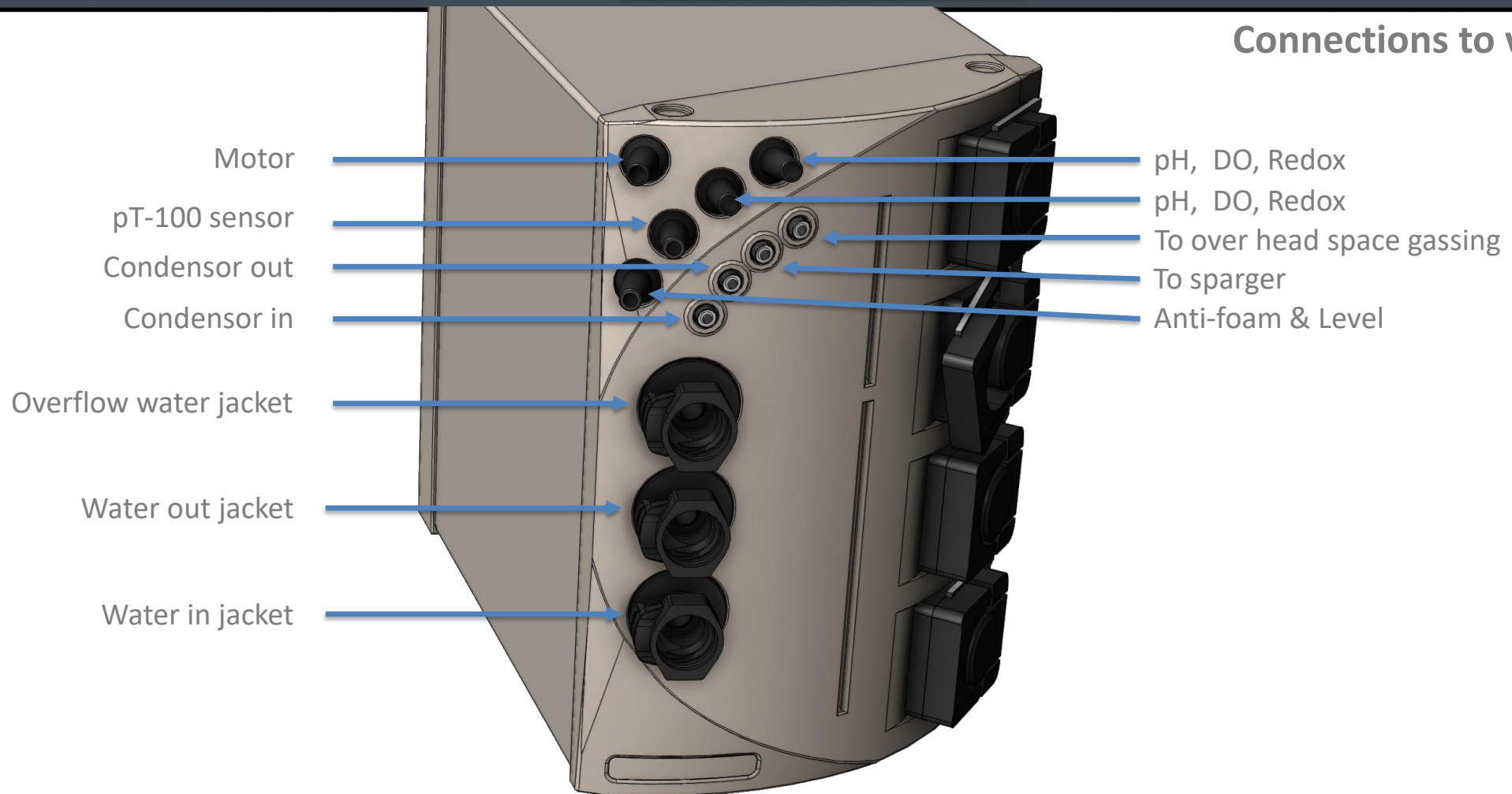


Feed



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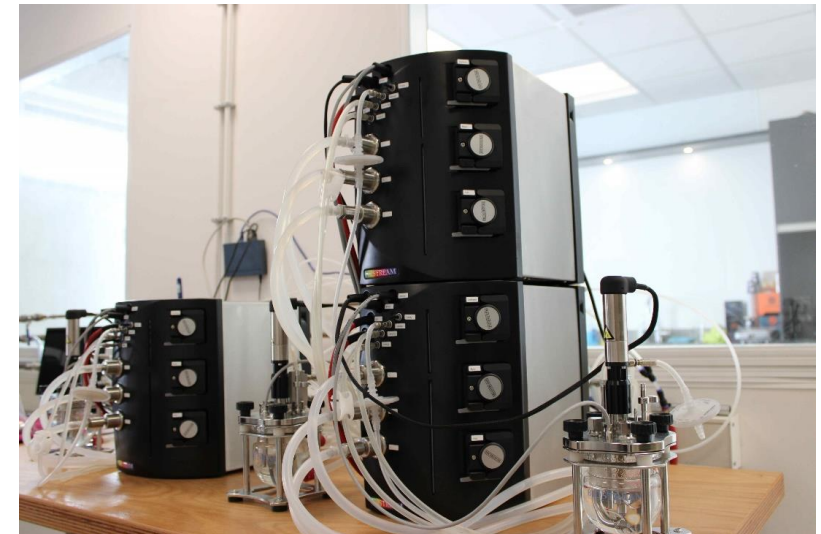
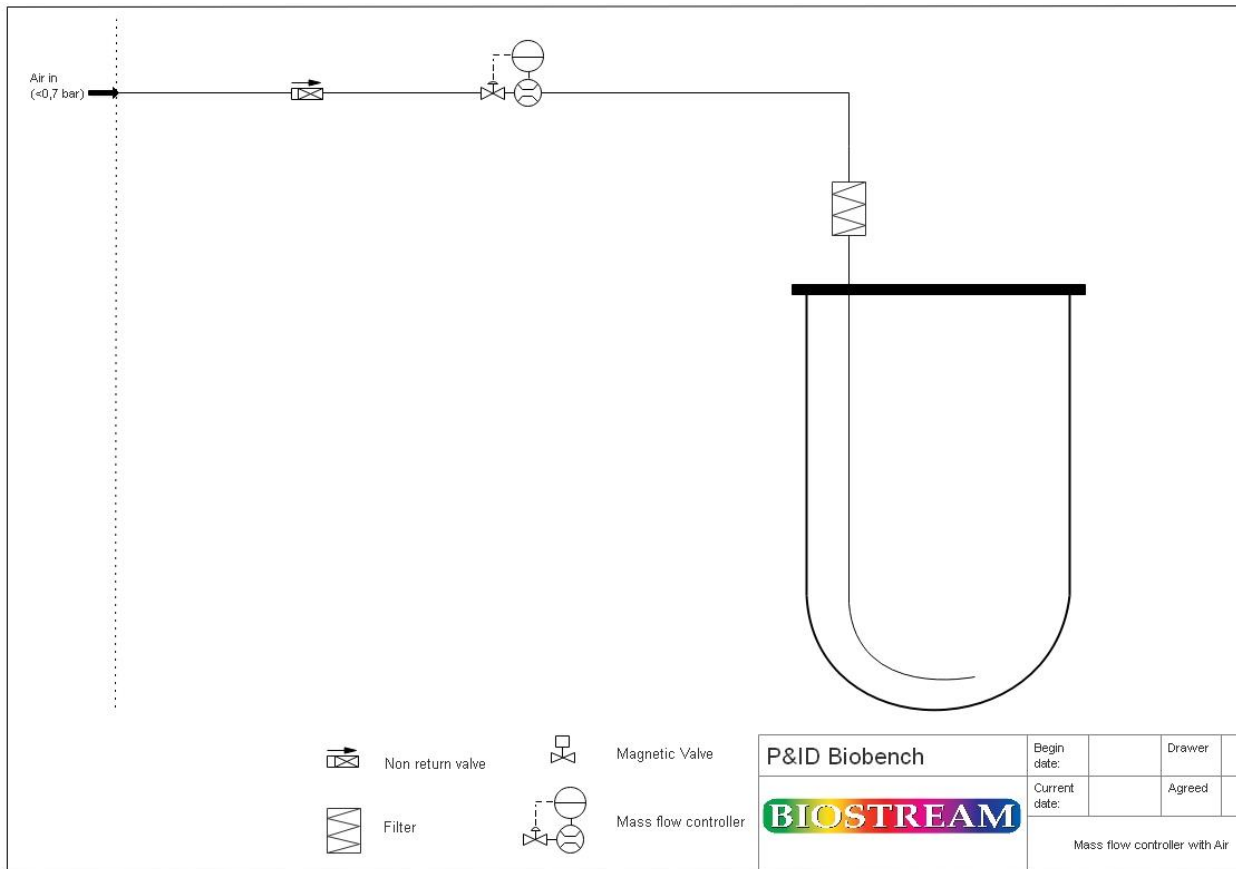
## Connections to vessel





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## Offered gas flow system



# BIOSTREAM

## Standard controller specifications



### Controller

#### Design

Multi touch 9 inch screen computer with advanced control (optional) or your own PC/laptop  
Capable of communicating with 32 utility stations each a separate vessel.

#### Function

Monitoring (data storage) and control



### Agitation

#### Drive

Depends on vessel

#### Stirrer speed:

Speed is adjustable between 20-1200 RPM.  
(depends on application)

#### Control

PID control.



### Temperature:

#### Range

Water jacket vessel

5-8 ° C above coolant (>0°C) from around 5°C above room temp to 55°C.

#### Sensor

Pt-100 sensor (vessel and water system)

Delta temperature control possible

#### Accuracy

+/- 0.2°C in range +10° to +55°C in fluids.

#### Control

PID control with cooling valve and water jacket heater

#### Tempe. security

Automatic safety thermostat



### pH

#### Range

2 - 14

#### Control

PID. Base and Acid addition to control pH.

Setting of dead band


#### Sensor


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





# BIOSTREAM


## Standard controller specifications

 **DO**  
Range  
Sensor  
0 – 150 %  
Intelligent DO probe with calibration data, runs and more (depends on brand)

 **Exhaust**  
Filter  
Condenser  
Standard 0,2 µm absolute filter  
High condensation and can be dismantled completely.

 **Integrated Pumps**  
4 corrective reagent and Substrate pumps possible.  
Standard 3 on/off (base, acid, foam) and 1 analog (feed)  
Easy adjustable from analog to digital and back.  
Additional integrated and external pumps possible.  
Free configurable with a block at the back

 **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.

 Lab technicians available for assistance



## 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

## Optional: Industrial computer

Connection to 32 Bioreactors with upgrading to 96 bioreactors.

With linux operating system

**Touch screen.**

DELL 23.8" Full HD



**Computer, Midi tower.**

Hard disk 1 TB SSD

AMD 3700x processor, 8 core,

128 GB work memory

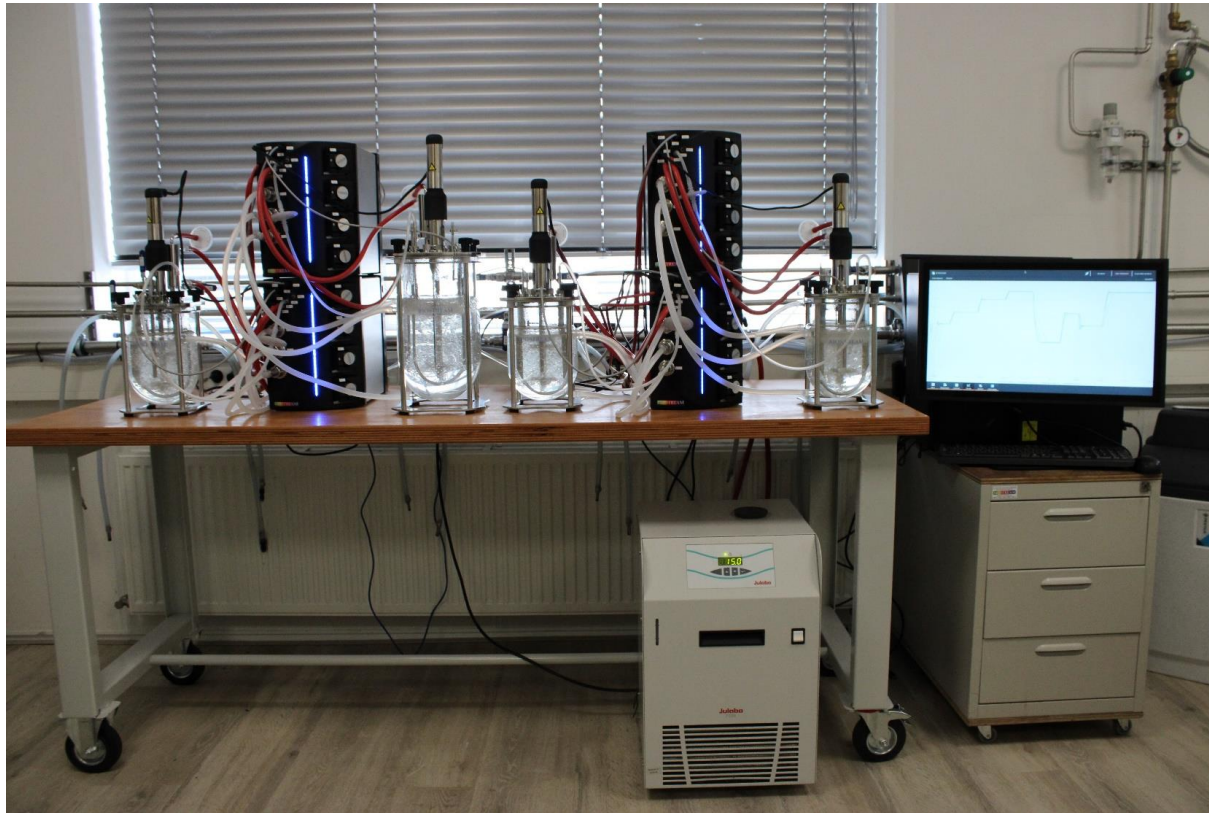
Processor cooler

MSI Radeon RX 570 ARMOR 8G video card

Including:

Keyboard and mouse

16 port Gigabit switch



## Option: 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:

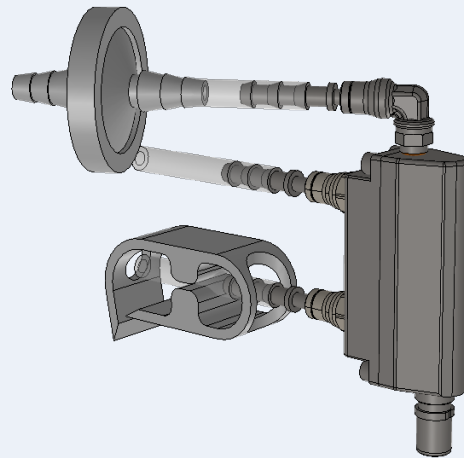
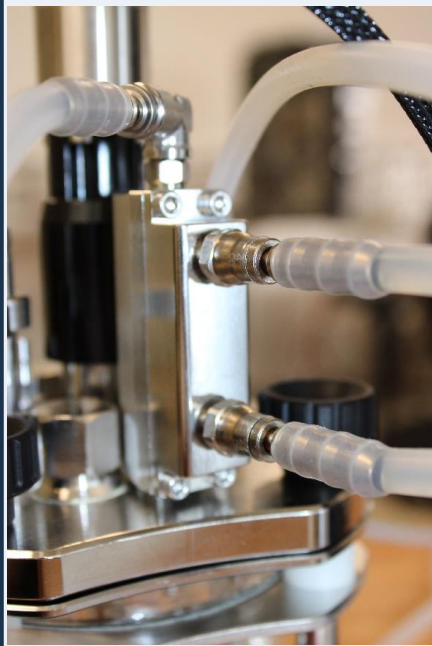
- No electrolyte or polarization is necessary.
- Quality of the sensor
- Calibration data available
- Re-calibration of the sensor during the run.
- Cascade possibilities with Stirrer, Flow, Gasmix and O2

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

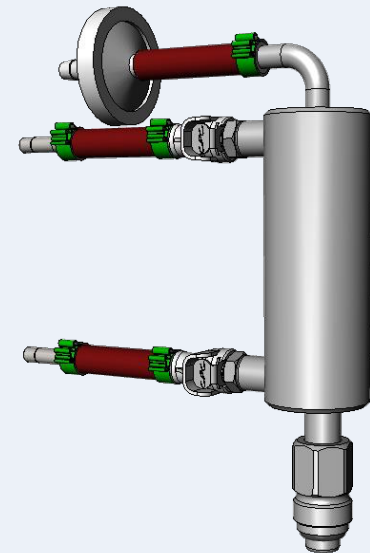


## Option: Condensor for cooling gas flow out.

- Water lock on the inlet to prevent water spill
- Dismantlable insert
- Connection on a 9 mm port
- All kind of fluids can be connected



From 250 ml to 1.5 liter vessel



From 2 to 7.5 liter vessel

# BIOSTREAM

Option: Antifoam probe, for port ø10 of PG13,5 mm port

|         |   |
|---------|---|
| Sensor  | Conductive with dosing needle             |
| Control | possible with peristaltic pump (antifoam) |
| Range   | 0 / 100 % (ON/OFF)                        |

Adjustable probe  
Material product wetted  
Surface product wetted  
O-Rings

Total length 120mm.  
316L, silicone sheeting  
0.8µm electro polished  
EPDM

