

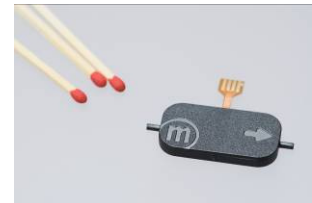
Application Note

Micropumps for nebulizers

In the field of medical devices, inhalators are used for nebulization of liquid drugs to treat pulmonary diseases. To make the medical treatment more comfortable and give more independency to the patient, portable nebulizers are gaining popularity. In comparison to stationary devices for clinical use, characteristics like orientation independence, size, weight and energy consumption play an important role. In addition especially for devices that are not used by qualified personnel only it is important to automatize procedures like the removal of residual fluid from the device.

While the nebulization itself is normally carried out by an ultrasonic transducer, the reliable fluid supply to this unit needs to be ensured. In most of the devices, the fluidic setup allows self priming and passive supply of liquid to the ultrasonic device. Unfortunately, this results in orientation dependence and limits the design and especially the location and arrangement of the fluid reservoir. These drawbacks can be abolished by introducing an active fluid supply to the nebulizer. Due to its small size of 30x15x3,8 mm³ and the low weight of only 2 gramms, the micropump mp6 can fulfill these requirements ideally. With its low energy consumption, the period of operation stays almost unaffected compared to a device with passive fluid supply. At maximum flow, the pump can be driven up to 60 hours continuously from 2 AA batteries for example.

With flow rates of up to 6 ml/min using aqueous media, the pumps exhibits a maximum flow rate that is well above the nebulization rates that are normally achieved in portable inhalation devices. At the same time, the maximum backpressure of 550 mbar (8 psi) minimizes the orientation dependence of the unit which results in simpler and safer functionality. The ingenious but robust and simple design of the mp6 micropump has only one polymeric material in contact with the fluid. In addition, the used material polyphenylensufone (PPSU) is certified in accordance to major medical standards.



Micro pump mp6



Portable inhalator

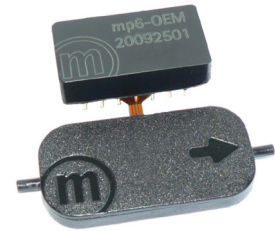


Inside the inhalator, the pump is either connected directly to the nebulization unit or via an intermediate reservoir. In the first case, the nebulizer is continuously supplied with fluid as long as the medical treatment is carried out. In the second case, the reservoir is completely filled by the pump and then emptied due to the nebulization process. Although this setup is more complex fixed volumes are delivered. In addition, as the intermediate reservoir is emptied during the spraying process no residual fluid is remaining on the backside of the atomizer.

The driving electronics for the pump can be assembled together with the electronics of the ultrasonic transducer on a single PCB. Therefore cost and space are minimized. A reference design of the driver that can be licensed for implementation in the customers products is available. Normally it is designed to be driven from voltages between 3 V and 5,5 V. Dependent on individual requirements the flow rate of the micro pump can be adjusted by minor changes to the driving circuit.

The available standard product mp6 enables product innovation of next generation nebulizers in short timeframes. Due to the automatized serial production, the pump is available in quantity.

In case the standard micropumps are not able to fully cover the applications need, Bartels microComponents offers to develop tailor-made micropumps, system integration and the development of application specific controllers.



mp6-OEM driver in size comparison to the mp6 micropump

General Specifications	mp6*
Type	Piezoelectric diaphragm pump
Pump medium	Liquids, gases and mixtures
Outer Dimensions (without fluidic connectors)	30 x 15 x 3,8 mm ³
Fluidic connectors	Tube clips, 1,6 mm outer diameter
Operating temperature	0 - 70 °C
Life time	> 5000 h ²
Material in contact with media	PPSU
Power consumption	< 200mW (at 3 V)
Max. flow, water ¹	6 ml/min +/- 15% (100 Hz)
Max. pressure, water ¹	550 mbar +/- 15% (100 Hz)

* Typical values. Values can vary under application conditions. Contact is subject to change without notice.

¹ Values takes with electronic controller mp-x set to 250V amplitude, SRS Signal

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

