



Cultivation Systems From Discovery to Production



Engineering for Life

Content

	Applikon Biotechnology	03	
	Cultivation Systems	04	RAMbio®
		06	Anaerobic Fermentation Monitor
		08	Micro-Flask <i>by Duetz</i>
		10	micro-Matrix
		14	MiniBioreactors
		16	Glass Autoclavable Bioreactors
		20	Single-use Bioreactors
	Process Control	24	Motor Controller
		26	my-Control
		28	in-Control
		30	ez2-Control
		32	i-Control
		34	SUB-Control
	Software & Automation	36	Lucullus
		44	V-Control
	Process Analytics	48	LumiSens
		50	DO ₂ Sensors
		52	pH Sensors
		54	RedOx Sensors
		56	iLine F
	BioBundles	58	Bundle Cultivation Systems
	Perfusion Cultures	62	BioSep Acoustic Cell Retention System
	Solutions	64	Special Projects
	Steam-in-place	66	Bench Top and Pilot Plant Bioreactor Systems
	Services	70	AppliCare
		75	Applikon Academy

Applikon Biotechnology

Applikon Biotechnology is a world leader in developing and supplying advanced bioreactor systems from laboratory, to pilot, to production scale.

Our mission is to provide reliable solutions for the bioprocess market that will enable an improved quality of life. We support industrial microbiology and the pharmaceutical industry in their upstream process by implementing scalable platforms from initial screening through development to full-scale production. By minimizing scale-up risks and shortening the time-to-market for our customers, we contribute to the improvement of Life Sciences. And that is our passion!

Expertise

Applikon Biotechnology is known for bringing new technologies to the market. We continuously improve and launch new bioreactor systems as well as process analytics and software tools. These new technologies offer advantages in process efficiency and thus costs. In particular our small scale designs that offer a complete solution for results generation, make us unique in the mini and micro bioreactor range.

Complete upstream product portfolio

Our focus is on supplying you the best product offering now and in the long-term future. Our portfolio ranges from very small bioreactors to large volume cultivation systems. Whether used for laboratory applications, good manufacturing practices, or the full scale-up process from lab to production, we have the right solution.

Worldwide activities

Since we started in 1974 we have shown a healthy growth resulting in a global market leader role. In fact, an expansion was necessary to keep up with this growth. Therefore, we doubled our facility in June 2017 to 5.800 m² total surface. All R&D, design and engineering takes place in-house in our headquarters in Delft, The Netherlands. Furthermore, we have our own sales and service organizations in the USA and UK and a network of well-trained local distributors for sales and service in over 35 countries worldwide.

Cultivation Systems | From Discovery to Production



RAMbio® | The High Intensity Mixer

- Increased oxygen transfer for aerobic cultures
- Take advantage of richer media formulations
- 2-6 fold increase in plateau biomass levels
- Up to 10-fold increase in product expression
- Up to 6-fold increase in Oxygen Transfer Rate
- Up to 5 times shorter cultivation time

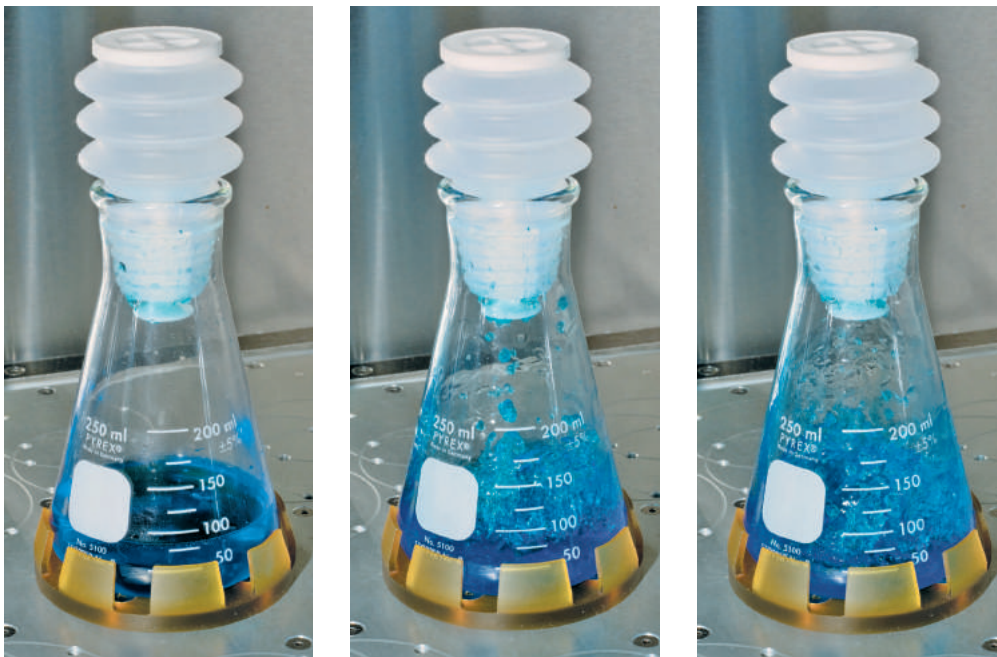
The RAMbio® biological mixer utilizes ResonantAcoustic® technology that applies low frequency and high intensity acoustic energy to agitate microbial cultures. The RAMbio® is a highly efficient mixer/incubator that dramatically enhances oxygenation and bulk mixing for bacterial and fungal cultures. Combined with the patented Oxy-Pump® stopper, oxygen transfer rates up to 6-fold higher than can be achieved with orbital-shaken cultures.

Features

- High gas transfer rates of any desired gas
- Humidity control
- Up to 18 flasks per unit
- Fully programmable (time, humidity, mixing intensity)

Applications

- Microbial cultures
- Fungal cultures
- Seed cultures



Shake flask under the influence of ResonantAcoustics®



Specifications

Capacity	18 x 250 mL flasks or 14 x 500 mL flasks or 8 x 1000 mL flasks or a mix of flasks
Dimensions	102 x 57 x 70 cm (W/D/H) 40 x 27 x 23"
Temperature control	Ambient +5°C to 60°C
Weight	200 kg (440 lbs)
Humidity control	Ambient to 90% RH
Power	110/230 VAC, 50/60 Hz
Mixing intensity	3 - 20g acceleration

Related products

- 250 mL flasks
- 500 mL flasks
- 1.000 mL flasks

Fermenter vessels:

- 250 mL Schott Duran Flasks
- 500 mL Schott Duran Flasks

Anaerobic Fermentation Monitor | Simple Parallel Cultivation

- Very user friendly laboratory device for monitoring anaerobic, metabolic yeast activity for alcohol production
- Proven value for research and QA purposes in all fields of yeast research and (bio) ethanol production
- Accurate comparison of conversion rates and yields under different conditions such as temperature, strain type, carbon source or nutrients

The Anaerobic Fermentation Monitor (AFM) is a robust and user-friendly laboratory parallel fermentation system that allows for accurate comparisons of carbon conversion rates and yields for six simultaneous anaerobic fermentations.

Monitoring the amount of gas that evolves from a fermentation broth under well controlled conditions is a reliable comparison method that has proven to be very useful in all industries that use anaerobic fermentations. Because carbon dioxide production is stoichiometrically coupled with carbon source conversion, very useful metabolic data can be obtained.

The AFM provides very accurate standard measuring of gas from six parallel fermentations that is both very low in maintenance and very easy to use.

Features

- Six independent yeast fermentations can be carried out simultaneously
- Stirrer speeds and temperatures can be set or time programmed for each fermenter flask individually
- Fully controlled with user-friendly control and data analysis software
- Automatic generation of advanced reports containing all measured data, data analysis tables and corresponding graphs
- Very strong magnetic stirrers, able to handle very viscous media



Applications

- Measure conversion rates and yields of lignocellulose hydrolysates into biofuels
- Test and compare different yeast strains or different feedstock/substrates
- Quality control of regular/commercial yeast
- Quality control of traditional feedstock (such as molasses)
- Conversion of wort into beer
- Conversion of grape juice into wine
- Alcohol tolerance and toxicity studies
- Industrial and academic research on yeast and potable alcohol/bio-ethanol/bio-butanol production

Specifications

Total volume (liter)	6 reactors of 500 mL
Minimum working volume (liter)	300 mL
Drive system	Magnetically coupled stirrer
Maximum stirrer speed (rpm)	50 - 1450
Impellers	Marine type
Temperature	Measurement: Pt-100 sensor in central stirrer bar Control: heating via central stirrer bar Temperature range is + 5 °C (ambient) – 75 °C
Dimensions (DxWxH)	30 x 85 x 67 (cm)
Empty Weight (kg)	75 kg

Related products

Fermenter vessels:

- 250 mL Schott Duran Flasks
- 500 mL Schott Duran Flasks



Micro-Flask by Duetz | Cultivation in Microtiter Plates

- Simultaneous and reproducible sampling of 96 frozen glycerol stocks
- Low and uniform evaporation rates for every well
- Seal and sterile barrier for individual wells prevents cross contamination

The Micro-Flask system facilitates reproducible and reliable culturing on microtiter plates. The system consists of sandwich covers, cover clamps and a cryo-replicator (for simultaneous inoculation of the plate without having to thaw the frozen stock). The Micro-Flask enables a single person to grow and test thousands of strains simultaneously with a minimum of repetitive handling.



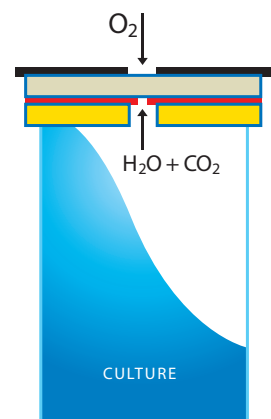
Cryo-Replicator for simple inoculation of 96-well microtiter plates

Features

- Turns 6, 24 and 96-well microtiter plates into individual micro-reactors
- Oxygen transfer similar to fermenters




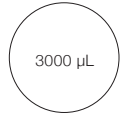








Applications

- High throughput screening and distribution of mutant and construct libraries e.g. in *E. coli* or yeast
- Metabolic flux studies and high-throughput screening for high activity prokaryotic or eukaryotic mutants
- Comparative studies, e.g. clinical isolates
- Growth medium optimization for cell lines or production strains



Cross-section of Micro-Flask sandwich cover

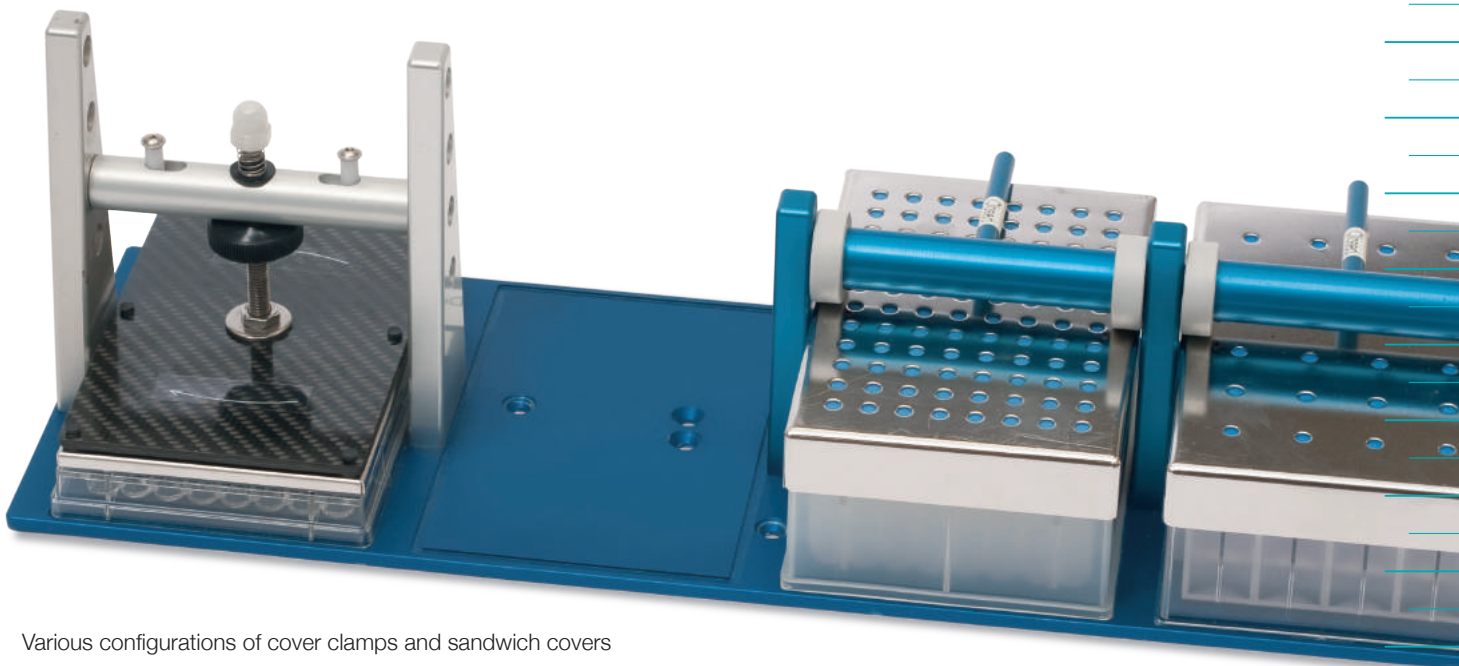
Specifications

Type of microtiter plate	Well volume	Culture volume	Orbital shaking frequency	Shaking amplitude	O ₂ -transfer rate (30°C, air, 1 bar)	Headspace refreshment rate	Evaporation rate per well (at 30°C)	Mixing pattern at 300 rpm	
								ampl.	ampl.
24-square deep-well polypropylene, 17x17 mm, depth 40 mm		2500 µL	300 rpm	50 mm	51 mmol O ₂ / l / h	2.5 mL / min	50% humidity: 50 µL H ₂ O per day 75% humidity: 25 µL H ₂ O per day		
		2500 µL	300 rpm	25 mm	39 mmol O ₂ / l / h	(1 VVM)			
		2500 µL	220 rpm	50 mm	35 mmol O ₂ / l / h				
		4000 µL	300 rpm	50 mm	24 mmol O ₂ / l / h	2.5 mL / min			
		4000 µL	220 rpm	25 mm	24 mmol O ₂ / l / h	(0.6 VVM)			
24-round low-well polystyrene, Ø 16 mm, depth 18 mm		750 µL	300 rpm	50 mm	40 mmol O ₂ / l / h	1.1 mL / min	50% humidity: 30 µL H ₂ O per day 75% humidity: 15 µL H ₂ O per day		
		750 µL	300 rpm	25 mm	25 mmol O ₂ / l / h	(1.4 VVM)			
		1000 µL	300 rpm	50 mm	30 mmol O ₂ / l / h	1.1 mL / min			
		1000 µL	300 rpm	25 mm	19 mmol O ₂ / l / h	(1.1 VVM)			
96-square deep-well polypropylene, 8x8 mm, depth 40 mm		500 µL	300 rpm	50 mm	38 mmol O ₂ / l / h	1 mL / min	50% humidity: 22 µL H ₂ O per day 75% humidity: 11 µL H ₂ O per day		
		500 µL	300 rpm	25 mm	12 mmol O ₂ / l / h	(2 VVM)			
		750 µL	300 rpm	50 mm	24 mmol O ₂ / l / h	1 mL / min			
		750 µL	300 rpm	25 mm	7 mmol O ₂ / l / h	(1.3 VVM)			
		1000 µL	300 rpm	50 mm	18 mmol O ₂ / l / h	1 mL / min			
		1000 µL	300 rpm	25 mm	3 mmol O ₂ / l / h	(1 VVM)			
96-round low-well polystyrene, Ø 6.5 mm, depth 11 mm		100 µL	300 rpm	50 mm	39 mmol O ₂ / l / h	250 µL / min	50% humidity: 6 µL H ₂ O per day 75% humidity: 3 µL H ₂ O per day		
		100 µL	300 rpm	25 mm	20 mmol O ₂ / l / h	(2.5 VVM)			
		150 µL	300 rpm	50 mm	32 mmol O ₂ / l / h	250 µL / min			
		150 µL	300 rpm	25 mm	16 mmol O ₂ / l / h	(1.7 VVM)			
		200 µL	220 rpm	50 mm	12 mmol O ₂ / l / h	250 µL / min			
		200 µL	300 rpm	25 mm	12 mmol O ₂ / l / h	(1.3 VVM)			

Related products

Microtiter plates:

- 24-square deep-well plates
- 24-round low-well plates
- 96-square deep-well plates
- 96-round low-well plates

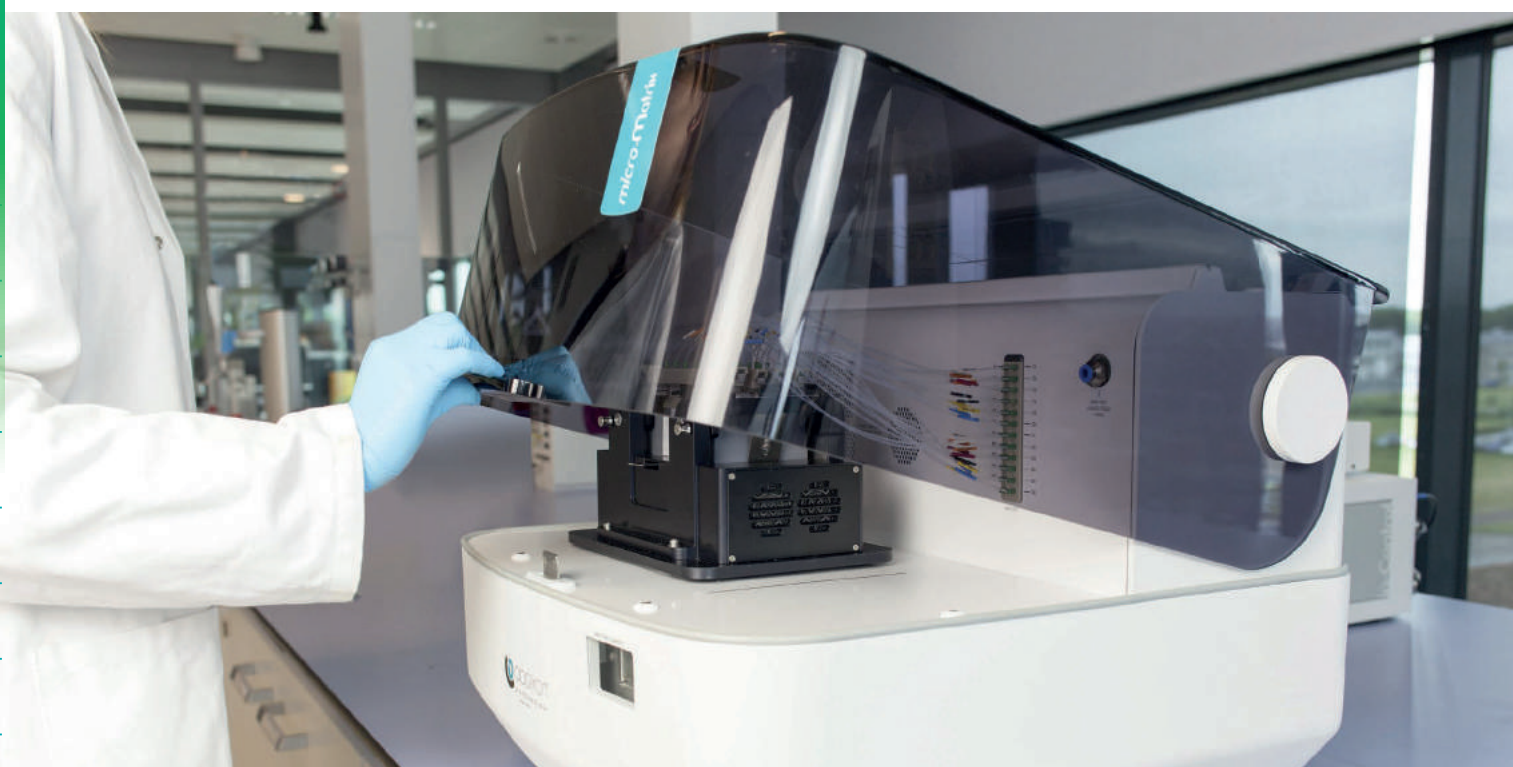


Various configurations of cover clamps and sandwich covers

micro-Matrix |

24 Bioreactors in a Convenient Microtiter Format

- Do more cultures in less time
- Liquid addition to the 24 wells
- PID controls of individual wells
- User friendly software enables more configuration for more complex recipes
- Small footprint on the bench in the lab



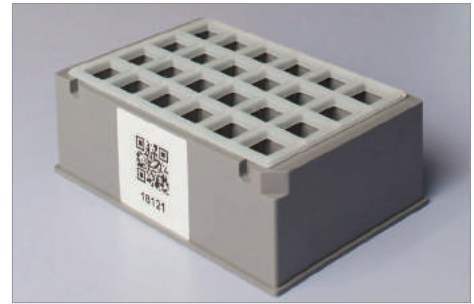
The unique micro-Matrix offers total control over 24 independent bioreactors in a simple microtiter plate footprint. Each of the 24 bioreactors on a plate offers independent controls, like its larger stirred-tank relatives:

- pH (measurement and two-sided control)
- temperature (measurement and two-sided control, including plate-wide gradients)
- dissolved oxygen control (measurement and two-sided control)
- individual liquid additions (including feeding profiles)
- up to 4 separate gas additions per row (individually controlled)

The micro-Matrix is a true scale-down of small scale bioreactors. The bioreactor square well cassette design is based upon the SBS-format microtiter plates that maximize mixing, optimize gas transfer, and seamlessly integrate into lab automation protocols. The PC-based human interface of the micro-Matrix reflects our popular my-Control interface and offers simple, intuitive interaction with each of the 24 bioreactors. Integrated LEDs indicate the status of the bioreactors (inactive / active / alarm) with color-based feedback, so that operators can get instant process information at one quick glance.

Features

- Individual monitor and control: pH, dissolved oxygen, temperature
- Liquid feeding enables true scale-down studies
- Simple, powerful software streamlines operator workflow
- Operating 24 bioreactors in parallel
- Screening tool



Applications

- Screening of cell-line and microbial cultures
- Process development studies
- Process optimization studies
- Small volume cultivations
- Anaerobic conditions for small volumes



Software

The micro-Matrix software offers an easy way to operate 24 bioreactors in parallel, plus simple comparisons of large numbers of experimental cultures. Using an instinctive left-to-right progression, the interface guides operators through instrument configuration, control strategy definition, experimental setup, and

data visualization. It is also possible to define time- and event-based control actions, and all data can be exported from the instrument mid-cultivation. At any moment in the run, an Excel file can be generated with graphs of all measurements.



Measurement and control

Each bioreactor has its own PID controller for pH, dissolved oxygen, and temperature. Individual pH control can be achieved via gas addition, liquid addition, or a combination of both. Dissolved oxygen level can be individually controlled by up to four gas additions per bioreactor. Temperature can be individually controlled by the integrated cooling and heating system on a

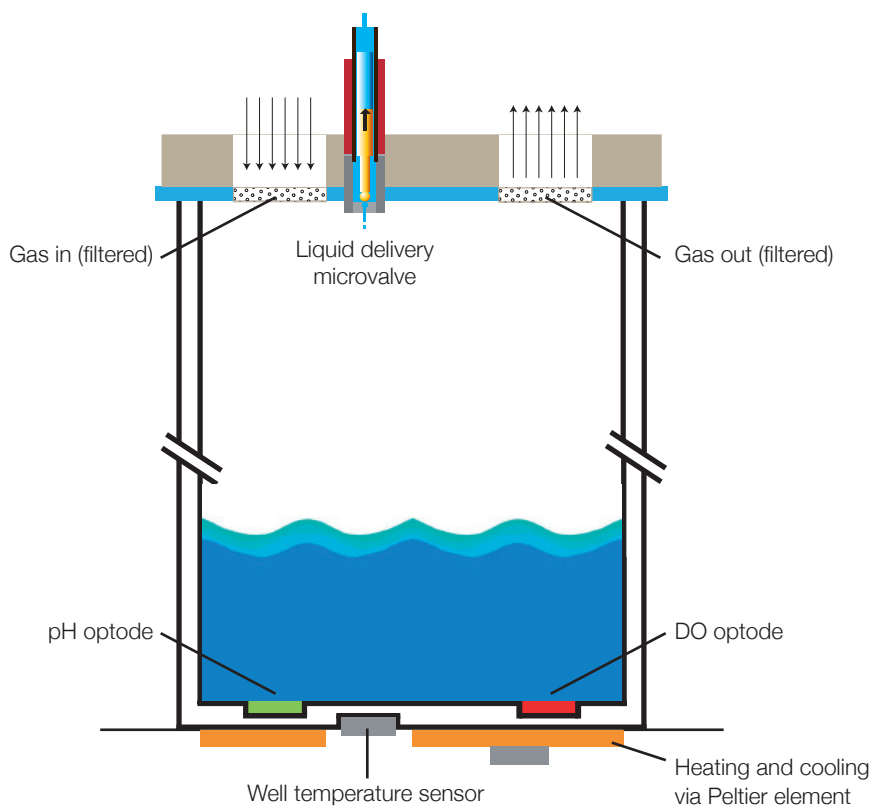
well-by-well basis, and users can define temperature gradients across the set of bioreactors. Advanced control strategies are also available to users interested in cascade controls, time-based setpoint changes, and event-triggered liquid feeds. Liquid feeding is also available using varying types of addition profiles.

Technical data

Each of the four gas feeds and one liquid entry are controlled individually per bioreactor (5 additions per reactor).

- Independent gas supplies: for Air / O₂ / N₂ / CO₂ / NH₃*
- Integrated liquid feed individually per well
- Cascade up to five actuators per control loop per bioreactor
- Control strategy is user definable per bioreactor per experiment
- Temperature measurement and control per reactor
- pH measurement and control per reactor
- DO measurement and control per reactor
- Orbital shaker 0-400 rpm @25 mm orbit

*Ammonia gas is supplied via Applikon designed ammonia pressure vessel for safety conditions.



Schematic diagram illustrating the functioning of the micro-Matrix control loops.

Specifications

Total volume per bioreactor well	10 mL	
Working volume per bioreactor well	2 - 5 mL	
Orbit diameter	25 mm	
Rpm range	0 - 400 rpm	
Gas delivery	0.1 - 15 mL / min	Per gas, per well
Number of gasses	4	
Gas feed pressure	> 1.0 (extern)	
Liquid delivery	200 nL	per bolus (approx.)
Liquid feed pressure	> 2.0 bar (extern)	
Temperature measurement range	0 - 45 °C	
Resolution	0.1 °C	
Accuracy	0.5 °C	
Temperature control range	15 - 45 °C	
ΔT between adjacent wells	1 °C	
Heat-up time	1 °C / min	20 °C to 37 °C
Control accuracy	± 0.1 °C	
pH measurement	5.5 - 8.5 pH	
Resolution	< 0.05 pH	@ pH 7.2
Accuracy	< 0.1 pH	@ pH 7.2
pH control range	5.8 - 8.2 pH	
Control accuracy	± 0.1 pH	
DO measurement	0 - 150 %	Air saturation
Resolution	< 1 %	Air saturation
Accuracy	< 0.5%	@ 0% air saturation
	< 3%	@ 100% air saturation
DO control range	0 - 150 %	
Control accuracy	$\pm 5\%$	Air saturation
Dimensions	415 mm	Height
	570 mm	Depth
	560 mm	Width
Weight	65 kg	
Oxygen Transfer Rate	250 mmol / l / h	
Mixing times	< 1 sec	

Connections

The micro-Matrix requires connection to a standard 230/115V AC power supply and pressurized gas and (air, oxygen, nitrogen, carbon dioxide). The micro-Matrix is connected to a computer through a standard Ethernet port.

Related products

- The polystyrene bioreactor cassettes conform to the SBS standard for 24 well culture plates (128 x 86 mm). The total volume per bioreactor is 10 mL with optimal working volumes from 2 to 5 mL. The square bioreactors are designed based upon our popular 24-well microtiter plate design to optimize mixing and gas transfer, and Applikon has characterized these plates to offer advice on proper selection of working volume and agitation to achieve your process goals. Cassettes are delivered beta-sterilized and sealed in a light shielding package.
- Filter bar

MiniBioreactors | Real Small... Real Bioreactors

- Generate more data in less time
- Easy set up and operation
- Less medium used during cultivation
- Little bench space required

The miniBio range of bioreactors (250 mL, 500 mL and 1000 mL total volume) is a true scale down of the laboratory scale bioreactor. The miniBio systems have the same flexibility as the laboratory scale bioreactors. This means that the miniBio systems can be customized to fit the demands of any process. The small volume reduces media costs and maximizes bench space, which is normally at a premium.

Applications

- Screening studies
- Media optimization
- Process optimization
- Microbial and cell culture
- Batch, Fed-Batch, Perfusion and Continuous cultivation

Features

- Small size bioreactors
- Generate scalable results

Related products

- Bottle holder
- LumiSens Optical DO₂ sensor
- pH sensor
- Lucillus software
- V-Control software



Specifications

	MiniBio 250	MiniBio 500	MiniBio 1000
Total volume (ml)	290	550	1000
Working volume (ml)	200	400	800
Minimum working volume (ml)	50	100	200
Aspect ratio total volume	2.3	2.1	2.3
Aspect ratio working volume	1.6	1.5	1.9
Dimensions (dxh)	180 x 400 mm	195 x 400 mm	200 x 550 mm
Dimensions for autoclaving (dxh)	180 x 250 mm	195 x 250 mm	200 x 400 mm
Drive system	Direct drive, lipsealed	Direct drive, lipsealed	Direct drive, lipsealed
Maximum stirrer speed (rpm)	50 - 2000	50 - 1750	50 - 1500
Maximum impeller tip speed (m/s)	2.3	2.0	3.5
Impellers	Choice of Rushton and marine		
Gas sparger	Porous sparger, open pipe sparger or jet sparger		
Gas overlay	Yes		
Exhaust gas	Electrically cooled exhaust gas condenser (evaporation <4% per day at 37°C @ 2vvm)		
Sampling	Fixed sample pipe with optional sampling system		
Draining	Height adjustable drain pipe		
Additions	4 fixed inlet ports and optional micro liquid injectors		
pH	Measurement: 8 mm classic pH sensor Control: via acid pump (variable speed pump) or CO ₂ gas in combination with alkali pump (variable speed pump)		
DO₂	Measurement: 8 mm classic polarographic DO ₂ sensor, optional LumiSens Optical DO ₂ sensor Control: via a combination of N ₂ , Air, O ₂ (optional MFC) and agitation or nutrient addition (variable speed pump)		
Temperature	Measurement: Pt-100 sensor in thermowell in topplate Control: electrical cooling and heating jacket via bioreactor wall		
Foam	Measurement: Height adjustable conductivity based foam sensor Control: anti-foam addition (variable speed pump)		
Level	Measurement: Height adjustable conductivity based level sensor Control: variable speed pump for liquid addition or removal		
Optional inlets	Septum, chemostat tube, liquid entry system		
Optional sensors	Biomass, Optical Density, O ₂ and CO ₂ off gas, weight balance		





apollikon®
BIOTECHNOLOGY
PRESSURE -1 / 0.5 barg
made in Holland

Glass Autoclavable Bioreactors | The World Wide Standard

- Wide range of volumes to fit many applications
 - Interchangeable modules to tailor the systems to research demands
 - Easy cleanability by electropolished finish of product
 - Simple set-up and easy handling
-

In the laboratory bioreactor and fermentor range Applikon is a worldwide market leader because of its dependable and easy to use systems. The bioreactors and fermenters excel in quality and modularity. An Applikon laboratory system is easy to upgrade if a change in research activities occurs. Applikon offers glass autoclavable bioreactors for cell culture applications and for microbial culture applications. The systems are built according to the specific demands of a process using an extensive array of high quality components. Because of the modularity and flexibility, the user can always adapt the systems to changed process demands. This results in low initial investment and low running costs. The stirred tank reactor (STR) is the most widely used bioreactor type. Glass autoclavable bioreactors and fermenters are available in 2 - 3 - 5 - 7- 15 and 20 liter total volume.

Features

- No welded parts in the bioreactor topplate
 - Optional high torque magnetically coupled agitator
 - All metal parts are constructed of stainless steel 316L
 - External mirror polished finish
 - Glass bioreactor vessels can be used up to 0.5 barg (7.5 psig) of overpressure.
 - Glass dished bottom vessels are made of borosilicate glass to guarantee:
 - resistance to thermal shock
 - excellent corrosion resistance
 - smooth, non porous surface for easy cleaning
 - optimal transparency for visual inspection of the culture
-

Applications

- Microbial cultures
 - Cell cultures
 - Batch
 - Fed-Batch
 - Perfusion
 - Continuous cultivation
-

Related products

- Bottle holder
 - Sensors
 - LumiSens Optical DO₂ sensor
 - BioSep
-

Specifications

	Total volume (L)	Working volume (L)	Minimum working volume (L)	Aspect ratio total volume (L)	Aspect ratio working volume (L)
2 liter single wall	2.2	1.7	0.5	2.2	1.9
2 liter jacketed	2.2	1.7	0.5	2.2	1.9
3 liter single wall	3.1	2.7	0.5	1.9	1.5
3 liter jacketed	3.1	2.7	0.5	1.9	1.5
5 liter single wall	4.8	3.4	0.9	1.6	1.1
5 liter jacketed	4.8	3.4	0.9	1.6	1.1
7 liter single wall	6.8	5.4	1.5	2.2	1.8
7 liter jacketed	6.8	5.4	1.5	2.2	1.8
15 liter single wall	16.5	12	3.0	1.7	1.5
15 liter jacketed	18.2	12	3.0	1.5	1.2
20 liter single wall	23.4	16	3.0	2.4	2.0
	Internal Diameter (mm)	Internal Height (mm)	Autoclave dimensions (WxH mm)		
2 liter single wall	105	240	ø190 x 436		
2 liter jacketed	105	240	ø219 x 486		
3 liter single wall	130	240	ø190 x 436		
3 liter jacketed	130	240	ø235 x 436		
5 liter single wall	160	250	ø260 x 436		
5 liter jacketed	160	250	ø260 x 480		
7 liter single wall	160	350	ø260 x 600		
7 liter jacketed	160	350	ø264 x 645		
15 liter single wall	222	440	ø381 x 710		
15 liter jacketed	240	440	ø391 x 740		
20 liter single wall	222	620	ø381 x 900		
Drive system	Direct drive, lipsealed or magnetically coupled				
Stirrer speed (rpm)	Standard range is 50 - 1250. 2 and 3 liter systems can be supplied with 2000 rpm motor				
Impellers	Rushton and marine with outside diameters 45 mm, 60 mm 75 mm or 85 mm				
Gas sparger	Porous sparger or L-type sparger				
Gas overlay	Yes				
Exhaust gas	Water cooled exhaust gas condenser				
Sampling	Fixed height or height adjustable sample pipe with optional sampling system Sample pipe internal diameters choices are: 1.7 mm, 4 mm, 6 mm or 10 mm				
Draining	Drain pipe				
Additions	Triple or single inlet ports and optional micro liquid injectors				
pH	Measurement: 12 mm classic pH sensor Control: via acid pump or CO ₂ gas (rotameter or MFC) in combination with alkali pump				
DO₂	Measurement: 12 mm classic polarographic DO ₂ sensor or LumiSens for 2-5 L. Control: via a combination of N ₂ , Air, O ₂ (Rotameter or MFC) and agitation				
Temperature	Measurement: Pt-100 sensor in thermowell in topplate Control: cooling and/or heating jacket via bioreactor wall or via internal heat exchanger				
Foam	Measurement: Height adjustable conductivity based foam sensor Control: anti-foam addition pump				
Level	Measurement: Height adjustable conductivity based level sensor Control: pump for liquid addition or removal				
Optional inlets	Septum, chemostat tube, liquid entry system				



Single-use Bioreactors

- Save time to prepare your bioreactor for the next batch
- Time of highly trained staff and scientist is spent more efficiently

Applikon offers several types of Single-use bioreactors

- AppliFlex ST, stirred tank bioreactors
- AppliFlex RB, rocking bioreactors from 10 to 50 liter
- Millipore Mobius™ CellReady
- HyPerforma SUB, stirred tank bioreactors from 66 to 2,700 L

All systems are unique in their accurate measurement and control of key process parameters. The systems can be controlled using the Applikon ez2-Control, ez-Control, i-Control or my-Control. Most systems can be equipped with re-usable sensors as well as fluorophor pH and Dissolved Oxygen sensors. Our well trained sales consultants are able to advise you on the complete configuration of your Single-use bioreactor system. All systems go through standard IV/OV and FAT procedures before they are delivered and installed turnkey and fully documented at the customers site. The qualified Applikon technical support team can take care of the installation and will be your first point of contact for any questions.

Features

- Simple operation
- OPC compliant controller
- Accurate process control
- Classic and Single-use (fluorophor) sensors for measurement of pH, Dissolved Oxygen
- Accurate control of pH, DO, temperature, mixing
- Data logging & SCADA (21CFR part 11) available
- Turn-key delivery
- IV/OV/FAT and SAT for the complete system
- Fully documented delivery eases validation
- One point of contact for the complete system
- Qualified support and service

Applications

- Cell culture
- Microbial
- Batch
- Fed Batch
- Perfusion
- Suspension cells
- Anchorage dependent cells

AppliFlex ST | Disposables Designed on Demand

Introducing the AppliFlex ST, a fully customizable single-use bioreactor available in 500 mL. Easily configure a new single-use vessel for each new process at lower initial investment costs, utilizing Applikon's innovative 3D printing. Build the bioreactor of your dreams.

The AppliFlex ST is a fully customizable stirred tank bioreactor enabling you to customize your head plate to your process. You can choose the type and number of impellers, the number of liquid and gas additions, and the type of sparger that will be most optimal for your process. No more blind plugs. The 3D printing production technology guarantees complete reproducibility between the different bioreactors, guaranteeing exact identical conditions between runs.

The Single-use bioreactors are designed according to the high Applikon quality standard and are 1:1 interchangeable with Applikon's glass vessels of the same volume. This means that you can switch between Single-use and re-usable system in no time and at no additional costs. All measurement and control auxiliaries are completely interchangeable between the Single-use and the glass bioreactors as well.



AppliFlex RB

The AppliFlex RB bioreactor range consists of a 10, 20 and 50 liter bioreactor bag. The control system (pH, Dissolved Oxygen, temperature, mixing) is the standard Applikon ez2-Control / ez-Control. The rocking motion offers gentle mixing. The same rocker can be used for the 10 (2x), 20 and 50 liter bioreactor bags. The AppliFlex RB bioreactors are an easy scale-up to the HyPerforma bioreactors; the bags are made of the same materials which eases validation.



Millipore Mobius™ CellReady

The CellReady 3L Bioreactor combines the advantages of a traditional stirred tank design with the flexibility of single use, making it a powerful solution for bench scale cell culture process development. The CellReady 3L bioreactor is ready to use out of the box as it is delivered pre-assembled and sterilized by gamma irradiation.

The bioreactor includes:

- Rigid tank design with the classic glass bioreactors geometry
- Pre-fitted, weldable C-flex tubing
- Vent filter, gas overlay, and two gas inlet filters
- 3 probe ports and one thermowell port
- Open-pipe and sintered microsparger
- Fluid addition/removal
- 4 Fluid Addition Lines
- 1 Sub-surface fluid inlet/outlet
- Bottom Drain port for harvesting
- In-line septum for small volume additions (i.e. anti-foam)
- Sampling: Sub-surface integrated side sampling to minimize sampling deal volume

The CellReady 3L bioreactor is supplied as a bundle with ez2-Control. The controller includes 2 rotameters with solenoid valves for control of pH and dissolved oxygen content, 1 pump for alkali addition, and a heating blanket for temperature control. It is possible to customize the controller with extra rotameters, mass flow controllers, built-in pumps, and the extended I/O board.



HyPerforma

The HyPerforma SUB provides all the advantages of Single-use bioprocessing in a classical stirred tank bioreactor system design. The critical design parameters of the S.U.B., such as height to diameter ratios, mixer design and location and typical control system interfaces, have been maintained. The SUB is available with new optimized standard BioProcess Containers with improved dual sparge capability. Open pipe and frit sparging systems are included to provide a wider range of operating conditions. A key element to the Single-use design is the plastic (polyethylene) impeller with a bearing/seal assembly linked to an external mixer drive. The range includes units with maximum working volumes of 50, 100, 250, 500, 1,000 and 2,000 liter.



Specifications



AppliFlex ST	0,5
Total volume (L)	0,5
Max working volume (L)	0,4
Min working volume (L)	0,1



AppliFlex RB	10	25	50
Total volume (L)	10	25	50
Max working volume (L)	5	12.5	25
Min working volume (L)	2	5	10



HyPerforma	50	100	250	500	1000	2000
Total volume (L)	66	120	316	660	1320	2700
Max working volume (L)	50	100	250	500	1000	2000
Min working volume (L)	25	50	125	250	500	1000



CellReady	
Total volume (L)	3.0
Max working volume (L)	1.0
Min working volume (L)	2.4

Motor Controller | Powerful Stirring

- Powerful stand-alone motor controller for laboratory applications
- Support of maintenance-free brushless motors reduces costs
- Easy operation due to very intuitive user interface

The Motor Controller is a robust and user-friendly device that allows for easy and stable mixing. The Motor Controller can be supplied with 4 different types of brushless stirrer motors that can support mixing in vessels up to 130 L.

The Motor Controller can be used in bioprocessing applications as a (more powerful) external motor controller for biocontrollers, such as the in-Control, or as a stand-alone controller that can be used for mixing applications. These can be mixing of medium tanks in bioprocessing applications or general mixing purposes in any industry. Furthermore, the Motor Controller can be used as replacement of the ADI 1032 motor controllers.

The Motor Controller can be controlled remotely, which allows for easy integration in existing systems and also allows for data logging in to external software platforms.

Intuitive software has been developed that makes it very easy for the operators to work with the controller and includes trending and alarming possibilities.

Features

- Intuitive 7" color touchscreen user interface
- Integration with biocontrollers and/or SCADA software through external control possibility
- Integrated trending and alarming possibilities
- Support of 4 different types of brushless stirrer motor for control up to 130 L vessels

Applications

- Stirrer motor controller in bioprocessing application
- Mixing device for general mixing purposes

Related products

- Brushless stirrer motors: M10 for 2 – 7 L bioreactor
M20 for 5 – 7 L bioreactor
M14 for 15 – 130 L bioreactor (cell culture)
M33 for 15 – 30 L bioreactor (microbial)
- Biocontrollers in-Control
ADI 1010



Specifications

Stirring

Measurement and control range	M10: 0 - 2000 rpm
	M14: 0 - 750 rpm
	M20: 0 - 2000 rpm
	M33: 0 - 1000 rpm
Measurement and control accuracy	0,1 % of full scale
Feedback	Encoder
Motor type	DC, permanent magnet
Safety features	External E-stop
External control	Via analog signal
	SCADA through ethernet connection

Control

Control hardware platform	Applikon proprietary
Control software platform	Applikon firmware
Certifications	CE certified, GAMP compliant,
Connectivity	Compatble with SUB-Control, ez-Control, ez2-Control, myControl, in-Control and i-Control

my-Control | Color your Lab

- Enhanced parallel processing by allowing up to 32 my-Controllers in one human interface
- Expandable control system with optional extra inputs and outputs
- Easy operation through web browsers

The my-Control is our most advanced bioreactor controller for small scale bioreactors starting at 50 mL (working volume). The system can control bioreactors up to a total volume of 3 L. This versatile controller can be used for both cell culture and microbial cultures. With its footprint of only 19 by 35 cm (W x D) it uses the minimal amount of bench space, allowing to set up as many as 5 on 1 m width of bench space. The built-in web server allows the my-Control to be operated by any computer with a web browser. Wireless devices like iPad, iPhone or Android tablets or phones can also be used to operate the my-Control. The selectable colored band on the unit allows the system to be personalized and to fit your laboratory.

Features

- Control of all bioprocess parameters, including pH, temperature, dissolved oxygen, agitation, foam and level
- Selectable autotuning adaptive PID control for accurate control when process conditions change during the culture.
- Extended liquid additions options tuned to small scale cultivation via up to 4 digital variable speed pumps at the front of the controller
- Enhanced gas addition strategies via 4 mass flow controllers
- No water connections needed due to electrical cooling and heating system for bioreactor and condenser
- USB connection for optional balances, Biomass, Fluorophor pH and DO sensors
- Redox measurements
- Same familiar Applikon control platform as ez-Control, ez2-Control, in-Control, SUB-One controller

Applications

- Microbial and Cell cultivation
- Batch, Fed-Batch, Perfusion and Continuous cultivation
- Ideal for screening, media optimization, modelling, and toxicity studies
- Autoclavable bioreactor processes up to 3 liter volume
- Single-use bioreactor processes up to 3 liter volume

Related products

- Autoclavable bioreactors
- Single-use bioreactors
- Sensors
- Lucillus software
- V-Control software



Specifications

Sensors	
pH Sensor	Traditional electrochemical or Single-use
DO sensor	Traditional Polarographic, LumiSens or Single-use
Redox	Traditional electrochemical
Temperature	Pt-100, measurement Range: 0-150 °C accuracy 0,1°C
Foam/level	Resistive based measurement
Weight	Input for external balances
Optional	Biomass (Capacitance or optical density) or Offgas measurements
Additional I/O	Up to 4 Analog in and 4 Analog out, up to 8 Digital out
Actuators	
Gas	Up to 4 MFC's or needle valves with solenoid valves, max flow 1.500 mL/min N2 equivalent
Liquids	4 variable speed pumps, up to 40 mL/min 2 microvalves or up to 4 external variable speed pumps
Stirring	0-2000 rpm
Temperature	Peltier elements or heating blanket or cooling with cold water water valve
Control	
Control Hardware and Software platform	Applikon proprietary and Applikon Firmware
Certifications	CE certified, GAMP compliant
21 CFR part 11 compatible	Yes
Communication & SCADA	Lucillus PIMS, BioXpert W10, DeltaV Applikon OPC server available



in-Control | Simply Powerful

- Increased flexibility by optional extra inputs and outputs
- Easy operation through touch screen interface and through web browsers
- Enhanced gas addition strategies via up to 4 Mass Flow Controllers
- Reduce footprint by small size controller
- Replacement of ADI biocontrollers

The in-Control is a process controller for laboratory scale bioreactors, offering high level control on a small footprint. The controller can be used for both cell cultures and microbial cultures. The system is designed to replace the ADI 1010 and ADI 1030 BioControllers. The intuitive human interface is a built-in color touch screen. This modular system allows you to create the most optimal set-up as you can add any extra inputs or outputs. You are in control.

Features

- Control of all bioprocess parameters, including pH, temperature, dissolved oxygen, agitation, foam and level
- Selectable autotuning adaptive PID control for accurate control when process conditions change during the culture
- USB connection for optional biomass or fluorophor pH and DO sensors and balances
- Ethernet communication to SCADA
- Same familiar Applikon control platform as ez-Control, ez2-Control, in-Control, SUB-One controller

Applications

- Microbial and Cell cultivation
- Batch, Fed-Batch, Perfusion and Continuous cultivation
- Autoclavable bioreactors up to 7 liter volume
- Single-use Bioreactor processes

Related products

- Autoclavable bioreactors
- Single-use bioreactors
- AppliSens sensors
- Lucillus software
- V-Control software



Specifications

Sensors	
pH Sensor	Traditional electrochemical or Single-use
DO sensor	Traditional Polarographic, LumiSens or Single-use
Redox	Traditional electrochemical
Temperature	Pt-100, measurement Range: 0-150 °C accuracy 0,1°C
Foam/level	Resistive based measurement
Weight	Input for external balances
Optional	Biomass (Capacitance or optical density) or Offgas measurements
Additional I/O	Up to 4 Analog in and 4 Analog out, up to 8 Digital out
Actuators (optional)	
Gas	External gas box, options for 4 MFC's or 4 Rotameters
Liquids	Using powerbox up to 8 digital outs for switchable pumps, up to 4 external variable speed pumps
Stirring	0-2000 rpm
Temperature	Heating blanket or cooling with cold water water valve
Control	
Control Hardware and Software platform	Applikon proprietary and Applikon Firmware
Certifications	CE certified, GAMP compliant,
21 CFR part 11 compatible	Yes
Communication & SCADA	Lucullus PIMS, BioXpert W10, DeltaV Applikon OPC server available



ez2-Control | Easy to Control your Bioreactor

- Powerful software features to simplify and optimize bioprocesses
- Up to 6 Mass Flow Controllers
- Less maintenance due to brushless motor



With a new fresh look, the ez2-Control is there to simplify your bioprocess. Its multiple software innovations make it easy to control your bioreactor. The new web-interface for ez2-Control (also compatible with ez-Control) provides a clear overview of the parameters of your bioprocess, putting the attention right where it's needed. Advanced user management enables you to create up to 21 users on 2 authorization levels. Back-ups, copies and pre-defined settings of configurations can simply be shared via USB. Extra flexibility is brought by additional analog and digital inputs / outputs. The new brushless motor requires less maintenance, which saves you costs in the long term. Only one cable for the motor power and feedback is required. The ez2-Control comes with a motor support at the side of the device for easy operation.

Features

- Remote desktop support
- Standard Redox connection included
- One connection / cable for motor power & feedback
- User friendly web-interface
- Full integration of digital sensors
- Adaptive PID
- Free loop configuration
- Gravimetric feed / flow control
- Total gas flow control to reduce shear stress for cell cultivations
- Same familiar Applikon control platform as ez-Control, my-Control, in-Control, SUB-One controller

Applications

- Microbial and Cell cultivation
- Batch, Fed-Batch, Perfusion and Continuous cultivation
- Autoclavable bioreactors up to 20 liter volume
- Single-use Bioreactor processes
- Steam-in-place bioreactors

Related Products

- Redox sensor
- Brushless motor
- Motor support for M10 and M20 motors
- V-Control
- Lucullus software

Specifications

Sensors

pH Sensor	Traditional electrochemical or Single-use Measurement range: 0-14 pH, accuracy 0,01 pH
DO sensor	Traditional Polarographic, LumiSens or Single-use Measurement Range: 0-100% saturation, accuracy 0,1%
Redox	Traditional electrochemical Range 2000 mV, accuracy +/- 1 mV, resolution 1 mV
Temperature	Pt-100 Measurement Range: 0-150 °C accuracy 0,1°C
Foam/level	Resistive based measurement
Weight	Balances
Optional	Biomass (Capacitance or optical density), offgas measurements, pressure
Additional I/O	Up to 8 Analog in and 4 Analog out Up to 8 Digital In and 8 Digital out

Actuators

Gas	Up to 6 MFC's with solenoid valves or Up to 4 rotameters with solenoid valves
Liquids	Up to 3 internal fixed speed pumps Up to 4 external variable speed pumps
Stirring	0-2000 rpm with feedback, accuracy 0,1% FS
Temperature	Heating blanket or internal Thermocirculator Cooling with cold water water valve

Control

Control hardware platform	Applikon proprietary
Control software platform	Applikon Firmware
Certifications	CE certified, GAMP compliant
21 CFR part 11 compatible	Yes
Communication & SCADA	Lucullus PIMS, BioXpert W10, DeltaV Applikon OPC server available

i-Control | The Scalable Control System

- Cost effective
- Off-the-shelf standard solution
- Robust industrial solution

i-Control is an easy to operate bioreactor control system and utility console. This scalable control solution is used to control processes in bioreactor systems from laboratory scale to pilot plant and production scale saving time and money during scale-up. The i-Control is available in a Single, a Dual bioreactor set-up as well as in a Quad (4 bioreactors) configuration. This standard control solution can be supplied with Allen Bradley or Siemens PLC's. Basic functionality includes advanced process control for numerous parameters, fully automatic sterilization and Clean-in-place routines. The off-the shelf system is supplied pre-configured and ready to use.

Features

- Reliable control platform (Allen Bradley and Siemens hard- and software)
- Supplier independent solution based on industry standard hardware
- Local Control and local display
- Integrates with any factory automation system
- Fully documented supply eases validation
- Can be used in a 21CFR part 11 compliant system

Applications

- Microbial and Cell cultivation
- Batch, Fed-Batch, Perfusion and Continuous cultivation
- Single-use Bioreactor processes
- Steam-in-place



Specifications

Sensors	
pH Sensor	Traditional electrochemical * *Single-use sensor options, redundant options available
DO sensor	Traditional Polarographic *Single-use sensor options, redundant options available
Redox	Optional
Temperature	Pt-100, measurement Range: 0-150 °C accuracy 0,1°C
Foam/level	Resistive based measurement
Weight	Balances and/or Load cells
Optional	Biomass (Capacitance or optical density), offgas measurements, pressure
Additional I/O	Configurable
Actuators	
Gas	Up to 8 MFC's with solenoid valves or up to 8 rotameters with solenoid valves
Liquids	Up to 4 internal variable speed pumps / 2+ external variable speed pumps
Stirring	0-2000 rpm
Temperature	Heating blanket or external Temperature Control Unit (TCU)
TCU options	Thermoflex Neslab, Lauda, GWK, Polyscience
Control	
Control Hardware and Software platform	Siemens or Allen Bradley / Siemens, Allen Bradley, iFix, DeltaV
Certifications	CE certified, GAMP compliant
21 CFR part 11 compatible	Yes
Communication & SCADA	Lucillus PIMS, BioXpert W10, DeltaV Applikon OPC server available

Related products

- Autoclavable bioreactors
- Single-use bioreactors
- Sensors
- Lucillus software
- V-Control software
- iFix software



SUB-Control | Controlling Single-use in Pilot & Production

- Fully configurable controller based on your requirements
- Turn-key package with Thermo Fisher HyPerforma S.U.B. and S.U.F.
- Variety of software platforms available for maximum connectivity.

The SUB-Control is a controller designed to work with pilot and production scale single use bioprocessing systems. It can be integrated with the Thermo HyPerforma S.U.B. in the range of 50 to 2000L maximum working volume, or the Thermo HyPerforma S.U.F in 30L or 300L size or Pall or millipore Single use Bioreactors.

The SUB-Control is equipped with the latest standard in pump, MFC and sensor technology. The SUB-Control comes in two versions. The SUB-Control ONE is based on the Applikon software platform which has the same advanced features as our bench top scale solutions such as the my-, ez-, ez2- and in-Control. The SUB-Control PLUS is based on PLC technology similar to our i-Control.

Features

Options in control platform

- Flexible Applikon based platform
 - Same familiar Applikon control platform as ez-Control, ez2-Control, my-Control and in-Control
- PLC control platform (hard- and software)
 - Rockwell Allen Bradley
 - Siemens
 - DeltaV DCS Platform
- Single-use supplier independent solution based on industry standard hardware
- Local control and local display
- Integrates with any factory automation system
- Fully documented supply eases validation
- Can be used in a 21CFR part 11 compliant system

Applications

- Microbial and Cell cultivation
- Batch, Fed-Batch, Perfusion and Continuous cultivation
- Single-use bioreactor processes



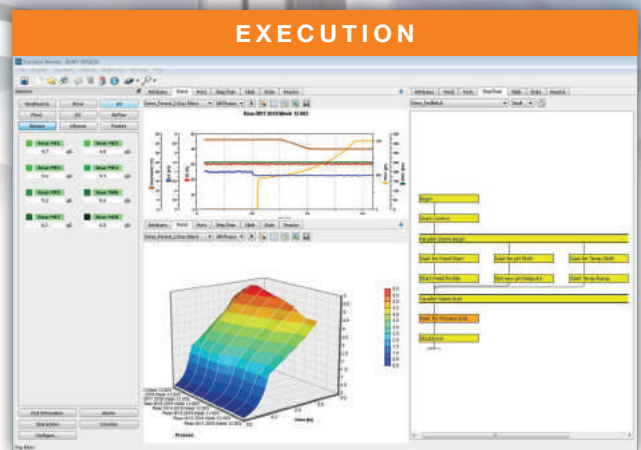
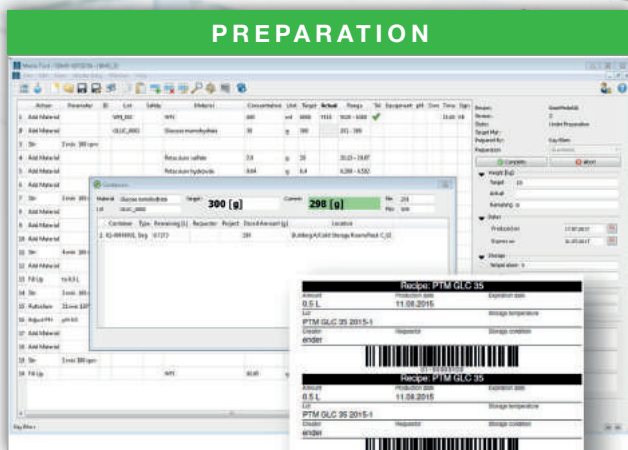
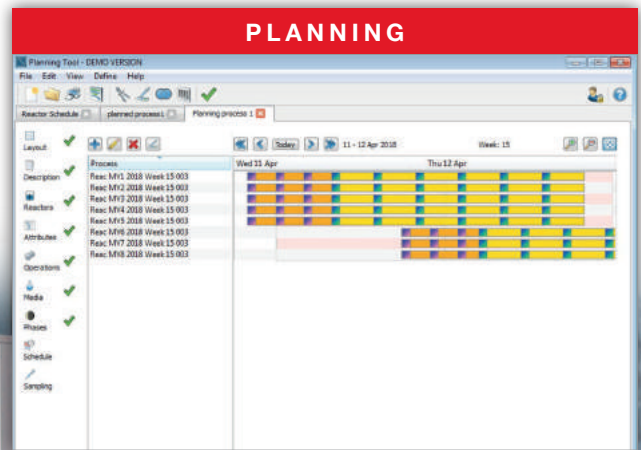
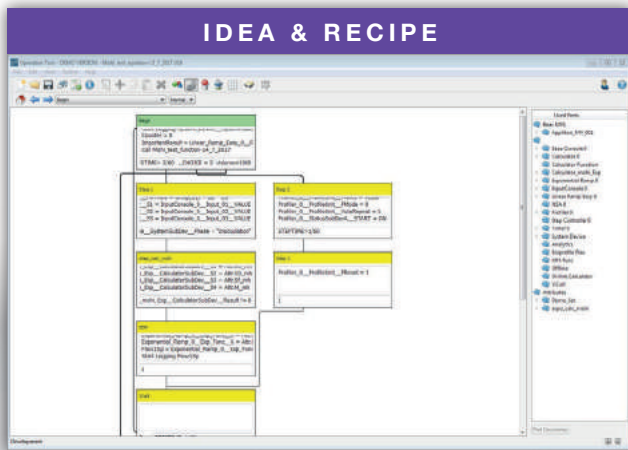


Specifications

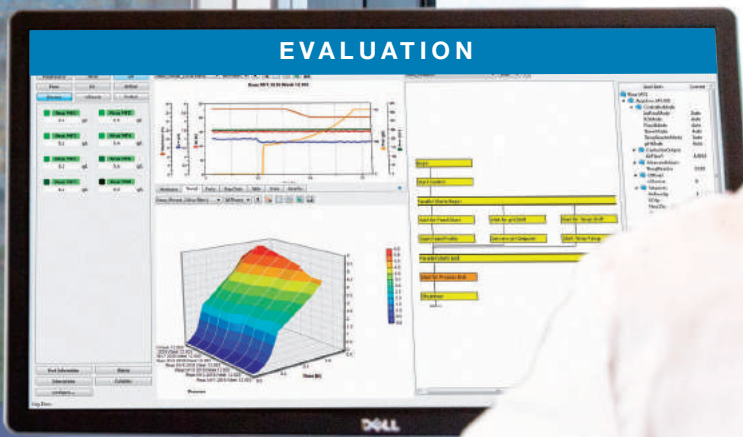
Sensors	SUB ONE	SUB PLUS
pH Sensor	Traditional electrochemical *	*Single use sensor options, redundant options available
DO sensor	Traditional Polarographic	*Single use sensor options, redundant options available
Redox	Optional	
Temperature	Pt-100, Measurement Range: 0-150 °C accuracy 0,1°C	
Foam/level	Resistive based measurement	
Weight	Reactor load cells and balances	
Optional	Biomass (Capacitance or optical density), offgas measurements, pressure	
Additional I/O	Up to 8 Analog in and 4 Analog out	Configurable Up to 8 Digital In and 8 Digital out
Actuators		
Gas	Up to 8 MFC's with solenoid valves or up to 8 rotameters with solenoid valves	
Liquids	Up to 4 internal fixed speed pumps	Up to 4 internal variable speed pumps
	Up to 2 external variable speed pumps	2+ external variable speed pumps
Stirring	AC or DC motor drive	
Temperature	Heating blanket or external Temperature Control Unit (TCU)	
TCU options	Thermoflex Neslab, Lauda, GWK, Polyscience	
Control		
Control Hardware and Software platform	Applikon proprietary and Applikon Firmware	Siemens or Allen Bradley Siemens, Allen Bradley, iFix, DeltaV
Certifications	CE certified, GAMP compliant	
21 CFR part 11 compatible	Yes	Yes
Communication & SCADA	Lucullus PIMS, BioXpert W10, DeltaV Applikon OPC server available	

Lucillus PIMS | From Idea to Report

One integrated software solution for the whole workflow around bioprocesses



Lucillus Process Information Management System (PIMS) offers a new dimension in upstream bioprocess data management. Classic SCADA solutions are limited to data acquisition and supervisory control functions, but Lucillus can additionally control a heterogeneous collection of devices and bioreactors from different vendors. Furthermore, Lucillus integrates functionalities and activities around creation and planning of recipes, reactor allocation, Design of Experiments, media preparation, media component traceability, data analysis, data mining, automatic reporting and modelling. The integration of all these functions into one comprehensive software solution saves the scientists time, since all data is stored in one central Oracle® database. No more need for data export and import between different solutions. Lucillus integrates all functions needed for complete data management of your upstream process.

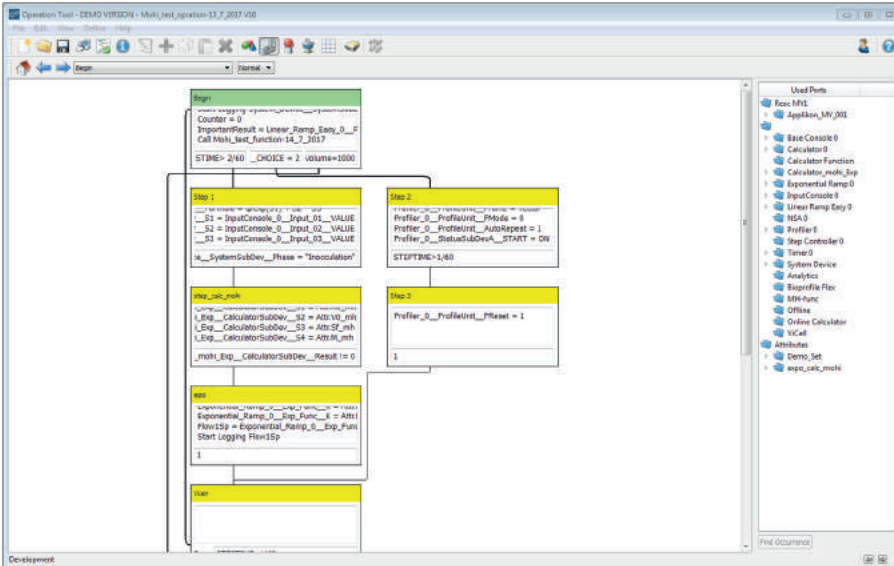


The ever increasing amount of process data generated by more sensors in smaller parallel bioreactor systems needs advanced software to turn this data into useful information. Lucillus PIMS offers a new dimension in data processing. Data management and data analysis is key for the future of R&D and process development in pharmaceutical industry. Lucillus PIMS software allows the user to monitor and control bioprocesses and offers an extensive toolbox for analyzing process data across platforms. Process information can be generated based on data generated in different brands of bioreactor types and wide range of different cultivation volumes. The combination of the software with the broad range of Applikon bioreactor systems offers the user a unique system for validatable fast track development and basic research.

Idea & Recipe

Make your process idea come true with an intuitive tool to create your process recipe

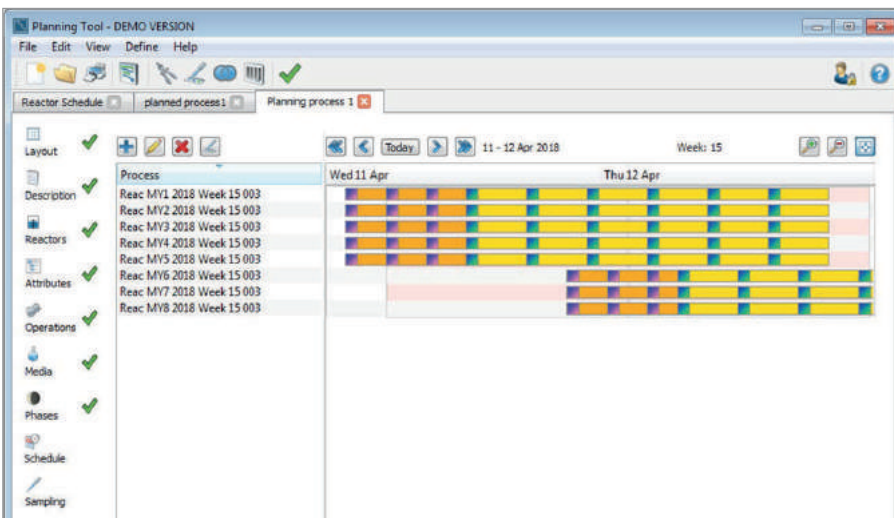
- Create your instruction sequences for simple or advanced processes and use them within multiple processes
- Integrate sequential calculations in your instructions based on time and events
- Receive Notifications, Emails, or SMS alarms in case your process deviates from your predefined limits



Planning

Define everything in advance with an intuitive workflow to start processes with minimal effort

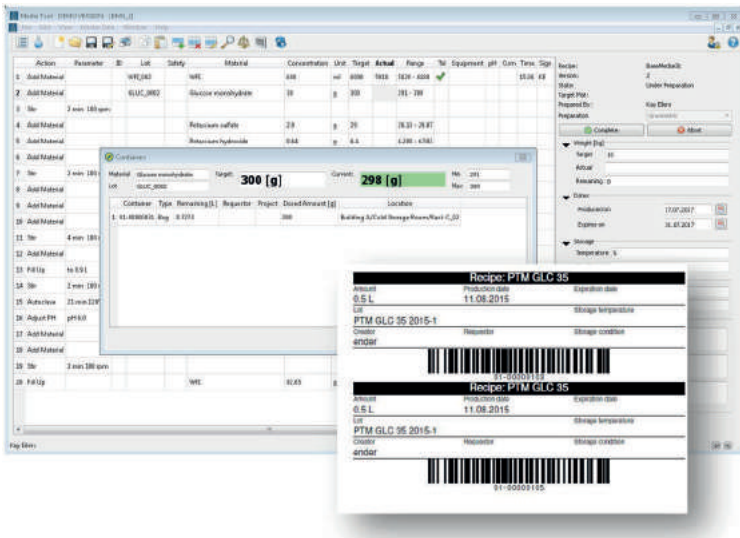
- Make optimal use of your shared resources using integrated scheduling tools
- Maximize your experiment efficiency by integrating third party DOE modules into your planning process
- Manage samples efficiently with overall strategies to coordinate sampling, sample tube preparation and barcoding
- Retrieve data automatically from at-line analyzers (E.g. Vicell, Nova pHox, Nova Flex etc.)



Preparation

Manage your Media center components and storage uniformly and efficiently

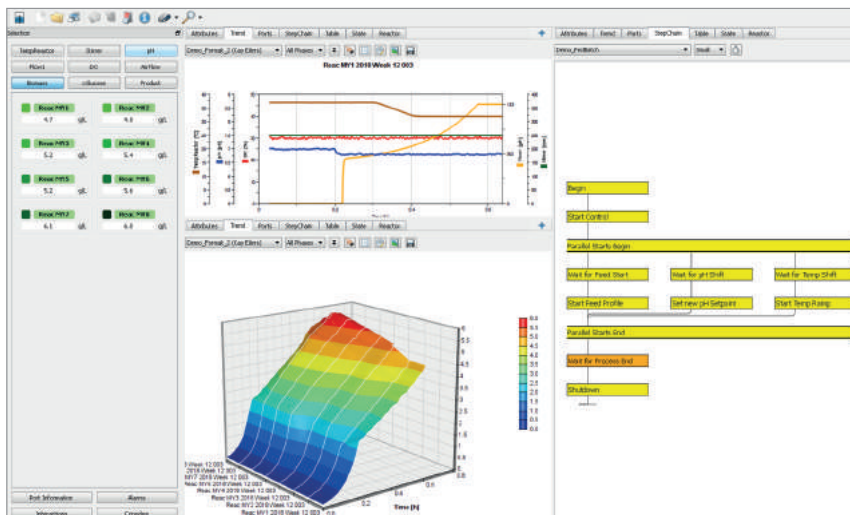
- Automate culture media creation
- Keep track of the availability of culture media in your storage
- Optimize the availability of raw materials in your storage
- Get more insight by keeping track of raw media components used in your culture runs



Execution

Execute recipes and monitor experiments

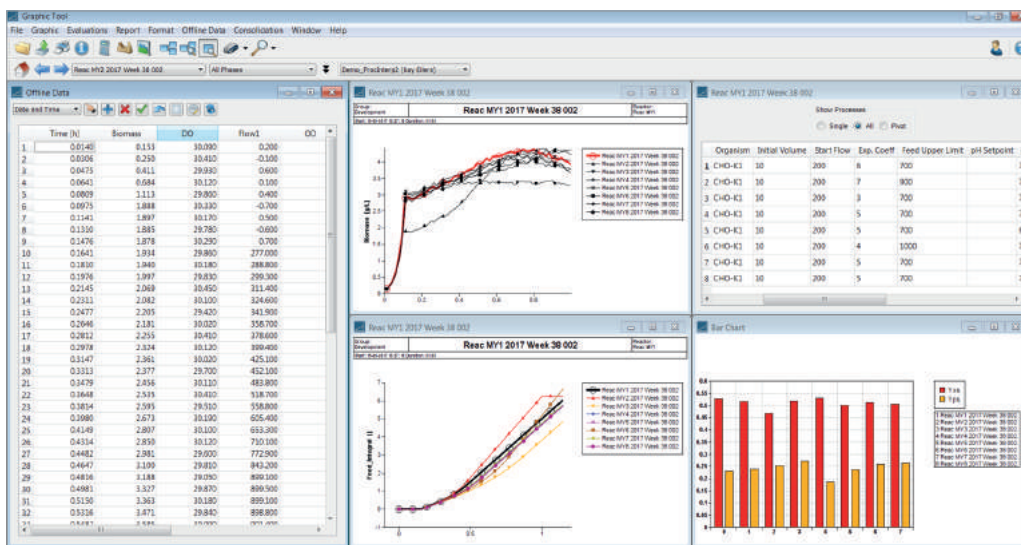
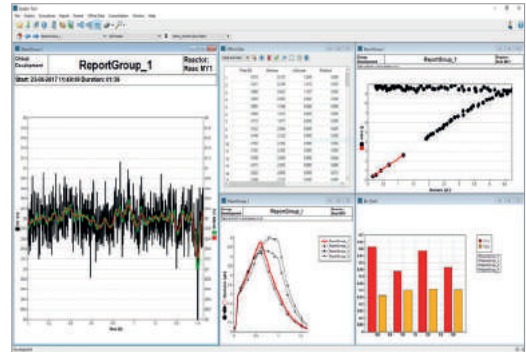
- Execute a process based on a predefined recipe or planning
- Start several bioreactors in parallel and monitor them simultaneously
- Store process data in a safe and industry standard Oracle database
- Make well informed decisions by comparing multiple processes simultaneously
- Evaluate running processes via 3D graphs and tables



Evaluation

Turn data into useful information using a wide range of evaluation components

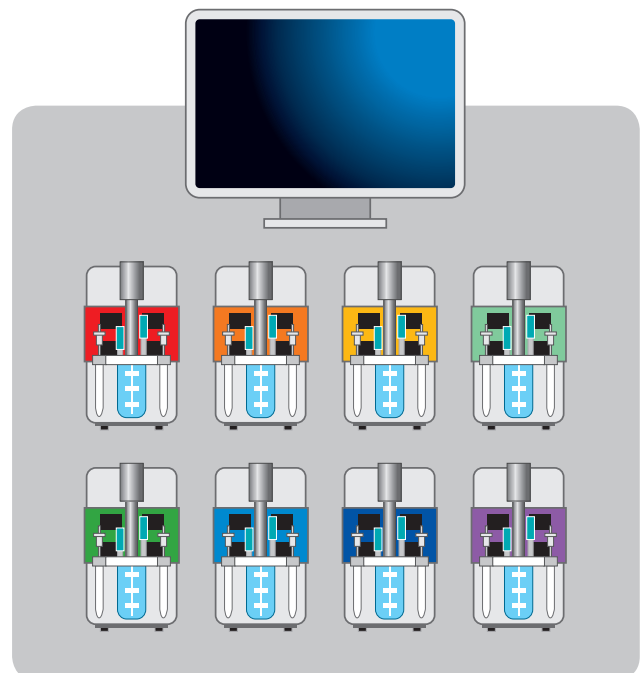
- Visualize process results by creating advanced graphs and tables
- Deepen your insight by using overlay graphs for a set of processes
- Turn data into useful information using advanced data analysis tools
- Automatically verify your process model against your experimental data
- Save time and achieve consistency by generating reports automatically



Lucillus PIMS can be supplied in three different architectures

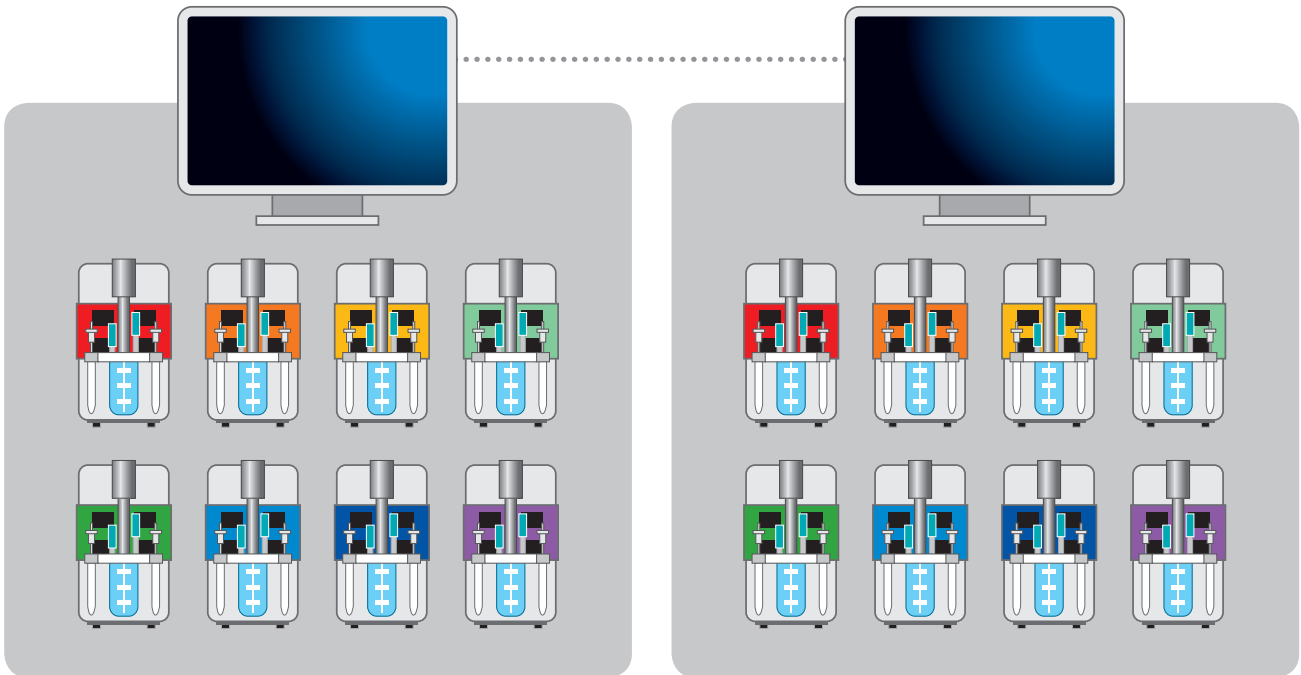
1 | Stand-alone edition

The stand-alone edition is used for up to 8 different bioreactors or one multi-bioreactor system on one computer. Data is stored in a local Oracle database and access to the process data can occur via the local computer or via a remote network link to this process computer. Interactions to the process can occur via the local computer in the laboratory.



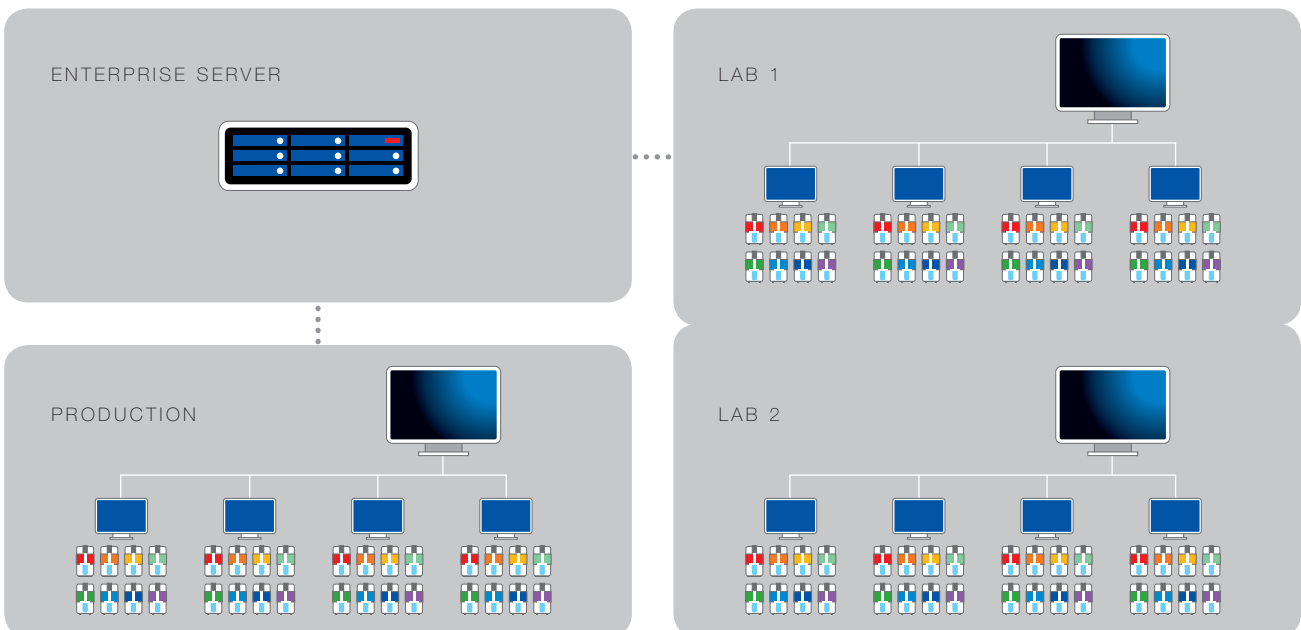
2 | Client Server Edition

The Client-Server edition is used for larger Lucullus installations, when different labs use the software. This distributed architecture allows the data to be stored in a safe location while the front end user interfaces are located near the bioreactors where they need to be. At the office, data can be reviewed via a direct link to the data server on the network. Data from different laboratories can be compared and can be used for process control or for reporting and making decisions for further process development.



3 | Enterprise Edition

For even larger Lucullus installations at different sites (and even in different countries) the Enterprise edition can be used. This version connects different installations of Lucullus and allows on the fly conversion and translation of process data. The authorized user can view and compare data between different sites. This could be a production site and a process development site, or could even be different development sites in different locations working on the same process.



Lucullus PIMS: Turning Data into Information

Specifications

Operating system	See table			
Computer Hardware	no specific demands			
Specifications	Lucullus Lite	Lucullus Standard	Lucullus Advanced	Lucullus Expert
General				
Operating system	Linux, Windows 7 (64-bit), Windows 10			
Communication drivers include	my-Control, in-Control, ez2-Control, i-Control, SUB-Control			
Optional Controller drivers	no	Sartorius controllers, Eppendorf Controllers, NBS controllers, Infors Controllers, Siemens PLC, AMBR, Shaker/Incubators		
Optional drivers for analytical instruments	no	Vicell, Nova Flex, Nove pHox, Flownamics and more		
Design of Experiments	no	no	yes	yes
Media preparation planning	no	no	no	yes
Analysis planning	no	no	no	yes
Resource planning (reactors)	no	no	yes	yes
Material Management	no	no	no	yes
Lot preparation	no	no	no	yes
Filling	no	no	no	yes
Storage management	no	no	no	yes
Data Acquisition	yes	yes	yes	yes
Process Control	no	yes	yes	yes
Monitoring and Alarms	no	yes	yes	yes
Sampling planning and management	no	no	yes	yes
Data Retrieval from Analytical Devices	no	yes	yes	yes
Interactive Data Analysis	no	yes	yes	yes
Performance Analysis	no	yes	yes	yes
Automatic report generation	no	yes	yes	yes
21 CFR part 11 compliant	no	optional	optional	optional
GAMP compliant	yes	yes	yes	yes
ISA S88 standard	yes	yes	yes	yes
Password protection	no	no	yes	yes
User definable access rights	no	yes	yes	yes
Remote Access	no	yes	yes	yes
Interactive Synoptic	no	yes	yes	yes

Specifications

	Lucullus Lite	Lucullus Standard	Lucullus Advanced	Lucullus Expert
Data management				
Data storage system	Oracle database	Oracle database	Oracle database	Oracle database
Minimum sampling frequency	1 second	1 second	1 second	1 second
Sample frequency selectable per parameter	yes	yes	yes	yes
Data reduction definable per parameter	yes	yes	yes	yes
Data export to Excel	yes	yes	yes	yes
Data export in ASCII format	yes	yes	yes	yes
Graph export in graphics format	yes	yes	yes	yes
Dynamic Data Link to other programs	no	yes	yes	yes
On-line calculations				
using on-line and off-line data	no	yes	yes	yes
Data display				
Line graphs	yes	yes	yes	yes
Maximum number of y-axes per graph	8	8	8	8
Synoptic (P&I diagram)	no	yes	yes	yes
Procedure flow chart	no	yes	yes	yes
Combination of current and historic data in graphs	yes	yes	yes	yes
Combination of different active batches in graphs	yes	yes	yes	yes
Measured data table display	yes	yes	yes	yes
Scatter plots	yes	yes	yes	yes
Storage of predefined graph settings	yes	yes	yes	yes
Supervisory control				
Programming of time based actions	no	yes	yes	yes
Programming of event based actions	no	yes	yes	yes
Profiling of setpoints	no	yes	yes	yes
Manual setting of local control setpoints	no	yes	yes	yes
Recipe definition	no	yes	yes	yes
Other				
Notebook for process and equipment remarks	yes	yes	yes	yes
Event viewer for system comments	yes	yes	yes	yes
Audit trail	no	optional	optional	optional



V-Control for R&D |

The scalable DeltaV™ solution for bioreactors in your lab

- Improved user experience with advanced automation tools
- Minimized scale-up risks with easy technology and data transfer
- Reduced time-to-market and development costs

V-Control is the scalable DeltaV™ solution for bioreactors in your lab. It harnesses the power of DeltaV™ in an off-the-shelf configurable system at a low reduced price point. V-Control combines the best of DeltaV™ automation with Applikon bioprocessing know-how into one platform for process control and data management from discovery to production. Seamless technology transfer and scalable data transfer result in optimal bioprocesses with shorter development lead times and lower development costs.



Features

- Native open-architecture DeltaV™ software with tailor-made functions
- User-friendly, alarm-based operator user interface
- Small benchtop footprint to connect up to 32 bioreactor systems per V-Control network
- Advanced automation tools for the best user experience:
 - Sensor calibration
 - Actuator calibration
 - Total gas flow
 - 3-point cascade
 - Cultivation mode
 - Bioreactor overview

Applications

- Microbial and Cell cultivation
 - Batch, Fed-Batch, Perfusion and Continuous cultivation
 - Autoclavable bioreactors up to 20 liter volume
 - Single-use Bioreactor processes
-

How V-Control works

Appli-V is the application within the V-Control solution that is built by software engineers from both Applikon and Emerson. This open-architecture software can easily be configured and is thus compatible with customized libraries. The fully interface is built using the default DeltaV™ PCSD library from Emerson to make it easy to use and to connect to existing systems. The end-user experience is enhanced and simplified with Emerson’s Human Centered Design based interface, attracting your attention whenever and wherever needed. V-Control is also compatible with DeltaV™ Batch and Configuration Audit Trail & Version Management



Related products

- my-Control
- ez2-Control
- ez-Control
- in-Control
- miniBio
- autoclavables
- AppliFlex ST
- Millipore Mobius™ CellReady
- SIP labscale
- Sensors

R&D / Pilot Plants

Clinical Operations

Commercial Production

Process PLM Infrastructure

ERP Software solutions

MES Software solutions

Integrated Data Collection from R&D to Production

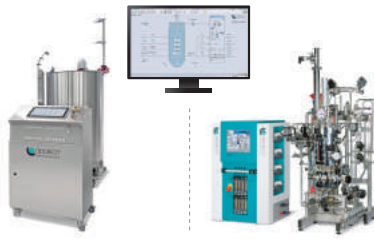
V-Control for R&D

Up to 32 bioreactors per network

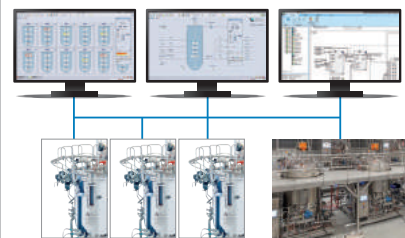


V-Control for Pilot & Production

Stand alone skids



Integrated V-Control Solutions



ISA-S88

ISA-S95

V-Control Add-ons

Reporting & Data management

V-Control comes with the standard DeltaV Historian embedded with real-time and historical trending capabilities. Additionally, an Excel Add-in will be provided to export your data to Excel.

Alternatively, V-Control can also be connected to external 3rd party historians, like OSIsoft PI or Aspentech, through OPC if more integration of data networks is desired.

DeltaV Discovery Operator Station

Improve the efficiency of R&D laboratories by adding extra operator stations to the V-Control network.

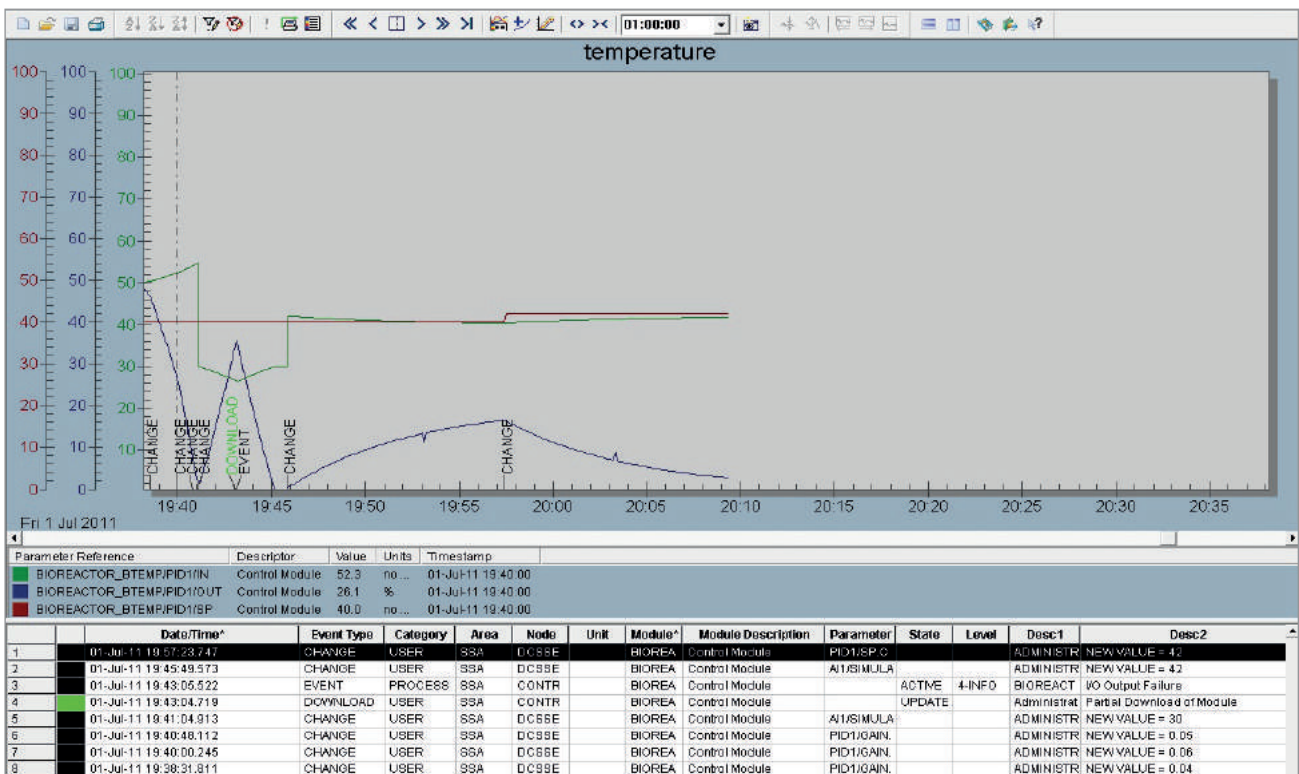
Do you want to operate your V-control system with a user-friendly interface, state-of-the-art graphics, real-time and historical trending capabilities, process alarms prioritized by the user, and system-wide, built-in security? Run your V-Control system using the DeltaV™ Operator Station. An Operator Station is made up of the Operator Station Software Suite and the DeltaV hardware to run it. Take advantage of single-click access to graphics, directories, and other applications. You get the most for your investment with the DeltaV Operator Station. This additional, independent operator station provides full operations capability for your V-Control system and enables that multiple workstations can be used simultaneously to work with the V-Control system.

DeltaV Batch Executive

The DeltaV Batch Executive manages everything from recipe execution to history collection. It is responsible for carrying out batch procedures, coordinating communication between phases, allocating equipment and other resources required by a batch, and send and receive recipe data from phases running in the DeltaV controllers. These events, along with all other recipe execution activities, are automatically generated and collected by the Batch Executive to provide detailed batch historical records.

DeltaV™ Configuration Audit Trail & Version Management

Configuration Audit Trail is a powerful tool that tracks changes and manages revision information for any item in the DeltaV™ configuration database. This application creates and maintains a configuration change history for configuration items such as modules, SIS modules, phases, operations, unit procedures and user accounts. The DeltaV security system provides function locks, which allow the system administrator to control the privileges granted to individual users.





LumiSens | Optical DO sensor

- Longer sensor life time since sensor is not sterilized
- Direct use after autoclaving as no polarization is needed
- Reduced maintenance costs since no electrolyte and membranes have to be replaced

Ready to go! The Applikon LumiSens sensor can be used right after autoclaving. Polarization is no longer needed, compared to the traditional polarographic DO₂ sensors, and the need for calibration is significantly decreased to only once per year instead of calibrating for every run. The RedFlash optical technology allows accurate measurements especially in the low oxygen concentration range where classic probes are less accurate. The LumiSens sensor is available for our mini bioreactor range and bioreactors up to 5 L. The smart sensor design separates the electronics from the glass sensor part, guaranteeing a long sensor life with repeated sterilizations.

Features

- Health status monitor to show sensor condition
- Insensitive to CO₂ fouling
- Ø8 mm sensor for accurate reading on small scale
- M12 thread integrated for direct mounting in top plate
- No interference with biotech-molecules, like mCherry, Texas Red and Chlorophyll a & b due to RedFlash technology

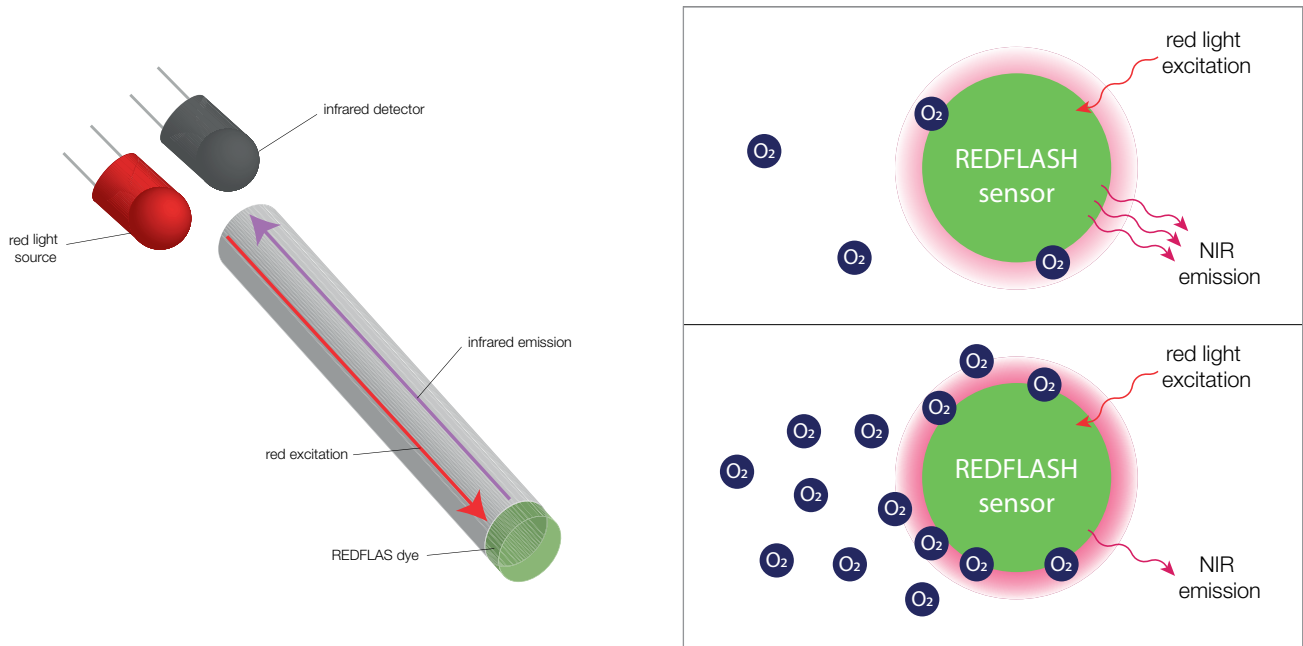
Applications

- Small bioreactors from 250 mL up to 5 liter bioreactors
- Long-term processes
- Anaerobic and micro-aerobic processes
- Microbial and cell culture processes

How the LumiSens works

The measurement principle is based on the phase shift between excitation and emission, which is directly related to the partial pressure of oxygen.

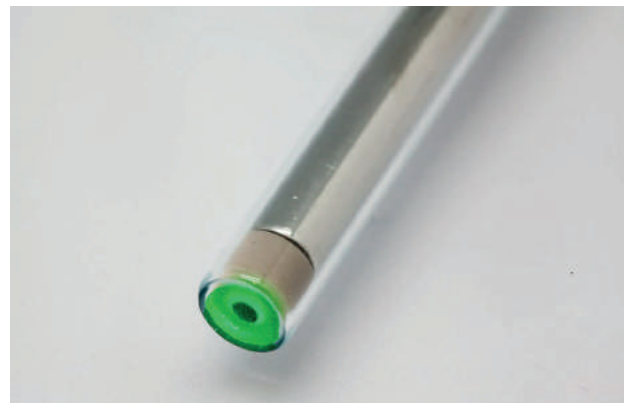
The RedFlash technology is characterized by high precision and reliability, low cross-sensitivity and fast response. The red light excitation significantly reduces interferences caused by auto fluorescence and reduces stress in biological systems. Besides, due to the excellent luminescence brightness of the RedFlash indicator, the actual sensor matrix can be prepared much thinner, leading to fast response time of the sensor.



LumiSens – two parts



Optical sensor on tip of stainless steel sensor housing



Green fluophore on tip of replaceable glass tube

Related products

- DO₂ Lumisens sensor Ø 8 mm (L = 115 / 135 / 185)
- Glass tube for DO₂ LumiSens sensor (L = 115 / 135 / 185)
- Sensor holder G $\frac{3}{4}$ " port M12 thread

DO₂ Sensors

- Low drift by usage of titanium and PEEK material
- Easy calibration & short response time
- Optimal cleanability due to fully electro-polished surface

Measurements of dissolved oxygen (DO₂) in biotechnological processes is a basis for process optimization and maximization of the product yield. A microorganism or cell responds to the oxygen concentration in regulating its overall metabolism. Therefore, knowledge of the DO₂ concentration and its proper control during the process are of great importance.

The AppliSens DO₂-sensor is specifically designed for long-term, stable and accurate measurements in bioprocesses. The DO₂-sensor has a titanium membrane module to minimize the measurement drift. The autoclavable polarization module allows polarizing of your DO₂-sensor while autoclaving your bioreactor system, resulting in a reduced start-up time of your cultivation.

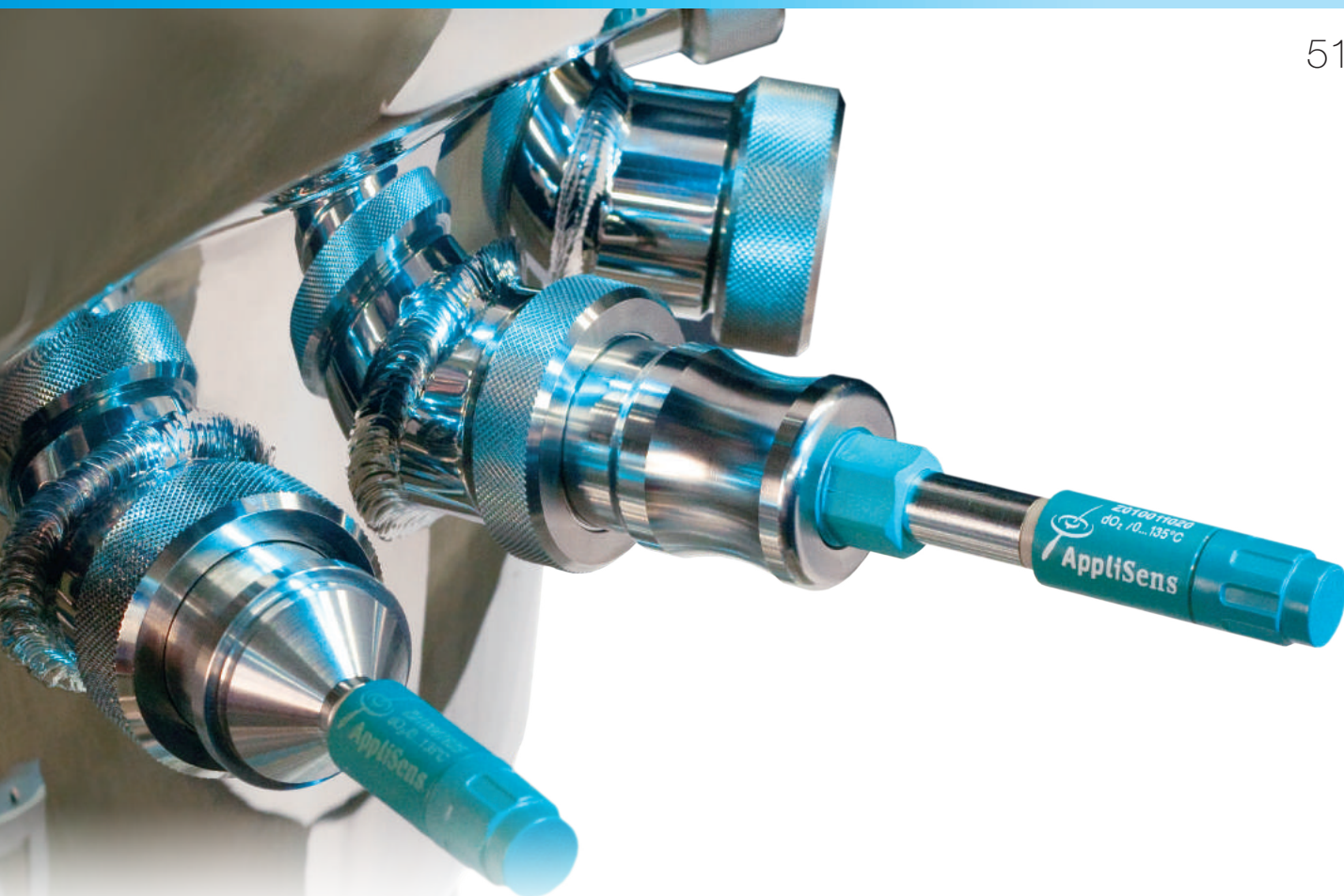
Features

- cGMP compatible by using FDA approved materials
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

Applications

- Microbial cultures
- Cell cultures
- Batch
- Fed Batch
- Continuous cultures
- Perfusion cultures





Specifications

Optimum polarization potential	- 800 mV @ 40°C	
Polarization potential amplifier	- 675 mV	
Max. pressure where linearity is guaranteed	4 bar	
Max. sterilization temperature	135°C	
Minimum polarization time	30 minutes	
Minimum polarization time after autoclaving	4h	
Optimum polarization time after autoclaving	Overnight	
Polarization current	Air / 25 °C / 1.013 bar / 100 % RH	(33 - 66) nA
Polarization current	Air / 40 °C / 1.013 bar / 100 % RH	(65 - 98) nA
Polarization current	O ₂ / 40 °C / 1.013 bar / 0 % RH	(300 - 350) nA
Response time gas phase 20 °C	t (90%)	(20 - 30) s
Response time gas phase 40 °C	t (90%)	(10 - 20) s
Response time gas phase 60 °C	t (90%)	(5 - 10) s
Drift between 15h - 5 days	< 0.2 % / day	
Drift between 5 days and 7 days	< 0.1 % / day	
Drift between 7 days and 30 days	< 0.05 % / day	

Related products

- DO₂ sensor Ø 8 mm (L = 115 / 135 / 185)
- DO₂ sensor Ø 12 mm (L = 110 / 154 / 235 / 325 / 425 / 590)
- DO₂ sensor cable (L = 0.65M / 2.0M)
- DO electrolyte
- DO membrane kits



pH Sensors

- Low sensitivity to fouling and thus drifting due to sleeve diaphragm
- Accurate measurement
- Stable signal over longer time

In your industry it is vital to have precise information about the pH value of the bioprocess. The pH level directly affects viability, productivity, and stability of the cells and it influences analysis of active ingredients. The AppliSens pH+ sensor has a fixed sleeve diaphragm that reduces the influence of the culture medium on the pH measurement. Compared to classic diaphragm types, this sleeve diaphragm increases measuring accuracy and increases the lifetime of the sensor which is vital for long lasting biotech cultivation processes.

Features

- Robust design by using tempered glass shaft
- Sensor head occupies minimal space on bioreactor top plate
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

Applications

- Microbial cultures
- Anaerobic microbial cultures (RedOx)
- Cell cultures
- Batch
- Fed Batch
- Continuous cultures
- Perfusion cultures



Specifications

Parameter	As Delivered
pH range	0 - 12 pH
Temperature range	0 - 135°C
Electrode zero point (E7)	+/-15 mV
Electrode slope (S4/7)	> 98%
Isothermal Intersection- pH (Eiso)	6.5 - 8
PH Range	4 - 9
Membrane resistance @ 25°C (ohm)	<1200
Membrane resistance @ 37°C (ohm)	<500
Calibration drift in Buffer 9 (mV / min)	< 2
Stirring Error (Buffer 9 @ 25 °C - pH)	< 0.05
Drift 72 hours after Autoclaving pH	< 0.13
Zero-point drift per week in PBS (pH)	< 0.05
Response Time (pH 9 to 4 @ 25 °C in Seconds)	< 90
Response Time 90% (pH 9 to 4 @ 25°C in Seconds)	< 45
Response Time (pH 9 to 4 @ 37°C in Seconds)	< 45
Response Time 90% (pH 9 to 4 @ 37°C in Seconds)	< 45

Related products

- pH gel sensor Ø 8 mm (L = 115 / 135 / 185)
- pH gel sensor Ø 12 mm (L = 120 / 235 / 325 / 425 / 590)
- pH sensor cable (L = 0.65M / 2.0M)
- pH sensor electrical connection



pH Sensor in TracFix
retractable sensor holder

RedOx Sensors

- Accurate measurement
- Easy calibration & short response time
- Stable signal over longer time

The RedOx potential (Reduction / Oxidation) of a bioreactor culture can be measured using a RedOx sensor. The value of the reading of the sensor can depend on pH, growth phase, growth medium components, and fermentation end-products (especially fermentation acids and hydrogen). RedOx measurement is also used in anaerobic fermentations as an alternative to the Dissolved Oxygen sensor which does not give much process information in anaerobic situations.

Features

- Robust design by using tempered glass shaft
- Sensor head occupies minimal space on bioreactor top plate
- FDA approved materials
- Withstands repeated SIP and CIP cycles
- Standardized PG 13.5 connection guarantees interchangeability with other bioreactor brands

Applications

- (Anaerobic) microbial cultures
- Cell cultures
- Batch
- Fed Batch
- Continuous cultures
- Perfusion cultures

Related products

- RedOx sensor Ø 8 mm (L = 115 / 135 / 185 mm)
- RedOx sensor Ø 12 mm (L = 110 / 154 / 235 / 325 / 425 / 590 mm)
- RedOx sensor cable (L = 0.65 m / 2.0 m)

Specifications

Diaphragm	Ceramic diaphragm
Indicator electrode shape	Ring
Indicator electrode type	Pt
Measuring range	-2000 ... 2000
Measuring unit	mV
pH range	0 ... 14
Reference electrolyte type	c(KCl) = 3 mol/L
Reference system	LL system
Shaft material	Glass
Temperature range, long-term (°C)	-5 ... 135



iLine F | In-Line Smart Cell Culture Monitoring

The iLine F brings real-time label free monitoring to suspension cell cultures (yeast, insect, mammalian and human cells) in bioreactors. The iLine F takes 3D holographic images of the cells and through advanced image analysis software, using machine learning algorithms, the cell count, morphology, cell viability, viral infection kinetics and 70 other parameters are generated automatically during the cultivation.



The iLine F is designed specifically for use in combination with all types of bioreactors (glass, SUBs, rocking motion bags). The technology can track a full cycle and monitor a variety of parameters such as cell count, morphology, viability and viral infection kinetics from very low to high concentrations. The iLine F can be used in various settings and can be integrated with the bioreactor control systems.



The iLine F is connected to bioreactors via a specific, sterile closed loop disposable fluidics system. Cells are pumped out of the bioreactor, via an innovative pumping system, flow through the imaging device in a temperature-controlled environment and flow back to the bioreactor after the holograms of the cells have been captured. The holograms are continuously analysed to compute different process critical parameters.

Thanks to its on-line features, the technology strongly improves productivity and quality and allows staff in charge of the bioprocess environment to focus on tasks not linked to sampling, staining and analysis of data.

The monitoring platform is used continuously throughout the cell multiplication cycle and gives very accurate information related to the ideal harvest time of the culture.



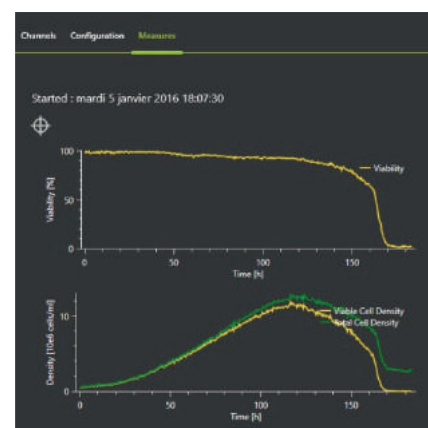
Parameters

The monitored parameters are indicated via a simple visual gauge. For more in depth knowledge, individual cells can be observed and analysed via an easy to use cell browser. Different color codes can indicate different statuses of the cell (dead, viable, infected, aggregated, engineered, producing,...).

The different parameters are measured by using a label free machine learning method based on the 'holographic' fingerprint of a cell. First of all, the iLine F captures holograms of all the cells flowing through the fluidics system in a 3D volume. In a second phase all objects within the observed volume are refocused. In a third step the holographic fingerprint of each cell is computed. The fingerprint is computed by a machine learning system and is based on a combination of 70 parameters that allow for a fast and accurate classification. The methodology used by the quantitative imaging-based platform can distinguish different cell statuses and subtle differences in and between cultures, making it a versatile and cost-effective solution.

The iLine F has been benchmarked and compared to existing manual and automated off-line methods and has shown to be more consistent and accurate.

More info can be found on the website: www.ovizio.com



BioBundle | Complete Cultivation Systems

- Turnkey solution
- Lower costs due to assembly in series
- Modular and configurable bioreactor system for multiple applications

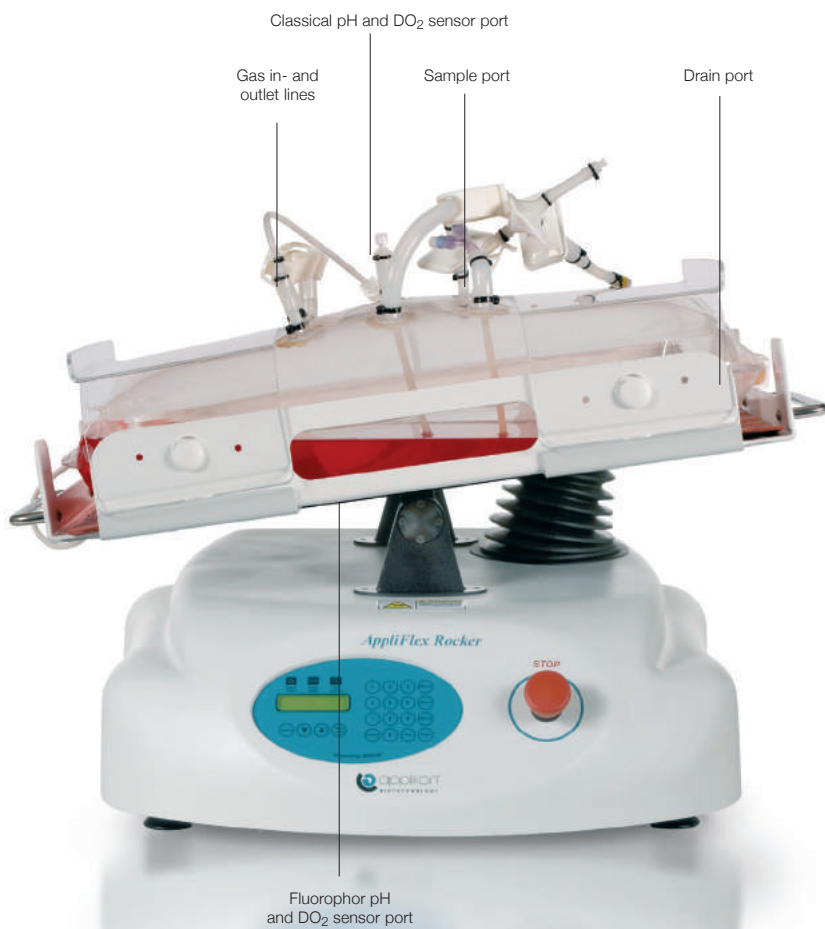
A BioBundle is a complete bioreactor system, equipped with all necessary components and is ready to use “out-of-the-box”. No detail is overlooked: the system is complete with silicone tubing, sample bottles and a “starter kit” including spare parts. The BioBundle is easy to set-up, requires no special skills or tools, easy to learn and easy to operate. Lucullus Lite Software for data acquisition is included. Select one or more of the optional add-on packs to customize your BioBundle.



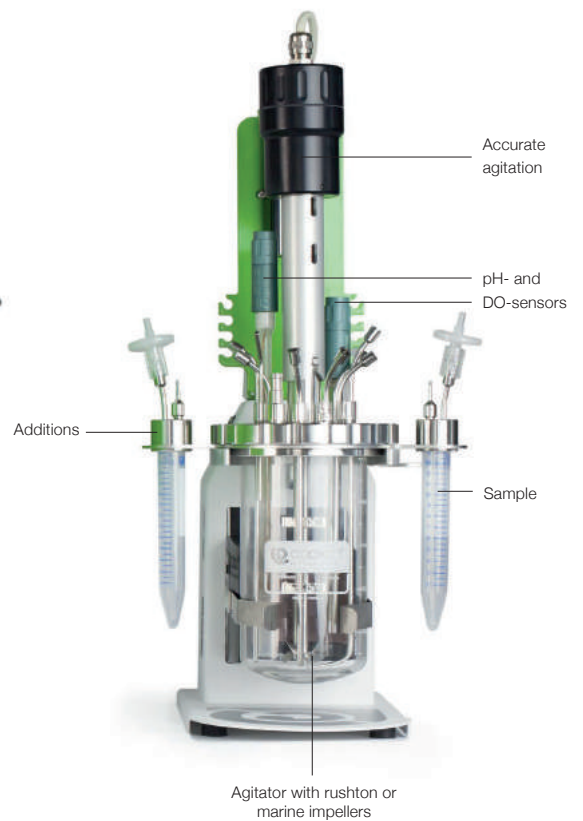
Autoclavable glass bioreactor

ez2-Control

The BioBundle provides a unique combination of ease of use and sophistication, reducing the time to start-up a process. The system is equipped with an intelligent and powerful process controller: easy and intuitive to operate, such that the user manual might not be needed. The process controller has control loops for pH, temperature, Dissolved Oxygen, foam/level and agitation and can apply a combination of digital and analog outputs for advanced process control and increased flexibility. Actuators such as rotameters, solenoid valves, mass flow controllers, pumps, thermocirculator and others can be controlled. The operator can set PID values, deadband for pH control, cascade control strategies, and dose monitors for liquid and gas additions. The advanced auto-tuning adaptive control system is part of every bundle and takes the guessing out of PID controller setting. The system can automatically and continuously calculate the best controller settings for every process.



AppliFlex RB



MiniBio

Features

- Lucullus Lite for data acquisition, process control and process optimization included
- Multiple bioreactors can be connected to one PC
- Compact design as accessories are integrated in a compact console
- State-of-the-art bioreactors for reliable operation with less maintenance

Applications

- Cell cultures
- Microbial cultures



Specifications

	MiniBioBundle Cell Culture	MiniBioBundle Microbial	BioBundle Cell Culture	BioBundle Microbial	AppliFlex BioBundle
Control system	my-Control	my-Control	ez2-Control	ez2-Control	ez2-Control
Total Volume	250 mL, 500 mL, 1000 mL	250 mL, 500 mL, 1000 mL	2 L, 3 L, 5 L, 7 L, 15 L, 20 L	2 L, 3 L, 5 L, 7 L, 15 L, 20 L	10 L, 20 L, 50 L
Working Volume	200 mL, 400 mL, 800 mL	200 mL, 400 mL, 800 mL	1.7 L, 2.7 L, 3.2 L, 5.4 L, 12 L, 16 L	1.7 L, 2.7 L, 3.2 L, 5.4 L, 12 L, 16 L	5 L, 10 L, 25 L
Agitator	Lipseal with marine impeller	Lipseal with Rushton impellers	Lipseal or magnetic with marine impeller	Lipseal or magnetic with Rushton impellers	Mixing by rocking motion
Aeration	Air supply via sparger	Air supply via sparger	Air and Oxygen supply via sparger	Air and Oxygen supply via sparger and overlay	Air and Oxygen supply via overlay
Exhaust gas	Optional gas outlet condenser	Gas outlet condenser	Gas outlet condenser	Gas outlet condenser	
Sampling	Sample pipe included	Sample pipe included	Sample pipe included	Sample pipe included	Sample line included
	Sample system optional	Sample system optional	Sample system optional	Sample system optional	Sample system optional
pH	Measurement via pH sensor control via liquid alkali pump and CO ₂ gas supply	Measurement via pH sensor control via liquid alkali or acid addition pump	Measurement via pH sensor control via liquid alkali pump and CO ₂ gas supply	Measurement via pH sensor control via liquid alkali and acid addition pump	Measurement via pH sensor control via liquid alkali pump and CO ₂ gas supply
Temperature	Measurement via Pt-100	Measurement via Pt-100	Measurement via Pt-100	Measurement via Pt-100	Measurement via Pt-100
	Heating only via heating blanket	Heating and cooling via Peltier system	Heating only via heating blanket	Heating via heating blanket cooling by cold water in heat exchanger	Heating only via heating blanket
Dissolved Oxygen	Measurement via DO ₂ sensor control via Air and O ₂ gas supply	Measurement via DO ₂ sensor control via Air supply and agitation speed	Measurement via DO ₂ sensor control via Air and O ₂ gas supply	Measurement via DO ₂ sensor control via Air and O ₂ supply and agitation speed	Measurement via DO ₂ sensor control via Air and O ₂ gas supply
Foam	Option	Measurement via Foam sensor control via anti-foam addition pump	Option	Measurement via Foam sensor control via anti-foam addition pump	
Level	Option	Option	Option	Option	
Liquid additions	4 fixed in topplate and 1 septum port	4 fixed in topplate and 1 septum port	3 ports in triple inlet and one inoculum port.	3 ports in triple inlet, one inoculum port and septum port.	One inoculum and alkali inlet.
	One liquid addition bottle included	Two liquid addition bottles included	One liquid addition bottle included	Two liquid addition bottles included	One liquid addition bottle included
Start-up kit	Included	Included	Included	Included	Included
Lucullus Lite software	Included	Included	Included	Included	Included

BioSep | Acoustic Cell Retention System

- Scalable perfusion device (0,1 – 1.000 L / day)
- No fouling or blocking for long term operation (no damage to cells)
- Automatic removal of cell debris

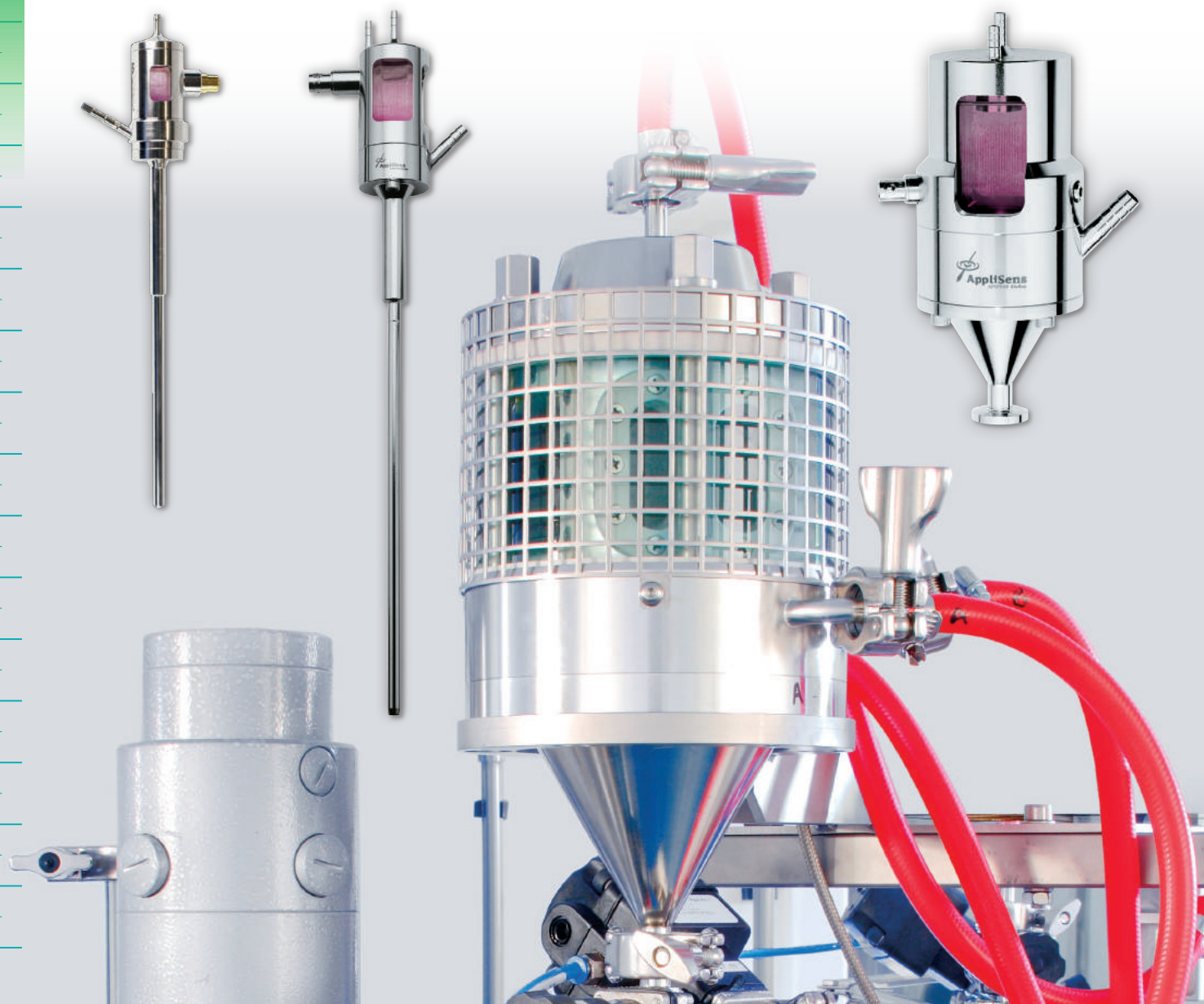
The Applikon BioSep system is a unique cell retention device for high-density perfusion processes. Using high frequency resonant ultrasonic waves to separate cells instead of a physical mesh or membrane, it offers all the benefits of traditional devices but without their inherent problems and limitations. The BioSep, based on the technology of acoustic resonance, is a non-fouling / non-clogging retention system. The BioSep can be applied in both R&D (max. 1 L/day), process development and on production scale (1000 L/day).

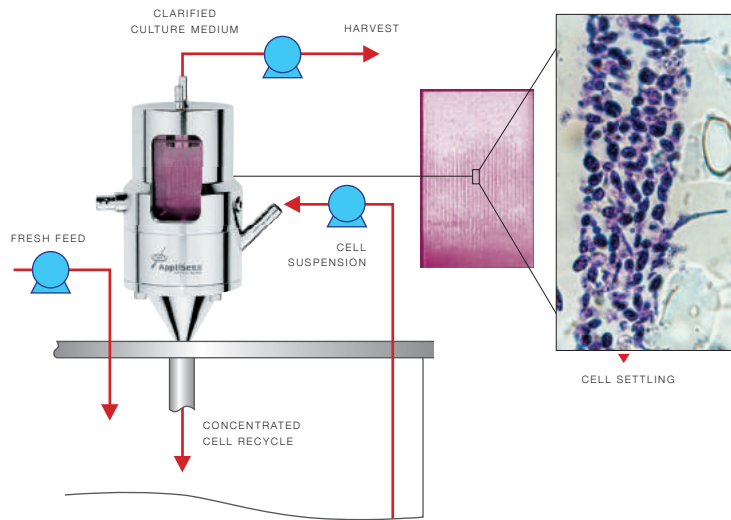
1 L BioSep

10 L BioSep

1000 L BioSep

50 L BioSep





Typical configuration of acoustic cell retention system

Features

- Proven under cGMP conditions
- Long-term cultivation possible (> 6 months)
- Easy to install and to operate
- Compatible with any bioreactor
- High separation efficiency (99%)

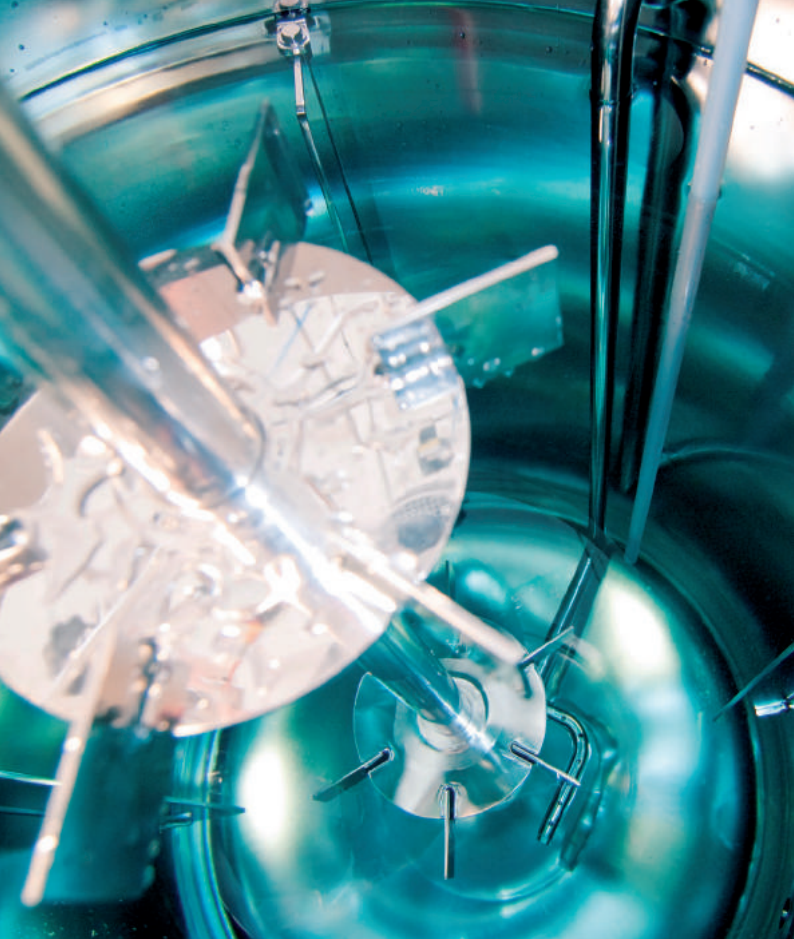
Applications

- Cell cultures
- Perfusion cultures

Specifications

BioSep system	1L	10L	50L	200L	1000L
Maximum perfusion rate	1 L/day	7 L/day	45 L/day	200 L/day	1000 L/day
Minimum perfusion rate	0.1 L/day	0.7 L/day	4.5 L/day	20 L/day	100 L/day
Separation efficiency	Up to 99% (depending on cell concentration and perfusion flow)				
Minimum cell concentration	2 x 10 ⁵ cells/ml (depending on cell size)				
Bioreactor connection	6 mm OD tube	12 mm OD tube	Mounted separately	Mounted separately	Mounted separately
Medium inlet	3 mm hosebarb	6 mm hosebarb	10 mm hosebarb	0.5" TC	0.5" TC
Return line to bioreactor	3 mm hosebarb	6 mm OD diptube	0.5" TC	0.5" TC	0.5" TC
Perfusion outlet	3 mm hosebarb	6 mm hosebarb	6 mm hosebarb	0.5" TC	0.5" TC
Weight	0.1 kg	0.5 kg	1.5 kg	13 kg	70 kg
Resonator volume	0.7 ml	7 ml	50 ml	290 ml	1450 ml

BioSep Controller	APS 995	APS 990	APS 990	APS 992	APS 993
BioSep Controller Power	15 Watt	150 Watt	150 Watt	350 Watt	1500 Watt
BioSep Controller Dimensions (DxWxH, mm)	Combined with my-Control	305x130x130	305x130x130	450x400x135	450x300x450
BioSep Controller Weight (kg)	Combined with my-Control	3.5	3.5	17.6	43



Special Projects | Customized Solutions

Bioreactors play a key role in the life science industry as an essential tool for, for example, the large-scale production of life-saving vaccines and first-rate medicines. The processing steps leading to these products can be complex, requiring tailor-made systems. This is where Applikon Biotechnology steps in. We provide the industry with solutions – both for development of new products and for the expansion of production capacity. These projects can range from very special mini bioreactors to a complete line of cGMP production systems ranging up to several thousand liters volume systems.



1500 Liter Bioreactor with i-Control

With over 30 years of experience we can design any system to suit your needs. Using modern design technologies, we will guide you through the process - from initial idea to final product. With advanced communication tools, verification tests and full documentation we ease all processes - making a product exceeds your expectations.

With our state-of-the-art facilities we are capable of manufacturing your perfect bioreactor system, no matter how complex. Our ISO 9001 certificate underlines the high quality level of our work and accompanying documentation. Our worldwide distribution network is there to guarantee the best after sales support and to make sure your systems stay in optimal working condition.

Bench Top and Pilot Plant | Steam-in-place Bioreactor Systems

Applikon's concept of modularity (using standard modules to customize the functions of the bioreactor) is extended to the stainless steel pilot plant bioreactors as well. For scale up purposes the range of the Bio Bench and Pilot Systems, designed and built to the latest standards on hygienic processing and cGMP and GAMP validation requirements, complements the laboratory scale bioreactor systems. Scale-up from laboratory scale to pilot plant and small scale production is simplified by the consistent bioreactor design and the scalable control solutions. All systems are designed to be cleaned-in-place. Applikon offers CIP systems ranging from fully manual control to fully automated. Standardized bioreactor systems are available up to 140 liter total volume and custom build units can be supplied up to 5,000 liter total volume. Designed according to ASME BPE guidelines.

Features

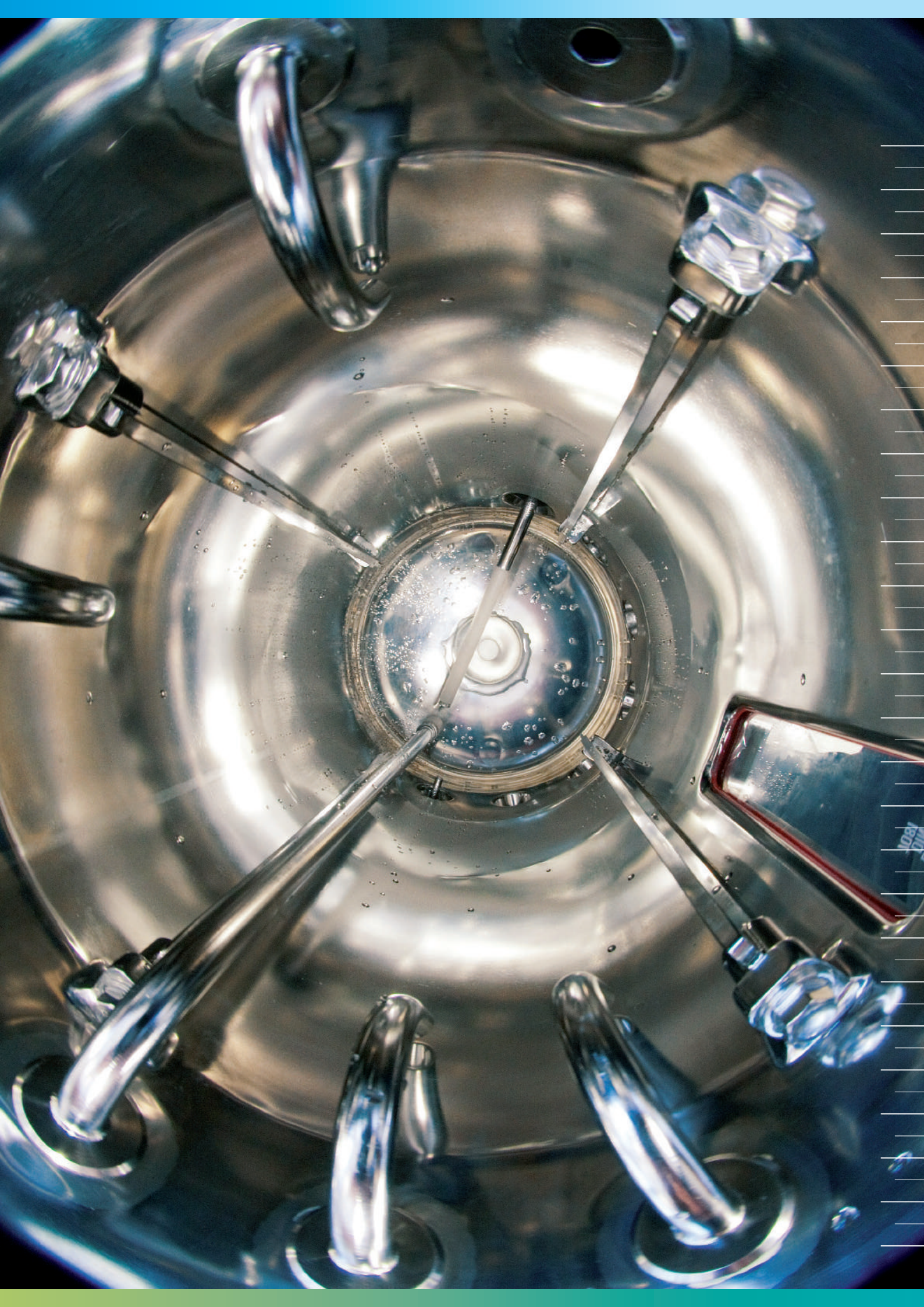
- Easy to clean mirror polished external finish
- Electropolished finish of all parts in contact with the culture ($Ra < 0.4 \mu m$) to allow efficient Clean-in-place
- Modular design allows easy adaptation to changing process demands
- Magnetically coupled agitator for peace of mind
- cGMP compliant design simplifies validation
- Compact design reduces floor space needed
- Open frame construction gives easy access for maintenance and operation

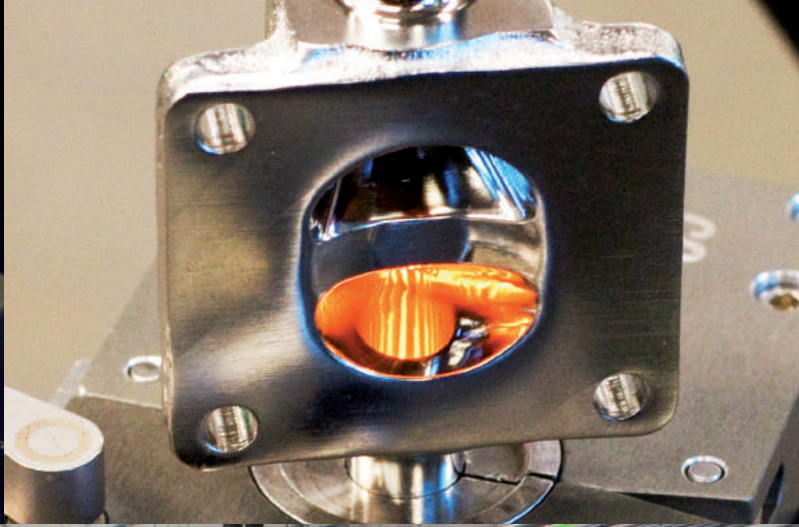
Applications

- Scale-up studies
- Medium optimization
- Process optimization
- Small scale production
- Microbial and Cell culture
- Batch, Fed-Batch, Perfusion and Continuous cultivation



15 Liter BioBench with ez-Control





Specifications

	Total volume (liter)	Working volume (liter)	Minimum working volume (liter)	Aspect ratio total volume	Aspect ratio working volume
20 liter Bio Bench	20	15	4	3.0	2.2
30 liter Bio Bench	30	22.5	7	2.0	1.6
30 liter Pilot Cell	30	20	7.5	1.5	1.0
60 liter Pilot Cell	60	40	10	1.5	1.0
130 liter Pilot Cell	130	100	28	1.5	1.0
20 liter Pilot Microbial	20	15	4	3.0	2.2
40 liter Pilot Microbial	40	30	7.5	3.0	2.2
70 liter Pilot Microbial	70	50	10	3.0	2.2
140 liter Pilot Microbial	140	100	20	3.0	2.2

Custom build bioreactor systems are available up to 5,000 liter total volume

Drive system	Magnetically coupled, optional mechanical seal, bottom or top mounted agitator for microbial cultures and top mounted for cell culture systems
Maximum agitator tipspeed (m/s)	5 m/s for microbial cultures and 1 m/s for cell cultures
Impellers	Rushton and marine with outside diameters 0.33 - 0.5 vessel diameter
Gas sparger	Porous sparger, L-Sparger or Ring-type sparger
Gas overlay	Optional gas overlay line
Exhaust gas	Water cooled exhaust gas condenser with internal spiral and/or jacketed
Sampling	Optional resterilizable sample system in DN25 port in lower side wall
Draining	Resterilizable bottom mounted bellows drain
Additions	Sterilizable additions (push valves) and resterilizable addition ports
pH	Measurement: 12 mm classic pH sensor in DN25 port in lower side wall Control: via acid pump or CO ₂ gas (rotameter or MFC) in combination with alkali pump
DO₂	Measurement: 12 mm polarographic DO ₂ sensor in DN25 port in lower side wall Control: via a combination of N ₂ , Air, O ₂ (Rotameter or MFC) and agitation or nutrient addition pump
Temperature	Measurement: Pt-100 sensor in DN25 port in lower side wall Cultivation control: cooling and heating jacket via bioreactor wall
Foam	Measurement: Height adjustable conductivity based foam sensor Control: anti-foam addition pump
Level	Measurement: Height adjustable conductivity based level sensor or loadcells in bioreactor frame Control: pump for liquid addition or removal



AppliCare | Total Process Control for You

With Applikon, service goes beyond replacing gaskets. Service is about in-depth product knowledge to be able to spot potential issues before they cause a problem. Service is an investment in reliable equipment, a reliable process and about providing advice to the customer to help improve efficiency. Applikon has built a company based on Service. Applikon can make the difference to your process.

AppliCare is designed to support you in the most optimal way.
In AppliCare you will find our complete service offer to ease your daily challenges.

AppliCare contains

- Workflow Optimization & Application Support
 - Quality & Compliance
 - Standard Service
 - Extended Warranties
 - Installation, Relocation and Retrofitting Services
 - On-Demand Service
-

Workflow Optimization & Application Support

Applikon employs a team of bio-process experts. This team is available to give you advice on basic or advanced process optimization questions involving process scale-up, aeration, mixing, temperature, pH and Dissolved Oxygen control and other process controller settings. Our in-house laboratory is equipped to run cultures and mimic your process conditions to be able to advise you based on hands-on experience.

You prefer we come to you to help improve your current workflow and bio-processes or even set-up complete new ones, please contact us and we will be your partner.

Quality & Compliance

All Applikon equipment is tested thoroughly throughout the manufacturing process. During our in-house verification processes we perform comprehensive tests on all Applikon equipment. All quality documentation is supplied with our systems.

The quality documentation is setup in such a way that it is ready to use for your validation and qualification process. Tailored to your requirements we can assist with Factory Acceptance Tests (FAT), commissioning, Site Acceptance Test (SAT), IV/OV. We bring over 40 years of experience with cGMP and EUDRALEX in verification, validation and qualification.

We can assist you from the start of your project, our projects department can assist in defining your requirements. It will make your life easier knowing that our experts in the bioreactor field have defined your URS so no detail is overlooked and all specifications are realistic and achievable.



Standard Service

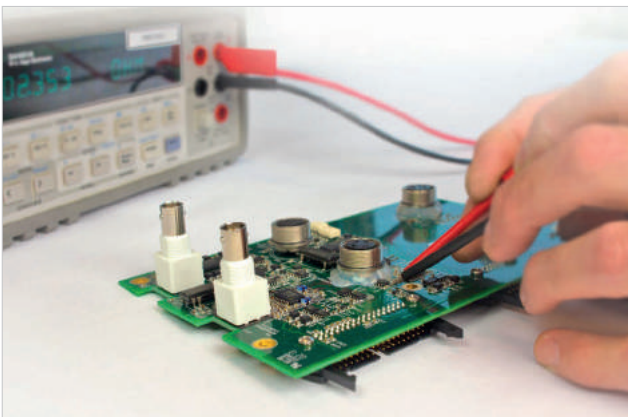
All Applikon equipment is guaranteed for one year after delivery against defective materials and workmanship. All component parts of our products are covered by this warranty, except for normal consumable items such as glassware, sensors, O-rings and gaskets etc. Warranties are also voided by unauthorized disassembly of equipment.



Extended warranties

We are happy to extend our warranty for an additional 4 years when we are sure the equipment is well maintained by an Applikon factory trained service technician. We can offer you our 5 Year Service Plan with following features:

- The 1 year standard warranty from delivery date is extended with an additional 4 years, bringing the total warranty period to 5 years.
- Within this service plan an Applikon factory trained service technician will visit your site one year after installation and 3 successive years to perform a Preventive Maintenance.
- During this Preventive Maintenance visit the equipment is inspected and wear and tear parts are replaced. Calibration of sensor inputs is verified, mass flow controllers (if present) and electronics are checked for accuracy.
- Travel-, working hours and parts used for Preventive Maintenance are included.
- Software and firmware updates are included to give you access to all the extra functionality that we develop over time.
- 20% discounted rate for Applikon organized training and seminars as a bonus.
- Precedency with all Service requests.





Installation, Relocation and Retrofitting Services

- The Applikon installation team will assist you in unpacking the equipment and verifying that all components are in the right condition after shipping and storage. After this initial inspection the installation team will assist in installing the equipment in the designated location. We can assist in connecting the systems to the site utilities and verifying that the utilities are of the right quality. After connecting the equipment, the installation inspection will be done. This inspection will make sure that the systems are properly placed, well connected and are ready to go. Following this is a functionality test to show that the system performs as specified when ordered.
- When you need to relocate your bioreactor system, our after sales support team can assist you with this. Your advantage is that the relocation will be done with a minimum of down time and once relocated your equipment is tested and ready to go. Our de- & re- commissioning service includes, access check, utilities check, customer regulations check, siting assistance, verification of and connecting to connections utilities, functionality tests and start up test procedures. Of course all these actions are fully documented to keep your system in a validatable situation.
- With our service plans, your bioreactors will last for many years. After many years of use, you may want to consider a controller upgrade to make use of new electronic and software functionality. We can offer different solutions for this. Options are: Controller replacement, Actuator replacement/upgrades, Sensor replacement/upgrades. These replacements offer an upgraded and updated bioreactor system that is ready to go for a number of years. Upgrades can be done in our factory or at your site. Contact your local Applikon office for details and options.

On-Demand Services

Applikon equipment is manufactured to the highest standards using carefully selected quality components. To ensure a long, trouble free life of your bioreactor, we recommend a regular annual service check as a preventive rather than any corrective procedure.



Preventive Maintenance

A complete annual service check of all components, performed by an Applikon factory trained service technician, complete with calibration checks and functionality tests for the bioreactor, its control system and its software. All tests are documented to provide you and us with a service history of your bioreactor. For all Applikon equipment we have a “fixed price” for an on-demand Preventive Maintenance.

Software Support

Our experts will assist you in writing advanced control statements and developing control recipes for your processes. This will allow you to make optimal use of your bioreactor system and will give you better results in a shorter time.

Non-Applikon Equipment Support

We are willing to service non-Applikon bioreactor systems when possible. When you need high quality, fast and knowledgeable support to get the most out of your bioreactor systems, talk to us we are able to assist you. Our “On-line Helpdesk” supplies our local sales and service organizations with the latest information about our products. The Helpdesk holds all technical service drawings manuals so all our service engineers have the most up-to-date information at their fingertips when they perform field service. A special section of our On-line Helpdesk is available for customers. This section contains user manuals, white papers, demo versions of software, trouble shooting tips and training programs.

Phone Support

Being a truly global operation Applikon can offer you 24 hours a day, five days per week (Mon-Fri) telephone support. Our offices in The Netherlands, UK and USA work together in giving you the best customer experience possible. Whatever the time of day (or night), there is always an Applikon office open and our trained support staff is available for you to answer your questions and trouble shoot your issues.

Applikon Academy | Be the Expert

Get trained and be ready!

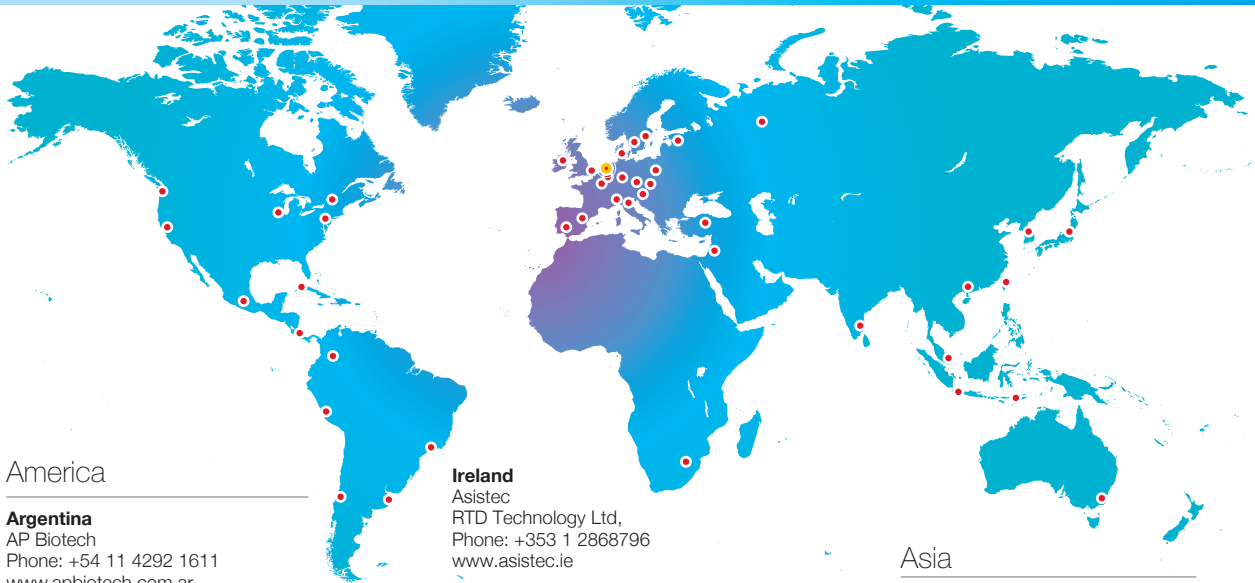
Well-trained scientists, operators, and engineers make sure that our systems are fully exploited. In our vision, training and instruction on how to handle our scientific equipment to make optimal use of its capabilities is not a one-time occurrence, but needs to be repeated on a regular basis. That's why we created a curriculum that can fit your needs. This ranges from educational hands-on and theoretical "Fermentation & Cultivation" sessions, to advanced SCADA/PIMS software training. Our team of bio-process experts is ready to give you advice on basic or advanced process optimization questions, including process scale-up, aeration, mixing, temperature, pH and Dissolved Oxygen control, plus other process controller settings. Our in-house laboratory is equipped to run cultures and mimic your process conditions so that recommendations can be drawn up for you based on hands-on experience. Through our Workflow Optimization Assessment we can even design training programs for your employees as well as put together a curriculum for you.

Training can also be held at your facility for a private training session, or in a central location near you for general access. Customized training can be organized on demand, focusing on your specific process challenges. You can ask us to come to you to help improve your current workflow and bio-processes or even set-up completely new ones. Please contact us and we will be glad to act as your partner.

Training courses available now!

- Basic Cultivation course
- Advanced Cultivation course
- Scale-down and Screening Methods
- Advanced Process Control training
- Basic Lucillus PIMS training
- Advanced Lucillus PIMS training





America

Argentina

AP Biotech
Phone: +54 11 4292 1611
www.apbiotech.com.ar

Brasil

Lobov Cientifica
Phone: +55 11 3829-8040
www.lobov.com.br

Mexico

Applikon Biotechnology Mexico
Phone: +52 55 5868 7814
www.applikon-biotechnology.com

Peru

Applikon Biotechnology Peru
Phone: +51 1657 1230
www.applikon-biotechnology.com

Europe

Belgium

Applikon Biotechnology BV
Phone: +31 10 208 3555
www.applikon-biotechnology.com

Czech Republic

Vekamaf spol. s.r.o.
Phone: +421 907 753 338
www.vekamaf.cz

Denmark

Holm & Halby A/S
Phone: +45 432 694 00
www.holm-halby.dk

Estonia

Biotecha Eesti OÜ
Tel. 00372 659 7101

France

System-c bioprocess
Phone: +33 475 548 600
www.system-c-bioprocess.com

Germany & Austria

I&L Biosystems GmbH
Phone: +49 222 391 920
www.il-biosystems.com

Hungary

Holimex Mérnöki és Kereskedelmi Kft.
Phone: +36 1 391 44 00
www.holimex.hu

Ireland

Asistec
RTD Technology Ltd,
Phone: +353 1 2868796
www.asistec.ie

Italy

Steroglass S.r.l.
Phone: +39 075 609 091
www.steroglass.it

Lithuania

BIOTECHA UAB
Phone: +370 5 237 6007
www.biotecha.lt

Poland

Labo Baza
Phone: +48 61 812 57 45
www.labobaza.pl

Russia

ABTEK Bioprocess Solutions
Phone: +7 (495) 723 6497
www.abtek.ru

Slovak Republic

Vekamaf spol. s.r.o.
Phone: +421 907 753 338
www.vekamaf.cz

Spain & Portugal

VERTEX Technics, S.L.
Phone: +34 93 223 33 33
www.vertex.es

Sweden

AB Ninolab
Phone: +46 8 590 860 70
www.ninolab.se

Switzerland

ReseaChem GmbH
Phone: +41 344 240 310
www.reseachem.ch

Turkey

Ant Teknik Cihazlar Ltd. Sti.
Phone: +90 216 422 67 00
www.antteknik.com

Australia & New Zealand

Australia

John Morris Scientific
Phone: +61 2 9496 4200
www.johnmorris.com.au

Asia

China

Applitech Pharma
Phone: +86 203 482 1111 (ext. 8216)
www.applitechpharma.com

India

Spinco Biotech Pvt. Ltd.
Phone: +91 44 2434 0174
www.spincootech.com

Indonesia

Pt. Arico Sainsindo Nusantara
Phone: +62 21 580 6342 / 3
www.ptarico.com

Japan

Sanyo Trading Co., Ltd.
Phone: +81 3 3518 1111
www.sanyo-trading.co.jp

Korea

Seoulin Bioscience Co., Ltd.
Phone: +82 1670 5911
www.seoulin.co.kr

Singapore

Zil Sci Pte. Ltd.
Phone: +65 676 729 29
www.zilsci.com

Taiwan

Tseng Hsiang Life Science Ltd.
Phone: +86 2 2785 1156
www.thco.com.tw

Thailand

Meditop Co., Ltd
Phone: +66 2933 1133
www.meditopthailand.com

Middle East & Africa

Israel

Medent LTD
Phone: +972 8 623 7984
www.medent.co.il

South Africa

Separations
Phone: +27 11 919 1000
www.separations.co.za

Headquarters The Netherlands

Applikon Biotechnology BV

Heertjeslaan 2
2629 JG Delft
The Netherlands
T. +31(0)10-208 35 55
F. +31(0)10-208 35 05
E. info@applikon-biotechnology.com

USA Main Westcoast Office

Applikon Biotechnology Inc.

1180 Chess Drive
Foster City CA 94404
Phone: +1 650 578 1396

Latin America Office

Phone: +52 55 5868 7814

United Kingdom Office

Applikon Biotechnology

Basepoint Business Centre
Oakfield Close
Tewkesbury Business Park,
Tewkesbury, Gloucestershire, GL20 8SD
Phone: +44 1684 851 281
United Kingdom



Engineering for Life

www.applikon-biotechnology.com