



You are interested in
the world's smallest micropumps
with piezo actuators?

Find out how to
get the optimal components.
Start with system integration
in just a few steps.

This document provides first information about pumps and different control modules. It also gives a short overview of controller specifications.

The mp6 micropump series is designed for the controlled handling of fluids and gases with variable flow rates. They require a non-symmetric signal which is exactly matched with the operation of the pump. To cover a large range of possible applications we developed several control units.

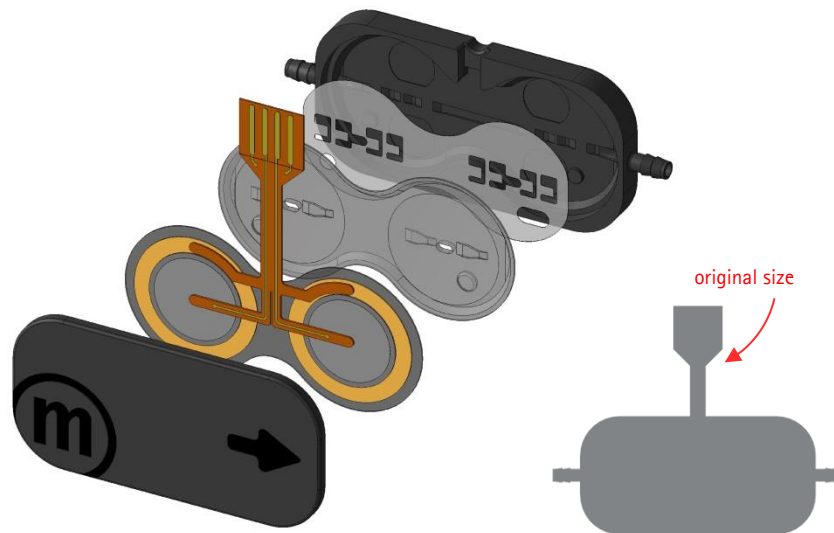
In case a component does not match your requirements please contact us so we can work together to fix your problem. Our competent team has a lot of experience in development and production to push your ideas to new levels.



The micropumps mp6 / mp6-AIR / mp6-AIR-HP / mp6-pi / mp6-pp:

The pumps are miniaturized versions of double diaphragm pumps. Each pump has two piezo actuators. Because of the small size and energy saving construction the production of high numbers is very cost-efficient.

Due to the production material and the variable flow rates the pumps are usable in many applications. The mp6 is a good choice for pumping liquids, while the mp6-AIR and the mp6-AIR-HP is used for gases. The mp6-pp and the mp6-pi offer more liquid media compatibility.



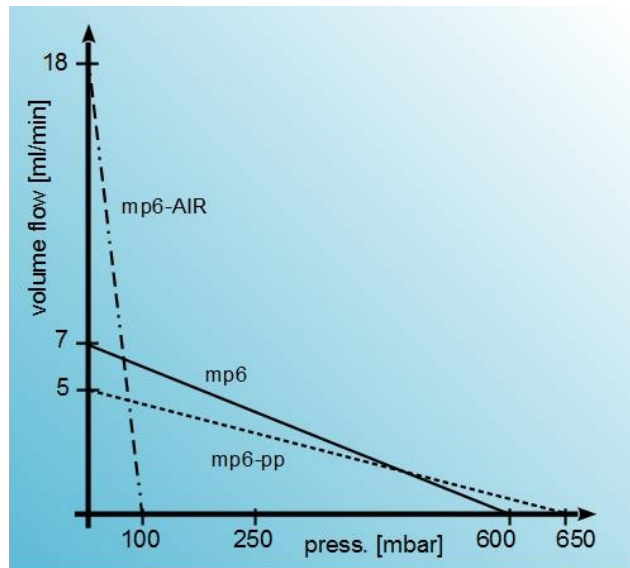
mp6, Exploded view

Dimensions in xyz = 30 mm x 15 mm x 3.8 mm (1.1811" x 0.5905" x 0.1496")

For all of the pumps the following rule applies:

The flow rates of the pumps are linearly dependent on the backpressure. At 0 mbar backpressure they achieve the maximum flow rate, at maximum backpressure the flow rate decreases to 0 ml/min.





Flow rate vs. pressure of the mp6, mp6-pp and mp6-AIR

The micropumps are offered as single units or together with evaluation sets. With the sets you are able to gather specific knowledge about the combination of our micropumps with your application and to reduce time and costs for a possible integration task. Together with the different control electronics you have a powerful platform to choose from.



The mp-x controller:

Driving the micropump with the **mp-x** allows you to gather comprehensive results in short time. You will also be able to consider the sometimes complex interaction of micro- and macrofluidics with direct measurements of your system right from the beginning. Furthermore you will also be able to conclude about how to integrate the micropump into any of your systems.



mp-x

Dimensions in xyz = 157 mm x 200 mm x 75 mm (6.1811" x 7.8740" x 2.9527")

For that purpose you can connect the **mp-x** via USB-port with a PC, manually control it with the NI-LabView interface and turn it into a fully automatized control. Experiments with systems in which pressure-, flow- or other -sensors gather additional data are easily achievable. You can start with basic LabView routines that we implemented already for you.

Independent of the NI-LabView develop environment you can choose every other computer language that can handle the communication with an emulated serial interface.

One big advantage of the **mp-x** controller is the possibility to set the whole range and combinations of all parameters:

Frequency: 1 – 300 Hz

Amplitude: 1 – 250 Vpp; asymmetric

Three different wave forms:

Sine; asymmetric

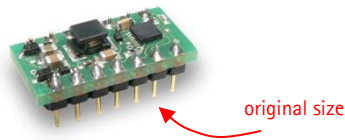
Rectangular; asymmetric

SRS; asymmetric, a compromise between performance and low noise



The mp6-OEM controller:

This controller IC is designed for the integration of the pump into a small space. The compact design allows a broad variety of application fields. Due to the optimized energy consumption it is possible to create unplugged systems. Battery operation allows mobile applications.



mp6-OEM

Dimensions in xyz = 21 mm x 11 mm x 6mm (0.8267" x 0.4330" x 0.2362") without socket pins

Please note that the **mp6-OEM** is not equipped with the same performance range of the **mp-x**.

The setting range of the parameter is limited:

Frequency: 25 – 226 Hz (other frequencies are available with additional external components)

Amplitude: 85 – 270 Vpp; asymmetric

Before May 2014: mp6-OEM have an amplitude range of 85 – 235 Vpp

Wave form: similar to rectangular; asymmetric

The wave form cannot be changed. Alteration of the frequency is possible for a certain range with external components, thus also with an external signal source like a microcontroller.



The mp6-EVA evaluation board:

In case you want to start without creating your own circuitry, we sell a special evaluation board, called mp6-EVA.



mp6-EVA incl. OEM circuit

Dimensions in xyz = 65.5 mm x 30 mm x 16 mm (2.5787" x 1.1811" x 0.6299") without jumper

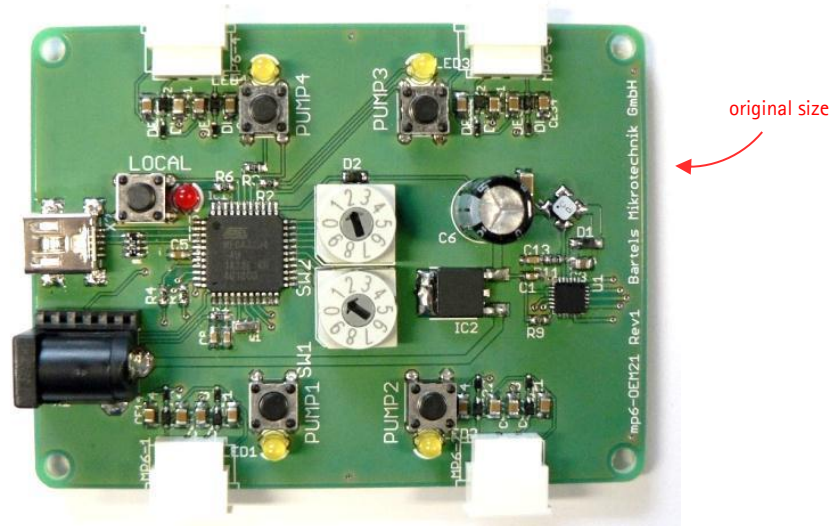
This board has the mp6-OEM already installed. Plugging this board into a PC allows you to start your tests instantly. The USB-port serves here only as a power source and not as a communication interface.

Amplitude changes are possible with the installed potentiometer. Further changes to frequency and amplitude are possible with the existing jumpers.



The mp6-QuadEVA evaluation board:

An alternative to the [mp6-EVA](#) is the [mp6-QuadEVA](#). It allows to control up to four micropumps for gas pumping, i.e. four pieces of [mp6-AIR](#) or [mp6-AIR-HP](#) micropumps. Nevertheless it is also possible to pump liquids, either with the [mp6-pp](#), [mp6-pi](#) or the standard [mp6](#) pump; though the higher frequencies will then not result in a performance boost.



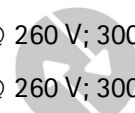
mp6-QuadEVA

Dimensions in xyz = 80 mm x 60 mm x 16 mm (3.15" x 2.36" x 0.63")

This board is not based on the [mp6-OEM](#) due to the high frequency signal generation. A DC power supply is required. The USB-port allows using some special software to control all four pumps together or separately. This software comes is available with the evaluation board. However, the USB port is not required to operate the board.

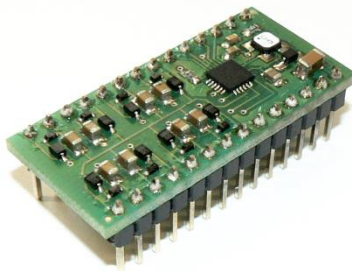
Some performance data when using the [mp6-QuadEVA](#):

- Maximal volume flow of a single [mp6](#): ~6.2 ml/min @ 260 V; 100 Hz
- Maximal pressure of a single [mp6](#): ~570 mbar @ 260 V; 100 Hz
- Minimal air volume flow of a single [mp6-AIR](#): ~20 ml/min @ 260 V; 300 Hz
- Minimal air pressure of a single [mp6-AIR](#): ~112 mbar @ 260 V; 300 Hz
- Minimal air pressure of a single [mp6-AIR-HP](#): ~150 mbar @ 260 V; 300 Hz
- Minimal air volume flow of a single [mp6-AIR](#): ~42 ml/min @ 260 V; 800 Hz
- Minimal air pressure of a single [mp6-AIR](#): ~147 mbar @ 260 V; 800 Hz



The mp6-QuadOEM controller:

An alternative to the mp6-OEM is the mp6-QuadOEM. It allows to control up to four micropumps for gas pumping, i.e. four pieces of mp6-AIR or the mp6-AIR-HP micropumps. Nevertheless it is also possible to pump liquids, either with the mp6-pp, mp6-pi or the standard mp6 pump; though the higher frequencies will then not result in a performance boost.



mp6-QuadOEM

Dimensions in xyz = 38 mm x 18 mm x 12 mm (1.50" x 0.71" x 0.47")

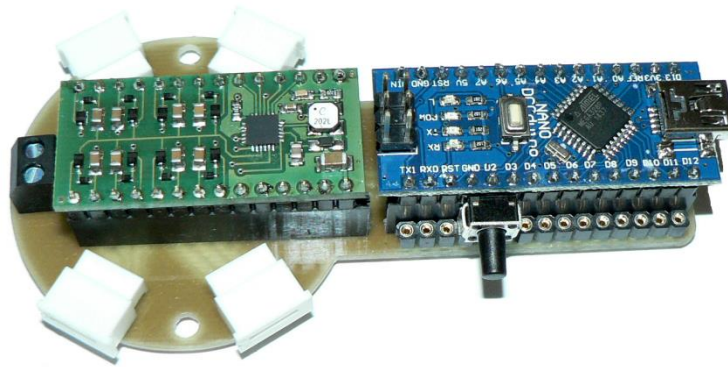
The mp6-QuadOEM comes in a package similar to an integrated circuit that enables integration into system electronics or on a PCB. The driving frequency, amplitude and also the driving signal is adjustable. Sine signal and rectangle are available amongst others. Every pump can be activated and deactivated individually. This driver is configured and controlled through an I²C interface.

Some performance data when using the mp6-QuadOEM:

- Maximal volume flow of a single mp6: ~6.2 ml/min @ 260 V; 100 Hz
- Maximal pressure of a single mp6: ~570 mbar @ 260 V; 100 Hz
- Minimal air volume flow of a single mp6-AIR: ~20 ml/min @ 260 V; 300 Hz
- Minimal air pressure of a single mp6-AIR: ~112 mbar @ 260 V; 300 Hz
- Minimal air pressure of a single mp6-AIR-HP: ~150 mbar @ 260 V; 300 Hz
- Minimal air volume flow of a single mp6-AIR: ~42 ml/min @ 260 V; 800 Hz
- Minimal air pressure of a single mp6-AIR: ~147 mbar @ 260 V; 800 Hz

The mp6-QuadKEY evaluation board:

The mp6-QuadKEY is an evaluation board that allows controlling the mp6-QuadOEM through an Arduino Nano or pin compatible microcontroller.



mp6-QuadKEY

Dimensions in xyz = 92 mm x 46 mm x 23 mm (3.62" x 1.81" x 0.91")

Up to four micropumps can be directly connected to the board. An external power supply terminal is available, but the board can also be powered through the microcontroller USB port. All of the microcontroller port pins are exposed for easy access (to connect external hardware). The mp6-QuadKEY comes with a demo software and source code.

Some performance data when using the mp6-QuadKEY:

- Maximal volume flow of a single mp6: ~6.2 ml/min @ 260 V; 100 Hz
- Maximal pressure of a single mp6: ~570 mbar @ 260 V; 100 Hz
- Minimal air volume flow of a single mp6-AIR: ~20 ml/min @ 260 V; 300 Hz
- Minimal air pressure of a single mp6-AIR: ~112 mbar @ 260 V; 300 Hz
- Minimal air pressure of a single mp6-AIR-HP: ~150 mbar @ 260 V; 300 Hz
- Minimal air volume flow of a single mp6-AIR: ~42 ml/min @ 260 V; 800 Hz
- Minimal air pressure of a single mp6-AIR: ~147 mbar @ 260 V; 800 Hz



A demonstration video of the evaluation kit [mp6-GO!](#) along with further information about our products can be seen on our „bartels-mikrotechnik“ homepage.

www.bartels-mikrotechnik.de

Although you have some possibilities to evaluate the application of the micropump with our controller solutions, it is impossible to cover all applications and media types. These will definitely induce different performance conditions to the pump. Therefore it is imaginable that some of these conditions will make it hard to achieve the desired pump performance in the evaluation process.

However, this does not mean that your application is not accomplishable. The simple functional principle of the piezo membrane pump and the controller allows adapting to your requirements. If you need a higher flow or pressure generation, a higher flow precision or other materials, we would be happy to discuss your application and adapt the micropump to your specific needs.

Please look over the information and feel free to contact us to discuss your questions on the pump or on the evaluation kits.

