

# miniPERM

## The Bioreactor for the Production of Monoclonal Antibodies and Recombinant Proteins

### miniPERM - Lab-scale protein production

miniPERM is an easy-to-use bioreactor which was developed for the efficient cultivation of cells in high density, and the production of monoclonal antibodies and recombinant proteins. Both, suspension cells and adherent-growing cells can be cultivated in miniPERM.

miniPERM is an effective alternative to static culture, roller bottles and fermentor systems because high concentrations of cell products can be obtained even in small volumes.

## Construction and Principle

### miniPERM structure

miniPERM is a two-compartment bioreactor. The production module (with culture volumes of 35 ml) is separated from the nutrient module (400 ml working volume) by a semipermeable membrane with an NMWCO of 12.5 kDa (Fig. 1).

### Basic principle

A semipermeable dialysis membrane separates the production module in which the cell cultivation takes place from the nutrient module which is filled with medium. Because of the small pore size of the dialysis membrane (12.5 kDa) neither cells nor secreted cell products can pass through the membrane and thus are concentrated in the production module. Nutrients and gases dissolved in the medium can however diffuse out of the nutrient module through the membrane into the production module.

At the same time, metabolites produced by the cells diffuse through the dialysis membrane into the nutrient module (Fig. 2). The outward-facing side of the production module consists of a thin, gas-permeable silicone membrane enabling an exchange of  $O_2$  and  $CO_2$ . The filter integrated into the screw-on cap of the nutrient module (0.2  $\mu m$  pore size) allows aeration of the nutrient module as well as an equalisation of the pressure between the bioreactor and the incubator atmosphere.

### Application spectrum

miniPERM offers a wide application spectrum for laboratory and research. Besides the cultivation of hybridoma cells for antibody production and the cultivation of transfected cells for the production of recombinant proteins, miniPERM can also be used for the production of biomass. Due to the optimised two-chamber-system, high cell densities and product concentrations can be achieved.

### The system

miniPERM is available in two versions:

#### ■ The assembled miniPERM bioreactor, sterile:

The complete miniPERM with production and nutrient module is available in sterile form as a disposable item and is not autoclavable.

#### ■ The reusable miniPERM:

The nutrient module (Cat.-No. 9600 1153) can be autoclaved and reused up to 10 times. The production module is sterile and can be used only once.

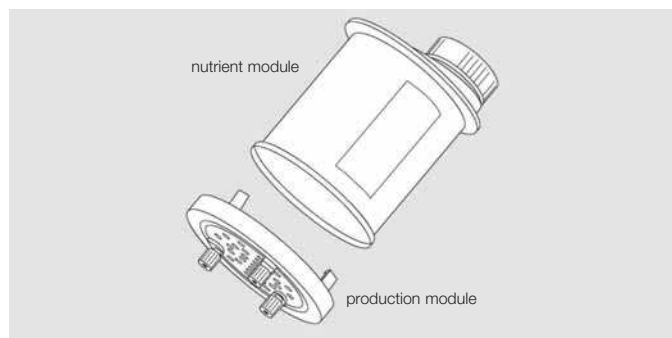


Figure 1

### Cultivation

In order to achieve an optimal diffusion of nutrients and metabolites, miniPERM must be rotated during the cultivation. The Universal Turning Device (Cat.-No. 9600 1061) provided for this purpose can hold up to 4 miniPERMs (Fig. 3).

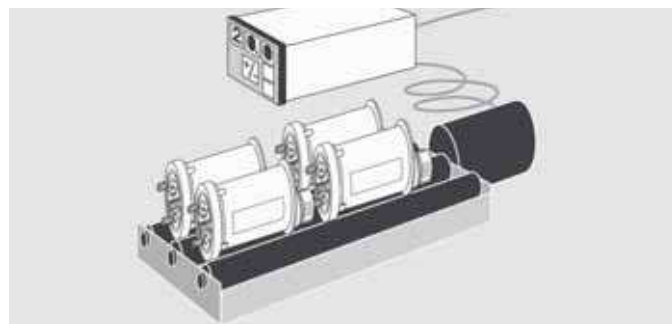


Figure 3: Universal Turning Device

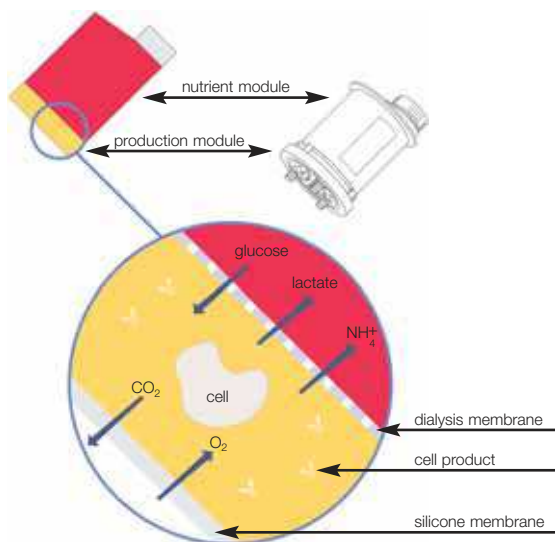


Figure 2: Principle of miniPERM

## miniPERM



## miniPERM

## Advantages

- High cell densities
- High product concentration
- Long term cultivation
- Ease of use
- Wide application spectrum

## Applications

- Production of proteins/  
monoclonal antibodies
- Cultivation of  
hybridoma,  
mammalian cells,  
transfected cells,  
plant cells,  
insect cells,  
tumor cells
- Production of biomass

2 HTS-  
Microplates3 Immunology/  
HLA4 Microbiology/  
Bacteriology5 Tubes/Multi-  
Purpose Beakers6 Liquid  
Handling7 Molecular  
Biology8 Protein  
Crystallisation

9 Separation

10 Biochips/  
Microfluidics11 Cryo-  
Techniques12 Lids/Sealers/  
CapMats13 Reaction Tubes/  
Analyser Cups

14 Accessories

## Selecting the Production Module

## ■ miniPERM classic

The miniPERM classic production module has a culture volume of 35 ml which is ideal for use in research and lab-scale applications. Suspended cells or adherent cells on microcarriers can be cultivated in miniPERM classic. Whilst miniPERM is optimised for the cultivation of hybridoma cells, many other cell types (e.g. CHO, BHK, SF, tumour cells, etc.) can be successfully cultured at high densities as well.

## ■ miniPERM SM

## Stationary matrix for adherent cells

The SM 2105 production module is ideal for the cultivation of anchorage-dependent cells (e.g. HEK or COS cells). These modules contain two polyester matrices upon which many cell types attach and divide. The SM production modules have a growth surface area of 240 cm<sup>2</sup>. When the cells secrete a product, this can be easily purified from the medium.

non-  
cytotoxic

non-  
pyrogenic

Cat.-No.	9600 1059 <sup>1)</sup>	9607 7009 <sup>1)</sup>	9600 1055	9600 1153
Description	miniPERM classic	miniPERM classic Test Kit	Production Module classic	Nutrient module
NMWCO* of Membrane [kDa]	12.5	12.5	12.5	-
Sterile	+	+	+	-
Autoclavable	-	-	-	+
Quantity per case	12	4 miniPERM 1 Start-up Support Kit	12	4

Cat.-No.	9607 7618 <sup>1)</sup>	9607 7609 <sup>1)</sup>	9607 7616
Description	miniPERM SM 2105	miniPERM SM 2105 Test Kit	Production Module SM 2105
NMWCO* of Membrane [kDa]	12.5	12.5	12.5
Sterile	+	+	+
Autoclavable	-	-	-
Quantity per case	12	4 miniPERM 1 Start-up Support Kit	12

\* nominal molecular weight cut-offs <sup>1)</sup> assembled

## miniPERM Accessories

The following accessories are offered for convenient handling during cultivation:



### Sterile single-use 50 ml Luer lock and 2 ml Luer syringes (Cat. No. 9607 7137, 9607 7136)

For simple and safe cell suspension inoculation, sampling and harvesting.

### Sterile filling tube 5" (Cat.-No. 9607 7138)

The sterile filling tube offers a simple solution to cell suspension transfer (e.g. from centrifuge tubes to single-use syringe). The filling tube is slightly flexible, connects directly to a 50 ml Luer syringe and has a sufficiently large inner diameter to minimize shear-stress induced cell damage.

### Luer syringe needles (25Gx 5/8") (Cat.-No. 9607 7135)

For sampling and supplementing the medium in the production module via septum ports.

### Septum port (Cat.-No. 9607 7134)

To simplify sampling and supplementing procedures and to further reduce contamination risks, a replacement of two of the three standard screw caps on the production module with sterile septum ports is possible.

The septum ports offer the possibility to add fluids or remove samples from the production module using sterile single-use syringe needles of small diameter.

There is no need to open the module. The septum ports should be replaced after they have been pierced up to 5 times.



### miniPERM stand (Cat.-No. 9600 1054)

For mounting the miniPERM bioreactor during inoculation, sampling and harvest.

### cellPROTECT (Cat.-No. 9607 7041)

cellPROTECT increases the viscosity of the culture medium and thereby protects the cells against shear stress. cellPROTECT is added to the cell suspension in the production module at concentrations of 0.05 to 0.1% w/v.

### antiFOAM a (Cat.-No. 9607 7320)

When serum-containing medium is used, significant quantities of foam may develop in both modules of the miniPERM. By adding 0.5 to 1 ml antiFOAM a to the nutrient module medium, this foam build-up is reduced.

### Start-up Support Kit

Accessories to inoculate, sample and harvest. Consists of:

- Filling tube 5", Luer, sterile (8x)
- Disposable hypodermic syringe 50 ml Luer, sterile (8x)
- Disposable hypodermic syringe 2 ml Luer, sterile (20x)
- Luer syringe needles (25G x 5/8"), sterile (20x)
- Septum ports, sterile (6x)
- miniPERM stand (1x)
- antiFOAM a, 5 ml, sterile (1x)
- cellPROTECT, 1 ml, sterile (1x)

Cat.-No.	9600 1057	9607 7037	9600 1038	9600 1036
Description	Screw cap for nutrient module	Screw cap for nutrient module	Screw cap for production module	Screw cap for production module
Sterile	-	+	-	+
Autoclavable	+	-	+	-
Quantity per case	30	16	12	6

2 HTS-  
Microplates3 Immunology/  
HLA4 Microbiology/  
Bacteriology

Cat.-No.	9600 1054	9607 7134	9607 7138
Description	Stand for miniPERM	Septum port	Filling tube 5'' (127 mm) Luer
Sterile	-	+	+
Quantity per case	4	100	100

5 Tubes/Multi-  
Purpose Beakers6 Liquid  
Handling

Cat.-No.	9607 7136	9607 7137	9607 7135
Description	Sterile, single-use syringe 2 ml Luer	Sterile, single-use syringe 50 ml Luer Lock	Luer syringe needles (25 G x 5/8'')
Sterile	+	+	+
Quantity per case	100	60	100

7 Molecular  
Biology8 Protein  
Crystallisation

Cat.-No.	9600 1094	9607 7320	9607 7041
Description	miniPERM Start-up Support Kit	antiFOAM a	cellPROTECT
Volume [ml]	-	100	100
Sterile	+*	+	+
Quantity per case	1	1	1

9 Separation

10 Blochips/  
Microfluidics

\*except miniPERM stand

11 Cryo-  
Techniques12 Lids/Sealers/  
CapMats13 Reaction Tubes/  
Analyser Cups

14 Accessories

## Turning / Rocking Device



## Turning/Rocking Device

### Universal Turning Device

#### Advantages

- Flexible application
- Space saving
- Incremental rotational speed control
- Simple installation

#### Applications

- miniPERM bioreactors
- Roller bottles
- Centrifuge tubes
- Reagent vessels

### Rocking Device

#### Advantages

- Simple set-up
- Different angles of inclination

#### Applications

- Cell culture vessels (e.g. quadriPERM, T-Flasks, lumox™ dish, petri dishes)
- Protein-/DNA-staining

## Universal Turning Device

### A turning device for universal application

In contrast to standard turning devices, the speed of this Universal Turning Device is digitally regulated across a rotational speed range of 0.1 to 40 rpm in steps of 0.1 rpm. It is therefore suitable for most laboratory applications.

The Universal Turning Device can be used with almost all laboratory incubators. The control unit remains outside the incubator and is connected to the Universal Turning Device by a flat cable that passes through the door seal.

Flexibility is guaranteed because the distance between the rollers is variable. It is therefore possible to simultaneously rotate different types of devices, e.g. roller bottles on one side and centrifuge tubes on the other.

### Special applications

The Universal Turning Device is ideal for high density cell culture in the miniPERM bioreactor because the rotational speed can be accurately regulated over a wide range. Optimal conditions for supplying the cells and removing their metabolic waste products and optimal gas exchange can be achieved.

## Rocking Device

Various static cell culture vessels can be mounted on the Rocking Device which provides a work surface of 30 cm x 23 cm. Via the adapter, two different angles of inclination (3° and 5°) can be set. The rocking frequency can be regulated between 0.1 and 40 units.



Cat.-No.	9600 1061	9600 1073
Description	Universal Turning Device	Rocking Device
External dimensions [cm]	45 x 10 x 25	45 x 10 x 25
Weight [kg]	7	7
Rated voltage [V]	240 / 120	240 / 120
Rated frequency [Hz]	50 – 60 / 60	50 – 60 / 60
Turning speed [rpm]	0.1 – 40	-
Quantity per case	1	1