Advanced in vitro exposure systems

VITROCELL®
12/7

VITROCELL®
SYSTEMS

VITROCELL® 12/7

Universal Exposure Module

12 and 24 well sized inserts

For seven cell culture inserts (12-well or 24-well size)

The VITROCELL® 12/7 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, 4 compartments are used for exposure to the substances and 3 compartments for clean air control. The 4rth position can be used for dosimetry. Capacity is easily increased by adding more modules. Each module can receive a different dose concentration, so that a complete dose / response profile is obtained in one experiment.

The cells are exposed at the air / liquid interface on up to 7 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.

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Base module

Seven compartments: four for test substance and three for clean air control.

The VITROCELL® 12/7 modules' casing is made of electropolished stainless steel. It is designed with seven compartments for 12-well or 24-well sized cell culture inserts and is fully autoclavable at 121° C (250° F) for 20 min. 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 a regulated flow of temperature-controlled water through the module.

The medium can be supplied by pipetting. This module design is renowned in scientific circles for its reliability and durability.

Aerosol exposure top with individual aerosol inlets

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 surface treatment for lowest adhesion results. The stainless steel 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.

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Option for microbalance sensor and other dosimetry tools

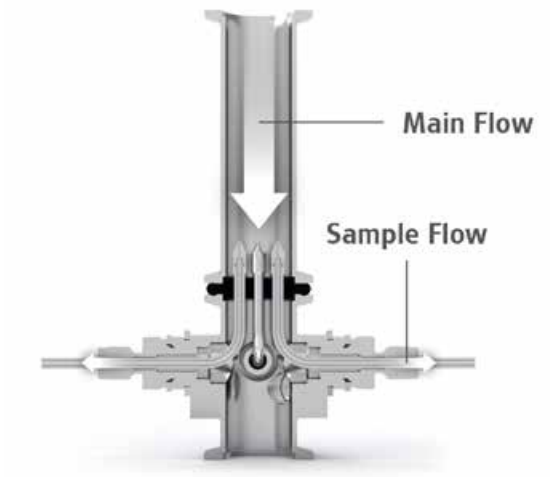
The QCM sensor can be integrated in the exposure module. It is capable of measuring the deposited mass in nanogram/cm^2 per second. Results are reported online by the VITROCELL® Monitor software. Data is presented in graphs and stored in MS Excel®.

Adaptor-Sets for cell culture inserts

Universal module with optional adaptor sets for:

- 12-well sized inserts
- 24-well sized inserts

All commercial brands are supported.



Optional Isokinetic Distribution System

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.

System available in different setups for dosimetry

The system can be combined with dosimetry tools: the 4^{rth} position of the module can accomodate a stainless steel insert for trapping constituents of the aerosol in liquids. Alternatively, it can be equipped with a microbalance sensor. A photometer can be added either directly in the aerosol flow of the Exposure Module or at a seperate port of the main aerosol flow.

Product Line Comparison			
			
Feature	**Flow 4**	**12/7**	**Essentials**
6 well sized inserts	✓	–	–
12 well sized inserts	✓	✓	✓
24 well sized inserts	✓	✓	✓
Ames 35 mm Petri dishes	✓	–	–
Microbalance (optional)	✓	✓	–
Heating method	*elctronically*	*waterbath*	*waterbath*
Exposure positions	*4*	*4*	*3*
Clean Air positions	*4*	*3*	*3*
Compatible with Isokinetic sampling	✓	✓	–
Easy closing mechanism	✓	✓	✓
Fixed Inlet distance	✓	✓	✓
Humdification system	✓	✓	✓
Media Cover (optional)	✓	✓	✓
In situ humidity sensor (optional)	✓	✓	–
Integration into VC Monitor Software	✓	–	–
Thermophoresis (optional)	✓	–	–
Removable media compartments	✓	–	–

Key Features:

- Suitable for cellQUART®, COSTAR®, FALCON® and ThinCert® 12-well sized cell culture inserts
- 4rth position for dosimetry
- Autoclavability of all components
- Media covers included
- Base module made of electropolished stainless steel for extreme durability
- Base module and exposure top heated by water circuit
- Hyperboloid geometry of inlets with diamond finish for optimized particle deposition and distribution
- Option: Quartz Crystal Microbalance, Dosimetry Inserts or TEM-Grid Holders

VITROCELL® SYSTEMS

VITROCELL 12/7 + Essentials Vape & Smoke

Turnkey Installation: available as bundle solution

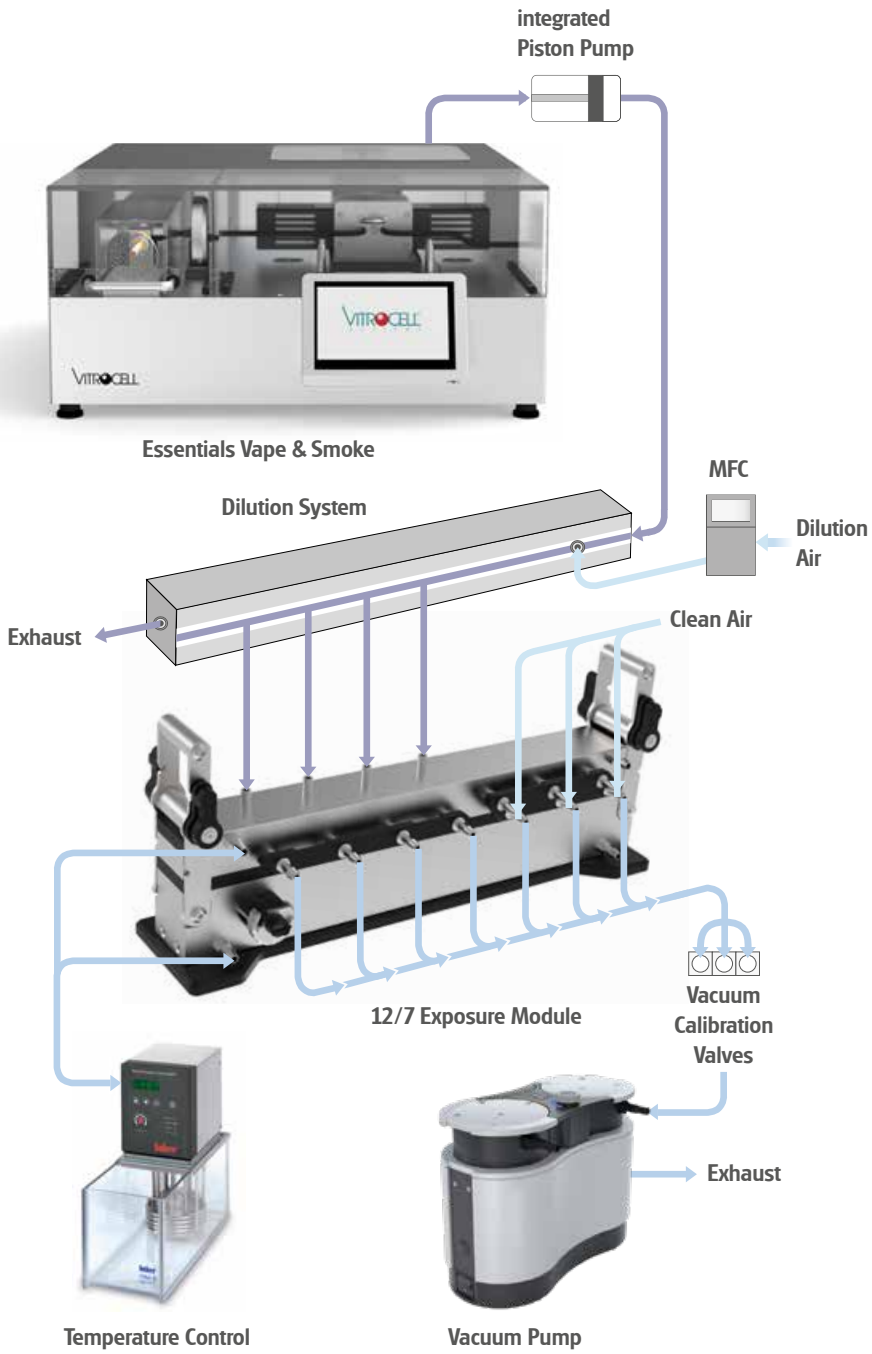
Application Area

1

- **Economic solution with extended exposure capacity**
- **For combustion and electronic cigarettes**
- **Freely programmable parameters**
  - Puff Volume
  - Puff Frequency
  - Puff Duration
  - Puff Exhaust Duration
  - Bell and square shaped puff profiles
- **Fully integrated software controls via touch screen**

Bundle features

- Smoking Machine for Combustion & Electronic Cigarettes
- Cell Culture Exposure System for 12- and 24-well sized inserts
- Dilution System
- Humidification
- Designed for easy use and maintenance



The VITROCELL 12/7 + Essentials Vape & Smoke bundle is the extended entry-level package for tobacco and vape research at the air-liquid interface

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VITROCELL® 4-Jet BioAerosol Generator

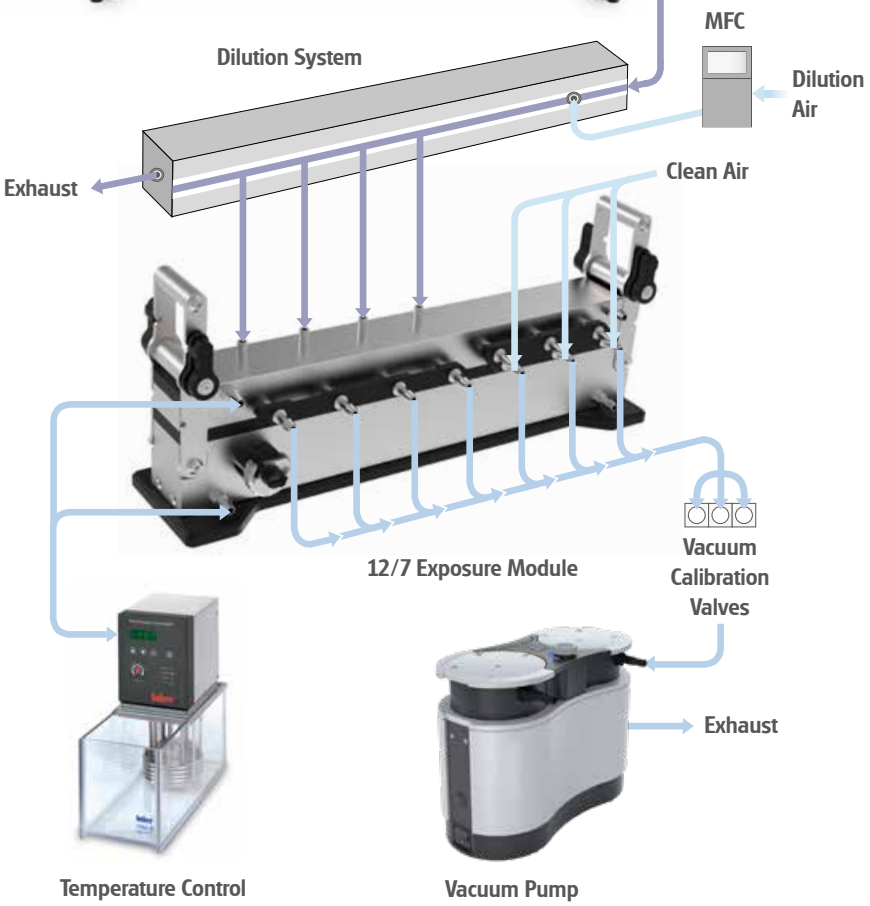
For liquids, proteins, bacteria, microorganisms with minimal sample volume and low flow rates

Application Area

2

The VITROCELL® 4-Jet BioAerosol Generator has been specifically developed and engineered for applications where the test substance must be dosed in smallest quantities. This is performed using a peristaltic pump.

It works at low air flows of e. g. 0.4 - 4 l/min. and has a small dead space. The aerosol concentration can be adjusted by either adjusting the liquid flow rate, changing the air flow rate or by adding the integrated dilution system.



Cylinder / Bag / Gas Mixing System

Application Area
3

Supply via cylinder, sampling bag or dynamic mixing system.

Possible sources of gases or mixtures:

Gas cylinder

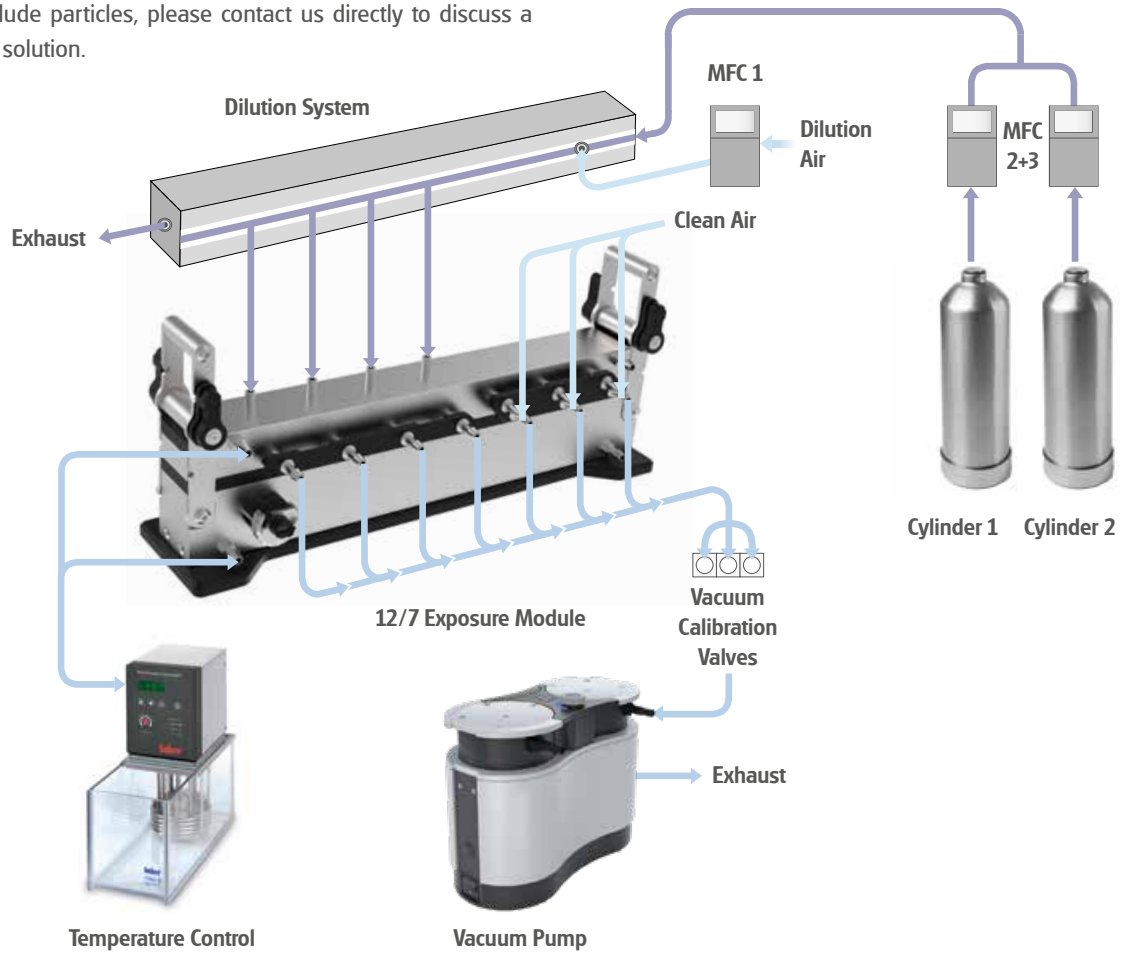
Gases and mixtures in various concentrations and specifications can be purchased from gas supply companies. The cylinders must have pressure and flow regulators. They can be connected to the VITROCELL® distribution system which then delivers the gases or mixtures to the VITROCELL® module.

Sampling bag

A sampling bag can be connected to the module and filled from various sources. For indoor or outdoor environmental sampling, VITROCELL® provides a dedicated vacuum filling system, allowing safe transfer of the sample to the laboratory. Please note: this procedure is not suitable for test atmospheres containing particles. For the collection of complex mixtures that include particles, please contact us directly to discuss a tailored solution.

Dynamic Gas Mixing System

There are various options to create individual mixtures with different dose levels. With the VITROCELL® Dynamic Gas Mixing System, it is possible to generate different dilutions of the test aerosol.



Spiking System

For the production of mixtures in ppm and ppb ranges.

Application Area

4

The VITROCELL® Spiking System has been specifically designed to provide optimal results when exposing gas mixtures from solvents, gases and vapors.

It is the perfect solution when the required concentrations are not available in cylinders. The gas mixture is produced dynamically by means of a digital syringe pump allowing injections of less than 0.1 µl with high accuracy. The component is fed into a zero gas flow through a heated mixing chamber at temperatures up to 400°C.

Programmable heating steps, mass flow controllers and the secondary dilution system allow the production of mixtures in various ppm and ppb concentration ranges.

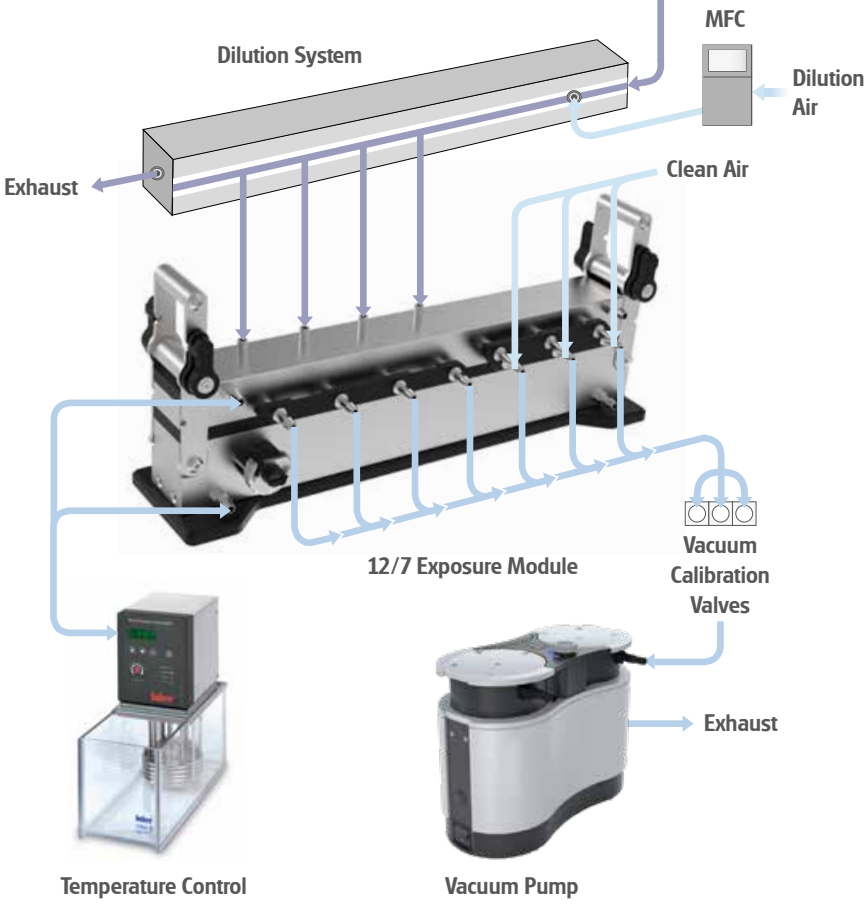
Spiking System

Syringe drive

High precision and electronically controlled.

Syringe types

Compatible with various syringe types.



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.

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