

PRODUCT CATALOGUE



2021

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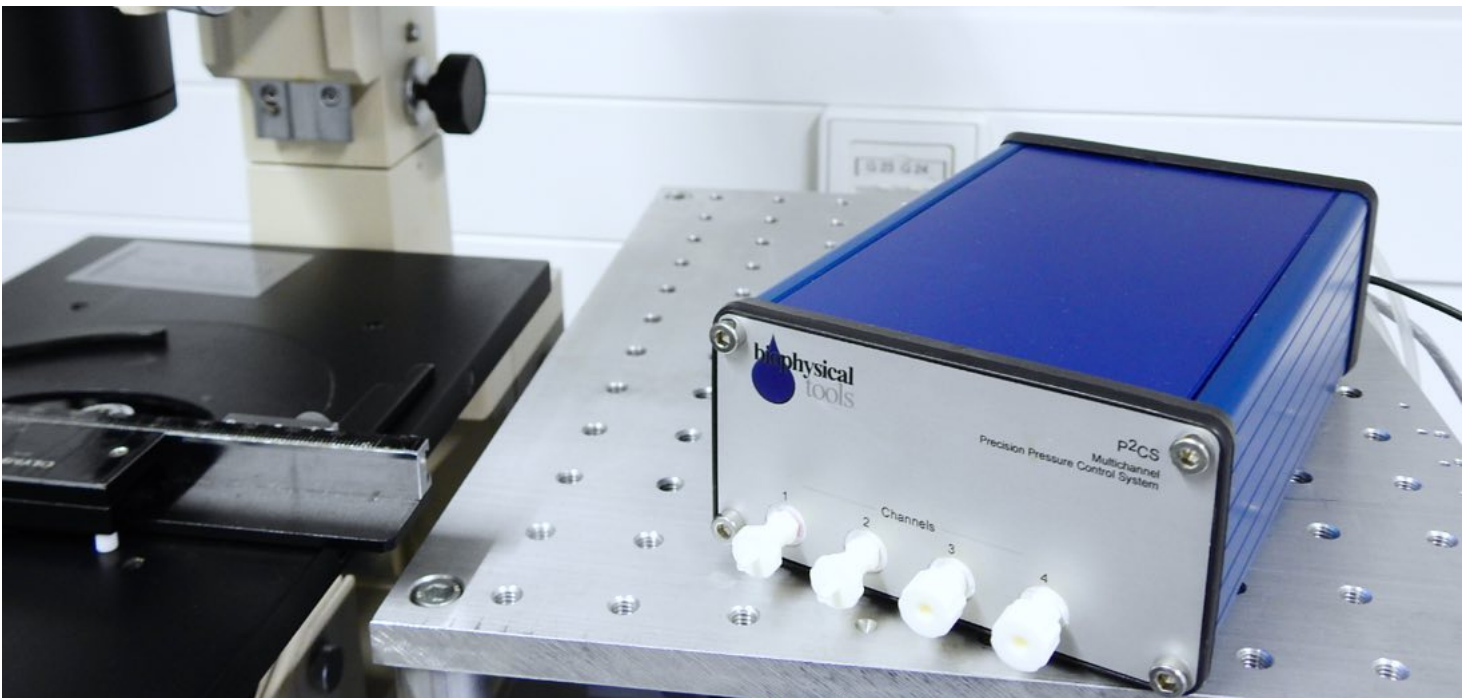
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Part I

Flow Control Systems

Precision Pressure Control System – P²CS

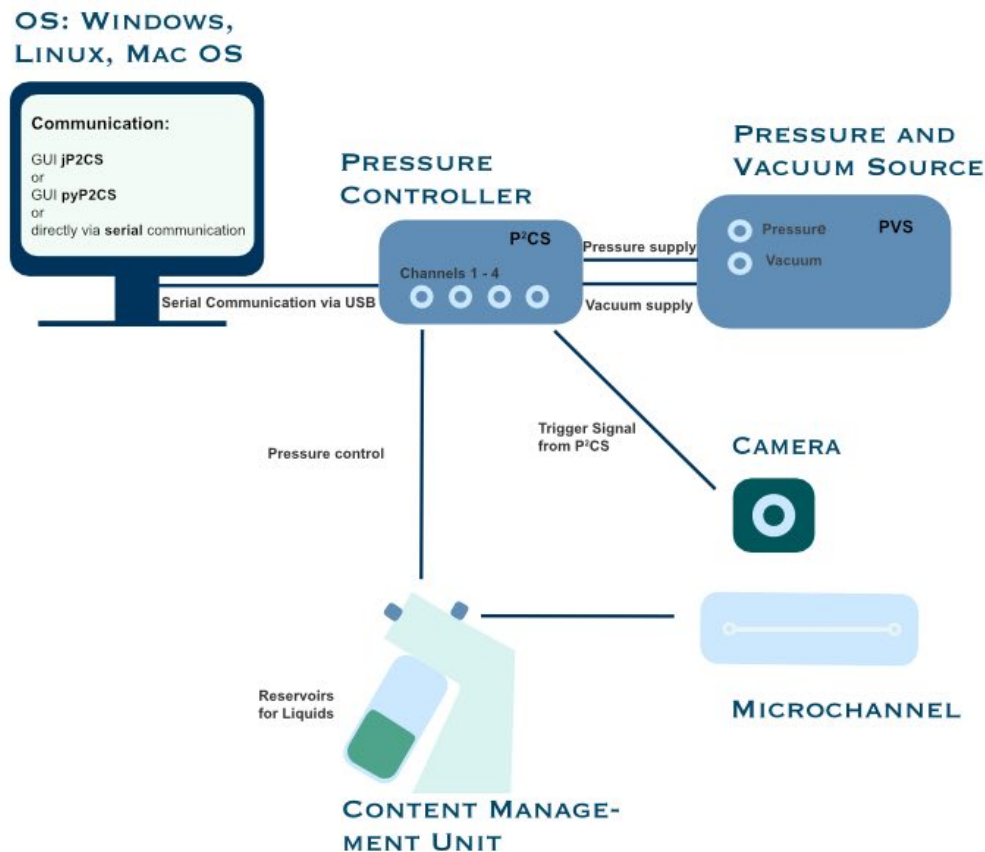
Intended Use and Fields of Applications



P²CS is a precise pressure control system, which provides pneumatic actuation and flow control. It allows a new level of fluidic control in nano-, micro- and mesofluidic channels and capillaries. As it regulates pressure and vacuum, bidirectional fluidic control, fast stopped flow and pulse function realisation become possible. A two-level pressure system with two sensors per channel enables precise control for high and very low flow rates.

This system is highly flexible. In addition to the proprietary GUI it also comprises GUI in Python, which is supplied with the source code. So you can adapt and develop it on its own. The system shows the best performance and is the most compact (lab space, small microscopy dishes) in the market. You can adapt it in many ways. Please, also consider our options: up-scaling, buffer reservoirs, pressure sources, connector kits, OEM modules, customised software development or complete customised systems, flow rate measurements with flow meters, fluid switches and more.

PRECISE AND STABLE PRESSURE-DRIVEN FLOW CONTROL FOR ANY MICROFLUIDIC APPLICATION – P²CS



ADVANTAGES OF THE SYSTEM

- No contact of the device with liquids – no risk of contamination.
- Pressure and vacuum in each channel.
- Only the reservoir on the chip can be filled – saving precious liquids/reagents.
- No impact of temperature changes.
- Compensation of the back pressure.
- No high pressures damaging your setup.
- Pulsation-free.
- Fast reaction time of 17 ms (100 mbar increment) or even 5 ms (100 mbar increment) in the PLUS model.
- No gas/pressure loss.

FEATURES OF DIFFERENT P²CS MODELS

FEATURES	P ² CS STANDARD	P ² CS PLUS	P ² CS 2 LEVELS	P ² CS ANALOGUE
SETTLE TIME: 17 MS / 100 MBAR STEP	◆		◆	◆
SETTLE TIME: 5 MS / 100 MBAR STEP		◆		
REACTION TIME: 4 MS	◆	◆	◆	◆
PRESSURE AND VACUUM IN EACH CHANNEL			◆	◆
TRIGGER FUNCTION	◆	◆	◆	◆
FUNCTION GENERATOR IN REAL TIME	◆	◆	◆	◆
2 SENSOR PER CHANNEL			◆	

CUSTOMISATION AND COMBINATION OF DIFFERENT FEATURES IS POSSIBLE. PLEASE, CONTACT US.

P²CS STANDARD

P²CS Standard is sufficient for the most microfluidic applications. It has a standard reaction time of 4 ms and a settle time of 17 ms per 100 mbar step. Still, the slew rate can be calibrated if needed. The system does not have overshooting and allows a gentle and ultra-precise and fast control of the pressure.

P²CS PLUS

P²CS Plus allows to work with larger volumes and has a faster reaction and settle time. It is particularly suited for mesofluidic applications.

P²CS ANALOGUE

This system is equipped with an integrated analogue mode via SMB connectors and is controlled by input voltages within the range of -10 V up to 10 V. The system can be operated in analogue mode with a function or signal generator.

P²CS 2 LEVELS

P²CS 2 levels is equipped with 2 pressure sensor in each channel. It allows to control the pressure over six orders of magnitude – e.g. from 5 μ bar up to 1 bar. This system is favourable for application when you plan to work as with very low flow rates as with higher flow rates.

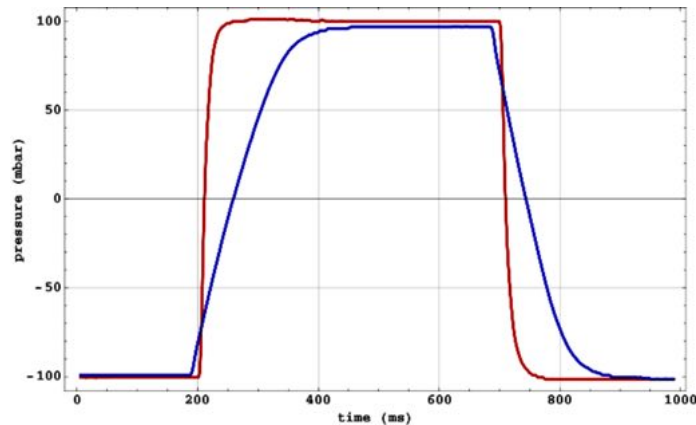
PRESSURE RANGES OF DIFFERENT P²CS MODELS

FEATURES	P ² CS STANDARD	P ² CS PLUS	P ² CS 2 LEVELS	P ² CS ANALOGUE
-50/+50 MBAR	◆	◆		◆
-100/+100 MBAR	◆	◆		◆
-500/+500 MBAR	◆	◆		◆
-1000/+1000 MBAR	◆	◆		◆
-200/+2000 MBAR	◆	◆		◆
-200/+4000 MBAR	◆	◆		◆
-100/+100 MBAR & -20/+20 MBAR			◆	
-500/+500 MBAR & -20/+20 MBAR			◆	
-500/+500 MBAR & -50/+50 MBAR			◆	
-1000/+1000 MBAR & -20/+20 MBAR			◆	
-1000/+1000 MBAR & -50/+50 MBAR			◆	
-1000/+1000 MBAR & -100/+100 MBAR			◆	

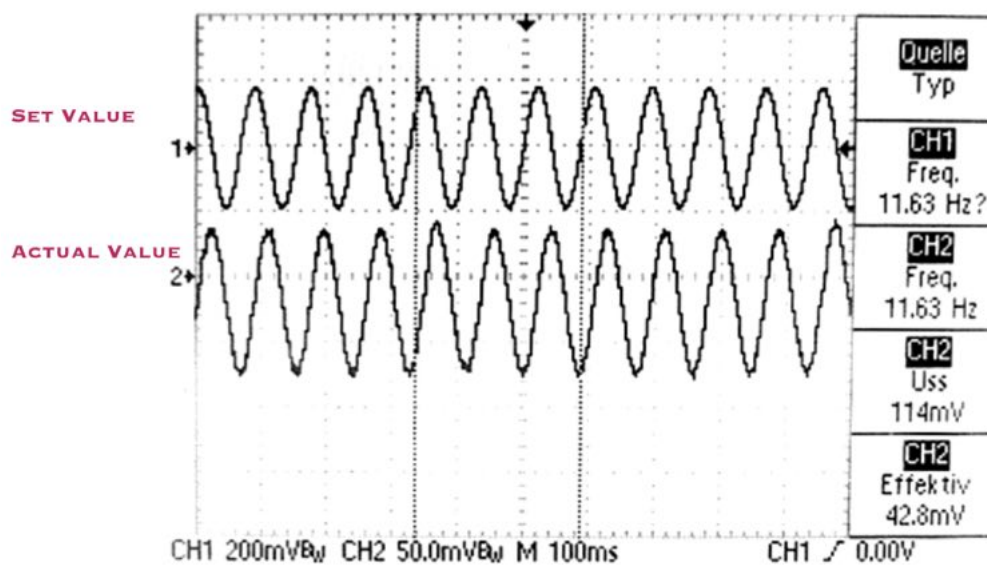
OTHER PRESSURE RANGES ALSO AVAILABLE. PLEASE, CONTACT US.

Slew Rate of P²CS and Function Generator

Pulse responses of P²CS Standard (blue curve) and P²CS Plus (red curve). The slew-rate is approximately 2.0 mbar/ms for P²CS and 15.5 mbar/ms for P²CS Plus. The gas consumption comprises about 200 ml/min or less for P²CS Standard and slightly increased for P²CS Plus.



You can run an automatic function for pressure, e.g. $30 \sin(t)$. The pressure values follow the graph in real-time on the microcontroller. No additional time is lost, since the function generator is implemented in the hardware, not in the control software on your PC.

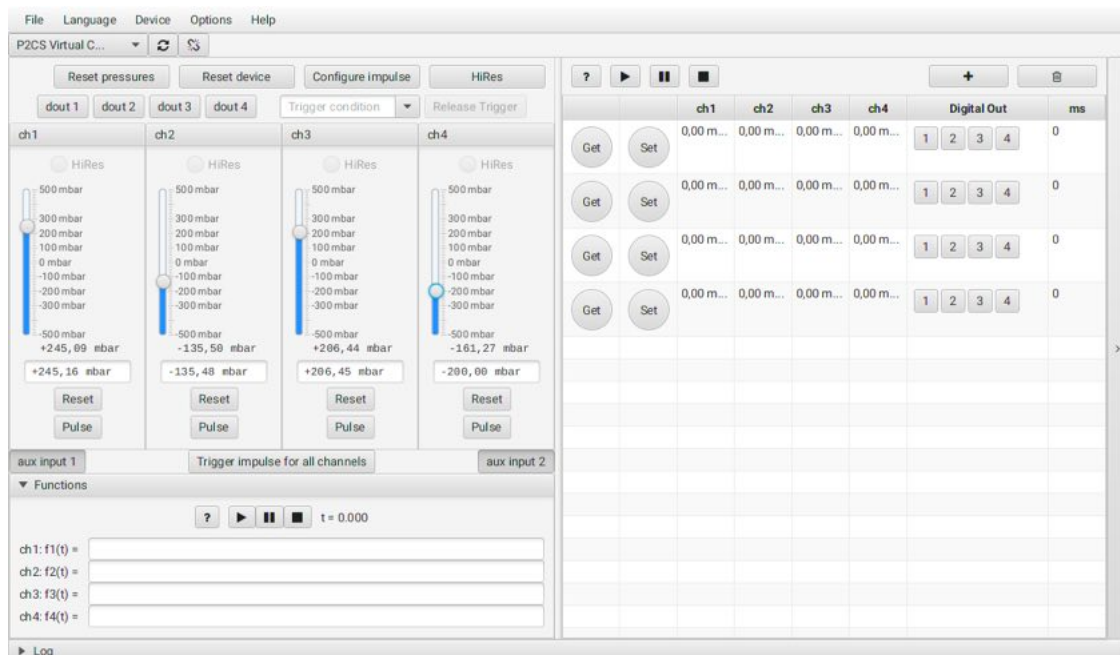


Communication and Control Software of P²CS

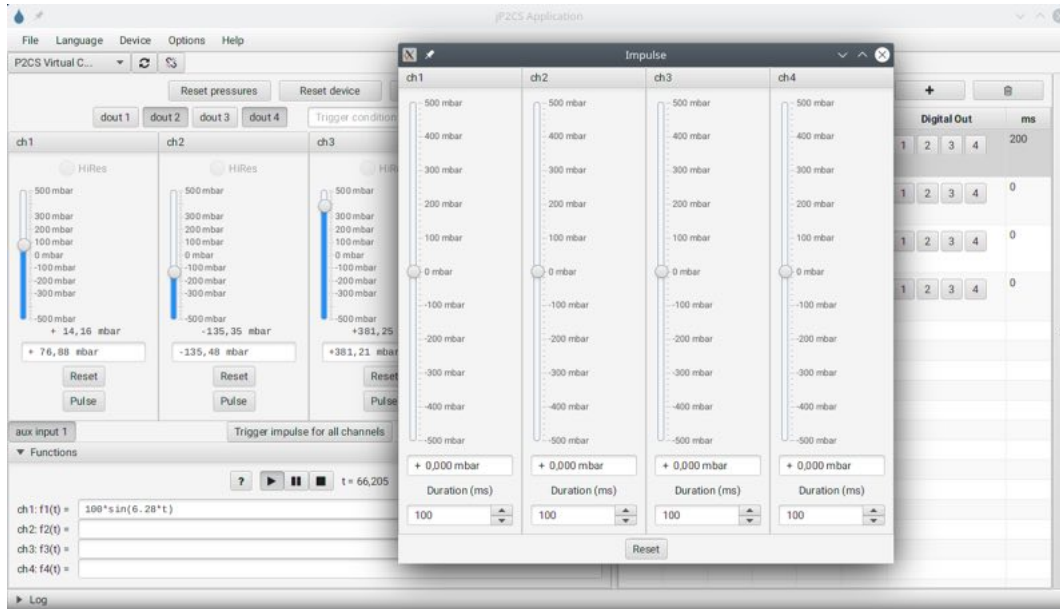
CONTROL SOFTWARE FOR P²CS – jP²CS

The control software is free of charge, including the future updates with always updated features, and allows to control the system intuitively. Use the following features to control the flow on the chip:

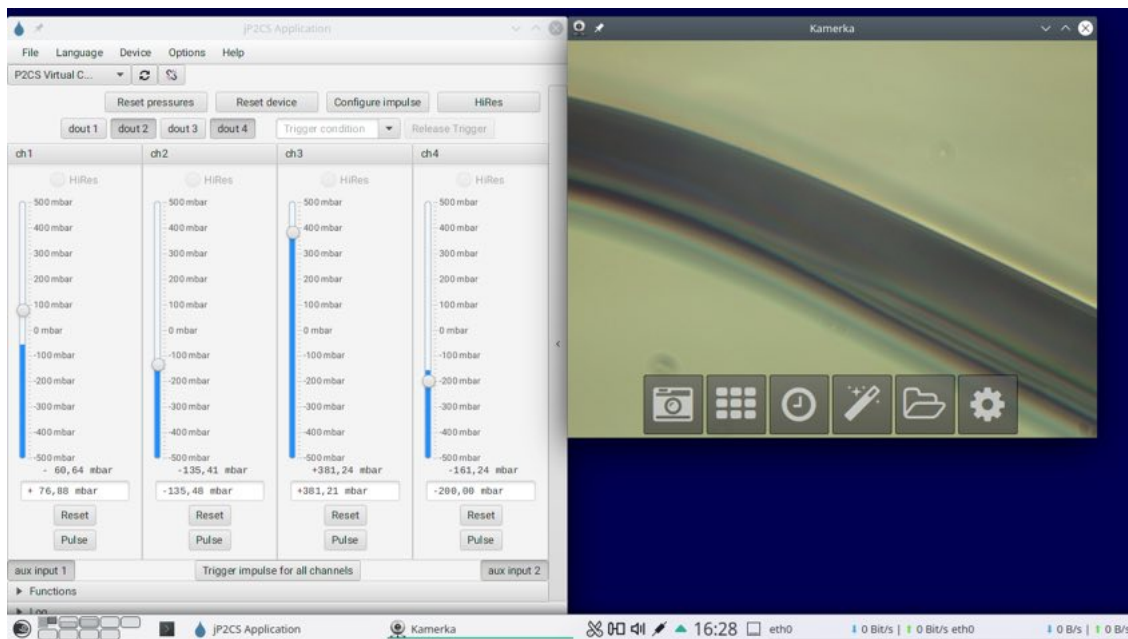
- **Sliders:** Just move the slider to the desired pressure value with your mouse wheel to control in small steps or with the left button of the mouse for bigger steps.
- **Target Values:** Use the field "Target Value" to enter the desired pressure in each channel.
- **Automated Protocols:** Save the protocols of you experiments with "Get", enter the desired times and start the protocol automatically with "Set" in the right side of the window.
- **Function Generator:** Enter the desired function into the function generator, e.g. $\sin(t)$ or $0.5 \cdot t$, and start the automated function.
- **Pulses:** Configure pulses and start them via the software. In this was drops can be generated much easier than using continuous flows.
- **Trigger:** Use the trigger function from the control software to control other devices and vice versa.
- **Languages:** The control software is available in German and English.
- **Firmware Update:** Use the firmware update in the control software to start the firmware update easily.



jP²CS allows as manual as automated control of the flow in the microfluidic chip. In addition, you can configure pulses and use them for a pre-set period of time in the respective channel.



jP²CS allows to adapt the window of the graphic user interface, so that you can concurrently see the microscope image and control the pressure – the full control of your experiment is possible.



DIRECT COMMUNICATION WITH P²CS

You do not need to install any drivers for the communication with P²CS via terminal or terminal software. No assembler programming knowledge or hex command are necessary to control and integrate the system in other environments, such as LabVIEW or similar. For this you can use approx. 60 different command in **plain text**. All commands are developed in a structured form comparable with SCIPY standard.

The direct communication can be also done with terminal software, such as CoolTerm, TeraTerm or CuteCom.

If you decide to use the direct communication, you can:

- use advanced commands configuring the reaction time and stabilisation time of the system
- let the system calculate and compensate the hydrostatic pressure
- use a graphic or numeric depiction of the pressure changes while controlling
- and much more

P²CS CAN BE CONTROLLED IN DIFFERENT WAYS:

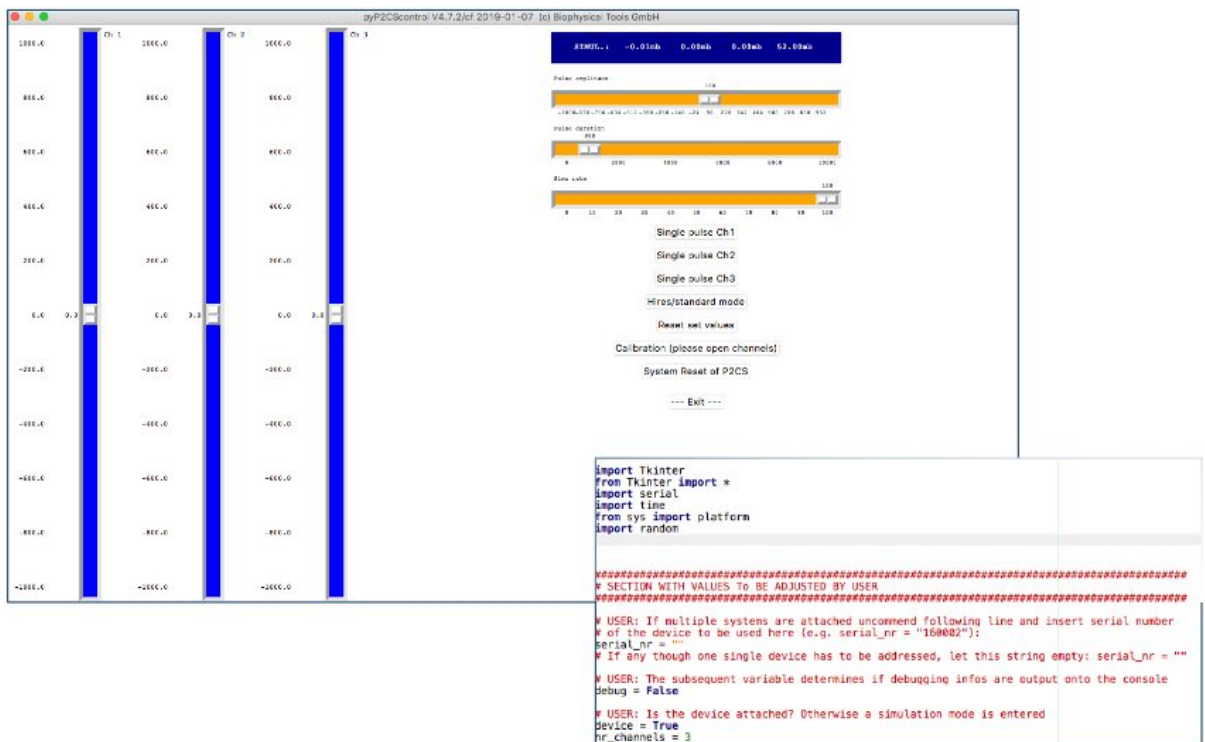
- via USB port – serial communication – directly via terminal (Linux, Mac OS X) or a terminal software (Windows, Linux, Mac OS X).
- via an intuitive graphic user interface jP2CS.
- via an intuitive graphic user interface pyP2CS.

CONTROL SOFTWARE WITH SOURCE CODE – pyP²CS

We provide you a well commented and structured source code for your further development. The script is available in both: Python 2.7. and Python 3.

If you decide to use the python script pyP²CS, you can:

- use it with different OS – Windows, Mac OS X, Linux, Raspberry Pi OS (previously Raspbian)
- develop own modules or just expand the existing script by adding or deleting buttons, texts or any other functions. The script is written in module for GUIs *tkinter*, so even beginners can start to program very quickly
- use a graphic depiction of the pressure changes while controlling
- and much more.

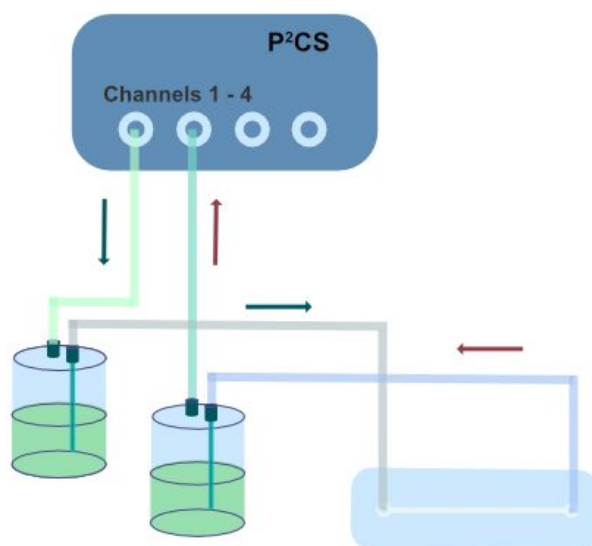


Technical Data of P²CS

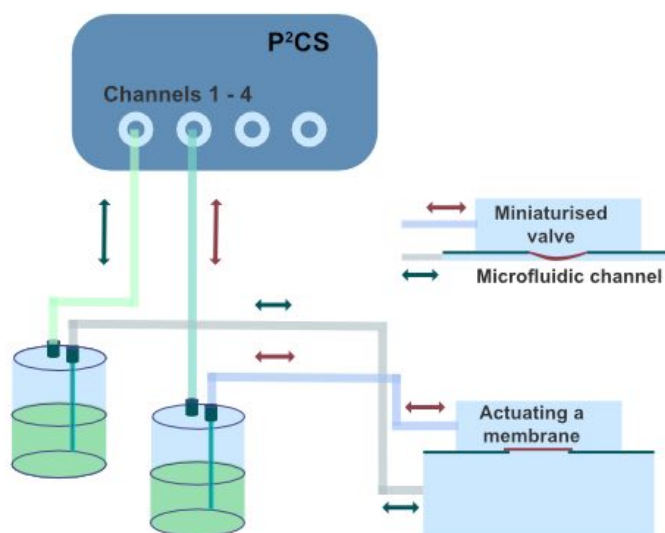
Parameter	Value
Physical Data	
Dimensions W x H x L	103 mm x 53 mm x 163 mm
Weight	<1 kg
Power supply	
Power supply	15-18 VDC
Input mains	110-240V ~ 50-60Hz
Power consumption	<10 W, typically 7 W according to version and operation mode
Pressure Ranges	
Pressure ranges	The pressure range starts with +/- 1 mbar going up to - 950 mbar to +1,000 mbar. For higher pressures (+2,000 or +4,000 mbar), the system works with minor vacuum values about -200 mbar.
Pressure accuracy	<0.5% FSS without calibration protocol.
Pressure resolution	14 bit
Pressure dynamic range	84 dB
Pressure precision	0.007% FSS
Pressure sampling frequency	1'000 s ⁻¹
Reaction of the System	
Reaction time	4 ms
Settle time	17 ms (100 mbar step, pressure supply $\Delta p = 1,400$ mbar)
Slew rate	max. 5 mbar/ms $\Delta p = 1,400$ mbar
Pressure and Vacuum Supply	
Gas consumption	Extremely low gas consumption in economic mode: < 100 ml/min at 500 mbar is typical. A 600 ml pressurised air bottle may last for many hours of permanent operation.
Tube Connectors	
Thread of pressure input	10-32 UNF (compatible to M5)
Thread of gas pressure output	10-32 UNF (compatible to M5)
Communication	
Embedded computer	Powerful real time embedded computer (ARM cortex) provides plenty of supplementary power for future software upgrades, extensions or customised developments.
Outputs	4 digital outputs for synchronisation of external devices
Inputs	2 digital inputs for synchronisation with external devices
USB connection	1x mini USB port or USB type A, for remote control via PC or tablet-PC
Communication interface	Open communication interface via virtual COM/serial port (UART), RS232 (optional)

Exemplary Applications with P²CS

FLOW CONTROL IN A TOTALLY CLOSED SYSTEM (ISOLATED FROM ATMOSPHERE) WITH P²CS

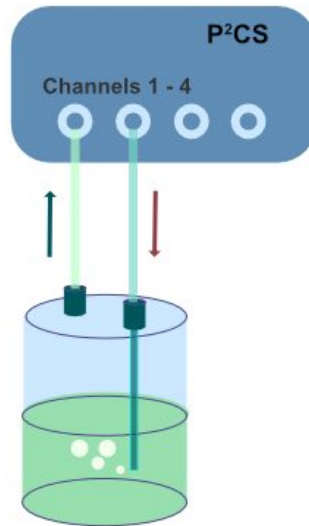


MEMBRANES ON-CHIP (E.G. BLM) AND EMBEDDED VALVES AND ACTUATORS ON CHIP WITH P²CS

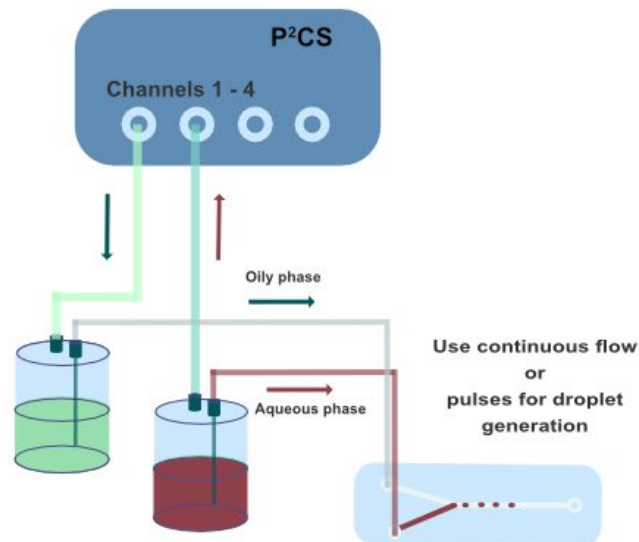


Exemplary Applications with P²CS

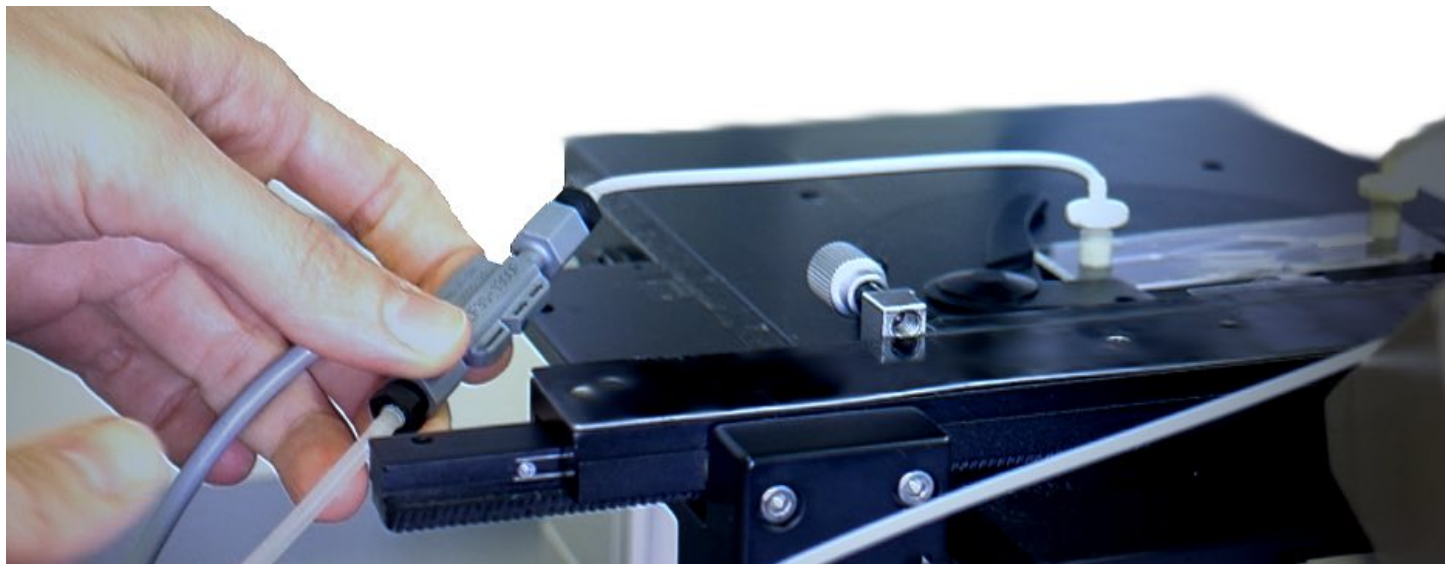
GASSING (ISOLATED FROM ATMOSPHERE) WITH P²CS



DROPLET GENERATION WITH P²CS EVEN JUST IN A Y-SHAPED MICROCHANNEL: USE CONTINUOUS FLOW, OR PULSES, OR THE FUNCTION GENERATOR TO GENERATE DROPLETS



Use of a Flow Meter with P²CS



When working with pressure-driven flow control systems in Microfluidics, we are working with pressure, not with volumetric flow rates. However, in some cases it is necessary or helpful to know the volumetric flow rate of the fluid in the microchannel. For example, in order to follow a specific protocol for a cell culture, stoichiometry in the microchannel or just to monitor the consumption of precious reagents. In such cases there are different approaches to determine the flow rate in the channel. In general, you can calculate it by weighing the droplets at specific pressure values and thus calibrate the system. This is the most precise method, however, cumbersome. Or you can use commercially available flow meters.

The flow meters we recommend are delivered with a control software for Windows. So you can monitor the flow rate and adjust the pressure at the same time. The flow rate monitoring can be also integrated directly into the control software of P²CS.

When integrating a flow meter, please be aware of the following **issues**:

- The flow rate control of the flow meters goes over one or two orders of magnitude. If you want to control the flow precisely, e.g. at several mL/min and at the same time at the rate of several $\mu\text{L}/\text{min}$, please consider the ranges of the flow meters. Probably, you would need not one, but several sensors for precise measurements.
- Consider the chemical resistance of the material in touch with your liquids.
- Flow meters tend to clogging and are wearing parts.
- Try to avoid air bubbles in order to minimise deviations in measurements.
- Calibrate the sensors for your liquids.

Pressure and Vacuum Source – PVS

Intended Use and Fields of Applications



Mobile Pressure and Vacuum Source **PVS** is designed to be used as a mobile pressure and vacuum source, in particularly with the pressure control system **P²CS** in cases when you do not want to depend on the pressure pipeline in the laboratory or would like to work in different laboratories with the complete setup.

Advantages of the system

- Mobile (relatively) light-weight silent pressure and vacuum generator, which allows to use the setup in any laboratory.
- Two modes available: pressure/vacuum and only pressure.
- Easy connection with silicone tubes and connectors.
- Almost silent (not comparable with conventional compressors).

Technical Data of the Pressure and Vacuum Source PVS

Parameter	Value
Electrical properties	12-19 VDC, max. 7 W
Power supply	100-240 VAC, 60/50 Hz
Max. pressure range	- 750 / 1,000, + 2,000 or 5,000 mbar (depending on the model)
Operation modes	Pressure or pressure/vacuum (switch on the frontside)
Ports at the rear panel	UNF thread 10-32 compatible to M5 pressure port vacuum port
Pumps	2 diaphragm pumps
Min. Life Time	Approx. 3,500 h Models with longer life time available
Working conditions	Approx. -700 / +750 mbar, 1,500 or 4,000 mbar, 18 V (depending on the model)
Operative time	Few hours, versions for continuous operation available
Ambient temperature	0 - 25° C.

Connection to P²CS:

PVS can be connected via microfluidic connectors with UNF 10-32 thread (compatible to M5) and standard silicone tubes to P²CS. Please consider the pressure ranges of the respective device when choosing the material, diameter of the tubes as well as the pressure stability of your connectors.

Available Models

- **PVS-750:** - 750 up to + 750 mbar
- **PVS-1500:** -750 up to 1,500 mbar
- **PVS-4000:** -750 up to 4,000 mbar

Part II

Microfluidic Accessories

Content Management Unit for Liquid Storage – CMU

Intended Use and Fields of Applications



Content Management Unit is designed for a user-friendly storage of reagents and liquids during a microfluidic experiment. Different volumes are available. The content management unit can be used with standard vial threads for the volumes 1.5 mL, 4 mL and 10 mL. CMU has standard threads for connectors: UNF 10-32, compatible with M5. So, you can exchange connectors and fingertight fittings depending on your needs towards tubes.

Advantages of the CMU

- No contamination, minimal risk of backflow into P²CS.
- Refilling of reservoirs without interrupting your experiment.
- Autoclavable material of the unit: POM (polyoxymethylene).
- Ease-to-connect to P²CS – use standard tubes.
- Standard threads, so that the connectors and fingertight fittings can be replaced according to the needs of the experiment.

Technical Data of CMU

Parameter	Value
Inteded Use	Content management unit for the use of reagents in a microfluidic setup, especially with the pressure control system P ² CS
Material	POM (Polyoxymethylene), autoclavable
Material of the Sealing Ring	Silicone (disposable)
Connector thread and tubing OD	UNF 10-32, 4x standard exemplary PEEK fingertight fittings or similar included, biocompatible, tubing OD: 1/16". Be aware that you can replace them according to your needs.
Models	
for different volumes with diverse vial threads (depending on your ordered variant and availability)	Thread ND 9: 1.5 mL vials Thread ND 13: 4 mL vials Thread ND 18: 10 mL vials



Liquid Handling Accessories: Manifolds, Holder, Screw Caps, Connectors and Fittings



Screw Caps with Luer ports:

We provide screw caps for laboratory bottles (type: GL45) with 2 or 3 ports with Luer connectors. The screw caps are compatible with standard laboratory glass bottles for 100 mL, 250 mL, 500 mL or 5 L. Choose the right fittings for your screw caps, which match perfectly on standard laboratory bottles for microfluidic long-term experiments, e.g. perfusion assays on organ-on-a-chip devices.

Also the caps for Falcon tubes (50 mL) can be equipped with two ports to connect the tubes.

Maximum pressure: 2 bar

Manifolds, pressure dividers, t-connectors etc.:

While using the same liquid at the same flow rate in different channels, you can use manifolds. Our standard manifold has 1 outlet and 8 inlets. Material: POM.

Other manifolds are available at request. A more cost-effective solution is to use T-connectors, Y-connectors, cross interconnectors. They can be used for an easy droplet generation in the connected

capillary, even without microfluidic chips.

While applying the same pressures for different fluids, you can use pressure dividers. They allow to use one channel of the pressure controller to control different liquids with the same conditions.

Microfluidic Starter Kit:

Microfluidic "Starter Kit" contains about 200 pieces of connectors, some exemplary tubing (silicone, PTFE), and filters, which can be utilised as backflow protection for the pressure controller while using vacuum.

Advantages of our microfluidic accessories

- easy and fast connection of P²CS, PVS, CMU or your alternative system
- tight connection to channels, tubes, bottles, etc.
- you do not need to order different connectors and tubings separately, but just start right away with the experiment

LET US TALK ABOUT ACCESSORIES YOU NEED. WE HAVE ALREADY TESTED MANY SYSTEMS AND CAN RECOMMEND SUITABLE SOLUTIONS!

Liquid Handling: Fluid Switch – FS

Intended Use and Fields of Applications



The fluid switch is designed to switch between different liquids in several channels - starting with **8 via 16, 32 up to 64 channels**. In this way you can realise fast switching between fluids or, for instance, mixing at different ratios.

The fluid switch can be controlled via the control software of P²CS - **jP²CS** or via P²CS over the serial communication. A standalone version is the Micro-perfusion system MPS-X.

Material of the valves in FS: PMMA and PEEK and EPDM or FFPM.

You can select different connectors, since the fluid switch has threads†M5 (compatible to UNF 32-10).

ADVANTAGES OF THE SYSTEM

- easy automated mixing of media or reagents
- stable pulsation-free flow in the perfusion head
- fast and interruption-free switching
- transparent perfusion head for a better observation of the experiments
- different channel geometries of the perfusion head available: mixing, multiplexing

Standalone version of the Fluid Switch is the Micro-Perfusion System MPS-X.

COMMUNICATION AND CONTROL SOFTWARE OF THE FLUID SWITCH

CONTROL SOFTWARE WITH P²CS – via jP²CS

The control software jP²CS allows to control the Fluid Switch directly via the State Assistant on the right side. Configure the pressures of P²CS, times of the respective valve state and control the system intuitively. Use the following features to control the flow on the chip:

- **Sliders:** Just move the slider to the desired pressure value with your mouse wheel to control in small steps or with the left button of the mouse for bigger steps.
- **Target Values:** Use the field "Target Value" to enter the desired pressure in each channel.
- **Automated Protocols:** Save the protocols of you experiments with "Get", enter the desired times and start the protocol automatically with "Set" in the right side of the window.
- **Set FS:** Configure the state of the single valves of the Fluid Switch: 1 = ON, 0 = OFF.
- **ms:** Define the time for the configured state of the valves.

The screenshot displays the jP²CS Application interface. On the left, four channels (ch1, ch2, ch3, ch4) are shown, each with a vertical slider for pressure control ranging from -1000 mbar to 1000 mbar. Below each slider are input fields for target values and buttons for 'Reset' and 'Pulse'. The 'Trigger impulse for all channels' button is at the bottom left. On the right, the 'State Assistant' window is open, showing a table for configuring valve states (FS) for each channel. The table has columns for 'ch1', 'ch2', 'ch3', 'ch4', and 'ms'. The 'ms' column shows a value of 3000. Below the 'State Assistant' window, a 'Setup for FluidSwitches State 2' window is open, displaying a table with 16 columns (Nr. 1 to 16) and 12 rows (Nr. 1 to 12). The table contains binary values (0 or 1) representing the state of the valves.

Nr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Fields of Application

The Fluid Switch FS is designed for a fast switching between different liquids or mixing different liquids via P²CS. You can automatically transport the required medium to your culture, implement a complete buffer exchange without any cell or tissue perturbations. With FS you can select and mix buffers, which flow into an attached cell-culture chamber or microfluidic chip. Further, you are not bound to a specific chip or chamber design and can attach the most suitable one.

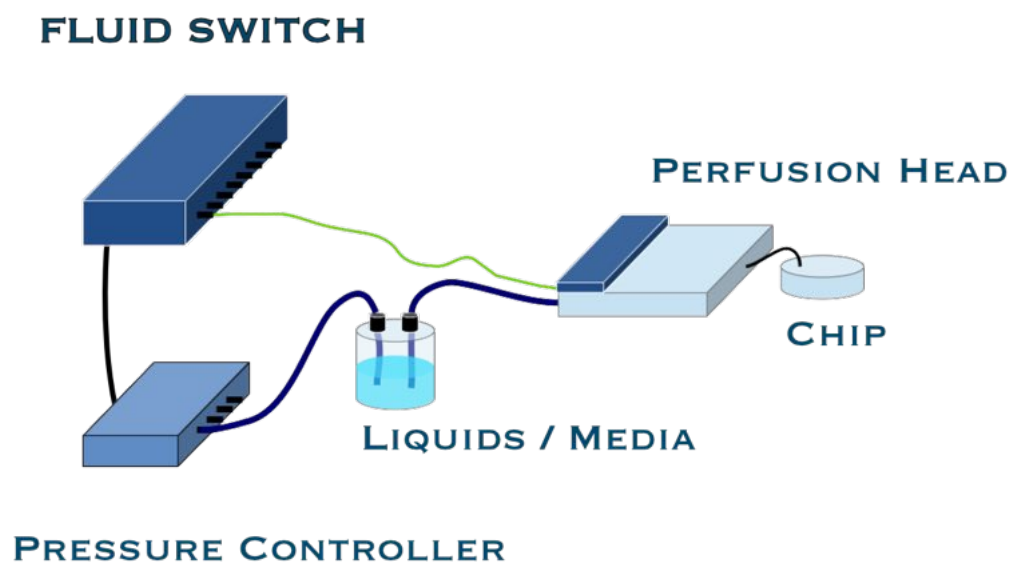
- perfusion of cell or tissue culture
- dose-response analysis
- mixing media or other liquids with specific ratios

Use of diverse fluids possible

- Water
- Biological fluids
- Slightly salty solutions

Included parts of FS

- Fluid Switch Controller
- Perfusion Head PH-X, consisting of a liquid management unit LPU with an integrated manifold. Different geometries available, e.g. 8 channels: 8 inlets to 1 outlet or twice 4 inlets to 2 outlets etc.)
- manifolds with different designs
- Moulding Kit for own manufacturing of manifolds out of PDMS (polydimethylsiloxane) (optional)



Technical Data of the Fluid Switch

Parameter	Value
Physical Properties	
Dimensions	
Fluid Switch: L x W x H	160 mm x 103 mm x 28 mm
Perfusion Head (PH-X): L x W x H	126 mm x 105 mm x 31 mm
Electric Properties	
Power Supply	18 VDC
Input Mains	110-240 VAC, 50/60 Hz
Power Consumption	< 10 W
Modes and Connections	
Operation Modes	Via P ² CS (option to P ² CS)
Number of valves per Fluid Switch	8 or 16
Number of PH-X to be connected with FS	Up to 2 PH-X
Liquid Contacting Materials of the PH-X	
Liquid Management Unit (transparent)	PMMA (acrylic block) and PDMS (manifold)
Valve Membrane	PEEK and EPDM or FFPM
Connectors within the PH-X and outside	Nylon
Tubes in the PH-X	Silicone
Liquid Processing Unit and Valves	
Number of Channels	Typically 8, 8 inlets - 1 outlet
Valve Type	On/off valves
Max. pressure	2 bar
Total Volume of the Valves	18.7 μ L = 0.019 mL
Threads of the In- and Outlets of PH-X	UNF 32-10 (almost identical to M5)

The number of channels and geometries of the perfusion head depends on the selected model of the system.

Check the compatibility of your reagents with the materials of the perfusion head: PMMA, EPDM or PEEK.

Part III

Perfusion Systems

Microperfusion System – MPS-X

Intended Use and Fields of Applications



Micro-perfusion system MPS-X is designed for cell and tissue perfusion, especially for precise and gentle switching of liquids between several channels depending on the selected geometry (e.g. 8 channel system). Thus, you can apply the perfusion system for continuous cultivation and flushing cells on a chip or in a cultivation chamber.

The system can be operated in a manual and programmable mode for the cell and tissue perfusion and allows to implement different arbitrary mixing ratios, e.g. for dose-response analyses. Thus, it is possible to realise perfusion or still to use the fed-batch approach as in an automatic as manual mode.

Advantages of the system

- easy automated or manual mixing of media or reagents
- stable pulsation-free flow in the perfusion head
- fast and interruption-free switching
- transparent perfusion head for a better observation of the experiments
- two modes of use possible: just with the hydrostatic pressure (e.g. 1 m water column = 100 mbar) or with pressure controllers up to 2 bar (e.g. P²CS)

Fields of Application

With the micro perfusion system MPS-X you can automatically transport the required medium to your culture, implement a complete buffer exchange without any cell or tissue perturbations. The perfusion system selects and mixes buffers, which flow into an attached cell-culture chamber or microfluidic chip. Further, you are not bound to a specific chip or chamber design and can attach the most suitable one.

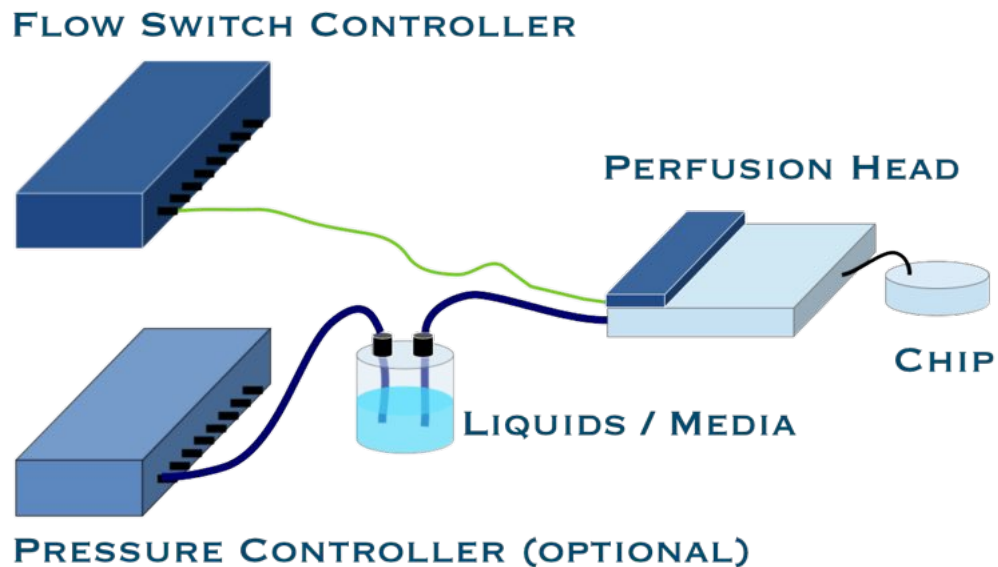
- perfusion of cell or tissue culture
- dose-response analysis
- mixing media or other liquids with specific ratios

Use of diverse fluids possible

- Water
- Biological fluids
- Slightly salty solutions

Included parts of MPS-X

- Flow Switch Controller
- Perfusion Head PH-X, consisting of a liquid management unit LPU with an integrated manifold. Depending on the system version one or two replacements for the manifold in the respective ordered design are added to the delivery (e.g. 8 channels: 8 inlets to 1 outlet or twice 4 inlets to 2 outlets etc.)
- manifolds with different designs
- Moulding Kit for own manufacturing of manifolds out of PDMS (polydimethylsiloxane) (optional)



Technical Data of MPS-X

Parameter	Value
Physical Properties	
Dimensions	
Flow Switch Controller (FSC): L x W x H	180 mm x 168 mm x 37 mm
Perfusion Head (PH-X): L x W x H	126 mm x 105 mm x 31 mm
Display of the FSC	4.3"
Weight	approx. 3 kg
Electric Properties	
Power Supply	18 VDC
Input Mains	110-240 VAC, 50/60 Hz
Power Consumption	< 10 W
Modes and Connections	
Operation Modes	Manual and automatic mode
Manual mode	Via 8 channel buttons and two control buttons
Automatic mode	Via script on a USB Flash Drive
USB port	USB 2.0 at the left side panel of the FSC
Liquid Contacting Materials of the PH-X	
Liquid Management Unit (transparent)	PMMA (acrylic block) and PDMS (manifold)
Valve Membrane	PEEK and EPDM or FFPM
Connectors within the PH-X and outside	Nylon
Tubes in the PH-X	Silicone
Liquid Management Unit and Valves	
Number of Channels	Typically 8, 8 inlets - 1 outlet
Valve Type	On/off valves
Max. pressure	2 bar
Total Volume of the Valves	18.7 μ L = 0.019 mL
Threads of the In- and Outlets of PH-X	UNF 32-10 (almost identical to M5)

The number of channels and geometries of the perfusion head depends on the selected model of the system.

Check the compatibility of your reagents with the materials of the perfusion head: PMMA, EPDM or PEEK.

Part IV

Optical Observation and Readout

Microfluidic Microscope Module – M³



Advantages

- Flexible orientation at any angle: upright, inverse or sideways
- Possible use as a secondary microscope, e.g. on top of a confocal or Raman microscope for fine positioning or for monitoring the samples
- Ocularless design for keeping the module simple and compact: the image is sent to a camera, spectrometer, or other optical devices
- Moveable elements (lenses, filters, mirrors)
- Intergration of a highspeed camera (e.g. 500 fps, monochrome or multicolour model) possible

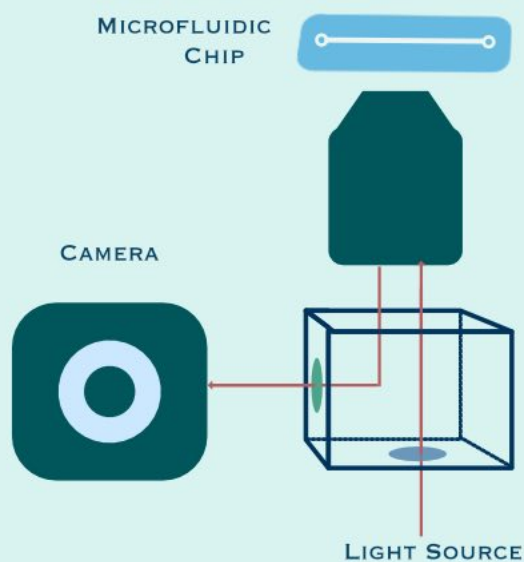
Configuration with/as

- Microfluidic microscope visualising the object of interest and the surrounding flow field simultaneously is possible
- Concurrent upright and inverse microscope recording from top and from bottom
- Cameras and spectrometers, PMTs or APDs
- Optical tweezers, transfection setups
- Synchronous observation of two focal planes (e.g. cell membrane and nucleus)
- Stereography, simple 3D imaging

Technical Data of the Microfluidic Microscope Module M³

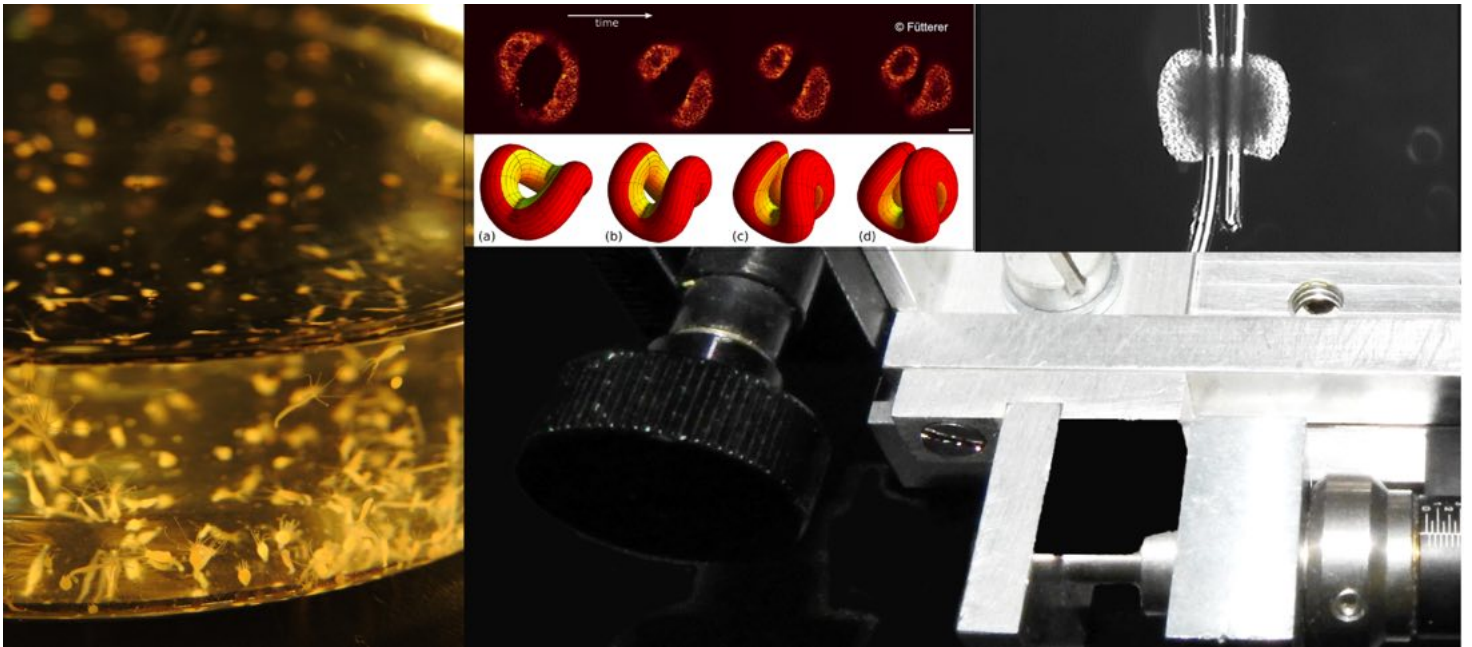
Parameter	Value
Kit Content	Microscopic frame, mirrors, lens holders, lenses, objectives (4x, 10x, other magnifications also available) and objective holders, illumination unit (typically spot light, white, other wave lengths are also possible), focussing unit (typically manual), filter cube (option), prism (option).
Camera	Can be selected specifically, typically we suggest a Ximea camera (monochrome or multicolor) or similar.
Physical Properties	
Dimensions L x W x H	160 x 100 x 60 mm
Weight	< 1kg
Material	Aluminium (anodised)
Threads	Universal C-mount thread, compatible with almost any camera model, Zeiss standard thread for microscopy objectives. Other threads are optional.

The exact specification of the Microfluidic Microscope Module depends on your requirements.



Part V

Instruments for Rheology

Tissue Stretcher – μ N-TS

The tissue stretcher μ N-TS is designed for characterisation of different tissues types – study of tissue contraction, measurement of forces and structure in the tissue, stimulation by forces, electrical fields and drugs.

The system can be used for different research topics, e.g. studying heart tissue, blood vessels, characterisation of dermal tissue, cancer tissue or *hydra vulgaris* as a model for many other applications.

Advantages

- Unique measurement range: μ N, μ m
- All changes during the experiment can be observed: compact device, which easily fits on any microscope stage
- Renewable wet chamber: After each experiment a fresh circular cover slip can be used
- Stand-alone device as well as use with PC

Part VI

Services and Customisation



Simulation of Fluid Dynamics

We analyse fluid dynamics in your application prior to the costly steps of manufacturing of microfluidic chips and simulate applications with liquids of different viscosity, liquid mixtures, temperature gradients, diffusive and advective mixing.

Rapid Prototyping of your microfluidic chips

Ask for approaches to test your chip concept/design prior to going to injection moulding.

Rapid prototyping can sometimes save an additional expensive step in chip manufacturing.

Customisation or Integration of Microfluidic Setups

Let us speak about your microfluidic setups. We can support you with our expertise in Hydrodynamics in order to integrate single components into an optimal microfluidic setup. We can also test the setup with our standard chips or with your chip.

Possible solutions

- Simulation of geometries for fluidic components (chips, manifolds etc.) before manufacturing, test with mathematical scripts (if applicable)
- Manufacturing of microfluidic chips in PDMS (polydimethylsiloxane) or as milling parts
- Customisation of microfluidic setups: selection and integration of different products and periphery

About Us

Biophysical Tools GmbH is your competent partner for Microfluidics – starting with the experiment planning up to its realisation. We are experts in ultra-precise and -fast flow control of fluids (liquids and gases) in Microfluidics and Mesofluidics, which is the focus of our both leading product groups, and in automation and miniaturisation of experiment protocols where fluidics plays a role.

Our goal is to provide highly precise standards for quantitative measurements in Biophysics, Biochemistry, Biology and Medicine. In addition, you benefit from our optional Open Source solution for the system control, for you can develop and adapt it on your own. We integrate our products into your IT environment and develop automatic protocols for the realisation of your specific experiments.

ARRANGE A PHONE CALL OR AN ONLINE MEETING AT: contact@biophysical-tools.de



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The design can deviate from the depicted devices depending on the model and material.

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