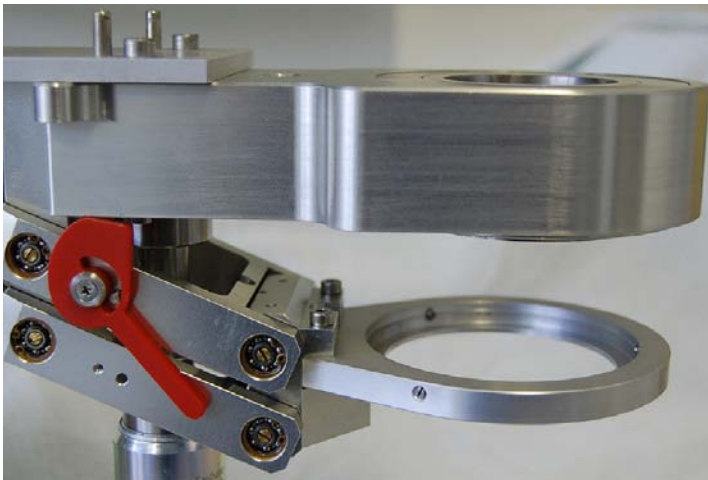


## BioTech-Flow-System (BTF-System)

The innovative, user friendly, highly precise, and flexible advanced rheological system (cone-plate-system) to solve rheological issues in the fields of live sciences, engeneering and fluid mechanics

### individual BTF



### „Top ten“ advantages

- 1. Generation of highly precise shear stress profiles:**  
e.g. used as calibration tool in fluid-dynamics; shear stress regulation from 0 to about 100 dyn/cm<sup>2</sup>
- 2. Free adjustable flow profiles:**  
provides regulated constant, pulsatile, oscillatory, and free adjustable flow profiles
- 3. Easy to handle setup for lifelong use**
- 4. Customer specific setups:**  
single BTF-units, multi channel setups, combined with or without control unit and/or software and/or impedance spectroscopy, usable also in BSL 4 labs

- 5. Transparency:**  
Online observation of the investigated system, e.g. living cells
- 6. Long-term experiments with continuous medium exchange**
- 7. Computer-regulated bioreactor:**  
flexible software for easy data navigation, classification, and image acquisition to allow time-resolved image analyses
- 8. Multi channel setup:**  
Investigations of manipulated and control cells of the same passage at different levels of shear stress within the same period of time
- 9. Electrophysiological measurements (impedance spectroscopy):**  
Barrier function of sheet forming cell layers (e.g. TER: transcellular electrical resistance of epithelial or endothelial cells)
- 10. Sealed chambers for cell culture**  
(e.g. infections, hypoxia)

### Accessories

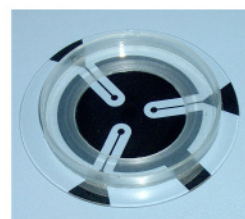
**Cone unit:**  
cone with cone retainer



**Culture dish**



**Sample chamber:**  
Culture dish with sample cup seal fitting diameter of plate: 65 mm



**MOS cell culture plate for impedance spectroscopy**

Special electrode material for optimized culture conditions and measurements

# Applications

## Biomedicine

- **Morphodynamics of cells under flow**  
e.g. cell motility, degree of orientation (alignment), cell elongation
- **Transcellular electrical resistance (TER) in sheet forming cell layers under flow**  
e.g. impedance spectroscopy as a electrical biosensor usable for examinations of intercellular adhesion in endothelial cells quantifying the integrity of the cell layer and the tightness of cell-cell contacts
- **Cytopathic effects of viral infections**  
(e.g. infections of the endothelium)
- **Wound healing scratch assay under flow**
- **Toxicology and drug screening**  
of biological active substances like pharmaceuticals, toxins, or chemicals. Cellular dysfunction can be uncovered and quantified under shear stress conditions, whereas their effects are often not observable under resting conditions

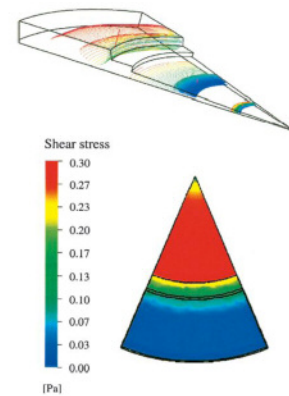
## Biomaterials

- **Characterization of biomaterials by analyses of cell motility, cell alignment and cell detachment under mechanical shear stress**
- **Measurement of protein adsorption kinetics (e.g. relevant to biomaterials) by Total Internal Reflection Fluorescence TIRF-Rheometer** (H.P. Jennissen, Essen)

## Aero- and Fluidynamics

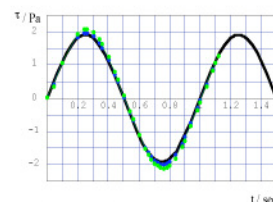
- **Calibration of MPS<sup>3</sup> (Micro Pillar Shear Stress Sensor) in nano- and microfluid dynamics**  
(S. Große, C. Brücker, W. Schröder, ACCESS e.V. Aachen)

## Highly precise flow profiles

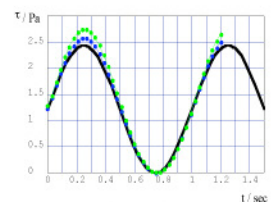


Well defined, homogenous flow profile in the ring area where the cells are cultured (red)

Oscillating flow



Pulsating flow



Comparison of tangential wall shear-stress component computed numerically and results from the analytical approach  
curve: analytical approach  
points: numerical simulation

4 channel BTF system



Prototype of BTF4 system, customer specific setup