Advanced in vitro exposure systems

VITROCELL®

12/12

VITROCELL® SYSTEMS

VITROCELL® 12/12
Exposure Module

For 12 cell culture inserts (12-well size)

Compact Design

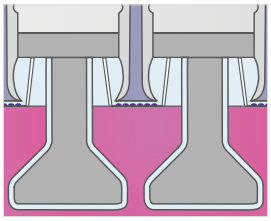
3 doses @ 3 replicates
1 control @ 3 replicates

The VITROCELL® 12/12 module system has been specifically designed and engineered to facilitate the research of human cell cultures in direct exposure to airborne substances such as gases, complex mixtures, nanoparticles and fibers. The system authentically simulates the conditions of human physiological exposure.

Normally only one system is required: 3 dilutions with 3 inserts each are used for for exposure to the substances and 3 inserts in the same system for clean air control. Each dilution represents a different dose concentration, so that a complete dose / response profile can be obtained in one experiment.

The cells are exposed at the air / liquid interface on 12 cell culture inserts using low flow rates of the aerosol.

After exposure, the cells are further processed to measure a wide range of endpoints, e. g. cytotoxicity, genotoxicity, proliferation, cellular and oxidative stress as well as inflammation (see also VITROCELL® assay guide).



Culture media supply
The media is supplied to the module by gravimetric method or syringe.

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Base module

The VITROCELL® 12/12 modules' casing is made of electropolished stainless steel. It is designed with 12 (4x3) compartments for 12-well cell culture inserts and is fully autoclavable at 121° C (250° F) for 20 min. The capability to expose with up to 4 dilutions or 3 dilutions plus 1 clean-air control in a compact module is its' outstanding feature. A transparent control window facilitates the external monitoring of media levels. Through the employment of a special adapter set, this module can also be flexibly combined for use with 24-well cell culture inserts. A constant unit temperature is guaranteed using an electronic temperature control.

The media can be supplied individually for each row of 3 compartments.

This module is renowned in scientific circles for its reliability and durability.

Optional microbalance sensor for dose monitoring

Cell culture insert (12-well size)

Available adaptor set for:
- **24-well sized inserts**

Aerosol exposure top

Special sealing and connection mechanisms guarantee a hermetic connection of the base module with the aerosol exposure top.

The aerosol inlet-stream flows through specifically shaped inlets. They are available in stainless steel or stainless steel with unique VITROGLIDE surface treatment for lowest adhesion results. The stainless steel / VITROGLIDE inlets are specifically designed for aerosols containing nanoparticles.

The aerosol inlets are connected to the distribution or dilution systems. Extraction from the module takes place via small holes using a controlled vacuum flow. VITROCELL® calibration valves, which are connected to a vacuum pump, control flow rates effectively. The aerosol exposure top features an in/outlet for heating the water circuit, ensuring corresponding temperatures with the base module. It is made of high-quality anodized aluminum.

Features

- Suitable for COSTAR®, FALCON®, ThinCert® and cellQART 12-well or 24-well sized cell culture inserts
- Autoclavability of all components
- Base module made of electropolished stainless steel for extreme durability
- Electronic heating system
- Base module and aerosol exposure top with integrated heating circuit
- Integration of the hyperboloid geometry of inlets into the aerosol exposure top
- The result: optimized particle deposition

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VITROCELL® 12/12 Docking Station

Easy connection to distribution and dilution systems

VITROCELL® 12/12 incl. rack, docking station, quick-connect system, distribution/dilution systems and vacuum valves.

Vitrocell 12/12 Base Module

VITROCELL® 12/12 quick connect system replaces the mounting of tubing material.

Features

- Complete rack system for fixation of components
- Docking station with sliding base for fast and safe connections
- Quick-connect system for distribution system

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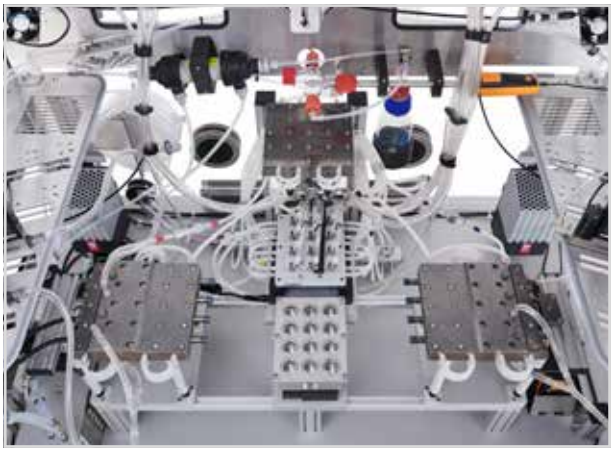
VITROCELL® 12/12 Climatic Chamber

The professional solution to avoid condensation during the exposure to liquid aerosols

System includes rack, docking station, quick-connect system, dilution systems and optional flow controllers for dilution air.

Easy access to all components.



Components can be separated with ease.

Features

- Dimensions (L x W x H): 1 280 x 900 x 870 (open 1 350) mm
- Supplied with dynamic double-jet dilution system for 4 dilutions with 3 replicates
- Integrated aerosol distribution system made of stainless steel / VITROGLIDE surface
- Climatic Chamber with temperature monitoring
- Unique quick-connect system for easier handling

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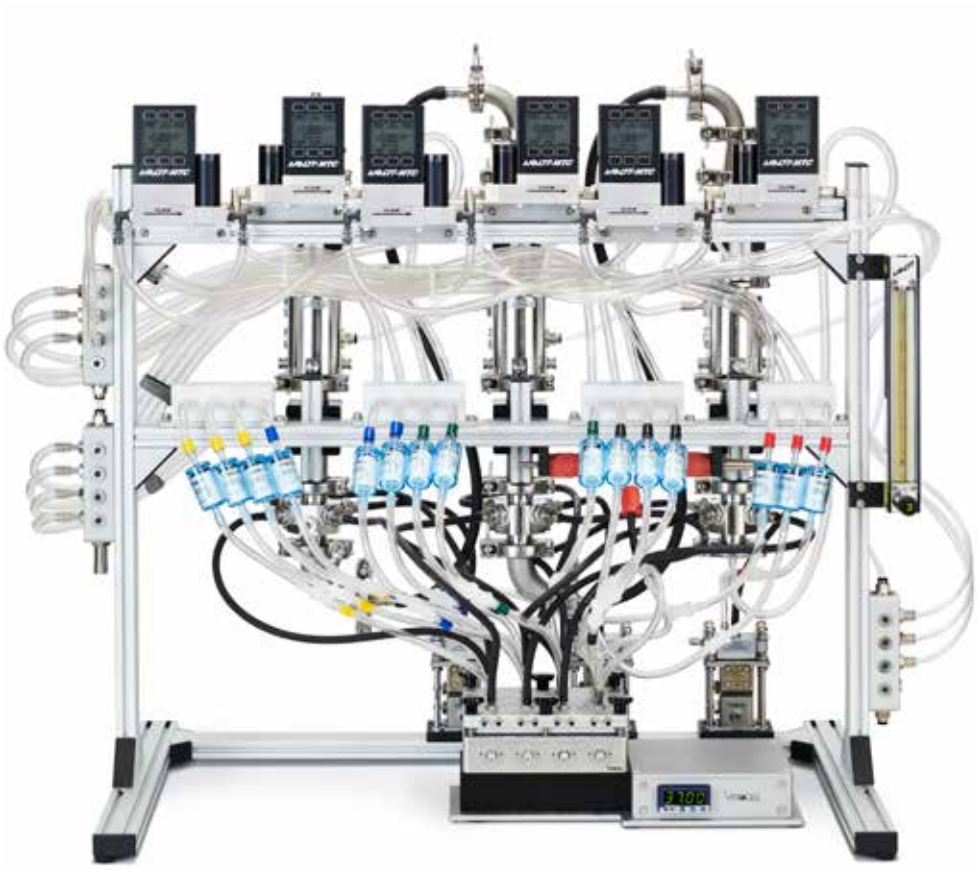
VITROCELL® 12/12
Isokinetic Sampling System

For uniform particle distribution – optional dilution systems

Compact Design

3 doses @ 3 replicates
1 control @ 3 replicates



Rack with Isokinetic Sampling and Dilution System and optional Microbalance Modules

The aerosol is guided from the central duct to the modules via isokinetic sampling probes enabling high reproducibility and uniformity of results.

The inlets aspirate directly from the constant flow of test substance.The isokinetic distribution system is made of stainless steel.

The optional dilution systems are equipped with air jets for dynamic dilution to obtain different dose / response results per row @ 3 replicates.

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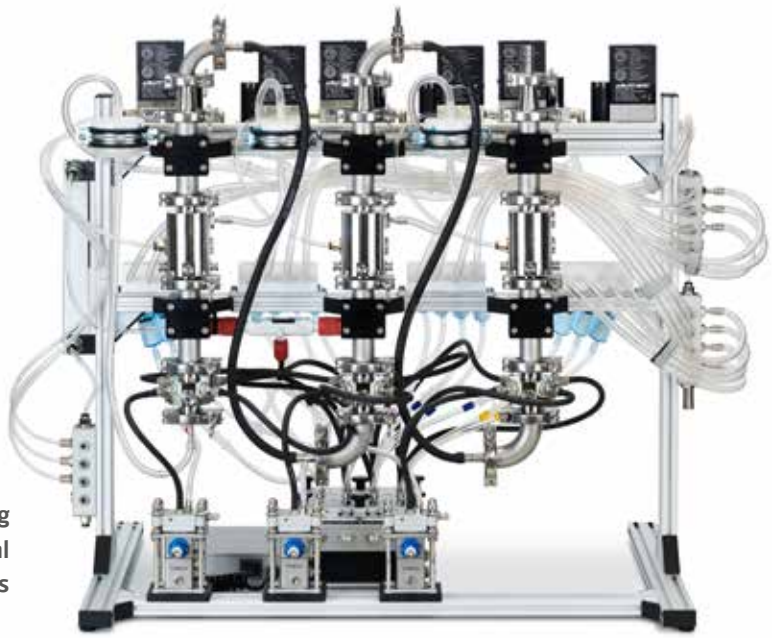

Back view – Isokinetic Sampling and Dilution System and optional Microbalance Modules

Small flange connections for easy disassembly and cleaning.

Isokinetic Sampling probes made of stainless steel.

Dynamic dilution system with air jets featuring a constant flow rate over the entire system.

The optional microbalance sensor is capable of measuring the deposited mass in seperate VITROCELL® 12/1 Modules at a resolution of 10 nanogram/cm^2 per second.

VITROCELL® Flow Monitor Software

Integration of the controllers into the VITROCELL® Monitor Software for easy setting of target flows and reporting of actual flows.

Features

- Distribution from the source of the test substances to the module inlets
- High reproducibility
- Optional dynamic dilution system

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12/12 PLUS Version

Four additional compartments for dosimetry

Compact Design

3 doses @ 4 replicates
1 control @ 4 replicates

The VC 12/12 PLUS System has an additional row with 4 media compartments - increasing the total amount to 16 positions. The 4 additional positions may be used for cell culture inserts or for dosimetry. The dosimetry positions can be equipped with either Quartz Crystal Microbalances, TEM Grid Holders or stainless Dosimetry Inserts for aerosol trapping in liquids.

VITROCELL® 12/12 PLUS with sQCM 12 microbalances

The sQCM 12 microbalance can be mounted in each row. Alternatively stainless steel Dosimetry Inserts or TEM Grid Holders are fitted here.

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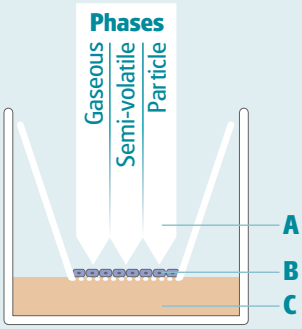
VITROCELL® Exposure Systems for Inhalation Toxicology

Direct Exposure Technology at Air/Liquid Interface

Air/liquid cultivation and exposure in Exposure Module

- **A** Direct and controlled exposure of test atmosphere to cells
- **B** Cells on membrane
- **C** Media below cells



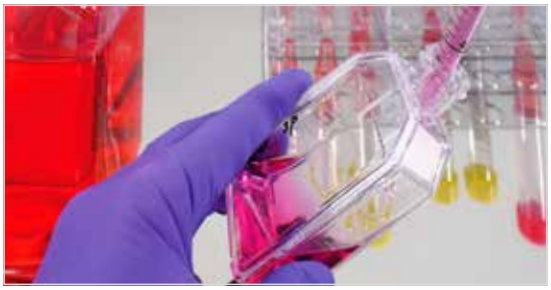
In response to the scientific need to expose in physiologically relevant conditions, VITROCELL® exposure modules have been specifically designed and engineered to enable direct exposure of mammalian cells or tissue at the Air/Liquid Interface where the cell systems are not covered with culture medium.

Researchers can thus use all cell types cultivated on microporous membranes.

This approach allows for more credible and authentic results than by submerged exposure due to a closer replication of the human physiology.

The advantages

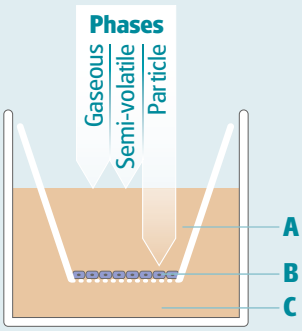
- **No losses**
- **No dissolution**
- **No reaction of constituents with culture medium**
- **High sensitivity**



Disadvantages of submerged exposure

Submerged cultivation and exposure in incubator

- **A** Medium above cells
- **B** Cells on membrane
- **C** Media below cells



The exposure of mammalian cells or tissues to airborne substances is frequently performed under submerged conditions. In doing so, the test substances are dosed into the culture medium. This procedure results in an undesired interaction of the formerly airborne substances with the medium, causing limitations for authentic analysis.

Therefore VITROCELL® recommends the air/liquid interface exposure technology.

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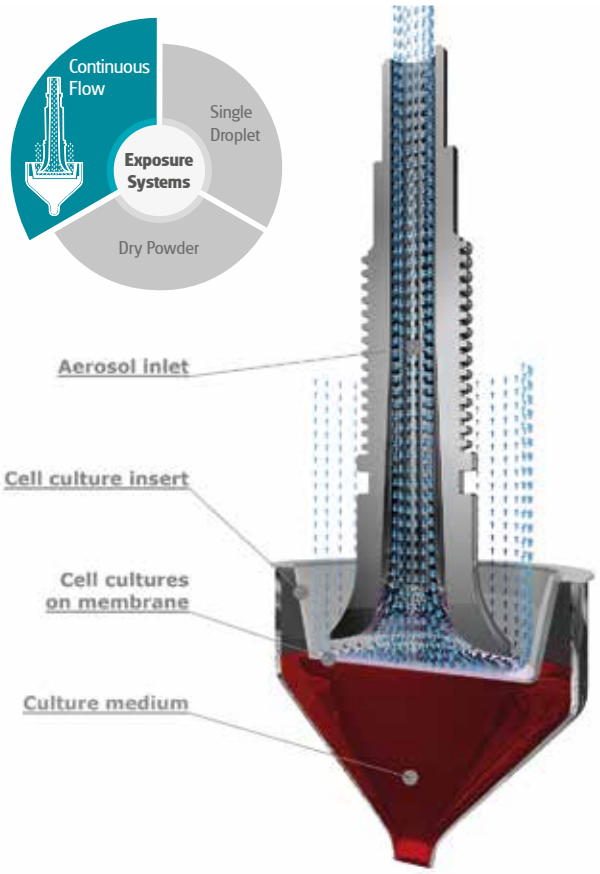
Exposure Principle

Continuous Flow Exposure

When using the Continuous Flow Exposure Systems, cell cultures are exposed to a continuous flow of gases, complex mixtures or particles. Only this exposure principle is suitable for aerosols containing a gas and particle phase.

The advantage of this method is a longer exposure duration. In the VITROCELL® standard systems exposure durations are normally up to 6 hours, whereas the VITROCELL® Automated Exposure Stations make exposures for 24 hours possible.

Continuous Flow Exposure is used for gases, chemicals or materials which are available in larger quantitities (several g) under a constant delivery. When scarce and very expensive materials need to be tested, this method is less suitable. We recommend in these cases Single Droplet Sedimentation or Dry Powder Systems.



Main application areas

- Gases and complex mixtures
- Chemicals and nanoparticles
- Environmental atmosheres
- Combustion and e-cigarettes

Continuous Flow Exposure Systems

6/4 CF

12/12

6/48 Climatic Chamber

Automated Exposure Stations

About VITROCELL®

VITROCELL® exclusively concentrates on the developing, producing, installing, training and servicing of advanced *in vitro* exposure systems.

The VITROCELL® Systems' team is driven by their vision for new in-vitro standards through state-of-the-art technology, highly qualified workmanship and absolute client dedication. VITROCELL® has successfully collaborated with clients from leading research institutes, contract research organizations, regulatory authorities or industrial laboratories across the world. Working with our team experts, all modules have been tailored to create durable and complete turnkey-systems for *in vitro* inhalation toxicology. Gases, environmental atmospheres, nano particles and complex mixtures are analyzed on lung cells at the air/liquid interface using these systems. VITROCELL® technologies are also applicable to solutions for skin research.

Over a decade of devotion to research in this specific field has given our team of design & precision manufacturing specialists the opportunity to mentor highly diversified and complex projects from conception to completion. We strive to become a constructive member of each research team, providing support when it is needed, advice when it is required and modules of the highest quality, which are even polished by hand before leaving here to be integrated into your workspace. Every piece of our German engineered equipment is manufactured to the highest of standards – yours.

For more information please scan the QR-Code:

VITROCELL® Systems GmbH
Fabrik Sonntag 3
79183 Waldkirch
Germany

Tel. +49 7681 497 79-50
Fax +49 7681 497 79-79
Email: info@vitrocell.com
www.vitrocell.com

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