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TechNote

Controller Overview

This TechNote describes the differences between the available micropump controllers.

For laboratory applications, there is the extended micropump control mp-x. It is able to drive one micropump mp6, mp6-pp or mp6-AIR or two micropumps mp5 with different driving signals, the full range of amplitude and frequency manipulation and has an USB interface.

For quick starting with the micropumps, the evaluation boards mp6-EVA and mp6-QuadEVA offer easy to use controller hardware. The mp6-QuadKEY offers even more flexibility via an Arduino board.

For integration purposes in mobile devices, in devices of small construction sizes and generally onto PCBs of any kind, the OEM driver chips mp6-OEM and mp6-QuadOEM were designed to offer most of the functionality required to drive the micropumps.

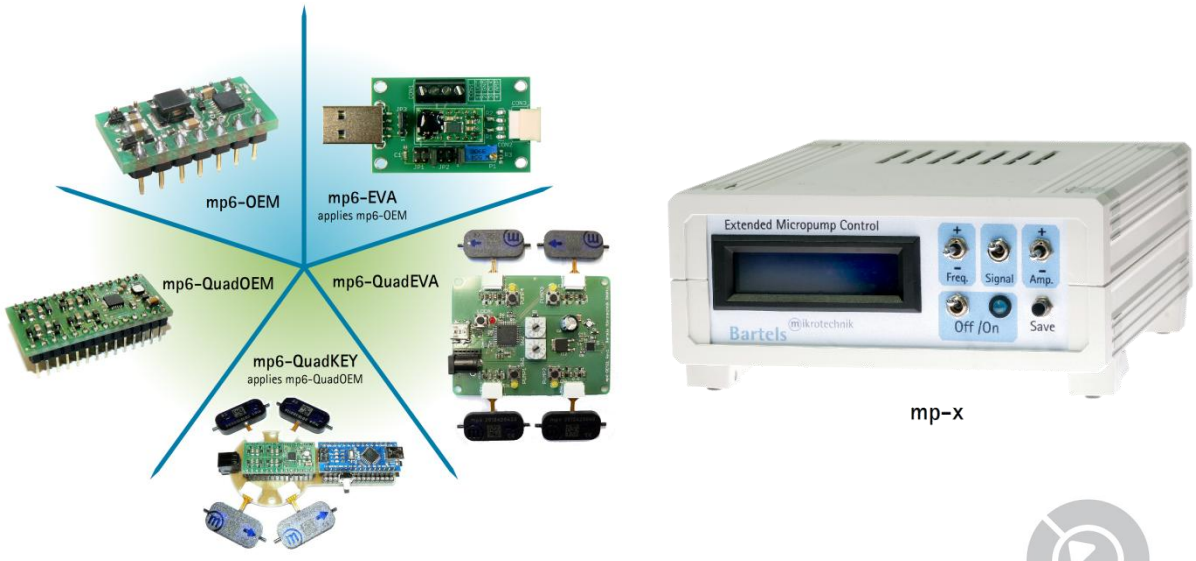

Figure 1 Micropump controllers.

Left: Different driver chips and evaluation boards for standard mp6-OEM and Quad-series

Right: Lab electronic mp-x.

The Quad-series is especially designed driving the micropumps for pumping gases. Although the other controllers are also able to do this, they have a frequency limit of about 300 Hz. The Quad-series allows frequencies up to 800 Hz. With higher frequencies, it is possible to achieve more volume flow and more pressure when pumping gases with the micropump mp6-AIR.

Nevertheless, it is also possible to pump liquids, either with mp6-AIR, mp6-pp or the standard mp6 pump, but the higher frequencies will not result in a performance boost.
Another feature is that the Quad-series can drive up to four mp6 pumps.

Overview	mp-x	mp6-OEM	mp6-EVA	mp6-QuadEVA	mp6-QuadOEM	mp6-QuadKEY
type	stand-alone lab electronic	driver chip	evaluation board for the mp6-OEM, driver chip detachable	evaluation board based on the mp6-QuadOEM	driver chip	evaluation board for the mp6-QuadOEM, driver chip detachable
pumps to connect	1 [1]	1	1	1 - 4	1 - 4	1 - 4
amplitude control	1 – 250 V	80 – 270 V	80 - 270 V	0 - 260 V same for all	0 - 260 V individual	0 - 260 V individual
frequency	1 – 300 Hz	typ. 25 - 225 Hz max. 300 Hz [2]	typ. 25 - 225 Hz max. 300 Hz [2]	50 - 800 Hz	50 - 800 Hz	50 - 800 Hz
signal	sine, rectangular, SRS	similar to rectangular	similar to rectangular	sine	sine, rectangular, other	sine, rectangular, other
adjustable parameters	amplitude, frequency, signal	amplitude, frequency, slew rate (signal)	amplitude, frequency	amplitude, frequency, active pump(s)	amplitude, frequency, signal shapes, active pump(s)	amplitude, frequency, signal shapes active pump(s),
power supply	external	via PCB	USB or external	external	via PCB	USB or external
minimal additional components necessary	everything included in set	connectors, PCB	everything included in set	everything included in set	µC, connectors, PCB	everything included in set
interface for parameter adjustments	on board controls or USB	passive components, DC voltage or PWM	passive components, DC voltage or PWM	on board controls or USB	I²C	open source (Arduino) via USB
supplementary	driver software	-	-	MS Windows application	-	-

[1] The mp-x can drive one mp6 (mp6-pp or mp6-AIR) or two mp5.
[2] Frequency increased with external components, see Operating Manual, chapter 6.6.2.

Water performance	mp-x	mp6-OEM	mp6-EVA	mp6-QuadEVA	mp6-QuadOEM	mp6-QuadKEY
mp6, max amplitude @100 Hz						
flow rate per pump	7 ml/min	7 ml/min	7 ml/min	6.2 ml/min [3]	6.2 ml/min [3]	6.2 ml/min [3]
pressure per pump	600 mbar	600 mbar	600 mbar	570 mbar [3]	570 mbar [3]	570 mbar [3]

[3] Measured with sine signal. Rectangular signal will exceed these values and create more noise.

Gas performance	mp-x	mp6-OEM	mp6-EVA	mp6-QuadEVA	mp6-QuadOEM	mp6-QuadKEY
mp6-AIR, max amplitude @300 Hz						
flow rate per pump	20 ml/min	11 ml/min	11 ml/min	18 ml/min [3]	18 ml/min [3]	18 ml/min [3]
pressure per pump	100 mbar	50 mbar	50 mbar	112 mbar [3]	112 mbar [3]	112 mbar [3]
mp6-AIR, max amplitude @800 Hz						
flow rate per pump	-	-	-	42 ml/min [3]	42 ml/min [3]	42 ml/min [3]
pressure per pump	-	-	-	147 mbar [3]	147 mbar [3]	147 mbar [3]

[3] Measured with sine signal. Rectangular signal will exceed these values and create more noise.

Current consumption		mp-x	mp6-OEM	mp6-EVA	mp6-QuadEVA	mp6-QuadOEM	mp6-QuadKEY [4]
max amplitude, 5 V power supply							
for 1 pump	@100 Hz	750 mA @ 7.5 V	30 mA	30 mA	60 mA	30 mA	50 mA
	@300 Hz		30 mA	30 mA	90 mA	70 mA	90 mA
for 4 pumps	@100 Hz	-	-	-	130 mA	80 mA	100 mA
	@800 Hz	-	-	-	220 mA	190 mA	220 mA

[4] mp6-QuadKEY is supplied with 7.5 VDC. Current consumption of micro-controller is included.

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