

Press Release

Bartels Mikrotechnik at ComPaMED 2006, **Hall 8 – Booth E20**

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Micropumps – the new potential for medical devices

Small and cost-effective systems for versatile applications

The standard pumps used in common medical devices are big in size and cost. The precision is achieved by exact working motors which drive a piston of a syringe or squeeze a tube for the movement of a fluid. Due to the electromechanical technology, the driving elements need a lot of space to built in and electrical power. A power-plug or big batteries are necessary to drive those pumps. In addition their setup is complex which makes the systems expensive and therefore not applicable for some products.

Bartels Mikrotechnik offers micropumps fully made of plastics, which makes the system as cheap as a cup of coffee in a restaurant – in high series production. Its setup is very straight forward: A piezoelectric membrane is deflecting and moves a fluid volume. Passive check valves rectify the fluid into one direction. Due to its design it is possible to pump liquids as well as gases.

Due to the broad dynamics of the micropump (viscosity water: 50 nl/min up to 5 ml/min; for gases: 50 µl/min up to 15 ml/min) many different media can be moved to be processed, analyzed or delivered. The lightweight micropump (0,8 g) fits into mobile systems and offers the patient or operator convenience and easy handling. It is particle tolerant up to 50 µm particle diameter.

The size is one of the biggest advantages together with the low power consumption. It can be battery-powered and runs for days without changing the energy source. Put two 1€Cent-coins on top of each other and you will roughly get the size of the micropump. That makes the system applicable for autarkic systems which have to be portable.

Due to the cost-structure this micropump can be used in disposable devices. This way contamination or spreading of bacteria is avoided. Once the pump



Small, portable disposable micropump with broad flow dynamics.



Functional principle of piezomembrane pump.

Press Release

was used for a patient it is thrown away together with the reservoir.
Electronics can be reused.

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Ideas for applications are numerous:

Insulin can be carried together with the pump inside a small container. A coin cell drives the small system. The size of the whole drug delivery system could for example be just one by three inches including the reservoir.

A mobile air monitoring system which includes a sensor to detect the properties of ambient air and a micropump which continuously delivers samples to the sensor. This system can be used to obtain occupational health safety in dangerous environments.

Blood samples can be moved to sensors to be analyzed within point-of-care devices. After usage the contaminated system can be discarded.

It has to be kept in mind that every application has its own specification requirements. In case the requirements are not fulfilled from the start, the micropump can be seen as basis for a perfect start to a customized system.

To control the micropump different approaches are possible. To use the micropump as an autarkic system a special electronics including batteries are used. For the connection to the PC a USB-stick drives the micropump and is controlled by software. With the extended control box, one has access to all parameters which define the performance of the pump. All electronic controls are available as evaluation kits. After the application specific parameters have been defined this can easily be transferred to a compact electronics module or custom IC.

About Bartels Mikrotechnik

Bartels Mikrotechnik is providing innovative technologies and product solutions spanning various branches from its MEMS background. Next to the technological know-how, the long time experience in micro systems technology and the powerful affiliate network, the combination of MEMS solutions centre, excimer

Press Release

laser jobshop and own products defines the unique selling proposition of Bartels Mikrotechnik GmbH.

At the ComPaMED in Düsseldorf the creative competence of the company and innovation potential of micro systems technology is presented through customer specific microfluidic products and own products as micropump and microvalves.

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Logical Establishment of a Micropump Family

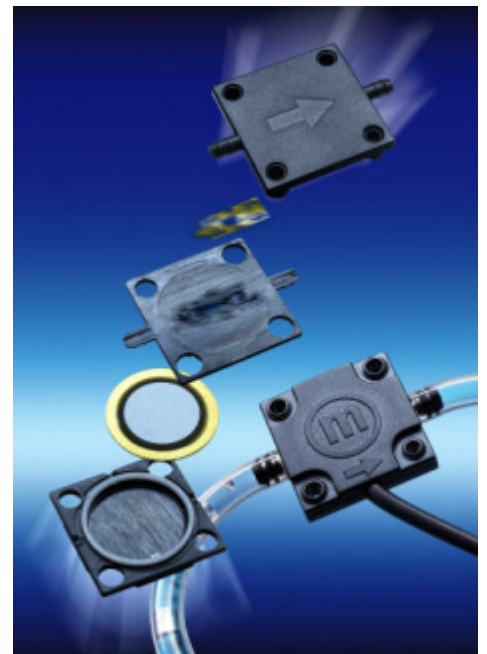
The striking characteristics of the micropump that Bartels Mikrotechnik first presented in 2004 are its tiny dimensions, its high pumping dynamics, and its capability for pumping gases and liquids. Developed as a low-cost product for the mass market, the logical further development is now following in the form of the adaptation for the application-specific requirements of the market. The first version of the micropump laid the foundation stone for the establishment of a family of products and for marketing to a wide variety of industries. So far, two patents have been applied for to protect the product and three more applications are being prepared in connection with the additions to the product family.

Next to development work on a stroke-limited pump for high through-put precision and low flow rates, a cascaded system consisting of more than one pump was set-up in order to achieve higher flow rates and/or to avoid pulsation. Further focus lies in the design and realisation of a controlled-loop system for medical applications.

Because of its tiny dimensions, the cost structure and low power consumption, the pump is of great interest for portable systems and/or as disposable.

Especially in the area of medical technology many potential applications can be identified. In drug delivery systems or as active component in diagnostic point-of-care applications or in combination with a sensor for air quality control for asthmatics or at working environment are just few examples.

The most important requirements for micropumps in this context are not only low power consumption but also, and in particular, counter-pressure stability, caused by the position at the patients site and pressure differentials resulting from the operating temperature of the system and the level of fill in the reservoir, as well as from the requirements for rates of flow specific to the application. In order to exercise control over the necessary streams of fluid,



Small but smart: Serial produced micropumps like this one offer flow rates of 50 nl/min to 5ml/min. Produced in high volumes, it becomes absolute low in price and is due to this predestinated for disposable use.

Source: Bartels Mikrotechnik GmbH

Press Release

Bartels Mikrotechnik is currently developing a coupled system consisting of a pump with an integral valve.

The active valve will be presented at the *ComPaMED* as a stand-alone component. The valve is designed along the same lines as the pump, with the aim of ensuring that the later system is identical in its lateral dimensions and thus only differs in height. The micro-valve is likewise available to potential customers as a stand-alone component and as a further element in the micro-assembly kit of fluidic components based on polymers.

Furthermore Bartels Mikrotechnik is at the moment working on the realisation concept of a controlled-loop system in order to achieve the requested flow accuracy for medical applications. The micropump coupled with a flow sensor and an intelligent electronic allows full control of the delivered volume. By this the field of application for the pump can be explicitly widened.

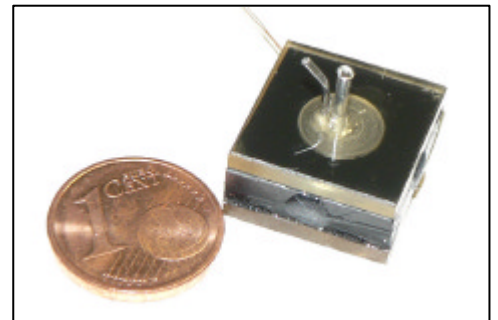
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Small and smart: Active micro valve
The first prototypes will be presented at
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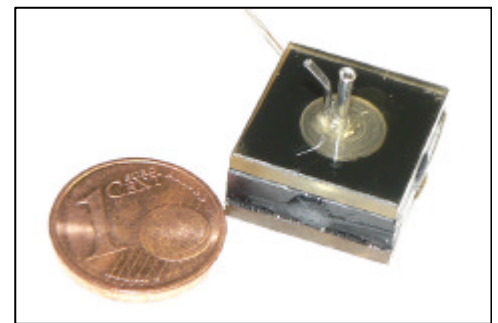
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Extended Portfolio of Microfluidic Components

The product portfolio of microfluidic components by Bartels Mikrotechnik is extended by an active micro valve next to the so far existing passive dynamic micro check valve and piezo membrane pump. At ComPaMED fair the first prototype will be presented.

The functional principle is based, as the micropump, on a piezo membrane. Otherwise the set-up is made of plastic to be able to produce in series at low-price. The valve is normally closed and closing pressures of 0,5 bar are achieved. The valve can be operated stand-alone or modular in combination with the micropump. After an iteration phase the transfer into serial production is aimed for 2007.



Small and smart: Active micro valve
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