



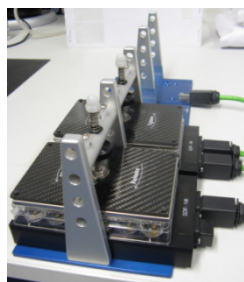
Mini Systems

my-Control and MiniBio



Full Range of Bioreactors

○ Micro
(200μl)



○ Autoclavable
1-20L



○ SIP/CIP
7-2,000L



Bioreactor Application

SIP Systems

Autoclavable - Glass

Appliflex

Mini Bioreactor

Micro Flask

Discovery

Screening

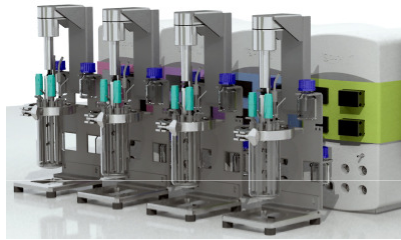
Process
Development

Process optimization

Production

Scale vs Throughput

SCALE

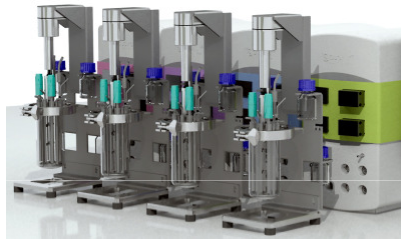


THROUGHPUT

As scale increases, throughput decreases

Throughput vs Information

INFORMATION



THROUGHPUT

- Traditionally, information increases as your throughput decreases
- Decisions must be made prior to fermentation
- Limited information available to make decisions

Better Technology, More Information, Better Decisions

INFORMATION



THROUGHPUT

- The *MiniBio* increase your throughput
- The *MiniBio* provides more information prior to stirred vessels
- Higher throughput and more information = better decision making

MiniBio & *my*-Control



Small Scale Bioreactors

- Functions:
 - Generate more data in less time
 - Easy setup and operation
 - Cultivate using less medium
 - Cultivate using less bench space
 - Generate scalable results
 - Mimic lab scale bioreactors
 - Easy data handling



my-Control

my-Control

- One system to control:
 - 250 ml up to 1000 ml MiniBio bioreactors
 - 1 - 3 liter Autoclavable bioreactors
 - 3 liter Cellready single use bioreactor
- PID and autotuning adaptive control
- Communication
 - Operation via webbrowser, iPod, iPhone or iPad, Android, Windows
 - 1 Up to 32 parallel my-Controllers



my-Control

- Sensors
 - Integrated amplifiers for Agitation, pH, DO₂, Temperature, Level and Foam
- Actuators
 - up to 6 variable speed pumps or micro valve additions (max 4 built in)
 - Needle valve with solenoid per gas
 - 3-way Mass Flow Controller,
 - Heating (via Peltier or heating blanket),
 - Cooling (via Peltier)
 - Condenser cooling (Peltier)

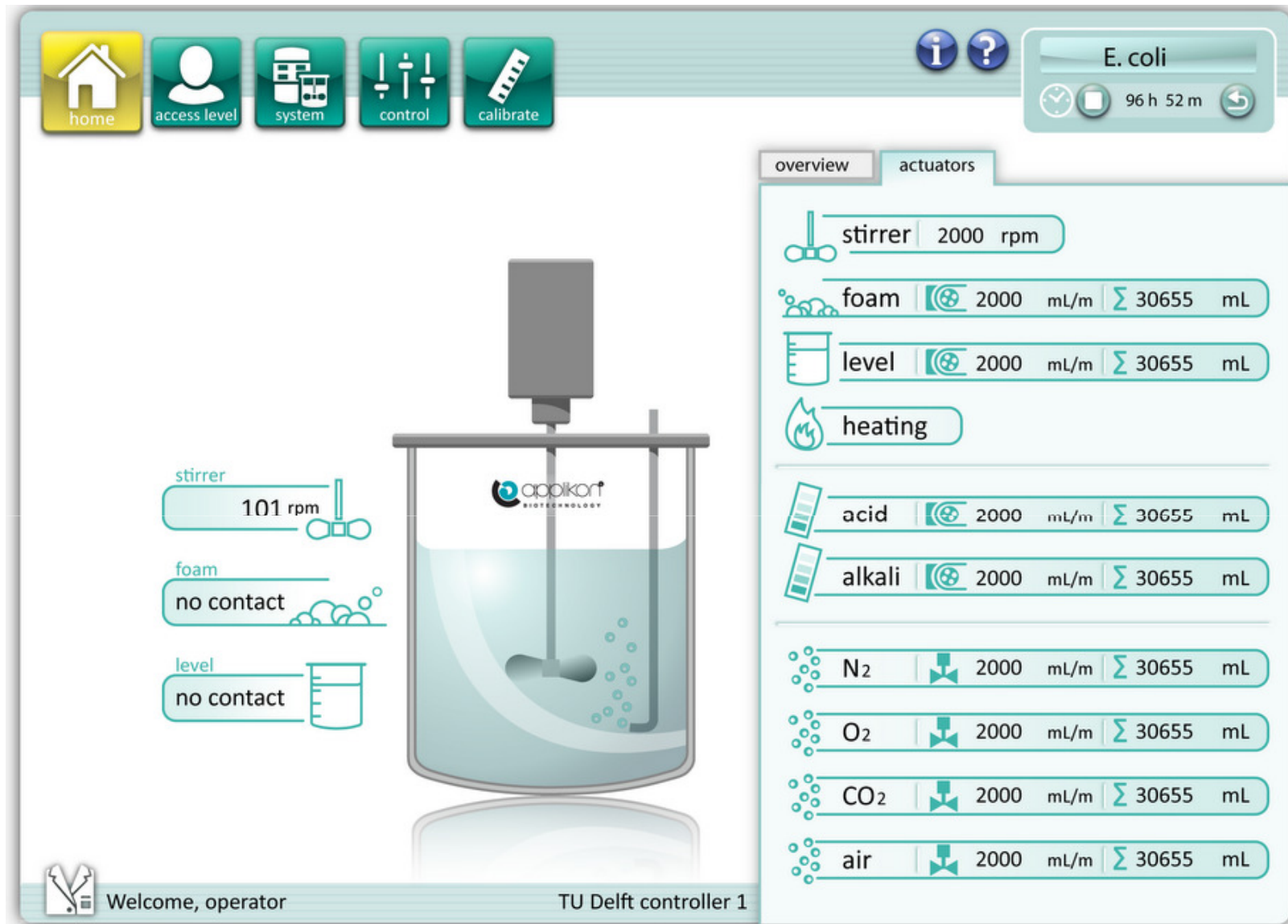
my-Control

- Inputs / Outputs

- Spare I/O:

- 8 x digital output
 - 4 x analog in (0 – 10 V)
 - 4 x analog out (0/4 – 20 mA)
 - USB connection for Biomass or Fluorophor pH and DO₂, Balances





home
 access level
 system
 control
 calibrate

limits
 setup
 manual
 loops
 actuators

ezControl

00h 01m 29s

Manual control actuators

N₂
 air
 O₂
 CO₂

Start/stop actuator or reset dose monitor for N₂

pump

dose monitor

Σ 1062.91 ml

✓

✗

Overview

Actuators

	N ₂		0.00 ml/min	Σ 1062.91 ml
	Mixed gas		0.00 ml/min	Σ 7.28 ml
	O ₂		0.00 ml/min	Σ 4.67 ml
	Total flow		0.00 ml/min	Σ 481.21 ml
	Alkali		0.00 ml/min	Σ 0.41 ml
	Acid		0.00 ml/min	Σ 1.45 ml
	Level 1		0.00 ml/min	Σ 0.15 ml
	Microvalve		1.00 ml/min	Σ 4279.64 ml

Welcome, System Engineer!

home

access level

system

control

calibrate

limits

setup

manual

loops

actuators

ezControl

00h 01m 29s

Alarm limits

Set upper/lower alarm limits for pH

set point
7.00

upper limit
8.00
value from 7.00 to 14.00

lower limit
6.00
value from 0.00 to 7.00

✓

✗

Overview

Actuators

pH7.007.00

Temperature22.5137.00

DO49.8520.00

Level0.000.00

Stirrer1999.112000.00






start


Welcome, System Engineer!

applikon


BIOTECHNOLOGY

Configure loops




 Set loop configuration for pH

actuators

 prev.

Primary


 next

Mixed gas

Total flow


above


Acid





below



Alkali








 up


 down

 remove

Controller setup






 Set algorithm config for pH



mode

☐ automatic


☒ preset


PID config


P	<input type="text" value="50.000000"/>	
I	<input type="text" value="0.000000"/>	S
D	<input type="text" value="0.000000"/>	S
	<input type="text" value="5.000000"/>	S
	<input type="text" value="0.000000"/>	
<div>reset </div>		





Dose monitor calibration


 N₂

 air


 O₂


 CO₂



 Set calibration configuration for N₂

time period




 00h 00m 00s

output

volume

ml

reset



calibration factor

1.000

ml/min


recalculate


factor


1.000

ml/min

reset







MiniBio bioreactor range



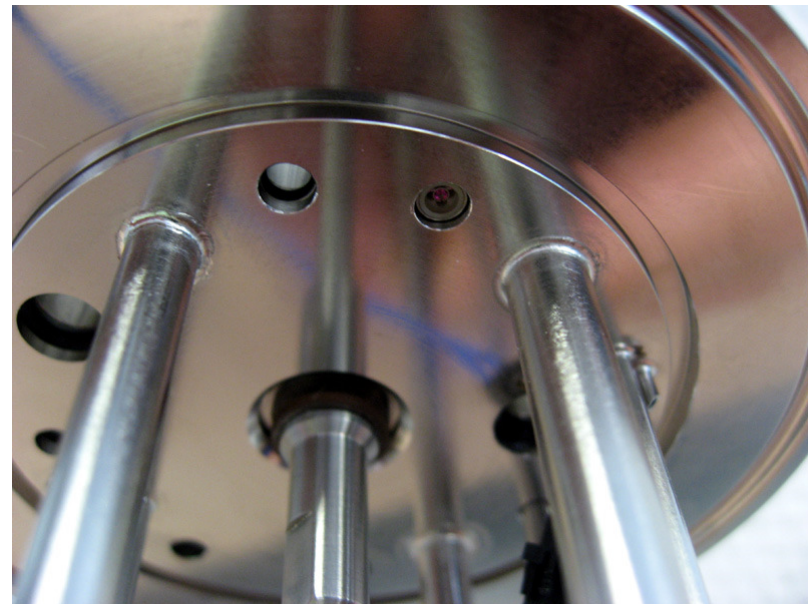
Small Scale Bioreactors

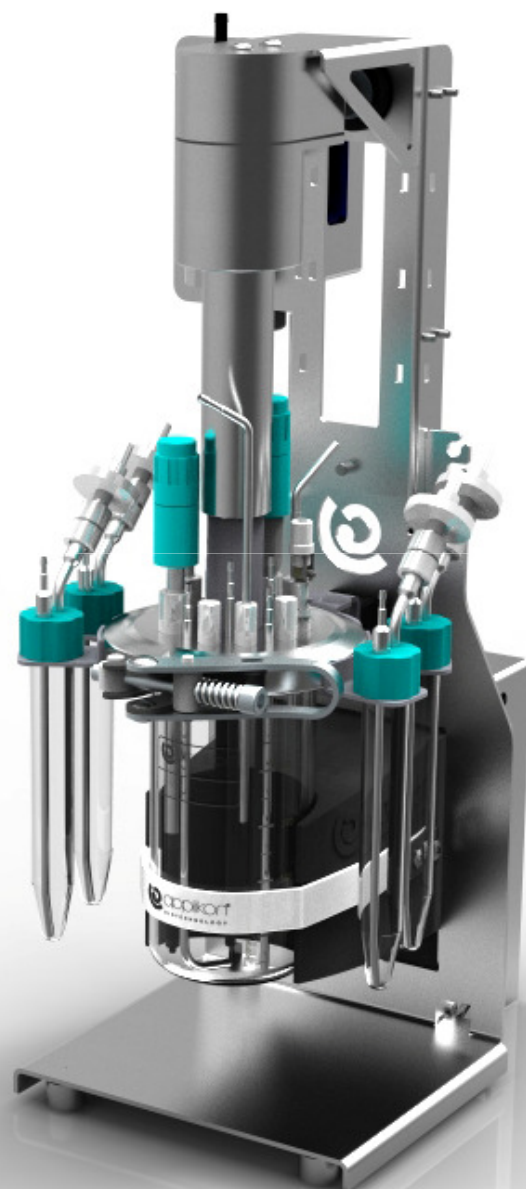
- MiniBio
 - 250 ml total volume
 - 50 ml .. 200 ml working volume
 - 500 ml total volume
 - 100 ml .. 400 ml working volume
 - 1000 ml total volume
 - 200 ml .. 800 ml working volume

MiniBio 250



Modular topplate
Classic pH, Temperature and
Oxygen sensors
Micro valve for micro liter
additions





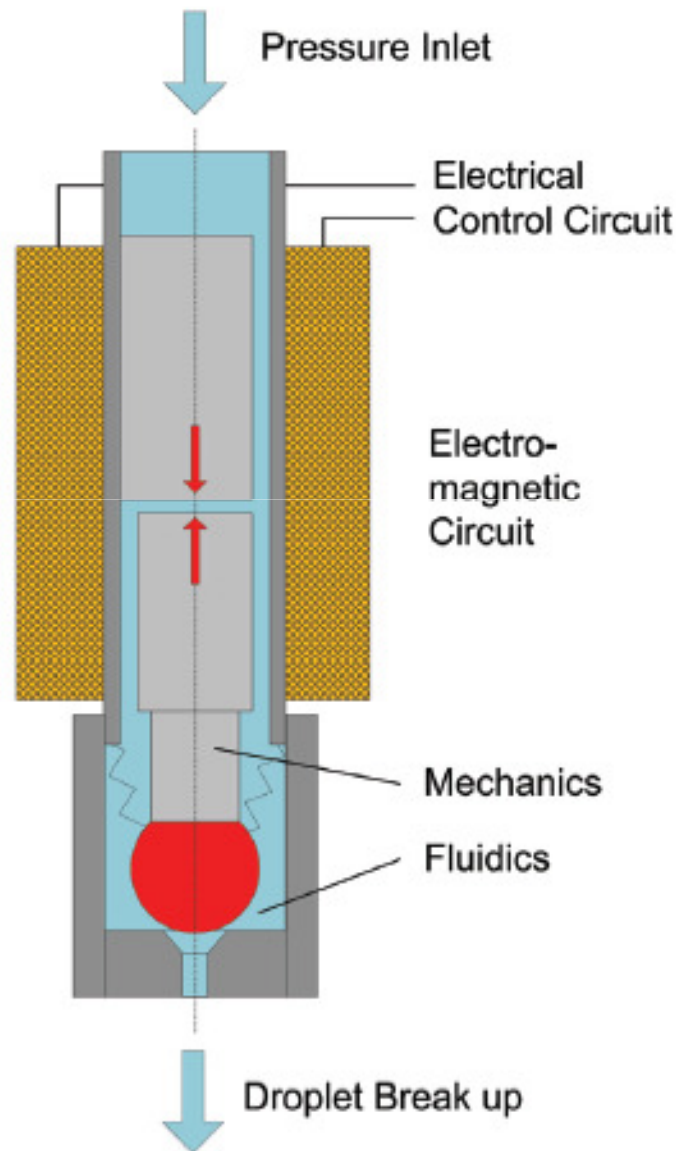
MiniBio

- Microbial and Cell culture configuration
- Batch, Fed-Batch and Continuous cultivation
- Stainless steel head plate and auxiliaries
- Borosilicate glass

MiniBio 250

- 8 ports for pH, DO2 sensors, septum, foam and level sensor, overlay, chemostat, microvalve, etc.
- Thermowell for temperature sensor
- Sparger aeration (L-sparger or porous sparger),
- 4 liquid inlets
- Fixed sample pipe
- Cooled condenser
(evaporation <3% per day at 37°C, 2vvm, 2000rpm)
- Lipsealed stirrer with height adjustable impellers
(Rushton or Marine impellers 50 to 2000 RPM)

Microvalve

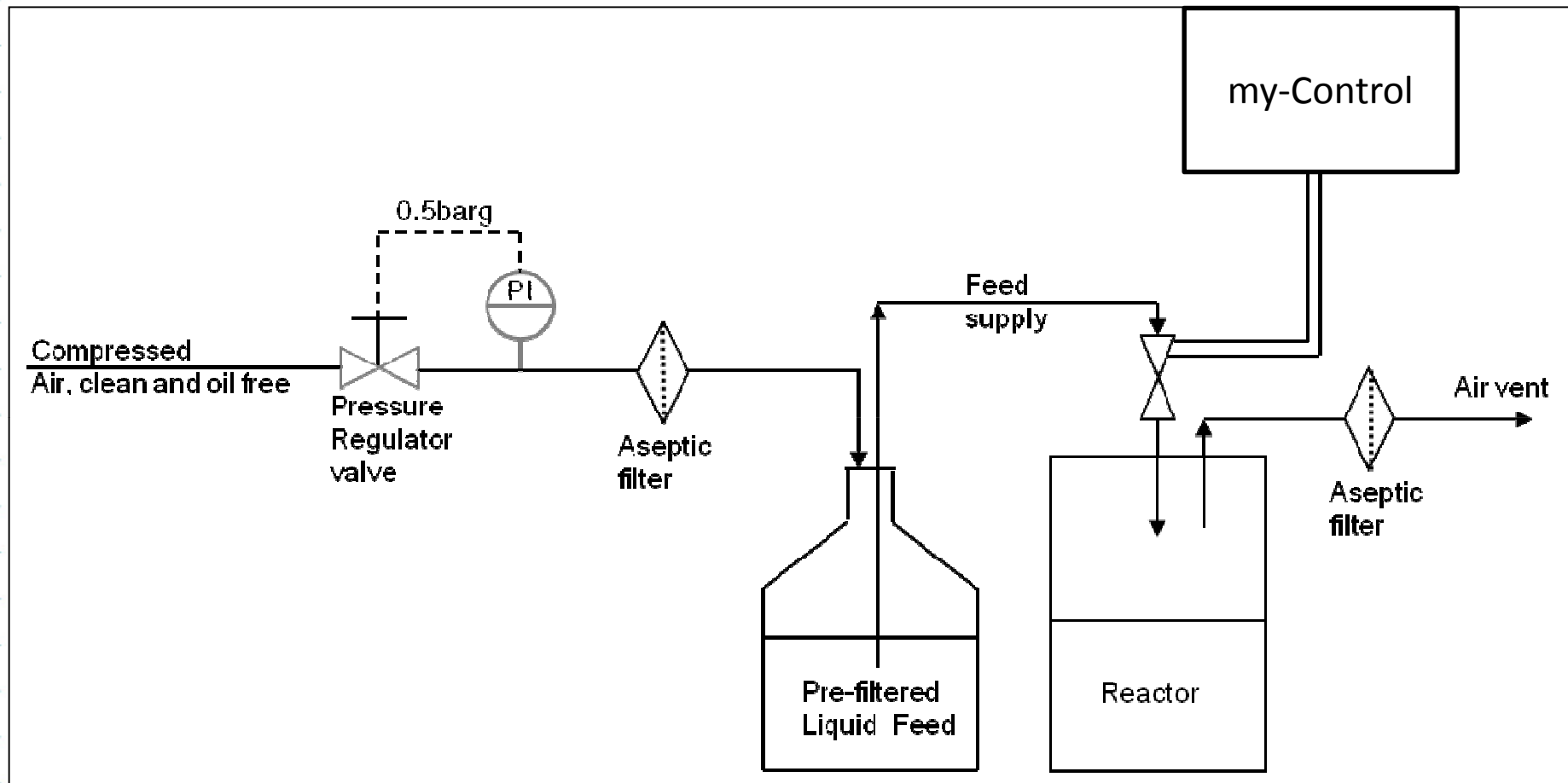


Microvalve

- Autoclavable
- Drops of 500 nL up to $\pm 50 \mu\text{L}$
- 1 drop per sec = continuous
- Flow of 1.8 ml/hour up to $\pm 200 \text{ ml/hour}$
- Activated from my-Control as pump output



Microvalve control



Microvalve control

- Pressurized addition bottle ± 0.5 barg
- Pressure control -> 0.5 barg pressure difference bottle/bioreactor
- Uncontrolled -> 5% accuracy
- Pressure controlled -> 2% accuracy

Mini BioSep

- 1L/day unit
- No recirculation
- External controller
- Integrated control in software my-Control
- Use variable speed pump my-Control



Supervisory Control And Data Acquisition



Supervisory Control And Data Acquisition

- BioXpert Lite
 - BioXpert V2
 - BioXpert XP/W7
- } One to one
-
- New SCADA
- One to Many

Bundles

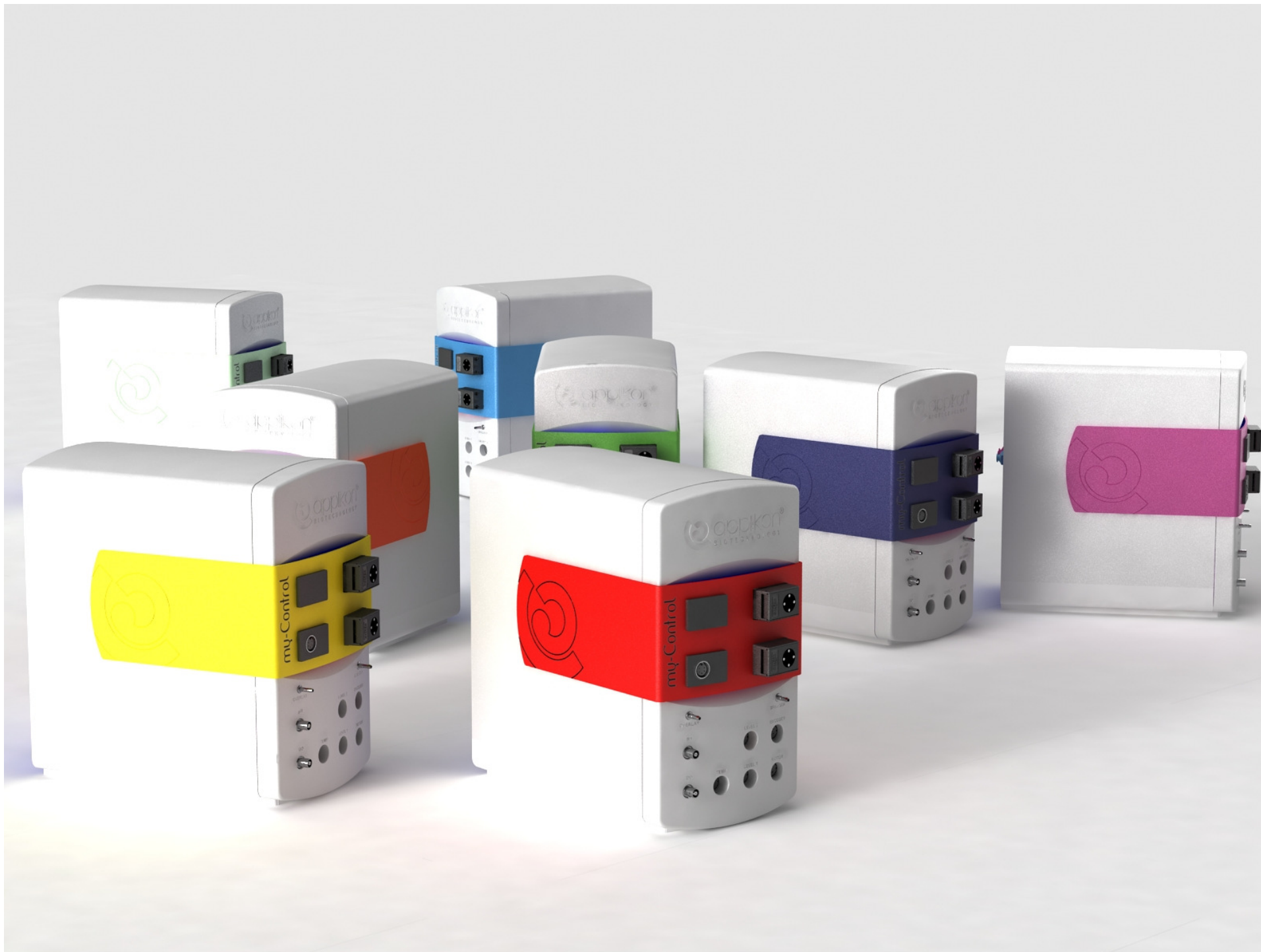
- Bundle MiniBio
 - 250 / 500 / 1000 MiniBio Bundle
 - Cell or Microbial
- Bundle autoclavable
 - 1, 2, 3 Autoclavable bundle with my-Control
 - Cell or Microbial
 - Silver front panel
 - Data acquisition

Bundles

- Bundle Cell
 - 1 pump (alkali)
 - 2 gasses (Air, CO₂, needle valve+solenoid)
 - Heating blanket
 - Stirrer
- Bundle Microbial
 - 2 pump (alkali/acid, foam)
 - 1 gas (Air, needle valve+solenoid)
 - Peltier temperature control
 - Stirrer

Bundles add-ons

- Internal pump(s)
- Microvalves
- Additional gas line, overlay output
- 3-channel MFC
- Analog inputs - sensors
- Analog outputs - pumps
- Full SCADA
- 22" Touchscreen PC / i-Pad ?
- Colored front panels



Features

- Mechanically coupled agitator that allows mixing up to 2000 rpm even in viscous media or high density cultures.
- Minimum working volume of 50 ml in our 250 ml system(with mixing and measurement and control of pH, Temp, DO, foam and level.
- Autotuning adaptive PID control for accurate control even when the process conditions change
- Up to 6 variable speed pumps per system
- Microdosing with flow rates down to 1.8 ml/hour continuously.
- Control any number from 1 to 16 or even 32 bioreactors from 1 pc.
- Very limited bench space 5 systems on 100x60 cm
- All electric connections (no water connections required)
- Additional inputs and outputs for external sensors and pumps
- Complete configurational freedom. Customer can connected any actuator to any sensor input and create a new control loop.
- Software runs within each controller so if you loose connection with the pc the process is not stopped.
- Individual coloring of the control units.

Questions