

# Cells and cell cultivation



**Bioreactors**  
for  
**biotechnology, medical engineering**  
and  
**pharmaceutics**

# The exclusive fermenter system

MDX fermenters have a high modularity and are ideal for applications in biotechnology, medicine and pharmaceutical research. Whether stirred fermenters, fixed-bed, flow chamber or mini-reactor, there are few limits left for building your fermenter. With volumes from 50 ml up to 20 litres and computerized process control units and data acquisition, MDX opens many possibilities for all kinds of applications in research and development.



## Culture vessels

- All fermenters are equipped with lids made from PEEK and vessels from borosilicate glass to reduce metal molecules in media.
- The "Vario system": Mini-reactors with a separable inner- and outer vessel and thus an extremely variable work volume to save expensive media. For example, "Vario 500" has a capacity of 50-500ml.
- Easy conversion: From an airlift-system to solid-bed or a simple stirred fermenter. All systems are easy convertible.

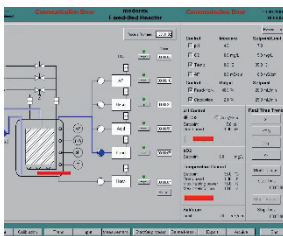
## Fittings



- Sampling fittings, no preflow, comfortable handling, sterile, repeatable sampling.
- Exhaust air condenser with high efficiency, low height.
- Air supply fitting with stainless steel frit.
- Small diameter ports make a high lid occupancy density possible with up to 15 ports.

MDX equips fermenters to customer requirements.

## Process control

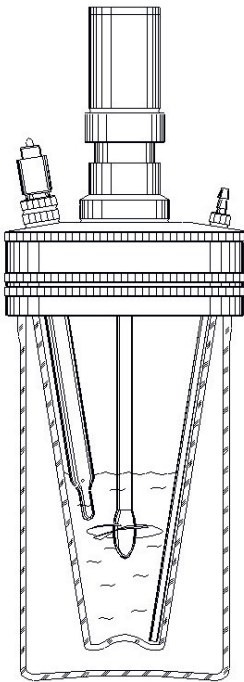


- Process controller FCU: PC-control system of up to 8 bio-reactors, control and easy data exchange via Windows-PC of: Speed, temperature, pH, redox, pO<sub>2</sub>, level or AF, gas mixture and continuous cultivation.
- Industrial measuring and control module system allows easy equipping according to requirements while data evaluation can be done with standard Windows programs.

## Materials



- **Guaranteed autoclavability:** By using high performance materials like PEEK borosilicate glass und stainless steels, all MDX fermenters are autoclavable. On request, it is possible to replace steel with titanium for usage of problematical media.



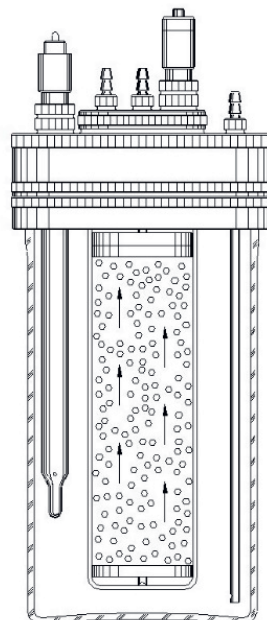
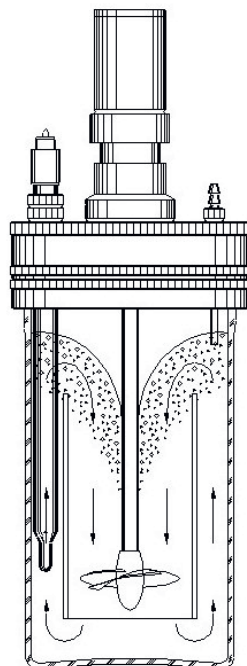
## The **Vario-System**

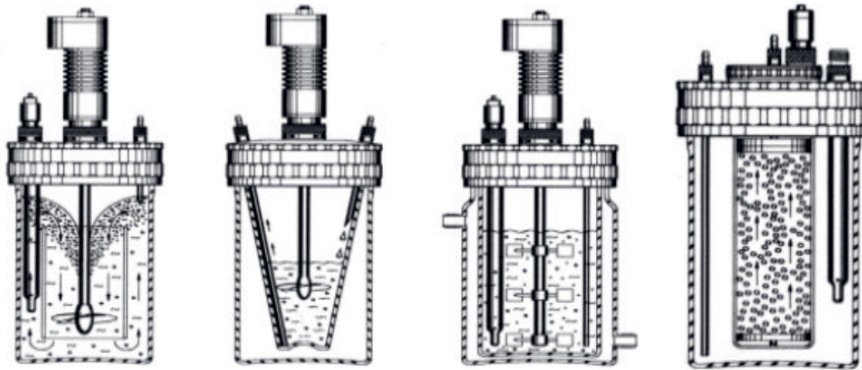
The variable mini-bioreactor

- **Vario 500:** The inner vessel allows volumes from 50ml-125ml similar to any other stirred mini-bioreactor. However, because of its removable inner vessel, the Vario-System can also increase its working volume up to 500ml. No other changes to the setup necessary.
- **Vario 1000:** The other option, if more capacity is required. The inner vessel of the Vario1000 can hold between 100-250ml, the outer up to 1000ml,

## The **modular standard fermenter**

MDX builds bioreactors according to the requirements of the customer. Nevertheless, there is always the next experiment. MDX standard fermenters are not only available in a wide range of sizes from 0,5L – 20L; they are also modular and thus easily convertible. Different fittings can simply be mounted on the lid and even changing the fermenter type is possible without requiring a complete new reactor.





Stirred bioreactors

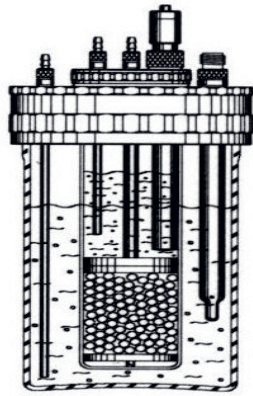
Airlift / Fluidized-Bed bioreactors

## Technical data

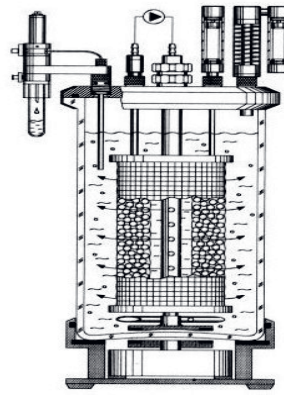
<b>Work volume</b>	0,5l	1l	2,5l	5l	10l/20L
<b>Sterilization</b>	Autoclaving	Autoclaving	Autoclaving	Autoclaving	Autoclaving
<b>Temperature range</b>	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C
<b>PH range</b>	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
<b>Stirring speed (only stirred bioreactors)</b>	0 – 2000	0 – 2000	0 – 2000	0 – 1500	0 – 1000
<b>Temperature</b>	Within the vessel by heating sticks, outside the system by double vessel and temperature control system	Within the vessel by heating sticks, outside the system by double vessel and temperature control system	Within the vessel by heating sticks, outside the system by double vessel and temperature control system	Within the vessel by heating sticks, outside the system by double vessel and temperature control system	Within the vessel by heating sticks, outside the system by double vessel and temperature control system
<b>Operation</b>	Batch, Fed-Batch, Chemostat, continuous	Batch, Fed-Batch, Chemostat, continuous	Batch, Fed-Batch, Chemostat, continuous	Batch, Fed-Batch, Chemostat, continuous	Batch, Fed-Batch, Chemostat, continuous
<b>PH regulation</b>	Acid, alkali or CO <sub>2</sub> basing	Acid, alkali or CO <sub>2</sub> basing	Acid, alkali or CO <sub>2</sub> basing	Acid, alkali or CO <sub>2</sub> basing	Acid, alkali or CO <sub>2</sub> basing
<b>Gas supplement</b>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>
<b>Stirring (only stirred bioreactors)</b>	Marine propeller or Paddle stirrer	Marine propeller or paddle stirrer	Marine propeller or paddle stirrer	Marine propeller or paddle stirrer	Marine propeller or paddle stirrer
<b>Ring sparger (air lift/fluidized reactor)</b>	yes	yes	yes	yes	yes
<b>Waste gas condenser</b>	yes	yes	yes	yes	yes
<b>Sampling system</b>	yes	yes	yes	yes	yes
<b>Magnetic clutch (only stirred reactors)</b>	yes	yes	yes	yes	yes
<b>Diving pipes</b>	yes	yes	yes	yes	yes
<b>Electrodes and cable</b>	yes	yes	yes	yes	yes
<b>Light</b>	on enquiry	on enquiry	on enquiry	on enquiry	on enquiry
<b>PC</b>	yes	yes	yes	yes	yes
<b>Data acquisition</b>	yes	yes	yes	yes	yes
<b>process control system</b>	yes	yes	yes	yes	yes

Dimensions/weight available on request.

Fixed-bed-reactor  
Axially working  
principle



Fixed-bed-reactor  
Radially working  
principle



## Technical data

<b>Working volumes</b>	0,1l	1l	2,5l	5l	17l
<b>Sterilization</b>	Autoclaving	Autoclaving	Autoclaving	Autoclaving	Autoclaving
<b>Temperature range</b>	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C
<b>PH range</b>	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
<b>Flow rate of pumps</b>	0 – 10 ml/min	0 – 100 ml/min	0 – 250 ml/min	0 – 500 ml/min	0 – 2 l/min
<b>Tempe ration and control</b>	Incubator	Within the system by heat sticks & sensors, outside the system by the use of double vessel & temperature control systems.	Within the system by heat sticks & sensors, outside the system by the use of double vessel & temperature control systems.	Within the system by heat sticks & sensors, outside the system by the use of double vessel & temperature control systems.	Within the system by heat sticks & sensors, outside the system by the use of double vessel & temperature control systems.
<b>Operation</b>	Batch, Fed-Batch Chemostat, continuous	Batch, Fed-Batch Chemostat, continuous	Batch, Fed-Batch Chemostat, continuous	Batch, Fed-Batch Chemostat, continuous	Batch, Fed-Batch Chemostat, continuous
<b>PH regulation</b>	Acid, alkali or CO <sub>2</sub>	Acid, alkali or CO <sub>2</sub>	Acid, alkali or CO <sub>2</sub>	Acid, alkali or CO <sub>2</sub>	Acid, alkali or CO <sub>2</sub>
<b>Gas-addition (outer vessel)</b>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>
<b>Gas humidification</b>	yes	yes	yes	yes	yes
<b>Waste gas condenser</b>	yes	yes	yes	yes	yes
<b>Sampling system</b>	yes	yes	yes	yes	yes
<b>Diving pipes</b>	yes	yes	yes	yes	yes
<b>Electrodes and cable</b>	yes	yes	yes	yes	yes
<b>Light</b>	on enquiry	on enquiry	on enquiry	on enquiry	on enquiry
<b>PC interface</b>	on request	yes	yes	yes	T
<b>Data acquisition</b>	on request	yes	yes	yes	yes
<b>Process control system</b>	on request	yes	yes	yes	yes

Dimensions/weight available on request.



## MultiFerm

New multiple cell culture bioreactor for medical and scientific pretesting and tests

- 12 mini fixed-bed reactors with 10 ml working volume each, in a 1.5 l media conditioning vessel.
- Automatic fermenter system with the necessary measurement and control facilities for feed, harvest, pH-levels and aeration.
- Easy data-transfer to other computers.
- Used in the production of monoclonal antibodies, cultivation of adherent and recombinant cells and in cell-physiological studies of tissue cells.
- Suited for the parallel cultivation of the identical or different cell lines, which grow under equal or very similar growth-conditions.

Advantageous to a conventional fixed-bed system

- Each single fixed-bed-reactor can work independently
- More options: Different media, different strain
- Kinetic model with kinetic parameter
- Higher cost-efficiency
- Time saving

# MultiFerm

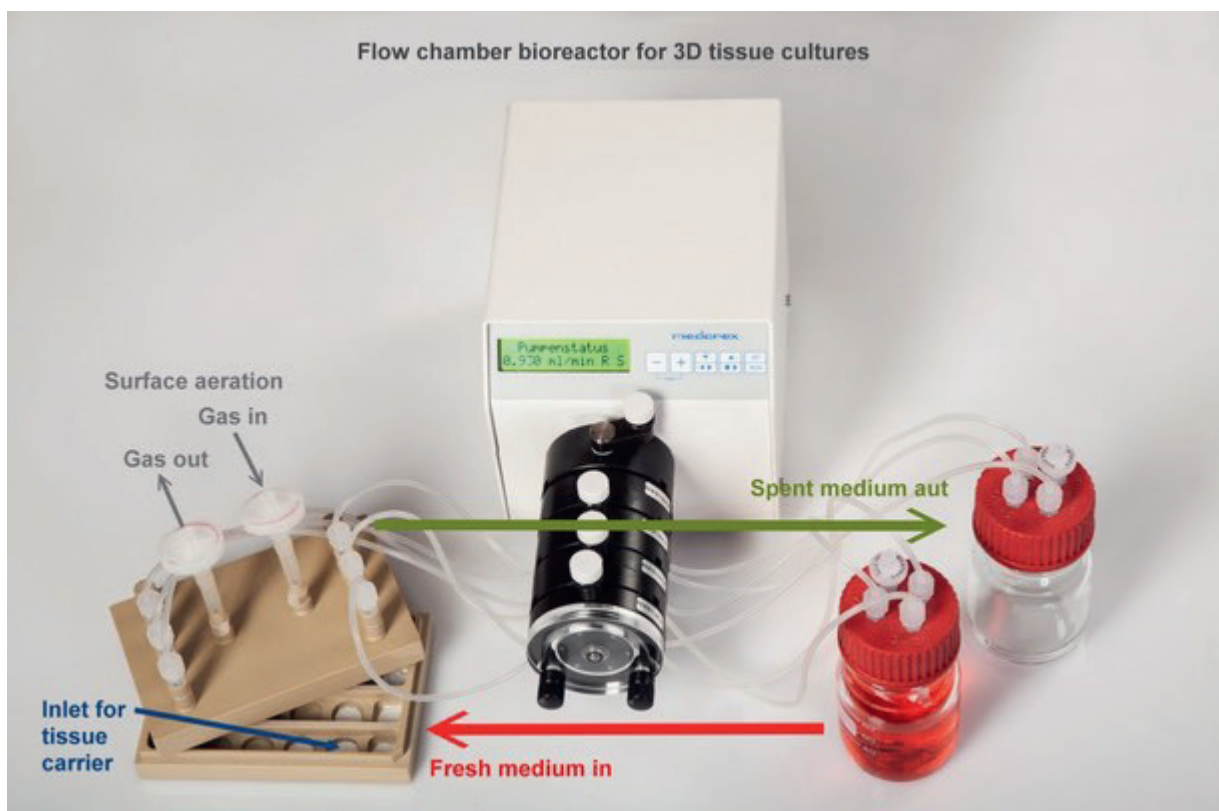
## Technical data

<b>Total volume</b>	1.5 Litre
<b>Working volume</b>	12 x 10 ml fixed-bed reactors
<b>Working principle</b>	Axial
<b>Sterilization</b>	Autoclaving
<b>Temperature ranges</b>	5 – 60° C
<b>pH ranges</b>	3 - 10
<b>Pumps</b>	for circulation of media and continuous cell cultivation
<b>Flow rates</b>	12 x 0.15 – 3 ml/min
<b>Heating</b>	directly via heating stick
<b>Operation</b>	Batch, Fed-Batch, continuous
<b>pH regulation</b>	Acid, alkali or CO <sub>2</sub>
<b>Gas-additions (outer vessel)</b>	Air, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>
<b>Gas humidification</b>	yes
<b>Waste gas condenser</b>	yes
<b>Sampling system</b>	yes
<b>Diving pipes</b>	yes
<b>Electrodes and cables</b>	yes
<b>Light</b>	on request
<b>Process control system</b>	yes
<b>PC interface</b>	yes
<b>Data acquisition</b>	yes
<b>Data saving</b>	yes
<b>Data transfer to other computers</b>	Yes

# Flow chamber bioreactor

## for medical, biotechnological and pharmaceutical research

The flow chamber bioreactor opens more possibilities for the cultivation of the tissues and adherent cells e.g., in the cultivation of the functioning liver cells, cartilages and flat skin cells.



The advantages:

- continuous perfusion
- cultivation method not only for tissue but also for cells
- adaptation to customer-specific carrier shapes and materials



# Tube qualities

Choose the right tube material for your application

Name	Silicone	PharMed /Santopren	TygonLFL	Viton /Fluran F 5500	NorprenA60G
<b>Advantages</b>	hardly any removing from softener and additions not toxic, resistance, ideal for low Temperatures, waterproof resistant to Ozone, radiation, sunlight	Suitable for Cell cultures and tissue. Impermeable for normal light and UV radiation. Can be welded, glued, formed. Low gas permeability. Suitable for the medicine and Food area.	The ideal tube for heavy demands. Transparent tube with a high life time, high chemical compatibility. Tasteless. Good dielectric qualities. Low gas permeability.	Permanency against corrosive media in the high temperature range. Chemically most resistant. Resistance against corrosive media Solvent and oils of high temperatures. Low gas permeability	Ideal for industrial applications. Heat and ozone constant. Good resistance against acids and cousins. Can be welded, glued and formed. Not aging, not oxidizing. Good dielectric qualities. Long lifetime and low gas permeability.
<b>Restrictions</b>	Not suitable for concentrated solvents, oils, acids or thinned biarbonate of soda lye. High gas permeability	Remove of additions is possible.	Not suitable for human blood and tissue parts.	Restricted life time	Removing the additions is possible
<b>Physical qualities</b>	Polydimethylsiloxan with silica, silicone oil additions. Compression resistance, transparent, white	Polypropylene elastomer, excellent tensile strength non-transparent, beige	Flexible and adaptive, transparent	Fluorine polymerelastomer non-transparently black	Poly propylene elastomer excellent tensile strength non-transparent, black
<b>Temperature range</b>	-50°C up to +230°C	-50°C to +135°C	-50°C up to +74°C	-40°C up to +200°C	-60°C up to +130°C
<b>Application</b> Acids Bases Solvent Pressure Vacuum Viscous media sterile media	conditional conditional not suitable Satisfactory good satisfactory good	good good not suitable good good excellent good	good not suitable good good good excellent good	excellent excellent good good good good satisfactory	good not suitable satisfactory good good excellent not recommendable
<b>Complies with the norms</b>	USP class VIFDA 21 CFR 177.2600 USDA standard	USP class VI FDA 21 CFR 177.2600 (only Pharmed) 3 ARPA and NSF	USP class VIFDA	No details available.	No details available.
<b>Sterilization</b>	With gamma rays or autoclave in a damp atmosphere. Don't sterilize with ethylene oxide..	Autoclavable without Ageing appearances	Steam and ethylene oxide sterilizing (max. 30 min. at 121° degrees Celsius)	Steam and ethylene oxide sterilizing (max. 30 min. at 121° degrees Celsius)	Not recommendable
<b>Permeability</b> CO2 H2 O2 N2	1200 16170 x 10 <sup>-11</sup> 200 80	1200 772 x 10 <sup>-11</sup> 200 80	563 362 x 10 <sup>-11</sup> 124 67	38 24 x 10 <sup>-11</sup> 14 5	1200 772 x 10 <sup>-11</sup> 200 80

Manufacturer's information should only be used as a selection aid.

Gas volume (cm<sup>3</sup>) x IDxW of hose (cm)

(Cm<sup>2</sup>) x Time (sec) x Pressure drop through hose wall (cmHg)

Prices on request