

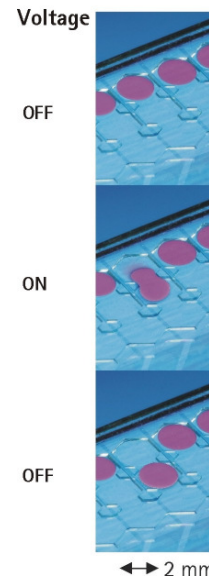
Application Note

Digital Microfluidics – Flexibility for micro liquid handling

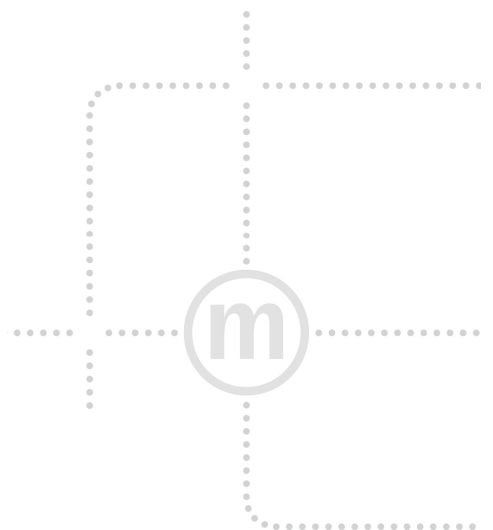
Bringing novel technologies into medical applications, the microEngineering division from Bartels Mikrotechnik offers development support and product innovation through microtechnology. The direct control of fluid operations offered by digital microfluidics is a key driver for the future development of microfluidic diagnostic systems.

Portable point-of-care testing systems are based on the secure handling of micro to nanoliter reaction volumes and parallel sample processing. In digital microfluidics small droplets can be flexibly manipulated electrically under software control to perform even the most complex liquid handling routines. Highly complex microfluidic systems can be designed in a compact, easy to use and highly flexible manner. Valves, pumps or microstructured surfaces are not required when this unique technology is applied.

The phenomenon behind 'digital microfluidics' is electrowetting. The wetting behavior of a droplet in contact with an insulated electrode is altered when an electrical field is applied. If the electrical field is applied non-uniformly a surface energy gradient is created which can be used to manipulate - transport - a droplet. The droplet can be moved from one electrode position to another with frequencies up to 200 Hz. Depending on the electrode design this allows free movement of a droplet under full control. Even a number of droplets can be controlled independently or in parallel. Next to pure



Electrowetting: A droplet is moved from one position to another when voltage is applied.



transportation routines merging, mixing and splitting of droplets as well as droplet generation is possible. Therefore the routines required in lab-on-a-chip operation can be realized highly flexible. It is even possible to configure assay routines according to the needs via programmable electrode control.

Typical technical data:

System type	bistable movement of droplets, either in an open or closed (covered) system
Fluids	liquid/liquid or liquid/gas
System architecture	2D or 3D; rigid or flexible
Functionality	droplet generation, moving, merging, mixing and splitting of droplets
Droplet size	10 μ m – 0.3 μ m
Droplet speed	0.3 Hz – 200 Hz
Operation voltage	typ. 15-50 VAC
Actuation modes	single droplet, multiple droplets simultaneous or multiple droplets separately

