

microComponents^m

Operating manual for Bartels accessories



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General

This operating manual contains all necessary instructions for the installation, commissioning, operation and maintenance of the Bartels accessories. The manual is intended to help you achieving optimal results in a short time and shall also assist avoiding possible sources of errors. The operating manual of the controllers and the micropumps 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 complies 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.

Passive check valve mp-cv

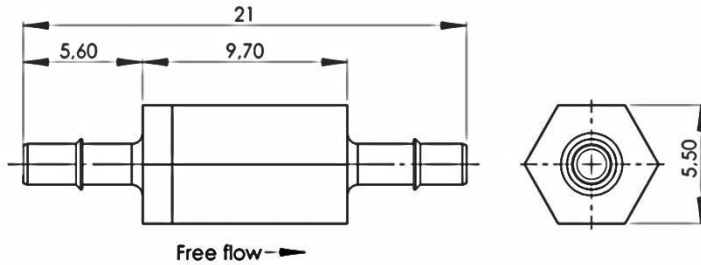
When the micropump is switched off, a back flow of the pumping medium, depending on a differential pressure between in- and outlet is possible!

In order to impede a back flow Bartels Mikrotechnik offers a passive check valve integrated in stainless steel.



The connection of the valves with the micropump can be done easily with suitable tubing. The valve should be placed between the micropump and the outlet reservoir.

Dimensions:



The valves are individually marked regarding the free flow direction.

Technical specifications:

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 wrench size) 0.82677 x 0.2165 in.	
Materials in contact with the pumped media	silicone, stainless steel	
Fluidic connectors	barbed tube clip, length : 5.6 mm for tubing with internal diameter: 1.3 mm	
Cracking pressure	typical < 35 mbar	
Max. back pressure	500 mbar	
Typical leak rate	<20 µl/h for DI-water (at 500 mbar)	

Please note that the volume flow of the micropump will be influenced by the check valve.

Connection cable mp6-con

The mp6-con is used for the electrical connection between the micropumps of the mp6-series and the controller mp-x.

Technical specifications:

mp6-con connection cable		Order code: mp6-con
Connector for mp6-series to mp-Labtronix		
Design and connectors	- Molex FCC 1.25 mm pitch - 85 cm (33.465 in.) cable - Binder 620 connector	



Tubing connector mp-y

The y-connector is suitable for a parallel operation of two micropumps.

Technical specifications:

mp-y tubing connector		Order code: mp-y
Y-connector for tubing, for the parallel use of two micropumps:		
Material	polypropylene (PP)	
for tubing inner diameters of	1.3 – 2.6 mm 0.0512 – 0.1024 in.	

Tygonschlauch mp-t

The mp-t is a tube made of the Tygon material that is compatible with the inlet and outlet of the micropump. The tube is available in two versions. On the one hand the hose with an inner diameter of 1.3 mm for the use of the micropumps mp6-liq, mp6-gas, mp6-gas+ and mp6-pi and on the other hand the hose with an inner diameter of 1.02 mm for the use of the micropump mp6-pp.

Technical specifications mp-t ID 1,3 mm mp-t ID 1,02 mm:

mp-t tubing	Order code: mp-t ID 1.3 mm	Order code: mp-t ID 1.02 mm
Inlet/outlet compatible Tygon® tubing.		
Inner diameter	1.3 mm	1.02 mm
Outer diameter	3 mm	2.74 .mm
Wall thickness	0.85 mm	
Sterilizable	Yes (autoclave or ethylene oxide)	
Color	transparent	
Packaging unit	1 m	
Suitable micropumps	mp6-liq, mp6-gas, mp6-gas+, mp6-pi	mp6-pp



Filter mp-f

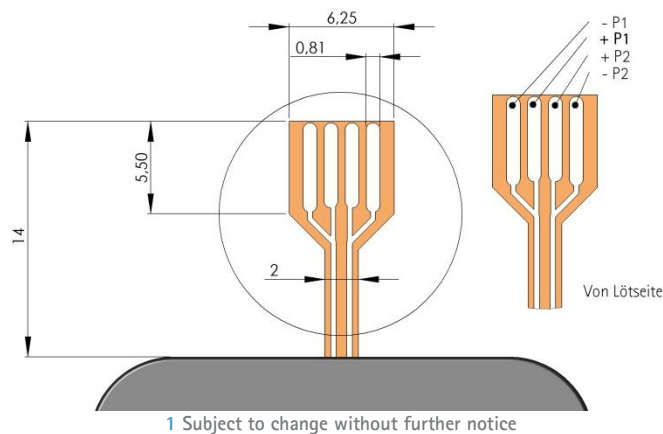
Depending on the particulate matter, the particle load has an influence on the performance of the micropump. The higher the load the larger the probability of clogging and blockage of the fluid channels. This can lead to a decline until stagnation of the flow rate of the micropump. We recommend only to pump liquids with a particle size smaller than 50 μm . We recommend the use of filters if you are pumping media that has a particulate load.

Technical specifications:

mp-filter	Order code: mp-filter
Protection of fluidic systems from particles.	
Dimensions	21 mm x 5.5 mm (length x wrench size) 0.82677 in. x 0.2165 in.
Fluidic connectors	barbed tube clip, length : 5.6 mm for tubing with internal diameter: 1.3 mm
Filter porosity	20 – 60 μm

Pump connector mp6-mol

The pumps can be connected via a FCC connector. The layout of the connector and pin assignment of the pumps is as shown below. Each piezo (P1 / P2) has a single lead for the negative (-P1/-P2) and the positive (+P1/+P2) supply voltage.



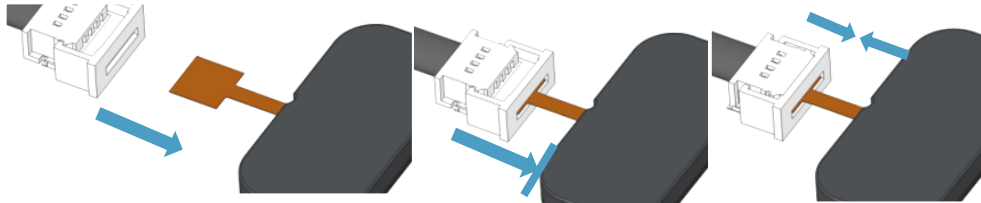
The recommended connector is a 4-pin 1.25 mm pitch FCC connector manufactured by Molex. The straight version part number 39 53 2045. An alternative is the angulated version with the part number 39 53 2044.

The connector is available in different versions to fit various applications. Reference drawings and further specifications are available under www.molex.com.

The recommended maximum wire length between controller and the pump is 1 m. The customer has to assure that the assembly of pump, controller and electrical connection complies with the EMC regulations and electrical safety in the specific field of application.



To connect the pumps and Molex, refer to following three figures. Orientate both components as indicated on the first picture, the pumps facing downwards with its serial number marking (!) and the Molex connector with the four small openings visible from above. Then insert the mp6/mp6-pp flex into the Molex connector (Step1). Close the Molex connector to complete the interconnection between both components (Step 2).



If the pump should be removed again, the Molex connector needs to be opened before removal!

In order to prevent damage to the flexible cable, the following points should be considered for the final pump assembly:

- the flexible connector must not be bent around sharp edges or kinked
- the flexible connector must not be bend on top or bottom of the pump
- the Molex connector is not water tight, additional sealing with e.g. silicone will be necessary
- fixation of the Molex connector in the final assembly is recommended



Hoseclamp mp-hc

The hose clamp mp-hc serves as a connector aiding the micropump functionality at high pressure applications, by preventing leakage at the micropumps fluidic connectors.

mp-hc host clamps	
Material	PPSU
Dimensions in close state	4 x 5,1 x 2 mm (width in tube direction)
Inner diameter (closed)	3 mm



Damper mp-damper

This damper is designed to reduce the pulsation of fluids from micropumps to allow sensors to measure more reliable. For example calorimetric flow sensors.

Technical specification:

mp-damper for the mpSmart-Dosing and -Lowdosing	
Material	PPSU (black/transparent) silicone PP (connectors) Delo 1895 epoxy based adhesive
Dimensions	17 x 19 x 5 mm
Number of in-/ outlets	2
In-/ outlet inner diameter	1,4 mm
In-/ outlet outer diameter	1,6 mm
Operating temperature	+5°C up to 45°C
Material in contact with fluid	PPSU, silicone, PP, epoxy based adhesive



Bubble trap

A bubble trap to get rid of bubbles in your flow stream.

Technical specification:

mp-bt	Order code: mp-bt
Dimensions	17 x 19 x 10 mm
Material	PPSU, PET
Media	Water based solutions
ports	Ø 1,9mm suitable for 1,3mm mp-t
Internal volume	100 µl
Water Entry Pressure:	1,9 bar
Necessary neg. pressure	100 – 200 mbar
Necessary accessories	mp6 @ 250Vpp/300Hz

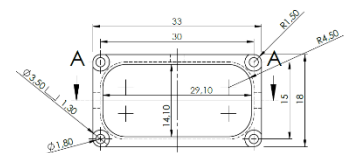
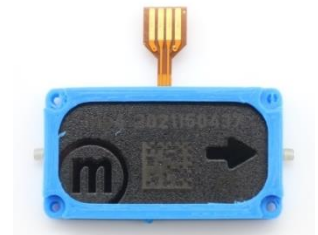


Mounting frame

This frame helps to mount the micropump mp6 via screws.

Technical specification:

mp-mf	Order code: mp-mf
Dimensions	33 x 18 x 4 mm
Material	PLA, blue
Suitable screw	M1,6



Valve driver mp-valvedriver

The valve driver the micropump at adjustable performance in a package similar to an integrated circuit. It enables integration into system electronics or on a PCB.

Technical specification:

mp-valve driver	
Dimensions	17,78 x 15,24 x 3,2 mm 0,62x 1,57 x 0,06 in.
Power supply	4,5 – 17 VDC (5 V recommended for optimized performance)
Current consumption	ca. 85 mA at 5 V ¹
Compatible valve	Takasago valve: SMV-2R-BN1F
¹ with the use of one SMV valve	



Active valve SMV-2R-BN1F from Takasago

An almost silent and low power active valve from the company Takasago. We cooperate with the German representative BMT.

Technical specification:

SMV-2R-BN1F active valve used in the mpSmart-Flowstop	
2/2-way valve – normally closed	
Dimensions	4 x 18,4 x 19 mm 0,62x 1,57 x 0,06 in.
Material	FPM, EPDM, FFKM, PPS, PEEK
Power consumption	0,3 W
Compatible valve	Takasago valve: SMV-2R-BN1F



Staiger Spider Valve

For precise dosing smallest amounts of gases and liquids. It is possible to achieve ultra-fast switching operations and high dosing accuracy.

Technical specification:

Staiger 5 mm spider valve	
2/2-way valve – normally closed and 3/2 way valve	
Operating temperature range	5 – 50 °C
Input voltage	5 V
Sealing material	FKM, other material possible
Switching time	< 1 ms
Media	Water and air
For more information please check the data sheet of our partner staiger, which is available on our homepage	



Sensors SLF3S-0600F & SLF3S-1300F from Sensirion

The SLF3s-1300F and SLF3S-0600F belongs to the latest generation of liquid sensors from Sensirion, which are used together with our mp6 micropump in the mpSmart-Dosing and mpSmart-Lowdosing.

Technical specification:

Sensor SLF3S-0600F & SLF3S-1300F	
Dimensions	48 x 15.5 x 8.9 mm ³
Low flow sensing	up to ± 2000 $\mu\text{l}/\text{min}$ (SLF3S-0600F) up to ± 40 ml/min (SLF3S-1300F)
Wetted materials:	PPS, stainless steel 316L, epoxy-based adhesive
More information in the data sheet from the company Sensirion available on our homepage	



Preassembled pressure sensor

Preassembled pressure sensor	
Dimensions	8 mm x 7 mm
Pressure range	Up to 15 psi
Measures gage pressure	
More information in the data sheet from the company Honeywell available on our homepage	



Microfluidic Chips from microfluidic ChipShop

Technical specification:

Microfluidic Chips:	Chip with 16 straight channels	Chip with 7 reaction chamber	Reaction chamber chip with 8 different depths
Width	1000 μm	-	-
Length	18 mm	-	-
Depth	200 μm	370 μm	100 – 800 μm
Volume	-	27 μl	3.6 – 28.8 μl
Fluidic interface	Mini Luer		
Material	Topas		
More information in the data sheet from the company microfluidic ChipShop available on our homepage or their own homepage			

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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