Cells and cell cultivation

Exclusive and variable
for small volumes and applications in
biotechnology, medical enginnering, pharmaceutical and food Industries

MDX Biotechnik International GmbH
Industriestraße 2 Tor 1
D-37176 Nörten-Hardenberg

Tel: +49 (0)5503-8086-62 • Fax: -32
email: info@mdxbio.de
http://www.mdxbio.de

HRB: 205602 AG Göttingen
UID : DE322057232

Kreis-Sparkasse Northeim
IBAN: DE16 2625 0001 0172 2436 69
BIC: NOLADE21NOM

The exclusive bioreactors

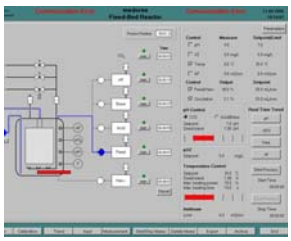
MDX fermenters have a high modularity and can be used easy and comfortable in biotechnological, medical and pharmaceutical research and industry. The systems can be offered as stirring reactors, fixed-bed bioreactors for the cell cultivation, fluidized-bed bioreactors, mini fermenter or air-lift system. The working volumes of the bioreactors can be varied from 50 ml up to 20 litres. The fermenters work automatically via a central control unit and open up many different cell cultivation ways and tests possibilities for the users.

Culture vessels can be offered:

- **As single or double vessel** with separable double vessels, with special lid of Peek material for the protection of the sensitive cells from metal molecules and with small diameters for the adaption in multi systems.
- As **"Vario systems"** smaller stirring bioreactors with inner and outer vessel – working volumes of inner vessels 50-125 or 125-250 ml, to save the expensive nursing-media, and outer vessel volumes of 500 or 1000 ml –. Or as standard vessel with 2.0 / 5.0 / 10.0 to 20.0 litres working volumes.
- Easy possibility of **conversion of the reactor-vessels** whether in a fluidized-bed system, Air lift, or in a separable double coat vessel for the cell cultivation. All systems are easy convertible.

Fittings

- **Sampling fittings**, no fore flow, comfortable handling.
  Option: automatically sampling with mini pumps.
- **Exhaust air condenser** with high efficiency, low height.
  Option: Teflon filter.
- **Air supply fitting** with stainless steel frit and Teflon filter.
- **Stirring device** with radial magnetic coupling, adjustable, different models of stirrers can be ordered.
- **Lid with ports for sensors** and fittings. Small diameters, high lid occupancy density with up to 15 ports and good accessibility.
- **Miniature-pO_2 sensors** 6 mm diameter and 12 mm diameter.
- **Fast tube clutch** for sterile connections.



Modular measurement and control system

- **Process controller FCU 05,** the central control system of up to 4 bioreactors, remote control and easy data exchange of:
  Speed, temperature, pH, redox, pO_2, level or AF, gas Mixture and continuous cultivation.
- **Measuring and control module system**, equipment depending on need.

Materials

- **High performance materials:** PEEK with high chemical and thermal resistance up to 260°C and FDA admittance, Viton, Teflon, stainless steel, Duran glass; for problematical media it is possible to replace steel by titanium.

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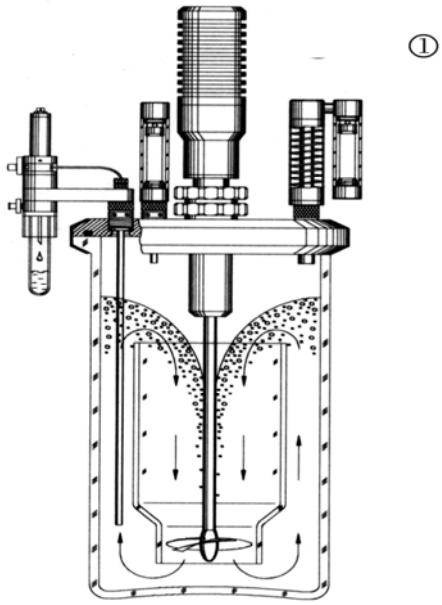
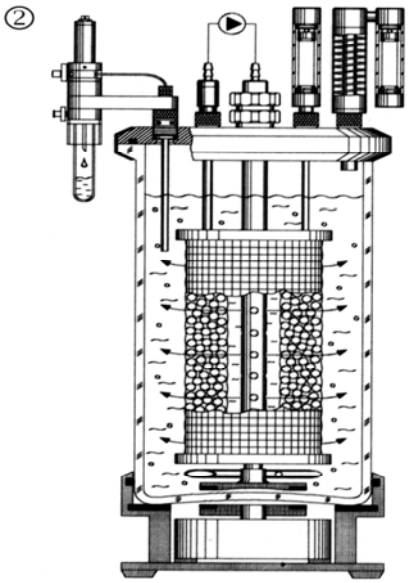
Bioreactors

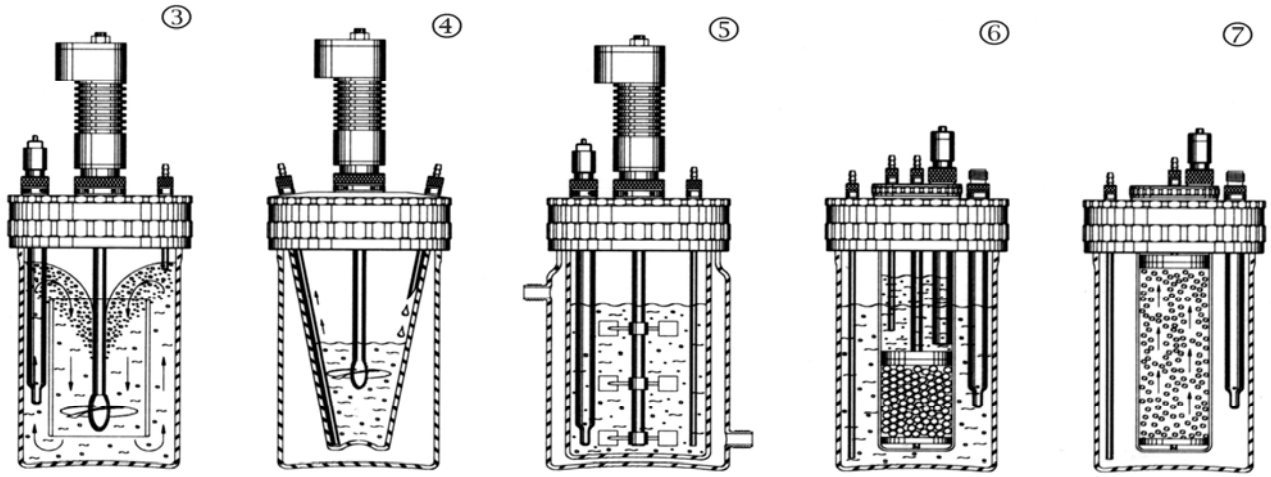
- Vessels of PEEK, flanged lids
- Fast temperature correction by sensors of stainless steel or titanium.
- Equipped with all necessary fittings and sensors.
- By sterile magnetic coupling and various stirring systems the instruments can be upgraded/modified for other applications.
- The production of special designs in consultation with the customers and according to their wishes.

Design examples

- Axial stirred system (1) with stirrer for different stirring tools, homogeneous and culture saving mixing.
- Fixed bed system (2) to 17 litres working volumes for cell cultivation in batch and continuous operation secure and high productivity.







The stirring bioreactors (1, 3, 4, and 5) are used for cell cultivation of shear stress insensitive cells as bacteria and many plant cells. They work completely automatically and are equipped with stirrer, magnet clutch, probes and fittings. They can be converted easy with few basic components into fixed bed systems (2 and 6), fluidized bed or airlift fermenter (7). The fixed bed bioreactors can be used in medical research and pharmaceutical industry for the cultivation of adherent, human and animal cells. The air lift and fluidized bed fermenter can be used in the cultivation of shear stress sensitive cells.

The stirring mini-bioreactor "Vario" (4) is offered with double coat vessels for the cultivation of cells with a stable cell wall. The mini bioreactors are offered with 0.5 or 1 litres volume as standard instruments. The capacities of inner vessels are 100- 125 ml “Vario 500” and 125-250 ml “Vario 1000”. They can be offered also as multi system with 4 bioreactors. The outstanding features of the mini-bioreactors are separable double vessels with high lid occupancy density, the saving of expensive nursing media with the same cell yield results by the conical forms, the low height and the small diameters of the inner vessels.

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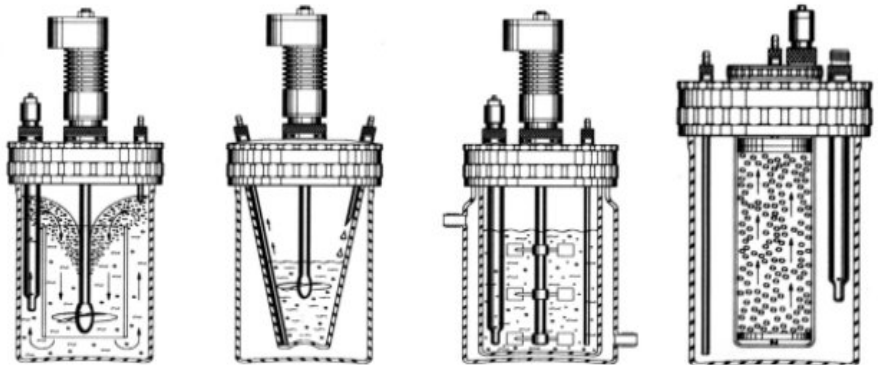

Stirring bioreactors **Airlift / Fluidized-Bed bioreactors**

Technical data

Work volume	0,5l	1l	2,5l	5l	10l
Sterilization	Autoclaving	Autoclaving	Autoclaving	Autoclaving	Autoclaving
Temperature range	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C
PH range	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
Stirring speed (only stirred bioreactors)	0 – 2000	0 – 2000	0 – 2000	0 –1500	0 – 1000
Tempe ration	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
Operation	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
PH regulation	Acid, alkali or CO_2 basing	Acid, alkali or CO_2 basing	Acid, alkali or CO_2 basing	Acid, alkali or CO_2 basing	Acid, alkali or CO_2 basing
Gas supplement	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2
Stirring (only stirred bioreactors)	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
Ring sparger (air lift/fluidized reactor)	yes	yes	yes	yes	yes
Waste gas condenser	yes	yes	yes	yes	yes
Sampling system	yes	yes	yes	yes	yes
Magnetic clutch (only stirred reactors)	yes	yes	yes	yes	yes
Diving pipes	yes	yes	yes	yes	yes
Electrodes and cable	yes	yes	yes	yes	yes
Light	on enquiry	on enquiry	on enquiry	on enquiry	on enquiry
PC	yes	yes	yes	yes	yes
Data acquisition	yes	yes	yes	yes	yes
process control system	yes	yes	yes	yes	yes

The technical data, the sizes and weights of the bioreactors can be sent when required.

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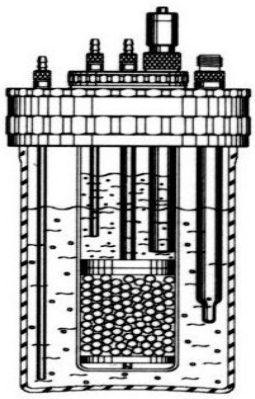
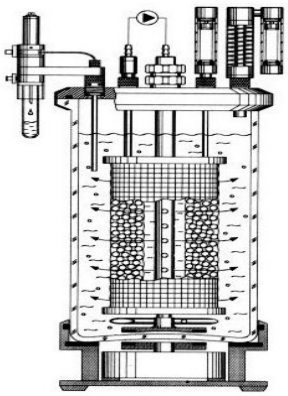


Fixed-bed-bioreactor, axial working principle



Fixed-bed-bioreactor radial working principle

Technical data

Working volumes	0,1l	1l	2,5l	5l	17l
Sterilization	Autoclaving	Autoclaving	Autoclaving	Autoclaving	Autoclaving
Temperature range	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C	5 – 60° C
PH range	3 - 10	3 - 10	3 - 10	3 - 10	3 - 10
Flow rate of pumps	0 – 10 ml/min	0 – 100 ml/min	0 – 250 ml/min	0 – 500 ml/min	0 – 2 l/min
Tempe ration and control	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.
Operation	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
PH regulation	Acid, alkali or CO_2	Acid, alkali or CO_2	Acid, alkali or CO_2	Acid, alkali or CO_2	Acid, alkali or CO_2
Gas-addition (outer vessel)	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2	Air, O_2, N_2, CO_2
Gas humidification	yes	yes	yes	yes	yes
Waste gas condenser	yes	yes	yes	yes	yes
Sampling system	yes	yes	yes	yes	yes
Diving pipes	yes	yes	yes	yes	yes
Electrodes and cable	yes	yes	yes	yes	yes
Light	on enquiry	on enquiry	on enquiry	on enquiry	on enquiry
PC interface	on request	yes	yes	yes	T
Data acquisition	on request	yes	yes	yes	yes
Process control system	on request	yes	yes	yes	yes

The sizes and the weights of the bioreactors can be sent on request.

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MultiFerm

A new multiple cell culture bioreactor for medical and scientific pretesting and tests

"MultiFerm" is an automated and easy-to-use 12-fold fixed-bed fermenter system of the parallel cultivation of sensitive animal, human and other shear sensitive cells which are without stable cell wall. The system is used in the production of monoclonal antibodies, cultivation of adherent and recombinant cells and in the cell-physiological studies of tissue cells as example tumour cells, primary cells, stem cells, liver and kidney cells. The fixed-bed system is equipped with the necessary measurement and control facilities, probes and sensors, peristaltic pumps, gas supply, control program and computer for saving, evaluation and transfer of the data to other computers. The system consists of an outer 1.5 l media conditioning vessel and 12 inner fixed bed reactors which are made of Duran glass and are fitted in the middle of the media conditioning vessel. The conditioning vessel is made of Duran glass also. This makes it possible to watch, to check and to control the development of the cell cultivation. The lid, the in and out leads are made of insensitive PEEK material to protect the sensitive cells from damages by free metal ions by the usual metal lids. The fixed-bed material consists of highly porous glass sinter pearls or other suitable carrier materials and is inside the fixed-bed reactors. The cells are transferred to the surface of the carrier material in the fixed-bed reactors and grow and increase on, around and between the carrier materials and can be used for further tests and examinations.

- Depending on cell-types and growth conditions "MultiFerm" is best suited for the parallel cultivation of the same or different cell lines which grow under the same or almost the same growth-conditions.
- The fermenter system is excellently suited for pre-testing and testing of medicine, biotechnology, pharmaceutical and food industry.

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“MultiFerm”
Technical data

Total volume	1.5 Litre
Working volume	12 x 10 ml fixed-bed reactors
Working principle	Axial
Sterilization	Autoclaving
Temperature ranges	5 – 60° C
pH ranges	3 - 10
Pumps	for circulation of media and continuous cell cultivation
Flow rates	12 x 0.15 – 3 ml/min
Heating	directly via heating stick
Operation	Batch, Fed-Batch, continuous
pH regulation	Acid, alkali or CO_2
Gas-additions (outer vessel)	Air, O_2, N_2, CO_2
Gas humidification	yes
Waste gas condenser	yes
Sampling system	yes
Diving pipes	yes
Electrodes and cables	yes
Light	on request
Process control system	yes
PC interface	yes
Data acquisition	yes
Data saving	yes
Data transfer to other computers	Yes

The weight and the size of the bioreactor can be sent on request.

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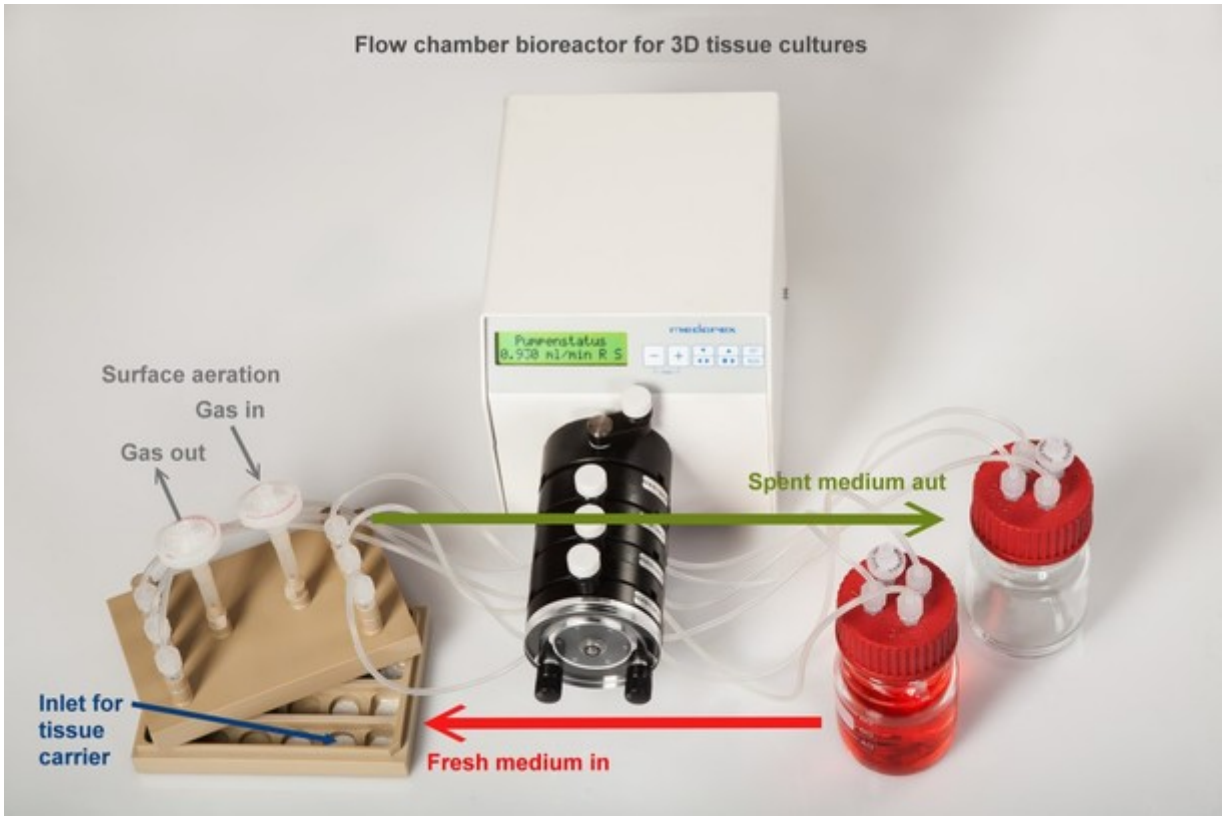

Flow chamber bioreactor for medical, biotechnological and pharmaceutical uses

MDX flow chamber bioreactor opens different and excellent possibilities for the cultivation of the functional tissues and adherent cells which need a carrier material for their growth. The fluid-bed bioreactor can be used in the medical technology and research, e.g., in the cultivation of the functioning liver cells, cartilages and flat skin cells. Moreover, it can be used in environment protection and development from drugs in pharmaceutical research. The function of MDX fluid-bed bioreactors

Description

The fluid-bed bioreactor can be used in the medical technology and research, e.g., in the cultivation of the functioning liver cells, cartilages and flat skin cells. Some cells of the functioning tissue are removed by biopsy and are cultivated in a culture bottle with specific nutrients medium. The cells are transferred after the reproduction to the carrier pads made of polymer, of porous ceramic or fleeceon in the chamber. The cells grow to functioning tissue cultures with corresponding properties. The developed cell cultures are removed enzymatic and further processed. The tissue cultivation process is carried out in an incubator at optimal temperature. The required nutrient medium for the cultivation of cell tissue must be prepared outside the fluid bed chamber. It is enriched with necessary nutrients for growth of the cells. The nutritious medium is pumped by a peristaltic pump continuous and slowly to the cells in the fluid-bed chamber. The spent medium is to remove by means of a pump from the chamber. The aeration of the cells is directly by convection. On this way, the tissues and the cells are optimally supplied with oxygen and nutrients and can grow well. The fluid-bed bioreactor can be used also in cell cultivation for the production of eukaryotic proteins, monoclonal antibodies and other cell substances of research and pharmaceutical industry and with specific bacteria's in the preliminary examinations and tests of the biotechnology e.g. at the reduction of pollutions in the wastewater or in the ground.

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medoClav

A high-pressure small-Batch steriliser with integrated stirring -system

"medoClav" is a small media autoclave with an integrated stirring system for the sterilization of max. 7 l media for 1 up to 3 bars pressure and adjustable temperatures up to 143°C. The stirrer of medoClav provides by homogeneous mixing an optimal sterilization of the media under predefined conditions. The temperature of the media autoclave is free adjustable up to a maximum of 143°C. The integrated media sensor and the switch are able to hold the temperature up to 60°C. This makes the bottling of media directly and sterilely by the sample valve easier.

- Sterilization of solid substances
- Sterilization of liquids
- Sterilization in oil bath
- Sterilization of nutrient media
- Cultivation of nutrient media (laboratory area)

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Tube qualities

Please, choose the right tube material for your application

Name	Silicone	PharMed /Santopren	TygonLFL	Viton /Fluran F 5500	NorprenA60G
Advantages	hardly any removing from softener and additions not toxic, resistance, ideal for low Tempera-tures, waterproof resistant to O zon, radiation, sunlight	Suitable for Cell cultures and tissue. Imper-meable for normal light and UV radia-tion. Can be wel-ded, sticked, for-med. Low gas per-meability. 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 permea-bility.	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, sticked and formed. Not aging, not oxidizing. Good dielectric qualities. Long life time and low gas permeability.
Restrictions	Not suitable for concentrated solvents, oils, acids or thinned biarboate of soda lye. Hgh gas permeability	Remove of additions is possible.	Not suitable for human blood and tissue parts.	Restricted life time	Removing the additions is possible
Physical qualities	Polydimethyl-siloxan 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 propylen elastomer excellent tensile strength non-transparent, black
Temperature range	-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
Application 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
Complies with the norms	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	No details
Strerilization	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
Permeability CO2 H2 O2 N2	 1200 16170 x 10-11 200 80	 1200 772 x 10^{-11} 200 80	 563 362 x 10^{-11} 124 67	 38 24 x 10^{-11} 14 5	 1200 772 x 10^{-11} 200 80

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

Gas volume (cm3) x IDxW of hose (cm)

(Cm2) x Time (sec) x Pressure drop through hose wall (cmHg)

All prices on enquiry

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