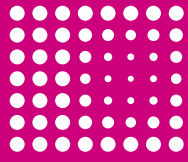


# CULTEX<sup>®</sup>

High Precision Exposure  
and Cultivation Systems



*The Airborne Exposure Experts*



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## Cultex<sup>®</sup> Laboratories – First Choice for *In Vitro* Toxicology

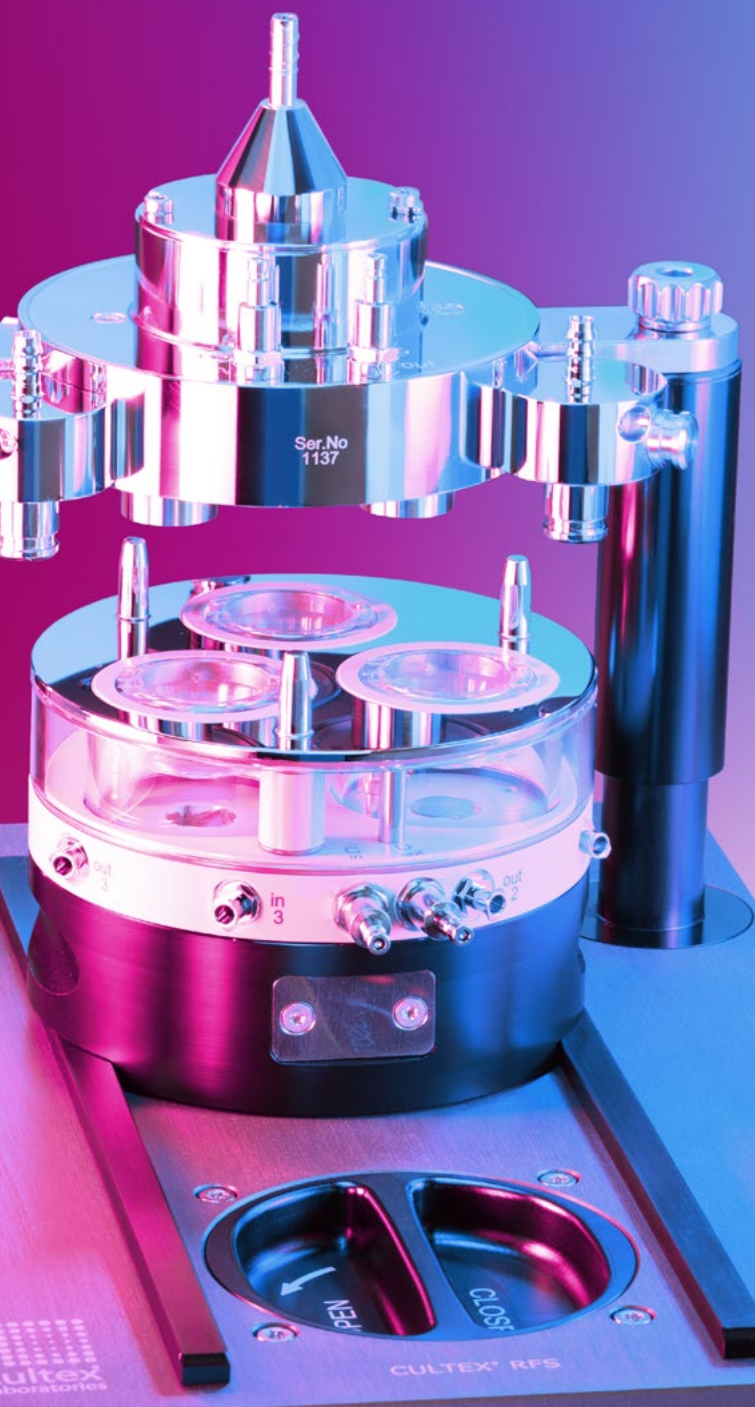
The CULTEX<sup>®</sup> system is the platform for *in vitro* toxicological analysis of airborne substances, such as gases, volatile compounds and complex mixtures under realistic (in- and outdoor) atmospheric conditions.

At Cultex<sup>®</sup> Laboratories we offer our customers from industry, research and governmental institutes exclusively designed culture and exposure systems as well as a full service spectrum spanning advice, planning and execution.

The original linear CULTEX<sup>®</sup> glass modules, developed and patented in 1999, have been replaced by our CULTEX<sup>®</sup> RFS modules due to our ever-expanding scientific knowledge and experimental experience. This new generation of modules is characterised by a higher stability, reproducibility and robustness concerning the deposition and homogenous disposition of particles on the cell cultures.

## Expertise and Methods

- ***In vitro* systems:** Primary cultures and cell lines from the respiratory tract including human donors
- **Types of exposure:** Exposure via the culture medium (e.g. soluble substances) or directly at the air-liquid or air-agar interface (gases, particles or complex mixtures, e.g. cigarette smoke)
- **Exposure systems for cells and bacteria** including generation and analysis of the test atmosphere:
  - CULTEX<sup>®</sup> RFS – Radial Flow System**  
Modular precision equipment for the direct exposure of cultivated mono- and co-cultures at the air-liquid interface (ALI) or air-agar interface
  - CULTEX<sup>®</sup> RFS Compact**  
Exposure module designed for analysing the biological effects of the test atmosphere on cells with or without negative control at the same time
  - CULTEX<sup>®</sup> EDD**  
Optional electrical deposition device to increase the deposition efficiency for micro-sized and nano-sized particles
- **Long-term cultivation**  
Automated cell cultivation systems:
  - CULTEX<sup>®</sup> LTC-C**  
Specifically designed for the computer-controlled cultivation of cells grown on commercial cell culture inserts under ALI conditions



## CULTEX® RFS – Radial Flow System

High-end exposure system for the direct exposure of cell culture inserts or Petri dishes developed on the basis of our former linear CULTEX® glass modules. The modular system consists of the aerosol guiding module and the sampling module integrated into a rack system functioning as a locking device.

The aerosol guiding module can be fitted tightly to the sampling module, thus realising a close connection between the two parts before exposure.

The sampling module houses three culture inserts, which can be separately supplied with medium by a computer-controlled pump. If required, the module can be fitted with an electrostatic device for efficient particle deposition.

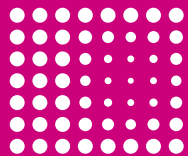
### The CULTEX® RFS offers

- Maintenance of cell viability under direct cell exposure conditions by
- Static or continuous medium supply
- Stable temperature within the unit externally controlled via a water bath
- Individual continuous exposure of the three insert positions at the air-/liquid interface via
- Specially designed inlet funnels

In general, this technology offers new possibilities for the characterisation of the biological effects of airborne substances, such as:

- Gases
- Volatile compounds
- Particulate atmospheres
- Complex mixtures

not only under laboratory, but also under outdoor and workplace conditions.



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## Features

- One modular system for 6.5 mm, 12 mm and 24 mm cell culture inserts as well as Petri dishes. Use of commercially available cell culture inserts (e.g. COSTAR<sup>®</sup> and Falcon<sup>®</sup>)
- Exchangeable gas inlets according to the insert type chosen
- All components are autoclavable
- Manufactured from boron silicate glass and polished stainless steel
- Integration of the module into a specially designed rack system for stability and comfortable handling
  - Easy loading of the insert positions by moving the basic module on the rack system
  - Tight connection to the exposure top by a specially designed locking device
- Efficient connection to the generation device for the test atmosphere via the central gas inlet
  - Cell culture maintenance
    - Individual medium supply for all three insert vessels via separate medium inlets
    - Regulated medium flow through the insert vessels, e.g. via computer-controlled pumps
    - Static, intermittent or continuous medium supply of the cultures via central individual in- and outlets for each transwell vessel
    - Integrated water heating circuit, controlled by an external water bath
  - Direct exposure of the biological test system
    - Test atmosphere entering the CULTEX<sup>®</sup> RFS module via a central inlet from which three radial tubes guide the atmosphere to the insert vessels for exposure
    - Individual exposure of the three insert positions via separate gas in- and outlets



*Here, the three individual gas inlets can be seen on the underside of the exposure top, fitting exactly into the insert vessels and thus realising a continuous flow of the test atmosphere above the test organisms regulated via flow controllers and a vacuum pump.*



- Homogeneous distribution and deposition of particles on the surface of the test cultures
- Dose-dependent exposure
- Stability and robustness of the system lead to reproducible results
- Measurement of various endpoints
  - Analysis of morphological, biochemical, molecular biological and genetic endpoints
- Direct exposure of monolayer cultures and tissue constructs

#### Optional

- Integration of an electrostatic deposition device for efficient particle deposition without interfering with cell maintenance



## CULTEX® RFS Compact

The CULTEX® RFS Compact combines all the advantages characterising our high-precision CULTEX® RFS while offering a more simplified setup. The CULTEX® RFS Compact is designed to house one size of cell culture insert.

The new modular system consists of two main parts, the aerosol guiding module and the sampling module housing six cell culture inserts.

### Features

- Modular system for six 6.5 mm or 12 mm commercially available cell culture inserts (e.g. COSTAR® and Falcon®)
- Combined exposure to clean air and the test aerosol or to the respective test atmosphere alone



## CULTEX® EDD – Electrical Deposition Device

The CULTEX® Electrical Deposition Device is the perfect addition to the CULTEX® RFS and CULTEX® RFS Compact.

With the knowledge gained from the CULTEX® RFS, we developed a well-engineered electrical deposition device which allows reproducible, controlled and optimised particle deposition. This device offers efficient deposition of particles without interfering with the cell maintenance. It expands the possibilities and the functionality of the CULTEX® Radial Flow Systems and allows higher efficiency in particle deposition especially at lower particle concentrations.



In combination with the CULTEX® Radial Flow Systems the electrical deposition device is applicable for a variety of cell inserts and Petri dishes.

The special design allows easy handling and cleaning and ensures reproducible results even with different aerosols and test substances.

The control unit guarantees smooth operation of the device, avoiding damage to the cells during exposure. The strength of the electric field can be accurately controlled and adjusted.

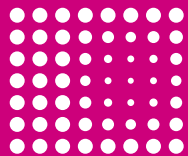
In combination with the CULTEX® DG – Dust Generator, ideal particle exposure can be achieved.

## Features

- Higher deposition rates
- Higher efficiency with less aerosol
- Applicable for 12 mm and 24 mm transwell inserts and Petri dishes
- No damage to cells
- Well designed, easy to handle and to clean
- Ideal integration into the CULTEX® RFS modules and the CULTEX® DG
- Easy to use electronic control unit for electrical deposition







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## CULTEX<sup>®</sup> DG – Dust Generator (acc. to Wright)

The newly developed CULTEX<sup>®</sup> DG – Dust Generator, together with the CULTEX<sup>®</sup> HyP – Hydraulic Press, completes the highly integrated setup for the *in vitro* exposure of particles together with the CULTEX<sup>®</sup> RFS modules.

Especially designed for *in vitro* exposure systems, the CULTEX<sup>®</sup> DG is able to provide uniform airborne concentrations of dust for long periods of time.

The CULTEX<sup>®</sup> DG is completely computer-controlled and allows precise and fully adjustable scraping of the test substance. The rotation speed such as the feed rate of the scraper can be controlled in a wide range by an external computer, connected to the Dust Generators USB socket.

The device is suitable for most dry dusts that can be compressed to dry dust cakes as produced by the CULTEX<sup>®</sup> HyP.

The dispersion of the particles is carried out at the scraper. An Elutriator, integrated into the CULTEX<sup>®</sup> DG, retains bigger particles and serves as a reservoir for a uniform and ideal particle-containing atmosphere, which will be sucked through the CULTEX<sup>®</sup> modules.





## Features

- Uniform airborne concentrations of dust
- Delivery for long periods of time
- Precise computer-controlled scraping
- Suitable for dry dust cakes produced by the CULTEX® HyP
- Dispersion carried out by a high velocity aperture plate
- All components made from inert material
- Operation control via an external computer
- Rotation speed of the scraper is variable from 1 to 800 rotations per hour
- Feed rate 0.24–20 mm per hour



## CULTEX® HyP – Hydraulic Press

The CULTEX® HyP – Hydraulic Press delivers optimally prepared dry dust cakes for the CULTEX® DG.

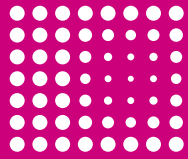
It provides accurate compression of a high variety of powders controlled via an electronic pressure switch.

The security of the operator is always guaranteed with a highly encapsulated system and secure operational process.

The CULTEX® HyP provides stable working conditions for the production of dry dust cakes for reproducible results.

## Features

- Accurate compression of a high variety of powders
- High protection for the operator
- Pressure control via electronic pressure switch
- Pressure from 2 kN to a maximum of 17 kN
- Compressed air from 1.25 bar to a maximum of 6 bar



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## Cultivation Systems

The claims and demands on cell culture systems capturing the complexity of *in vivo* tissue concerning composition and stability in relation to toxicological issues require the provision of reproducible cell populations for studying the toxic profile of substances even with differentiated cells.

The CULTEX® Long-Term Cultivation Continuous (LTC-C) system was specifically designed for the computer-controlled cultivation of cells (up to 24 cell culture inserts, e.g. COSTAR® or Falcon®, size 12 mm) that are grown for weeks on commercial cell culture inserts under ALI conditions.

## CULTEX® LTC-C – Long-Term Cultivation Continuous

The CULTEX® LTC-C was designed to automatically supply cell cultures with medium at different time intervals over long periods of time to avoid staff-dependent variations during the cultivation process. Medium exchange as well as medium agitation and mixing are computer-controlled to guarantee optimal culture conditions.

The equipment consists of the incubator module, which can be operated under cell-specific conditions in a CO<sub>2</sub> incubator and the control unit. Integrated in the control unit, there is a programmable logic controller (PLC) as well as a pump for the supply of medium to the incubator module and a pump for the removal of the medium.

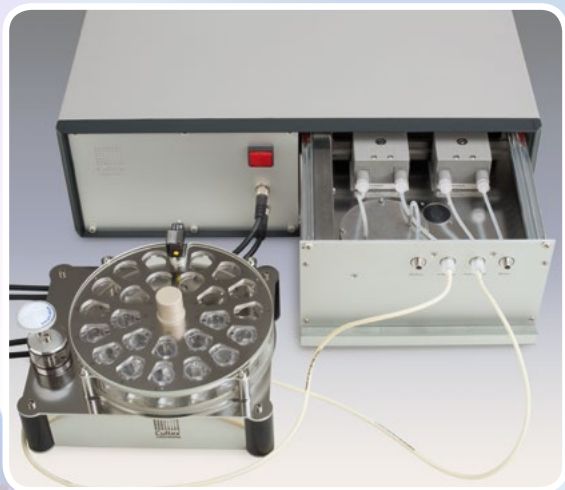
The control unit is equipped with an integrated web server. Visualisation of the procedures and measured data is carried out by a web browser, e.g. via a laptop computer.

The fully automated CULTEX® LTC-C requires less manual input compared with standard cell culture work, saves manpower and removes the individual influence of the worker.



## Features

- Operation of the CULTEX® LTC-C under cell-specific conditions inside a CO<sub>2</sub> incubator
- Control unit outside the CO<sub>2</sub> incubator
- Preheating of the fresh medium by a heat exchanger in the control unit
- Air bubble precipitator
- Computer-controlled medium exchange
- Requires less manual work and saves manpower
- Continuous as well as intermittent medium supply
- Computer-controlled circulation of the medium via a mixing disc
- Control of the medium level by an ultrasonic pulse-echo sensor
- All cell or medium housing components of the system are autoclavable



## CULTEX® LTC-C Rack

An optimal installation of the CULTEX® LTC-C module inside an incubator can be achieved by using the specially designed CULTEX® LTC-C Rack. It takes up to four modules, which can be run in parallel. The construction guarantees a horizontal position of the cultivation unit thus providing comparable medium levels in all culture inserts.

- Moveable platforms for the handling of the CULTEX® LTC-C modules
- Adjustable horizontal orientation of the module inside the incubator
- Four parallel incubator modules controlled by one control unit







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