

Application Note

Active Sensor Feeding with Micropumps

Together with the request for higher safety and efficiency in industrial processes, the use of sensors increases continuously.

To generate stable and defined measurement values in these processes, the environmental conditions of the sensor need to be kept at a constant level. This especially applies to feeding the sensor with an analyte fluid. Besides a faster response to changing analyte properties, a lowered target concentration at the point of measurement can be balanced as applied for catalytic sensors for example.

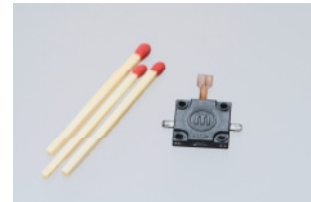
As because of these reasons various sensors can not be used with completely passive feeding, micropumps from Bartels Mikrotechnik open up new fields of application. Due to their simple setup, they can be produced at a low cost level and with their particle tolerance they prove performance under real conditions.

With its small dimensions, the pump can either be used as a subassembly together with the sensor or as an OEM component to be integrated into a more complex unit. Especially for portable instruments, where miniaturization plays an important role, the low energy consumption comes into play. Battery operation can be easily realized. Dependent on the customers need the driving electronics can be either integrated into the main PCB of the unit or even inside an enlarged pump housing.

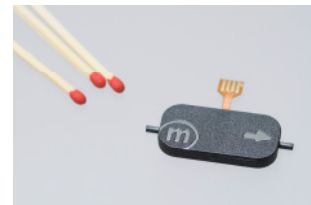
The use of an inert polymer in combination with an optimized placement of the pump inside the system enables operation also under difficult conditions.

The micropumps mp5 and mp6 can provide a maximum flow rate of 6 ml/min with liquids and 21 ml/min with gases. By using the available evaluation kits, the pump performance can be tested in the target application and the driving parameters can be defined.

In a customer application, the pump has been used to monitor a mixture of hydrogen, oxygen and nitrogen gas. Using a bypass channel, gas was extracted for analysis and fed to the sensor. Dur-



Micropump mp5



Micropump mp6



Subassembly combining sensor and micropump for flange mounting

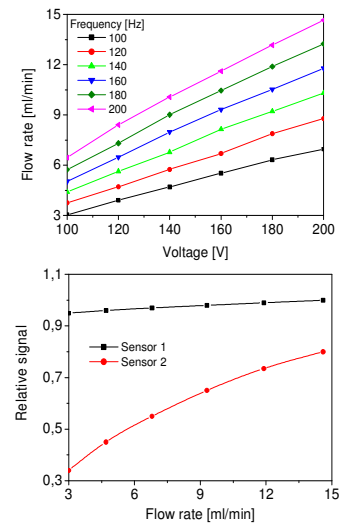


ing the system evaluation of the pump, characteristic flow rates in dependence on driving voltage and frequency have been determined, as shown in the first graph.

The second graph shows the dependency between the relative sensor signal and the gas flow. On the one hand this shows the signal improvement with active sensor feeding, on the other hand the need to provide a stable flow rate throughout the measurement.

As a compromise between extracted gas volume and sensor sensitivity, a flow rate of 7ml/min was chosen for the final system. Together with this, the driving parameters of the pump are defined, which provides the basis for a customer specific, low power micro-pump driver.

Besides standard components, Bartels microComponents is specialized in the development of application specific pumps and system integration.



Measurement values and diagrams provided by Dr. J. Zosel, KSI Meinsberg

General Specifications	mp5*	mp6*
type	piezoelectric diaphragm pump	
pump medium	liquids or gases	liquids, gases and mixtures
outer dimensions (without fluidic connectors)	14 x 14 x 3.5 mm ³	30 x 15 x 3.8 mm ³
fluidic connectors	tube clips, 2 mm outer diameter	tube clips, 1.6 mm outer diameter
operating temperature	0 – 70 °C	
life time	> 5000 h ²	
materials in contact with media	PPSU/PI/NBR	PPSU
max. flow, water ¹	5 ml/min (100 Hz)	6 ml/min (100 Hz)
max. pressure, water ¹	250 mbar (100Hz)	550 mbar (100 Hz)
max. flow, air ¹	15 ml/min (300 Hz)	On request.
max. pressure, air ¹	30 mbar (300 Hz)	On request.

* Typical values. Values can vary under application conditions. Content is subject to changes without notice.

¹ Values taken with electronic controller mp-x set to 250 V amplitude, SRS signal

² Conditions: DI water, room temperature, settings mp-x: 100 Hz, 250 V, SRS.

Typical Characteristics:

