# Bartels Micropumps

Micropumps transporting the tiniest amounts of gases or liquids can be considered the heart of microfluidics.

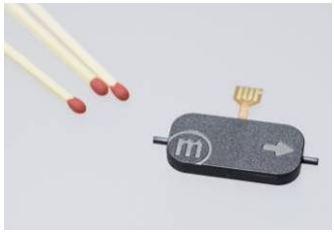
In many sectors they have become indispensable. Dosing lubricants, feeding sensors with sample gas or mixing starch into the steam of flat irons are only a few of the manifold tasks they can fulfill. Many further fields of application for example are located in medical technologies and analytics.

Extremely small in size and low in weight, with good particle tolerance and temperature resistance, Bartels micropumps are well prepared to be used in any of these sectors. As they are almost completely made of plastics, large quantities of these pumps can be produced at low cost and may well be used as disposables.

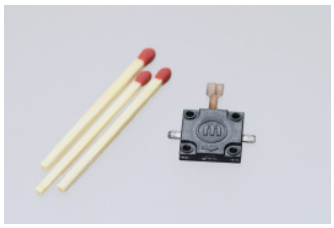
The functional principle of the Bartels micropumps is based on a piezoelectric diaphragm in combination with passive check valves. A piezo ceramic mounted on a coated brass membrane is deformed when voltage is applied. By the resulting down stroke, the medium is being displaced out of the pump chamber below. The check valves on both sides of the pump chamber define the flow direction. When the voltage decreases, the piezos correspondent deformation causes an upstroke of the membrane. The medium is sucked in and the chamber is filled again. In every second, the pump can do several hundreds of such pumping cycles. The pumping performance can be influenced by adjustment of the parameters.

Important advantages for all users result from the radically simple pump design: Injection molded parts for housing and pump chamber, piezo actuators and passive valves constitute the key components. Thus any adaptation to specific requirements concerning flow rate or back pressure is easy to realize. This customization of micropumps and the correspondent electronic controllers is part of the services offered by Bartels microComponents. If requested, the pumps can be fully integrated into complex system designs as well.

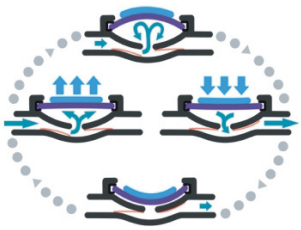
Once the perfect pump for your application has been found, you may purchase an exclusive production license for this version to include the component into your own production processes. Of course Bartels microComponents can also realize a high quality serial production for you at low cost.



mp6 – the small power pack.



mp5 – small, smart and low in price.



Functional principle.



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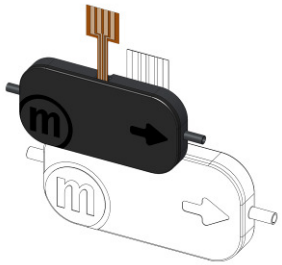
### mp6 Micropump

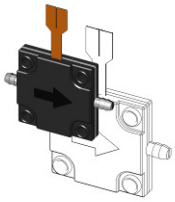


The Bartels micropump mp6 combines two piezo actuators inside a single housing. The new pump joins the established functional principle and central advantages of its parent generation mp5 with its own specific innovative features.

The small power pack can handle twice the back pressure the mp5 can cope with, has an increased priming capability and is of higher bubble tolerance, so that even gas-liquid-mixtures can be pumped without problems.

In the entire pump only one material gets into contact with the medium: all relevant parts are made of PPSU. Low prices in large quantities due to an automated assembly and low power consumption are further advantages of the mp6.

### mp5 Micropump

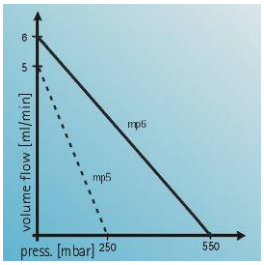


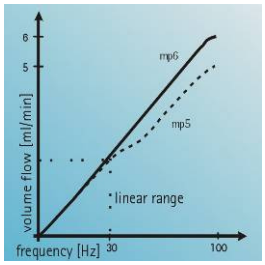
The mp5 from Bartels microComponents is the smallest and lightest micropump available.

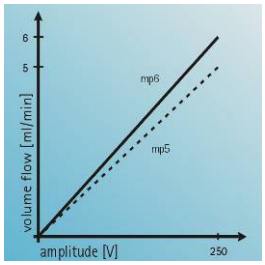
Since 2004 the mp5 has successfully shown the potential of piezo membrane pumps. Due to the limited bubble tolerance and higher price in medium quantities, it is now replaced by its successor the mp6 in many applications. If size is a challenging factor, then the mp5 is still the right choice.

Its low power consumption and tiny size makes the mp5 the perfect pump to be fully integrated into your product's design. Test the mp5 now and ask about the possibilities of a customer specific adaptation - for your individual micropump.

### Typical characteristics of the Bartels micropumps:



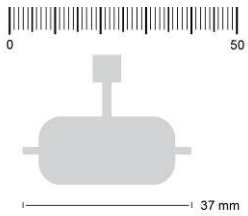



**Technical Data of the mp6** [1]

| mp6 | | | Order code: mp6 |
|---|---|---|---|
| Pump type | | | piezoelectric diaphragm pump |
| Number of actuators | | | 2 |
| Dimensions without connectors | | | 30 x 15 x 3.8 mm³ |
| Weight | | | 2 g |
| Fluidic connectors | | | tube clip (outer diameter 1.6 mm, length 3.5 mm) |
| Electric connector | | | flex connector / Molex FCC 1.25 mm pitch |
| Power consumption | | | < 200 mW |
| Self-priming | | | yes [2] |
| Pumping media | | | liquids, gases and mixtures |
| Operating temperature | | | 0 – 70°C |
| Life time | | | 5000 h [3] |
| IP code | | | IP33 [4] |
| Materials in contact with media | | | polyphenylene sulphone (PPSU) |
| Suitable evaluation controller | | | mp-x and mp6-OEM |
| Typical values of flow and back pressure for selected media (values defined with mp-x: 250 V, SRS): | | | |
| Gases | | Max. flow | 18 ml/min (300 Hz) |
| | | Max. back pressure | 100 mbar (300 Hz) |
| | | | |
| Liquids | Water | Max. flow | 6 ml/min +/- 15% (100 Hz) |
| | | Max. back pressure | 550 mbar +/- 15% (100 Hz) |

[1] Typical values. Values can vary under application conditions. Content is subject to changes without notice.
[2] Conditions: suction pressure < 10 mbar, DI water, settings mp-x: 100 Hz, 250 V, SRS, the max. flow rate will be reached after a few minutes of operation time.
[3] Conditions: DI water, room temperature, settings mp-x: 100 Hz, 250 V, SRS.
[4] Can be changed to IP44.




Please find more information concerning the controller and the equipment in the corresponding data sheets.



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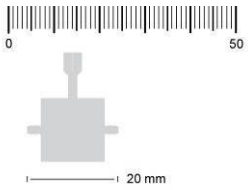
## Technical Data of the mp5[1]

| mp5 | | | Order code: mp5 |
|---|---|---|---|
| Pump type | | | piezoelectric diaphragm pump |
| Number of actuators | | | 1 |
| Dimensions without connectors | | | 14 x 14 x 3.5 mm³ |
| Weight | | | 0.8 g |
| Fluidic connectors | | | tube clip (outer diameter 2 mm, length 3 mm) |
| Electric connector | | | flex connector / phone jack |
| Power consumption | | | < 200 mW |
| Self-priming | | | yes [2] |
| Pumping media | | | liquids or gases |
| Operating temperature | | | 0 – 70°C |
| Life time | | | 5000 h [3] |
| IP code | | | IP44 |
| Materials in contact with media | | | polyphenylene sulphone (PPSU), polyimide (PI), nitrile butadiene rubber (NBR) |
| Suitable evaluation controller | | | mp-x and mp5-a |
| Typical values of flow and back pressure for selected media (values defined with mp-x: 250 V, SRS): | | | |
| Gases | | Max. flow | 15 ml/min (300 Hz) |
| | | Linear range | 0 - 5 ml/min @ 0 – 50 Hz |
| | | Max. back pressure | 30 mbar (300 Hz) |
| | | | |
| Liquids | Water | Max. flow | 5 ml/min (100 Hz) |
| | | Linear range | 0 – 3 ml/min @ 0 – 30 Hz |
| | | Max. back pressure | 250 mbar (100 Hz) |
| | | | |
| Repeatability (30 Hz, 250 V, SRS) | | | < 12 % |
| Viscosity | | | <~ 120 mPas |




[1] Typical values. Values can vary under application conditions. Content is subject to changes without notice.
[2] Conditions: suction pressure < 10 mbar, DI water, settings mp-x: 100 Hz, 250 V, SRS, the max. flow rate can be reached by manual priming.
[3] Conditions: DI water, room temperature, settings mp-x: 100 Hz, 250 V, SRS.

Please find more information concerning the controller and the equipment in the corresponding data sheets.



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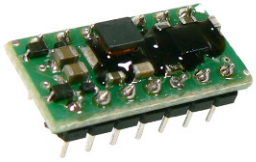
# Equipment for the Bartels Micropumps

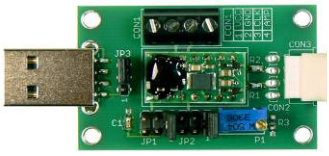
| **mp-x controller** | Order code: mp-x |
|---|---|
| Access to the full range of driving parameters. A system for the professional evaluation of the micropumps mp5 or mp6. | |
| Dimensions | approx. 7.5 x 16 x 20 cm³ |
| Pumping media | liquids or gases |
| Adjustable parameters | amplitude/frequency/signal form |
| Amplitude range | 0 - 250 V |
| Frequency range | 0 – 300 Hz |
| Signal form | sine, rectangular, SRS |
| Power supply | mains adaptor |
| Current consumption | 500 mA at 7.5V |
| Max. flow rate for water (typ.) | 6 ml/min (DI-water, SRS, 250 V, 100 Hz) |
| USB-Port incl. Driver | setting parameters via the PC of the user |
| Pump connectors | for 1 - 2 mp5 or one mp6 |

mp-x



mp6-OEM

| **mp6-OEM controller** | Order code: mp6-OEM |
|---|---|
| The controller drives the mp6 at adjustable performance in a package similar to an integrated circuit. It enables integration of a small pump driver into the system electronics or on a PCB. | |
| Dimensions | 1.05 x 2.05 x 0.90 cm³ |
| Pumping media | liquids or gases |
| Adjustable parameters | amplitude / frequency |
| Amplitude range | 100 – 235 V |
| Frequency | 25 – 120 Hz |
| Signal form | similar to rectangular |
| Power supply | 2.5 V– 5 V DC |
| Current consumption | approx. 40 mA at 3 V |
| Max. flow rate for water (typ.) | 4.5 ml/min |



mp6-EVA

| **mp6-EVA evaluation board** | Order code: mp6-EVA |
|---|---|
| The evaluation board enables the simple use of the mp6-OEM controller. Next to preset standard parameter (235 Vpp, 100 Hz) the mp6-EVA also allows to adjust the pump parameters, partly by external tuning. As the supply voltage of the module can be provided via USB (no data interface), just attach it to a USB power supply and start the evaluation. Alternatively it can also be supplied by a 2.5 – 5 V voltage source. | |
| Dimensions | 6.5 x 3 x 2 cm³ |
| Pumping media | liquids or gases |
| Adjustable parameters | amplitude / frequency |
| Amplitude range | 100 – 235 V |
| Frequency | 25 – 120 Hz |
| Signal form | similar to rectangular |
| Power supply | USB; 2.5 V– 5 V DC |
| Current consumption | approx. 40 mA at 3 V |
| Max. flow rate for water (typ.) | 4.5 ml/min |



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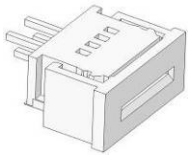
| **mp6-con connection cable** | Order code: mp6-con |
|---|---|
| Connector for mp6 to mp-x | |
| Molex FCC 1.25 mm pitch, 85 cm cable, Binder 620 connector | |

mp6-con

| **mp6-mol connector** | Order code: mp6-mol |
|---|---|
| Connector to micropump mp6, for custom made cabling | |
| Molex FCC 39532045<br>1.25 mm pitch<br>1 packaging unit = 10 pieces | |

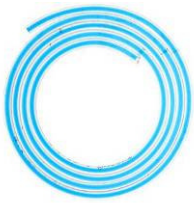


mp6-mol

| **mp-cv check valve** | Order code: mp-cv |
|---|---|
| The passive check valve eliminates the back flow of the pumping medium, when the micropump is switched off. It can be connected via tubing. | |
| Dimensions | 21 mm x 5.5 mm (length x span width) |
| Materials in contact with the pumped media | silicone, stainless steel |
| Fluidic connectors | tube clip<br>inner diameter: 1.6 mm<br>length: 5.6 mm |
| Cracking pressure | typical < 35 mbar |
| Max. back pressure | 500 mbar |
| Typical leak rate | < 20 µl/h for liquids (500 mbar) |

mp-cv

| **mp-t tubing** | Order code: mp-t |
|---|---|
| Inlet/outlet compatible Tygon® tubing | |
| Inner diameter | 1.3 mm |



mp-t

| **mp-y tubing connector** | Order code: mp-y |
|---|---|
| Y-connector for tubing, for the parallel use of two micropumps: | |
| Material | poly propylene (PP) |
| for tubing diameters of | 1.3 – 2.6 mm |

mp-y



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**Sets:**

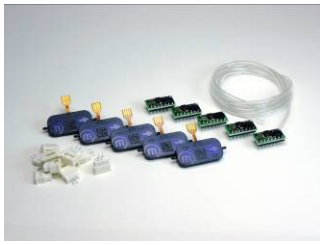
| **mp5-go! Set** | Order code: mp5-go! |
|---|---|
| The evaluation of the mp5 can be started directly with this set. It contains: | |
| 3 micropumps mp5 | |
| 1 mp-x controller | |
| 1 meter mp-t tubing | |

mp6-go! Set

| **mp6-go! Set** | Order code: mp6-go! |
|---|---|
| The evaluation of the mp6 can be started directly with this set. It contains: | |
| 3 micropumps mp6 | |
| 1 mp-x controller including connection cable for 1 mp6 | |
| 1 meter mp-t tubing | |

mp6-basic Set

| **mp6-basic Set** | Order code: mp6-basic |
|---|---|
| The evaluation of the mp6 can be started directly with this set. It contains: | |
| 3 micropumps mp6 | |
| 1 mp6-EVA evaluation board | |
| 1 meter mp-t tubing | |



mp6-pro Set

| **mp6-pro Set** | Order code: mp6-pro |
|---|---|
| The evaluation of the mp6 can be started directly on the customer's circuit board with this set. It contains: | |
| 5 micropumps mp6 | |
| 5 mp6-OEM controller | |
| 1 mp6-mol connector | |
| 1 meter mp-t tubing | |

The offered equipment is meant to assist your evaluation process. After the feasibility of the micropump in the customer specific application is proved, an adequate miniaturization of the controller and the equipment can be carried out. The design of a customer specific controller is part of the services offered by Bartels microComponents.

Please contact us, if we can support you in choosing the suitable equipment.



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