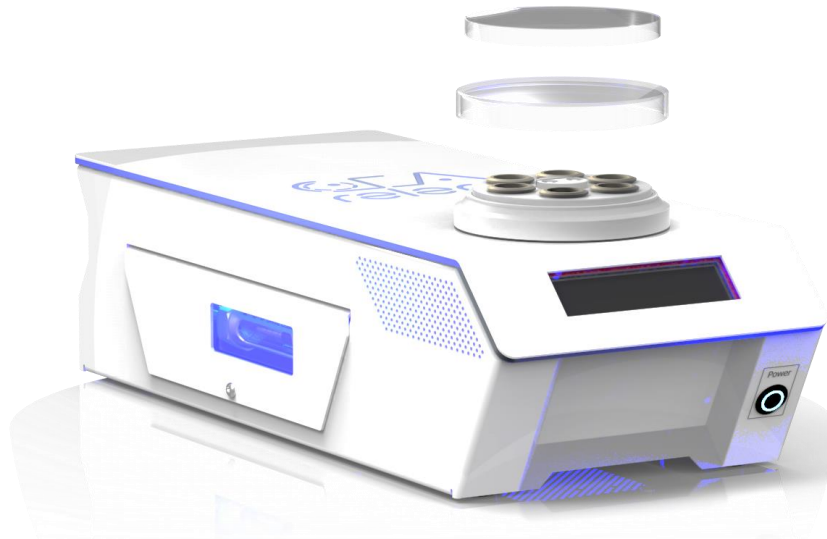


CFA_{refer}- Bench-top auto-analyzer for cell force measurement



The Cell Force Analyzer (*CFA_{refer}*) is a measurement device for cellular mechano-biological studies. It precisely measures mechanical forces (stresses) of eukaryotic cell layers and their changes due to biochemical, pharmacological, or mechanical interventions. The compact device fits on any laboratory bench or under a clean-bench hood. The physical force sensor is an ultra-thin, flexible, and biocompatible PDMS membrane forming the bottom of a cell culture cylinder on which cells are seeded: *The CellDrum™*. In addition to biological applications, CFA_{refer} also enables non-biological material tests as an experimental channel.

Areas of application

- **Pharmaceutical applications** [1,2,3]
Pharmaceutical and biochemical substances, dose-response, kinetic studies, reversibility.
- **Medical research** [4,5,6,7]
Hypertension, Cardiovascular System, Sepsis, Wound healing bioavailability tests with patient's blood plasma.
- **Non-biological material testing** [8]
Curing time detection for adhesives/dyes/sprays, phase transitions of polymers.

Advantages of CFA_{refer}

- Compact and versatile use
- Autoclavable & Sterilizable
- Precisely controlled temperature environment
- Incubator safe components
- Highly reproducible data
- Any adherent cell types can be examined
- Fast measurement
- Automated data analysis
- Designed for six consecutive measurements in one run

Measurement Principle

The CFA_{refer} measures the compliance that is the inverse modulus of elasticity of cultured cell layers in the CellDrum™. Its highly flexible membrane mimics the soft mechanical "environment" of cells in tissues and creates near physiological mechanical conditions for cell growth on it. The CFA_{refer} measures a physically defined mechanical stress in N/m^2 and is therefore independent of the device setup. Thus, it serves as reference method for any other less defined "cell force" system.

Measurements are carried out in a controlled environment at $37^{\circ}\pm 0.2^{\circ}C$. Due to using the soft and μm -thin membrane on which the cell layers adhere and are cultivated, the deflection of the membrane reacts to induced, extremely small cell force changes of the sum of all cells in the layer. After cell culturing and positioning the CellDrums™ in the CFA_{refer} , it performs and analyses these measurements semi-automatically. Media and substance changes are possible at any time.

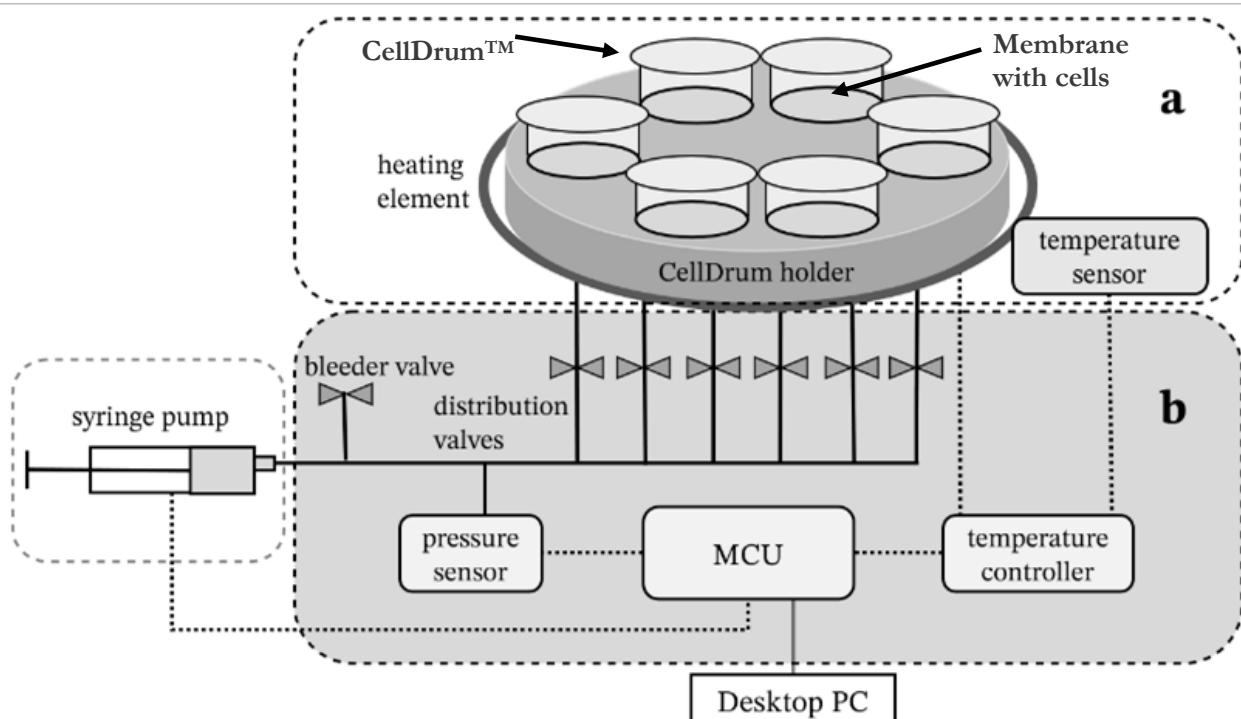
Customer Services

We offer a range of services to provide our customers with the best possible support. These include workshops, training courses and a telephone hotline for CFA_{refer} applications and help you plan experiments.

Contract Services

We also offer chemically pre-functionalized CellDrums™ so that you can apply your own biological coating for optimized cell adhesion depending on the cell type you want to use. Based on our broad experience we offer on your request customizing membranes for you with our various biological pre-coating extra cellular matrix (ECM) formulations.

Depending on your budget, please check the possibility of commissioning our experienced team to carry out your drug studies /experiments for you or simply lease the CFA_{refer} from us at favorable conditions.





User interface

To use CFA_{refer}, the user would need to install the software on a computer to establish connection with the CFA_{refer}, to facilitate the execution of experiments and to monitor those experiments in real-time. Key software modules are:

Section 1: Measurement

Section 2: Setup Measurements

Section 3: Post-data processing

In **section one**, the user must enter crucial information as experiment title, substances, concentrations, medium type, medium volume, and cell type as well as membrane thickness. Without this input the measurement will not start. Users also have the option to include additional commentary on samples.

To prevent measurements from being accidentally started when entries are still incomplete, the user must check the "Setup complete" box and activate each channel that is eligible for measurement. After completing these steps, the measurement can be started.

In **section two**, the measurements are carried out. The experimenter can follow the process on the screen at the same time (see Figure). This way, any errors occurring during a measurement can be detected in a timely manner.

In the event of an obvious error, the user can interrupt the measurement and cancel it. After a successful measurement, all data is saved manually. There is the option of saving or exporting a comprehensive report with both raw data and graphics for further processing.

In **section three**, the stored results can be visualized, filtered and further processed.

Technical Data

Cell culture media volume: 6 x 500 μ l

Culture surface area: 6 x 200 mm^2

Pressure range: -125 to +125 Pa

Output value: Sample Compliance (Pa^{-1})
Tension (Pa), Strain (%), E-Modulus (Pa)

Zero-point accuracy (sensor): 0.08 Pa

Accuracy: 3% of measured value
typically $\pm 2.9\text{kPa}$

(tension)

Measurement time (6 CellDrums™): 190 s

Calibration: automatic

Temperature: 30 bis 40°C (+/- 0,2 °C)

Dimensions (HxWxD): 140x185x435 mm

Weight (with shock-absorbing base) 7.1 kg

Contact:

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