

microComponents<sup>m</sup>

# Operating Manual for Controller mp-x



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## General

This operating manual contains all necessary instructions for the installation, commissioning, operation and maintenance of the controller mp-x. The manual is intended to help you achieving optimal results in a short time and shall assist avoiding possible sources of errors. The operating manual of the micropumps and other controllers are available separately.

The products have been designed with state-of-the-art technology and in accordance with all relevant safety regulations. However, a risk of damage to the units, other property, the operator and/or other persons cannot be fully excluded.

Always ensure that specialized and trained personnel will comply with the following general instructions.

Therefore, please keep this manual and hand out copies as required.

Bartels Mikrotechnik GmbH rejects any responsibility for damages to persons or property resulting from non-compliance with the instructions in this manual. In this case all warranties shall be void.

### Declaration of conformity

Bartels Mikrotechnik GmbH declares that the products are compliant to the RoHS directive 2011/65/EU. The controller comply with the requirements of EMV 2014/30/EU and CE markings have been affixed to the devices. Additionally, the controllers are also compliant to the EU Low Voltage Directive 2014/35/EU.

### Description of functions

The micropumps have been developed for the transport of gases or liquids. The controllers have been developed for operating the micropumps. Bartels Mikrotechnik can assume no liability for damages resulting from the pump media. This applies especially for hazardous fluids.

The pumps must be operated with Bartels Mikrotechnik electronics. Bartels Mikrotechnik GmbH cannot guarantee the proper work of the units with customer specific electronics. If other controllers than the ones from Bartels Mikrotechnik are used, Bartels Mikrotechnik disclaims any warranty.

Moreover, please note that components of the controller and pump are operating with high-voltage. Therefore, persons wearing pacemakers are recommended to avoid the operating system.

Bartels Mikrotechnik assumes no liability for abnormal handling, improper or negligent use of the micropump and the controller that is not conform to the specified purpose of the system. This applies especially for micropump controllers, components and systems of other manufacturers, which have not been certified by Bartels Mikrotechnik.

We guarantee that the micropumps comply with the actual state of scientific and technical knowledge and due to this, the operational risks are limited to a minimum.



Do not open the housing of the micropump and the controllers. In those cases, Bartels Mikrotechnik cannot issue a guaranty anymore. Please keep this manual safe and give a copy to all users.



## Proper use

### Intended purpose

The micropump is intended for pumping liquids or gases with varying flow rates controlled by the electronics. The controllers are intended for operating the micropumps. Any other use of the micropump or controller unit is deemed improper.

Do not make any modifications or extensions to the pump or controller without the prior written consent of the manufacturer. Such modifications may impair the safety of the unit and are prohibited! Bartels Mikrotechnik GmbH rejects any responsibility for damage to the unit caused by unauthorized modifications to the pump and risk and liability are automatically transferred to the operator.

### Misuse

The use of liquids, which may alone or in combination create explosive or otherwise health-endangering conditions (including vapors) is not permitted.

### Staff selection and qualification

All work in connection with the installation, assembly, commissioning/decommissioning, disassembly, operation, servicing, cleaning and repairing of the pump and the controller must be carried out by qualified, suitably trained and instructed personnel. Work on electrical components and assemblies must be carried out by personnel with the necessary qualifications and skills.

### About this operating manual

Warnings and important notes are clearly identified as such in the text. The relevant text sections feature a specific sign. However, this icon cannot replace the safety instructions. Therefore, carefully read all safety instructions in this manual. Warnings and important notes in this text are highlighted as shown below, according to the severity of the damage that might result from non-compliance.

 **DANGER**

**DANGER INDICATES A HAZARD WITH A HIGH LEVEL OF RISK THAT, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.**

## The mp-x controller

Technical specifications mp-x controller

mp-x controller

Order code: mp-x

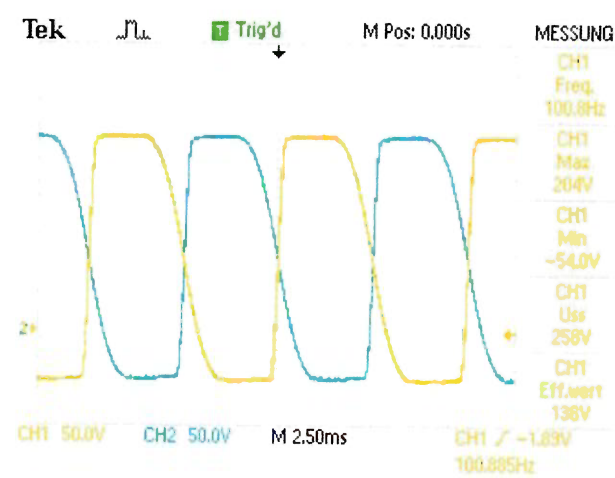
Access to the full range of driving parameters. A system for the professional evaluation of the micropumps.

Dimensions	7.5 x 16 x 20 cm 2.983 x 6.299 x 7.874 in.
Weight	ca. 800 g
Adjustable parameters	amplitude, frequency, signal form
Amplitude range	0 – 250 V
Frequency range	0 – 300 Hz
Signal form	SRS, rectangular, sine
Power supply	mains adaptor
Current consumption	750 mA at 7.5 V
USB-Port	one
connectable micropumps	mp6-hyb, mp6-gas, mp6-gas+, mp6-pi, mp6-pp: 1x



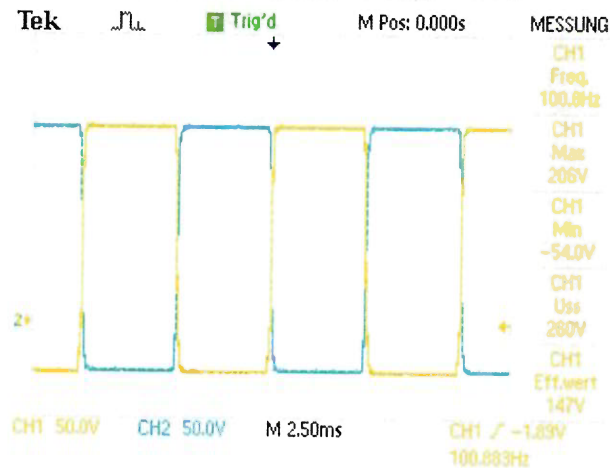
Electrical signal form

SRS



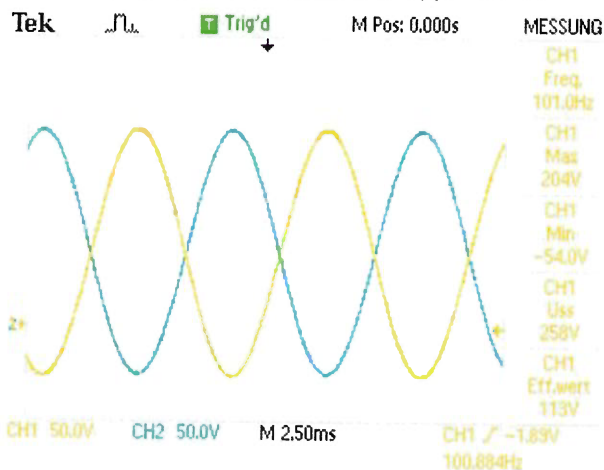
mp-x; SRS-signal; 250 Vpp; 100 Hz

Rectangular



mp-x; rectangle signal; 250 Vpp; 100 Hz

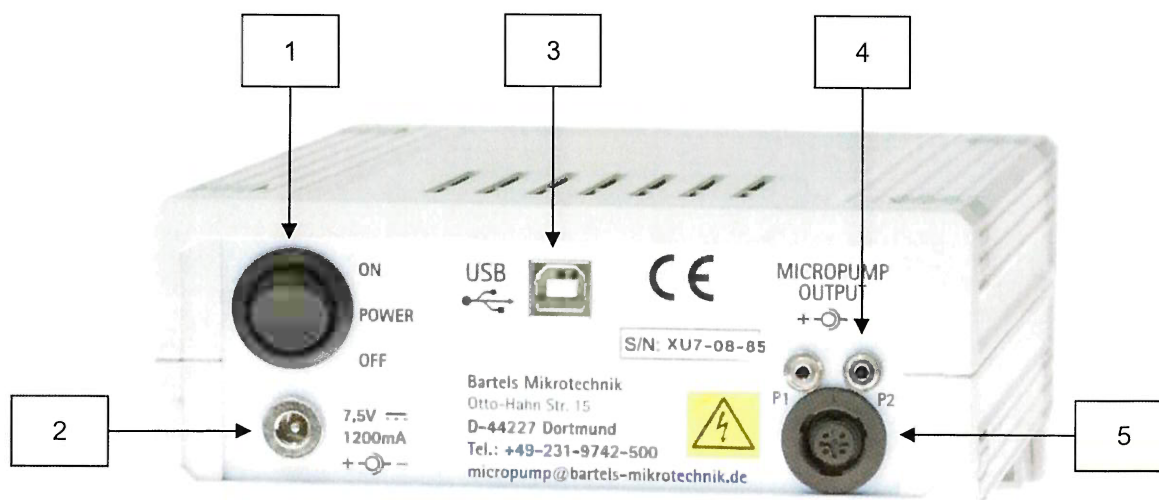
Sine



mp-x; sine signal; 250 Vpp; 100 Hz



Connecting the pump to the mp-x



- 1 Main power switch
- 2 Power supply connector
- 3 USB interface for computer connection
- 4 Connections port for one or two mp5
- 5 Connection port for one micropumps of the mp6-series

**Please note** that it is only possible to connect either one micropump of the mp6-series or a maximum of two mp5 to the mp-x, otherwise a maximum voltage drop is possible!

- Step 1:** Plug the micropump control cable into the corresponding micropump connector.
- Step 2:** Check the mains adaptor plug polarity. It is pictured next to the power supply connector at the back of the controller. If the plug polarity is wrong, the controller cannot work.  
Please make sure that the setting on the included connector is attuned to 7.5 V.
- Step 3:** Connect the mains adaptor with the power supply connection.
- Step 4:** Plug the mains adaptor into a mains socket.
- Step 5:** Now you can start the control unit with the main power switch.

 **DANGER**

**THE "MICROPUMP OUT" CONNECTOR CAN CARRY HIGH VOLTAGE!**  
**PLUG IN THE MICROPUMP CONTROL CABLE ONLY WHEN THE MP-X CONTROLLER IS SWITCHED OFF!**

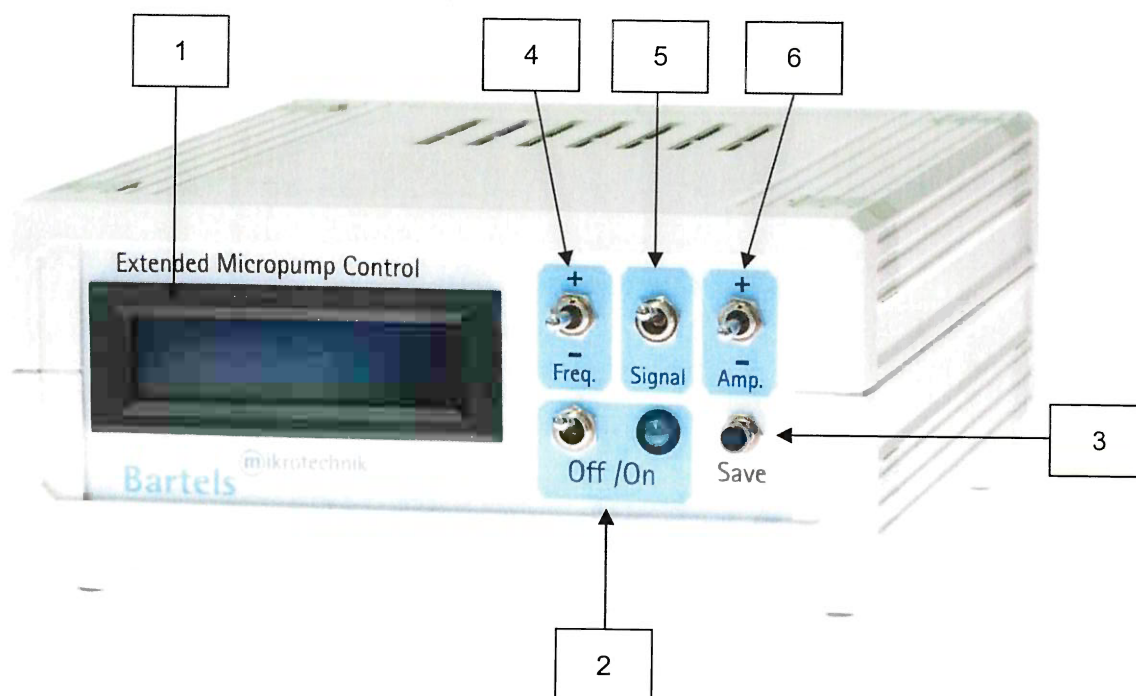


## Operation of the mp-x

The mp-x provides three parameters to be selected independently of each other to control the micropumps:

- Frequency
- Amplitude
- Signal form

It is possible to change the settings while the pump is operating. However, to extend the lifetime it is advisable to turn off the micropump first before changing the settings.



- 1 LCD Display
- 2 **On/Off-switch:** Push the on/off switch to turn the pump and control diode on or off.
- 3 **Save:** Push the save switch to save the present settings.
- 4 **Freq.:** Push the switch up to raise and down to reduce the frequency.
- 5 **Signal:** Push the switch once to changes between SRS, rectangular or sine.
- 6 **Amp.:** Push the switch up to raise and down to reduce the amplitude.

To operate the micropump, prepare the controller as described in point 0 and follow the steps below:

- Step 1:** Choose a frequency by pushing the frequency switch up and down.
- Step 2:** Choose one of the signal forms by pushing the signal switch.
- Step 3:** Set the amplitude by pushing the amplitude switch up and down.
- Step 4:** Push the on/off switch to turn on the micropump and the control diode.
- Step 5:** Push the on/off switch again and the micropump will stop while the control diode turns off.

The Save-switch will store the current settings.

For shutdown of the controller please switch off the mp-x first and then the main power-switch on the backside of the controller. Then disconnect the power plug. Do not unplug the micropump before switching off the controller.

Installation of the drivers "USB Micropump Control" and "USB Serial Port"

In order to control the mp-x with a computer, a driver needs to be installed. The installation is done in two steps. First, the USB driver is installed. Second, the driver for the mp-x itself is installed which can be used as a serial interface from different software packages.

For "Windows XP" and former Windows versions

- Step 1:** Connect the control unit with the USB port and turn it on. A message appears that new hardware was found and the hardware assistant starts automatically. Please click "Next" to continue.
- Step 2:** Choose "Find a suitable driver for the device" and click "Next" to continue.
- Step 3:** Place the CD into the disc drive.
- Step 4:** Choose "Search for the best driver in these locations" and tag "Include this location in the search". Then browse and select the CD.
- Step 5:** When the software has found the driver named "USB Micropump Control" select "Next". The installation will start now. If the message appears that the Windows Logo Test was not successful, please select "Continue Anyway" as this has no relevance in this case. Click "Finish" to complete the installation.
- Step 6:** After that installation, the hardware assistant pops up again for the serial port. Repeat the steps 1-5.

For "Windows 7"

Dependent on the individual system settings, different steps for installation might be necessary. The procedure applies in general also for Windows Vista.



- Step 1: Log in with administrator rights.
- Step 2: Connect the control unit with the USB port and turn it on. A message appears that new hardware was found.
- Step 3: Open the device manager and double click the item "USB Micropump control" filed under "additional hardware" (or similar). In the pop up window click on "update driver" and select the directory including the driver files (e.g. the cd rom drive). It needs to be confirmed that the driver should really be installed as it has no digital signature.
- Step 4: Repeat the steps 2 and 3 for the serial port. Starting with step 2 again, a device named "USB serial port" will be listed. The drivers need to be installed as described above.
- Step 5: The device manager will show the number of the serial port (e.g. COM 4). Note this for further use of the device with application programs.

#### For "Windows 8"

- Step 1: Log in with administrator rights.
- Step 2: From the Metro Start Screen, open Settings (move your mouse to the bottom-right-corner of the screen and wait for the pop-out bar to appear, then click the Gear icon).
- Step 3: Click "More PC Settings".
- Step 4: Click "General".
- Step 5: Scroll down, and click 'Restart now' under "Advanced startup".
- Step 6: Click "Troubleshoot".
- Step 7: Click "Advanced Options".
- Step 8: Click "Windows Startup Settings".
- Step 9: Click "Restart".
- Step 10: On the Startup Settings screen, tap the F7 or 7 key on your keyboard to select the "Disable driver signature enforcement" option.  
Wait until the system has restarted.
- Step 11: Go to the mp-x driver folder "XU7 USB Driver 2.08.30" and click on "ftdibus Bami.inf", then click "Install".  
Wait until installation is finished.
- Step 12: Go again to the mp-x driver folder "XU7 USB Driver 2.08.30".  
Click now "ftdiport Bami.inf", then "Install".  
Wait until installation is finished.
- Step 13: Now you can connect the mp-x with any USB-port. If the mp-x was already connected, disconnect it and connect it again.

#### For "Windows 10"

- Step 1: Log in with administrator rights.
- Step 2: On the Start Menu, click in the Startup/Shutdown-Symbol (  ) and while holding down the shift-key (arrow up) click on "Restart".
- Step 3: Click "Troubleshoot".



- Step 4:** Click "Advanced Options".
- Step 5:** Click "Windows Startup Settings".
- Step 6:** Click "Restart".
- Step 7:** On the Startup Settings screen, tap the F7 or 7 key on your keyboard to select the "Disable driver signature enforcement" option.  
Wait until the system has restarted.
- Step 8:** Go to the mp-x driver folder "XU7 USB Driver 2.08.30" and click on "ftdibus Bami.inf", then click "Install".  
Wait until installation is finished.
- Step 9:** Go again to the mp-x driver folder "XU7 USB Driver 2.08.30".  
Click now "ftdiport Bami.inf", then "Install".  
Wait until installation is finished.
- Step 10:** Now you can connect the mp-x with any USB-port. If the mp-x was already connected, disconnect it and connect it again.

#### Operation via USB port (after installation of the drivers)

The driving parameters can be set via your PC. For this purpose you can use software (or programming language) of your choice that is capable of sending commands to serial COM-Ports. In the example below the Windows software Hyperterminal is used. As the Hyperterminal is not available in Windows 7 anymore, we recommend freeware terminal software like PuTTY (<http://www.putty.org>).

Please note that the mp-x requires a time of approx. 100 ms to process a command. Therefore real-time flow control is not possible. Regardless of the time for processing a command, every change (amplitude, frequency or signal form) results in a jump in flow.

#### Hyperterminal example:

- Step 1:** Connect the control unit to your computer and turn it on.
- Step 2:** Start Windows Hyperterminal. Every new session has to be titled.
- Step 3:** Choose the COM-port specified in the device manager.
- Step 4:** The connection-settings have to be:  
Bits per second: 9600; Data bits: 8; Parity: none; Stop bits: 1; Flow control: none

Possible commands (followed by the enter key):

bon	turns the micropump on
boff	turns the micropump off
F(1-300)	sets the required frequency between 1 and 300 Hz
F100	here as an example 100 Hz.
A(1-250)	sets the required frequency between 1 and 250 Vpp
A100	here as an example 100 Vpp
MS	sets signal form modus (S)ine
MR	sets signal form modus (R)ectangular
MC	sets signal form modus SRS
(enter key)	displays present settings of the control unit

The control unit can also be used via LabView, Matlab or other programs. Using LabView, please ensure that the "NI-Serial" package is installed. This will be installed in regular cases together with LabView, but sometimes this option is skipped during install.

It can be downloaded on the National Instruments website as the "NI-Serial" package:

<http://joule.ni.com/nidu/cds/view/p/id/2316/lang/en>

Afterwards it is possible to select the right COM-port for your mp-x in the VISA resource name.

On request, we can send a package of LabView-Routines as an example of implementation.

**We also offer to develop customer specific software for the application of the controller units!**

All values are approximate and no guarantee of specific technical properties.

Changes in the course of technical progress are possible without notice.



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