Cultivation Systems
From Discovery to Production

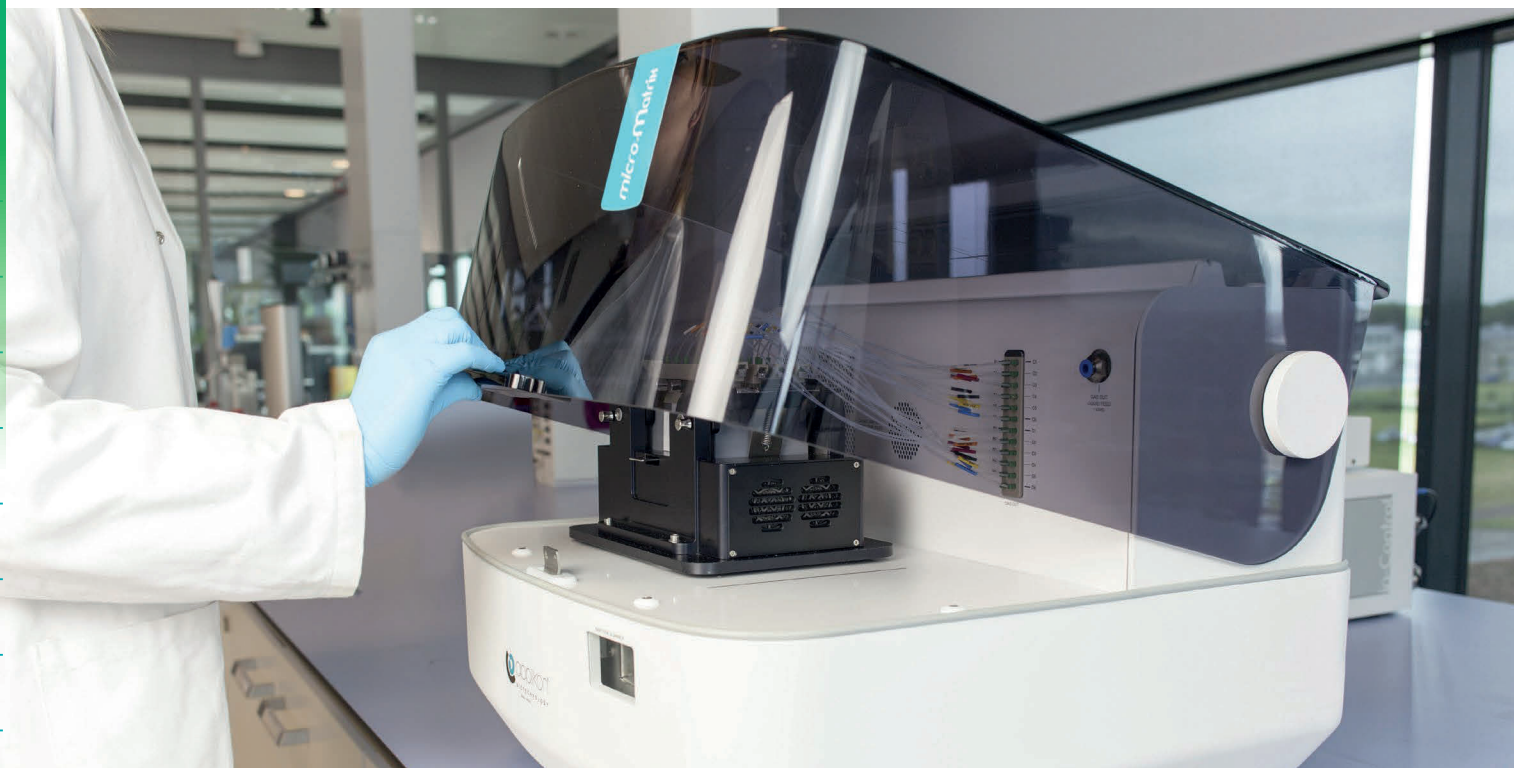
applikon® BIOTECHNOLOGY

Engineering for Life

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



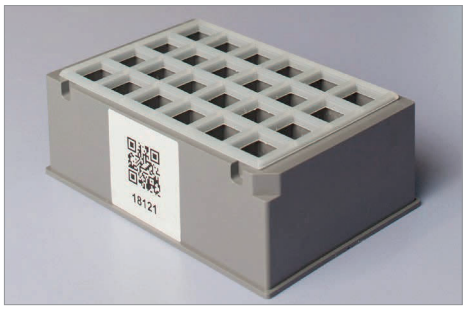
The unique micro-Matrix offers total control over 24 independent bioreactors in a simple microtiter plate footprint. Each of the 24 bioreactors on a plate offers independent controls, like its larger stirred-tank relatives:

- 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

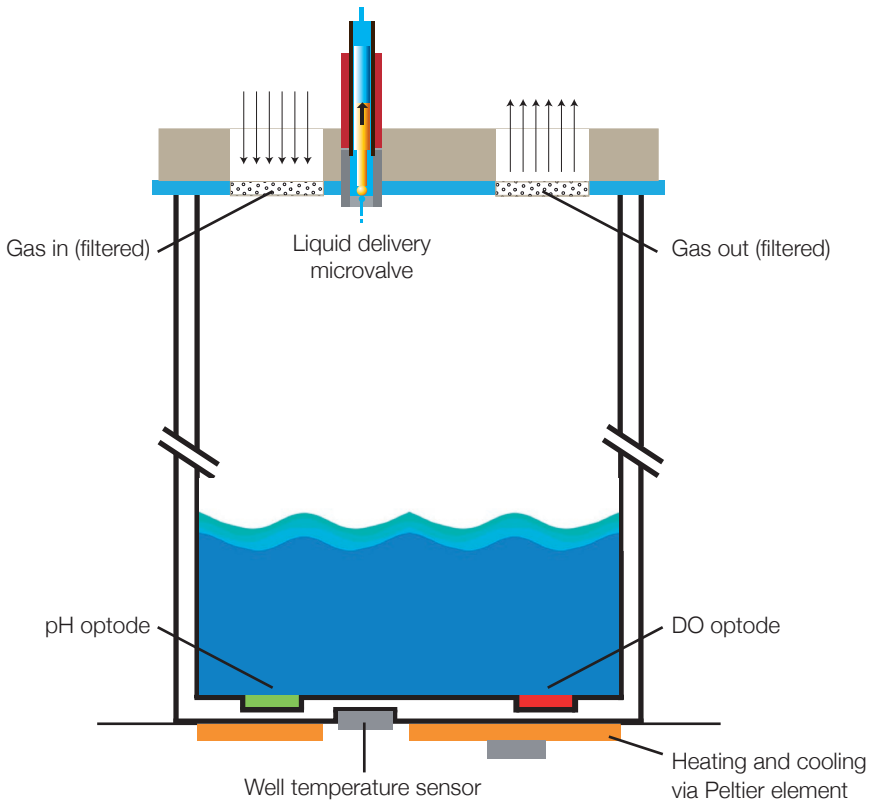
Each bioreactor has its own PID controller for pH, dissolved oxygen, and temperature. Individual pH control can be achieved via gas addition, liquid addition, or a combination of both. Dissolved oxygen level can be individually controlled by up to four gas additions per bioreactor. Temperature can be 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 / O_2 / N_2 / CO_2 / NH_3*
- 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

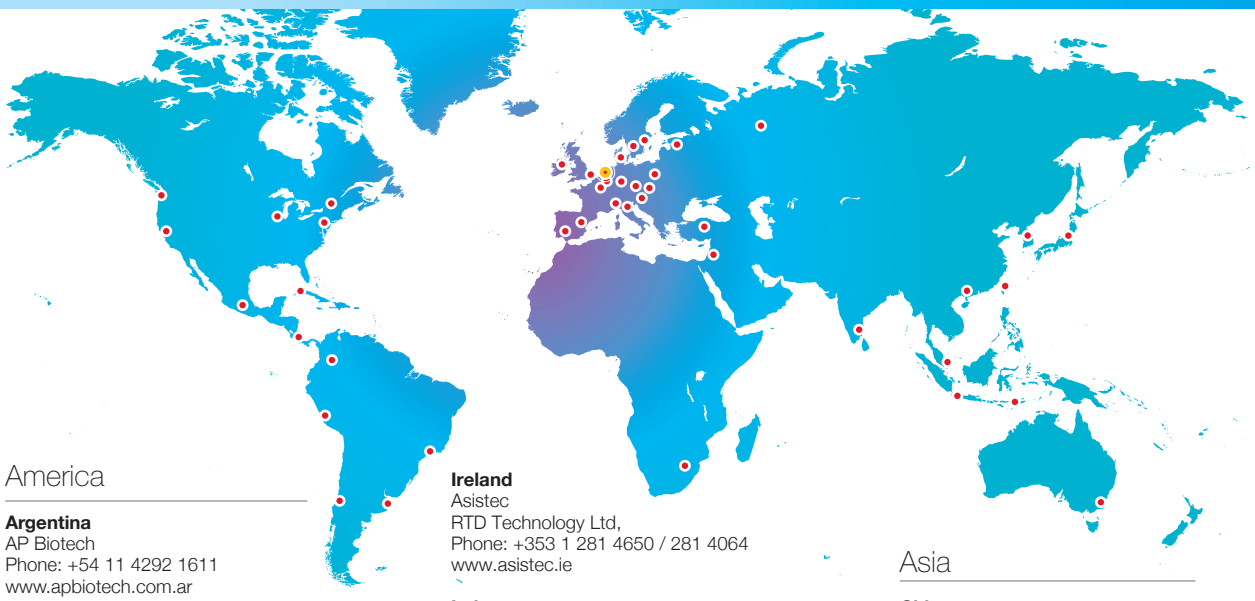
Total volume per bioreactor well	10 mL	
Working volume per bioreactor well	2 - 5 mL	
Orbit diameter	25 mm	
Rpm range	0 - 400 rpm	
Gas delivery	0.1 - 15 mL / min	Per gas, per well
Number of gasses	4	
Gas feed pressure	> 1.0 (extern)	
Liquid delivery	200 nL	per bolus (approx.)
Liquid feed pressure	> 2.0 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	± 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



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