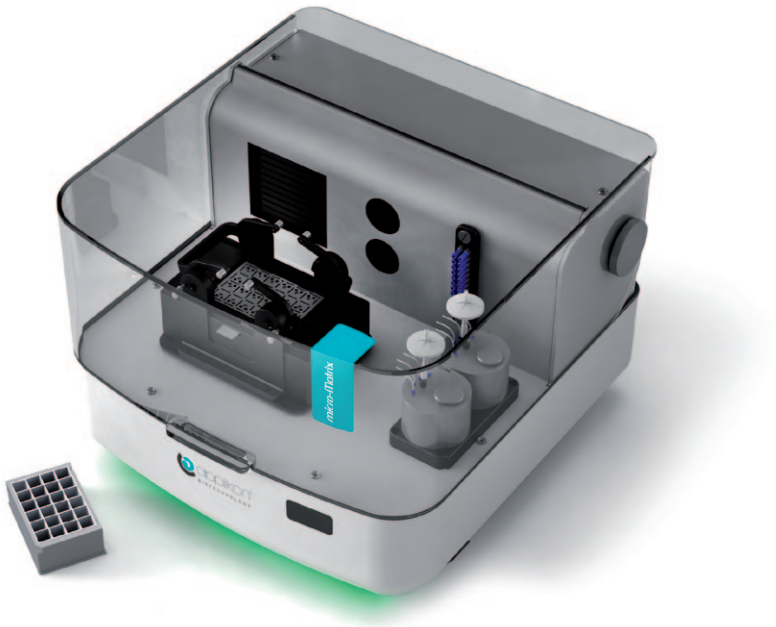
micro-Matrix:
24 bioreactors in a convenient microtiter format

- Independently controlled bioreactors accelerate development
- Liquid feeding enables true scale-down studies
- Simple, powerful software streamlines operator workflow



Introduction

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 offer independent controls like its larger stirred-tank relatives:

- pH (measurement and two-sided control)
- temperature (measurement and 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 (individually controlled).

The micro-Matrix is a true scale down of small scale bioreactors. The bioreactor square well cassette design is based upon our popular 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 with one quick glance.

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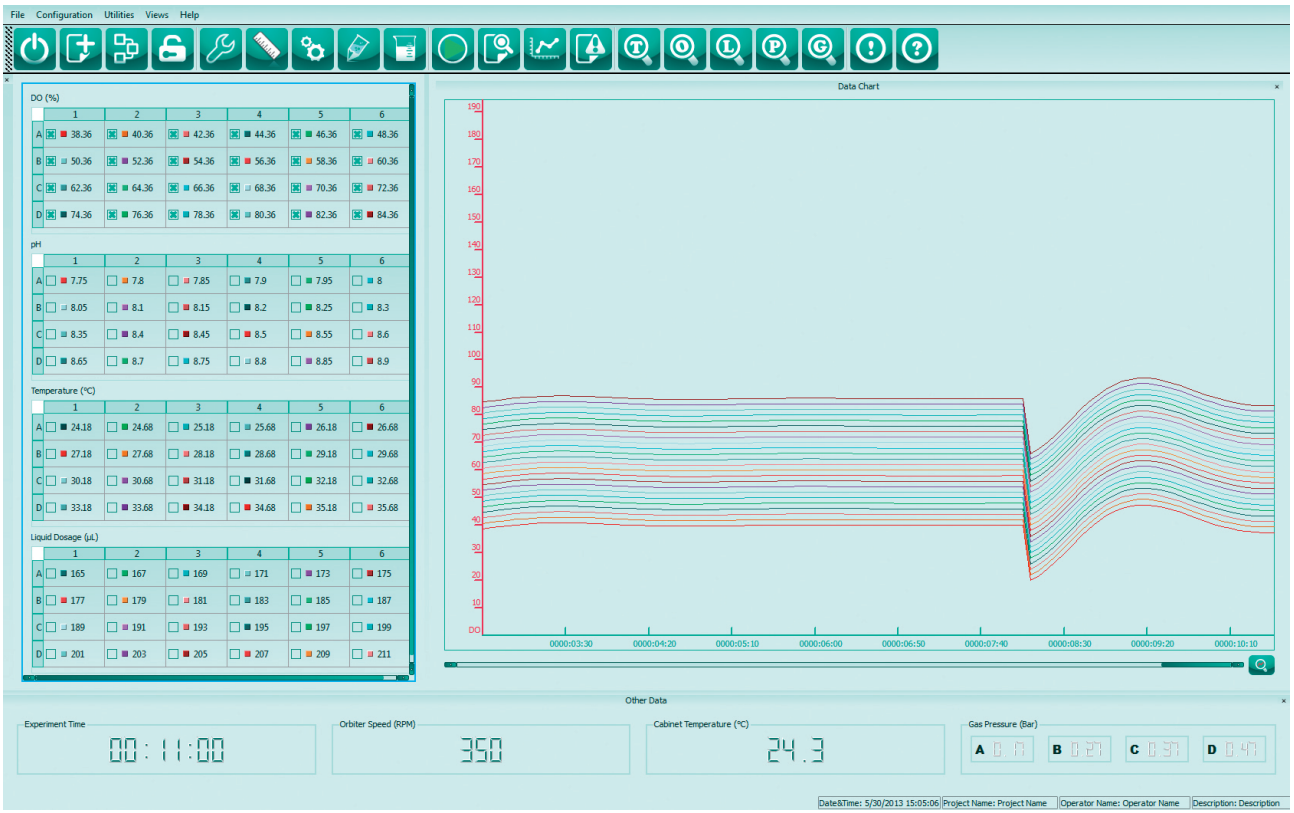
With you every step of the way

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 experimental setup, instrument configuration, control strategy definition, 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.



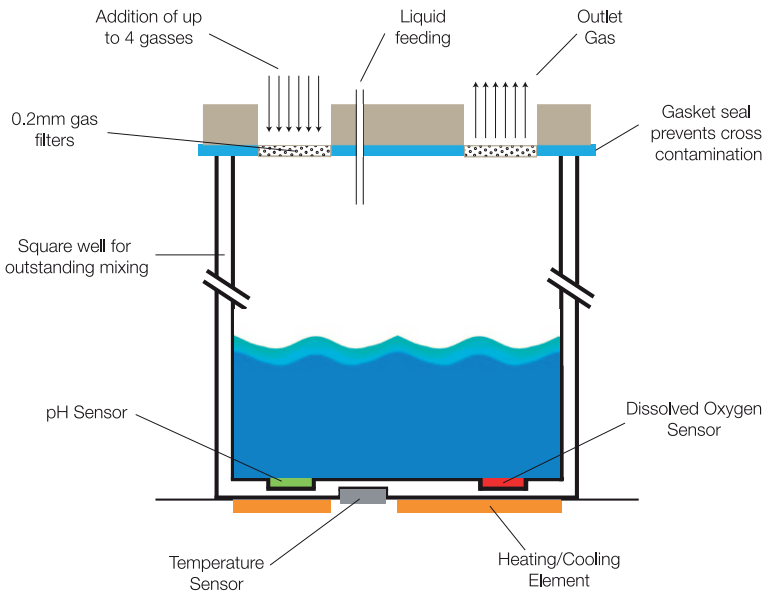
Measurement and control

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 (up to 5 actuators per process variable), time-based setpoint changes, and event-triggered liquid feeds. Liquid feeding is also available using varying types of addition profiles.

Applications

- Screening of cell-line, microbial, and/or yeast libraries
- Process development studies
- Process optimization studies
- Small volume cultivations



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

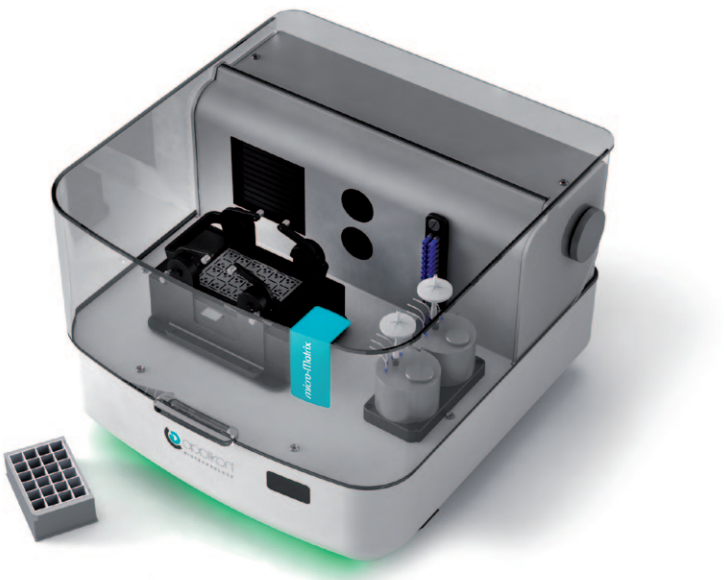
Technical data

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 0-350 rpm @ 25 mm orbit

Cassettes

The polystyrene bioreactor cassettes conform to the SBS standard for 24 well culture plates (128x86 mm). The total volume per bioreactor is 10 mL with working volumes from 1 to 7 mL (recommended working volume is 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.



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.

Specifications

Total volume per bioreactor well	10 mL	
Working volume per bioreactor well	1 - 7mL	
Orbit radius	25 mm	
RPM range	0 - 400 RPM	
Gas delivery	0.1 - 25 mL/min	Per gas, per well
Number of gasses	4 max	
Gas feed pressure	2.0 barg	
Liquid delivery	50 nl per pulse	
Liquid feed pressure	1.0 barg	
Temperature measurement range	10 - 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	6 - 8 pH	
Resolution	< 0.05 pH	@ pH 7.2
Accuracy	< 0.1 pH	@ pH 7.2
pH control range	6 - 8 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
	570 mm	Width
Weight	60 kg	
Oxygen Transfer Rate	> 300 mmol/L/h	
Mixing times	< 1 s	

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