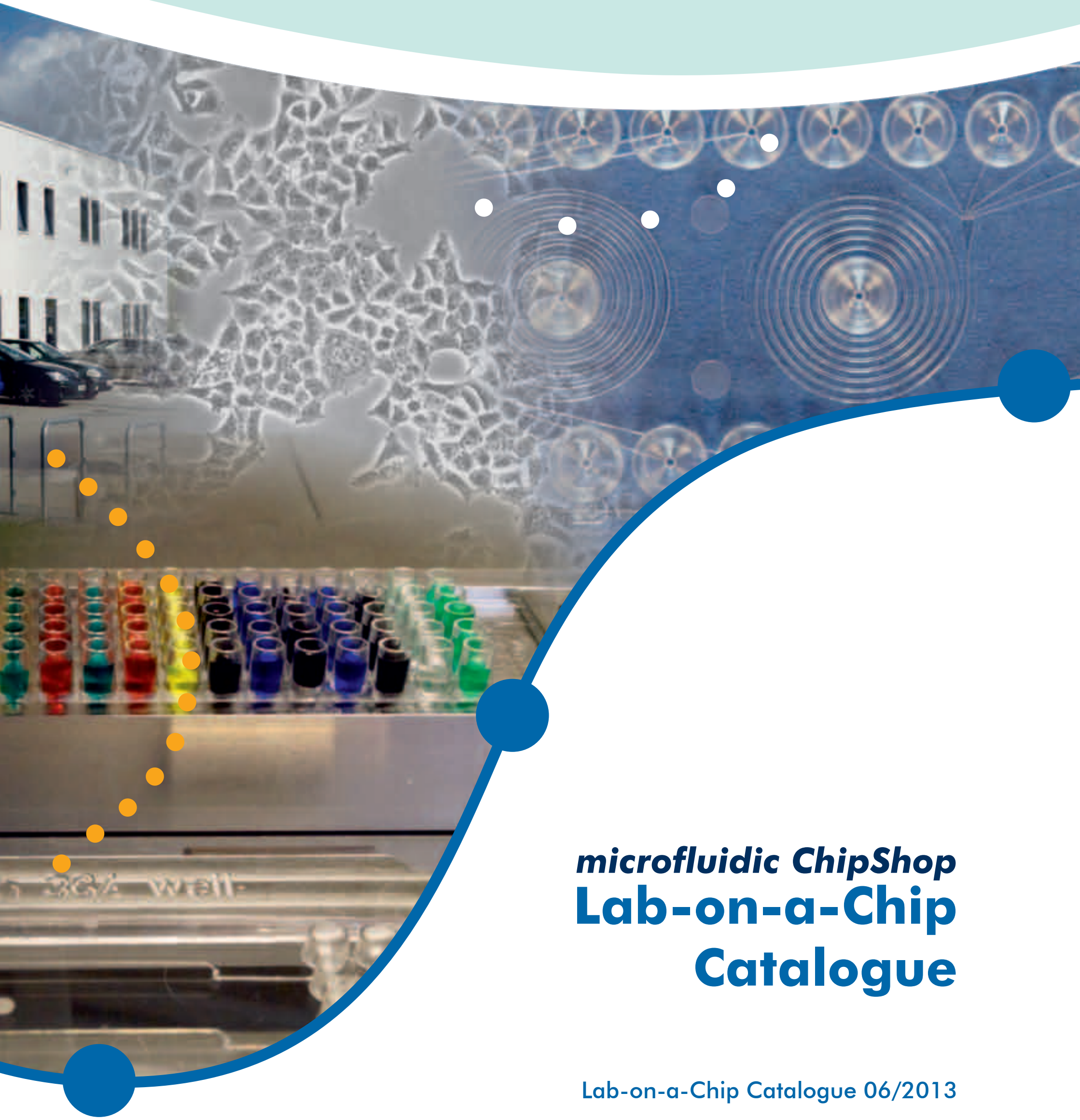
microfluidic ChipShop



microfluidic ChipShop
Lab-on-a-Chip Catalogue

Lab-on-a-Chip Catalogue 06/2013

microfluidic ChipShop – The company

The lab on the chip – miniaturized solutions as easier and faster analytical tools for the life sciences, diagnostics, analytical sciences, and chemistry are at the heart of *microfluidic ChipShop*'s business.

The company, started in 2002 as a spin-off from the Fraunhofer Institute for Applied Optics and Precision Engineering and the Application Center for Microtechnology Jena, has become a world leader in this rapidly growing technology field. Specialists from microfluidics, precision engineering, polymer microtechnology, medical technology, chemistry, biology, and diagnostics form a multi-disciplinary team to develop and manufacture "lab-on-a-chip" systems mainly in polymers. Using industrial manufacturing techniques allows a seamless transition from development stage through small batch production to mass fabrication, an important role in comprehensive support for our customers.

Precision manufacturing on the micrometer scale

A unique feature in *microfluidic ChipShop*'s services is to offer miniaturized components and systems both as self-developed standard products as well as customized solutions from prototype to volume production. *microfluidic ChipShop* covers the entire value and technology chain, starting from the design of the microstructures, followed by mold-insert fabrication, polymer replication using precision injection molding, hot embossing, or casting, mechanical processing steps up to the biochemical functionalization of surfaces and reagent storage on the chip, and finally, industrial quality control. In addition, *microfluidic ChipShop* supports customers in the miniaturization of their biological and diagnostic tasks, e.g. in the transfer of biological assays on the chip, the development of PCR protocols for chip-based applications, or the selection of suitable materials for the immobilization of biomolecules. For these means, the company has its own application department.

Furthermore, the development of complete systems including instrument, chip, and associated application protocols is carried out by *microfluidic ChipShop*; examples include systems for the polymerase chain reaction in a continuous flow or chip-based capillary electrophoresis. To implement these highly complex projects, *microfluidic ChipShop* maintains a worldwide network of research and development collaborations.

In order to fulfill our customers' needs and to deal with all regulatory issues associated with the development and fabrication of diagnostic and medical devices, *microfluidic ChipShop* has been certified according to DIN EN ISO 9001 and DIN ISO 13485 since 2003.

Miniaturized solutions for diagnostics, analytical sciences, and life sciences

Miniaturization has already transformed the world of electronics and became a driver for many markets. Now it's a driving force for an innovation in the life sciences, diagnostics, analytical sciences, and chemistry, which is labeled "lab-on-a-chip." The use of micro- and nano-technologies allows the development of fast, portable, and easy-to-use systems with a high level of functional integration for applications such as point-of-care diagnostics, forensics, the analysis of biomolecules, environmental or food analysis, and drug development. The core of such "lab-on-a-chip" systems are polymer substrates in standard laboratory formats such as microscopy slides or microtiter plates, equipped with tiny structures for the transport and handling of samples. All the functionalities of a chemical or biochemical laboratory, such as the mixing of liquids, aliquoting, the amplification of biomolecules, the synthesis of novel materials, the hybridization of DNA molecules, or the detection of specific substances by optical or electrochemical methods, can be integrated on a single chip. Furthermore, components such as filtration or separation membranes, valves, biochemical sensors, electrodes, and magnetic beads can be integrated into a microstructured polymer substrate.

The integration of biochemical functions on a single chip makes numerous time-consuming and potentially error-prone individual steps redundant, such as multiple pipetting or sample transfer from one device to another.

Standardization: Established formats – Innovation in the core

Lab-on-a-chip technology as a novel technology offers a wide range of advantages for the different applications but also throws up some challenges. On the one hand, restrictions on using novel tools need to be overcome, while on the other hand the introduction of new technologies needs to be affordable. To meet these challenges, *microfluidic ChipShop* drives standardization efforts forcefully: As chip formats, *microfluidic ChipShop* makes use of existing laboratory standards like the microscopy slide or the microtiter plate, allowing the use of standard laboratory equipment like microscopes, pipettes, or laboratory automation. Directly integrated fluidic interfaces enable an easy chip-to-world coupling and a seamless transfer of liquids from the standard lab to the microworld.

The second major advantage of the strict implementation of the standardization concept is cost. During the development process, an investment in an injection-molding tool is a significant hurdle, especially for small- and medium-scale production. To overcome this obstacle, *microfluidic ChipShop* has various injection-molding tools that can be used on existing platforms – ranging from microscopy slides, microtiter plates, to the CD format – for the integration of custom-specific designs. This approach not only reduces costs, but it also speeds up the development process, since the time from design release to the first chips in our customers' hands can be reduced significantly.

microfluidic ChipShop – Our infrastructure

In May 2011, *microfluidic ChipShop* moved into its new corporate headquarters. The purpose-built facility, located in one of Jena's new industry parks conveniently located close to the autobahn, contains on a space of approx. 2.500 sqm (approx. 27.000 sqft) all the required infrastructure for your one-stop-shopping in microfluidics development and production. The building is organized in three main production areas: The first wing contains the precision mechanic workshops. In this area, the design and generation of molding tools, mold inserts and precision machined polymer or metal components takes place. Design data generated by our CAD/CAM team is transformed into parts and tools by our precision and ultraprecision milling and turning machines. These machines as well as equipment for electro-discharge machining (EDM) are placed in a climate-controlled environment with a temperature control of ± 0.5 °C, partly with especially vibration-isolated foundations.

For the manufacturing of polymer parts using injection molding and hot embossing, a temperature controlled clean space of approx. 400 sqm (4.300 sqft) is provided. The injection molding machines are housed in clean-room hoods in order to reduce the particle load. From this area, the parts are transported into a class 7 cleanroom area of 500 sqm (5.400 sqft) for back-end processing. In this area, processes like surface functionalization, integration of wet and dry reagents, spotting, assembly and packaging takes place. For special purposes the company has in addition a class 6 cleanroom (room in room concept). Optical measurement stations including a confocal white-light interferometer and high-precision stereo microscopes are complemented by functional fluidics testing stations for an industrial quality control of our manufactured goods.

The third division contains our biological and biochemical laboratories. In these labs, our team of biologists and chemists develops protocols for on-chip assays, reagent storage solutions or surface modifications for our customers. For this purpose, equipment like spotting tools, PCR machines, lyophilizers or electrophoresis stations is available. These labs also house our microfluidics instrumentation labs, where not only our own instruments, the ChipGenie series, are developed, but also validation experiments for the microfluidic characterization of components and systems are carried out.

Training facilities and office space for guest scientists and development partners complement our infrastructure offerings.

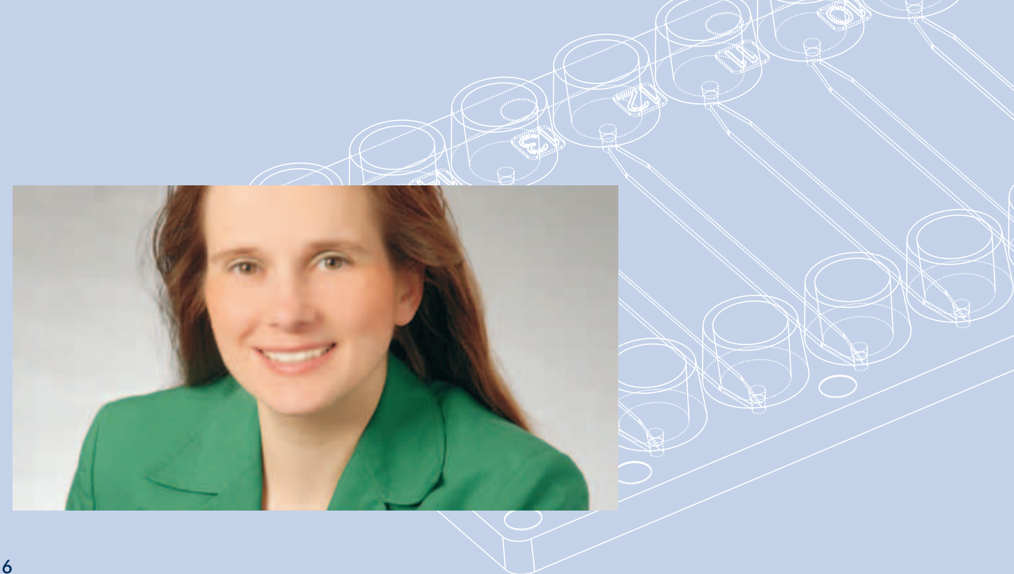
The *Lab-on-a-Chip Catalogue* – Shortcut to the world of microfluidics

Offering catalogue devices and development platforms, fulfilling common laboratory standards in their dimensions and interfaces, *microfluidic ChipShop* allows users a quick, low-cost, and low-risk entry into the innovative field of microfluidics. The chips offered within *microfluidic ChipShop's Lab-on-a-Chip Catalogue* cover a range of applications from simple liquid handling, electrophoresis, extraction, or mixing up to sample preparation and complete analytical tasks.

Please enjoy our *Lab-on-a-Chip Catalogue* as your roadmap to microfluidics. We will be more than happy to assist you with our design and fabrication services as well as to discuss your special needs in the microfluidic world.

Yours,

Dr. Claudia Gärtner
CEO



Contents

microfluidic ChipShop's Lab-on-a-Chip Catalogue

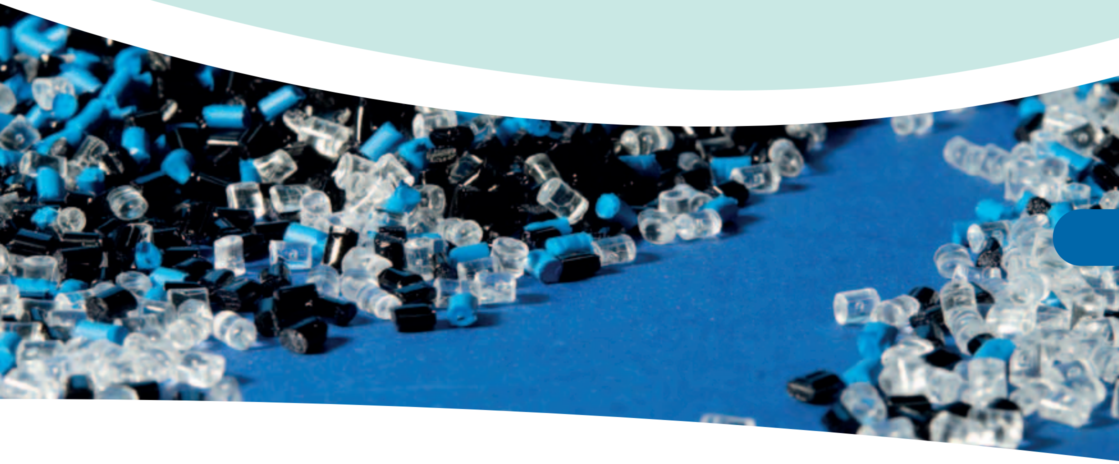
Our mission at *microfluidic ChipShop* is to shrink the biological and chemical laboratory and to bring lab-on-a-chip systems into daily laboratory life.

This catalogue is part of our service to make our mission happen: From off-the-shelf microfluidic chips to complete lab-on-a-chip systems, our products serve a wide range of customer needs.

Whether you need a single chip or thousands, in the following pages you will find the essential components for an easy route into the world of microfluidic handling and manipulation. Be it for the first steps with lab-on-a-chip systems or the evaluation of new designs and functions: you do not need to make up your own design, you avoid tooling costs, and we ensure fast delivery to your doorstep.

Of course, our expertise at *microfluidic ChipShop* extends well beyond the products listed in this catalogue: Whether you seek a competent microfluidic-chip manufacturer, whether you want to translate specific functions into microfluidic designs, or whether you want to develop entire lab-on-a-chip systems, we are here to help you with our full range of production and development services.

1 Materials in microfluidics



Materials in microfluidics

Material matters – and a large choice of different materials is at hand ranging from a wide variety of polymers, to glass, silicon to ceramics or metals. All materials have their pros and cons, looking e.g. at cost or geometrical freedom polymers are dominating. This chapter gives guidance through the material choice. Off-the shelf devices are at hand in polymers, on request on glass, custom-designs can be offered in all kind of materials and material combinations.

1.1 Materials in microfluidics

In microfluidics, a wide variety of materials is in use. Historically, microfluidics and the use as lab-on-a-chip for applications in life sciences or analytical sciences started with technologies being available from semiconductor industries. Consequently, since these technologies were available and allowed for microstructuring, they were used for the first microfluidic devices. Materials that were applicable to be structured by technologies used in semiconductor industries were glass and silicon. First microfluidic devices, besides ink jet printer heads for non-life science microfluidics, were made from glass and silicon, reaching back to the 1970ies with Stephen Terry's gas chromatograph integrated on a silicon wafer, functional but rather expensive.

The semiconductor technologies have been available at many engineering institutes, thus these disciplines pioneered in microfluidics due to the availability of elaborate and usually expensive technologies

Another manufacturing technology arose by simply taking the microstructured silicon devices made by the semiconductor technologies and replicating the structures in a soft polymer in a process called casting, just by pouring the liquid polymer onto the silicon matrix, hardening it and removing the soft polymer replicate. This process can be repeated may times, and besides one-time investment in the silicon master, it is from an equipment point of view an extremely low-cost technology. Material used for this process is a special kind of silicone, usually PDMS (Polydimethylsiloxane).

Later on, a merger of conventional fabrication technologies for e.g. standard life science plastic lab ware, namely injection molding, with microtechnology took place. The challenge that had to be overcome to make this technology available for microfluidics was in a first instance the generation of the microstructured master in metals that withstands, depending on the feature sizes, several thousands to several hundred thousand replication cycles. After the replication, assembling technologies needed to be developed. Finally, this replication technology in combination with a wide variety of available polymers, enables a most cost efficient fabrication together with the widest design freedom.

1.2 Materials and underlying technologies

Each material has different characteristics and the technology choice for the micro-structuring has to be done accordingly. An overview on the different technologies being applied is given in Table 1.

Table 1: Technologies for microstructuring of different materials

Material	Technology	Comment
Metal	• Precision mechanical machining • Laser machining • Electro Discharge machining	
Silicon	• Wet chemical etching • Dry etching (DRIE)	
Glass	• Wet chemical etching • Powder or sandblasting • Photostructuring	
Elastomers	• Casting	
Thermoplastic polymers	• Injection molding • Hot embossing • Laser machining • Precision mechanics	Injection molding as replicative technology allows for the most cost-efficient fabrication of microstructured devices.

The fabrication of a lab-on-a-chip system requires more than just the microstructured part. Usually at least a cover lid needs to be placed on the microstructures, requiring special assembly technologies.

For glass and silicon, established processes are at hand, exceeding also for "cold" processes easily the 100°C temperature. Silicone can be easily mounted onto itself or glass and silicon, but the joint can be released. For thermoplastic polymers, several technologies are at hand allowing to join parts without harming microstructures and working without elevated temperatures.

1.3 Glass versus polymers

Comparing two main materials in microfluidics, namely glass and polymers, shows their pros and cons.

Glass and the standard thermoplastic polymers being in use in microfluidics are highly optically transparent.

Table 2 summarizes pros and cons of glass versus polymers.

Table 2: Characteristics of glass and polymers

Optics	Standard thermoplasts	Glass
Transparency	• Good	• Good
Autofluorescence	• Low (right polymer choice important)	• Low
Application in UV region	• In near UV special polymers available	• Quartz glass needs to be chosen
Surface roughness	• Depending on mold insert quality. • Can be optically smooth.	• Smooth for wet etched devices, rough surface after powderblasting. Afterward chemical polishing possible.
Thermal stability	• Depending on the polymer choice. Standard polymers used for PCR application withstand 100°C and slightly higher temperatures.	• Usually transfers to liquid phase around 600°C for many glasses
Stability against organic solvents	• Limited	• High
Stability against standard solvents in life sciences (acetone, alcohol)	• Polymers available	• High
Stability against acidic solutions	• High	• High
Stability against basic solutions	• High	• Medium
Unspecific binding of biological components	• Polymers with low unspecific binding available. Surface functionalization to avoid this problem available	• High. Surface functionalization to avoid this problem available
Part design		
Design freedom	• High	• Low
Combination of different structural depths in one device	• Easy	• Difficult and more than one depth directly increases the price
Direct integration of fluidic interfaces	• Easy – directly in the injection molded part	• Difficult, usually an afterwards assembling process of a non-glass-component
Direct integration of e.g. reservoirs	• Easy – directly in the injection molded part	• Limited. Large structures cannot be integrated as glass part due to cost issues.

Additional functionalities	Standard thermoplasts	Glass
Integration of liquid and dry reagents in the chip	• Easy	• Limited to impossible. For bioreagents like enzymes with limited thermal stability impossible.
Integration of hybrid components like filters	• Easy	• Limited to impossible
Integration of valves on chip	• Easy	• Limited to passive and elastomeric membrane valves
Fabrication		
Material cost	• Low to medium, 2 – 20 € / kg	• High
Highest price impact	• Replication (microstructuring) has a negligible impact! • Assembly	• Footprint of the device. E.g. already the material price for a microfluidic chip in the format of a microscopy slide is a few € (depending on material choice). • Microstructuring • Assembly

Looking at the different characteristics, also in combination with the price, polymers will always be used when glass is not required, since they are the cheaper devices. Glass is of interest if elevated temperatures are necessary, much above 100°C, what is usually not the case in life sciences, and if specific organic solvents should be used.

If bioreagents should be stored on-chip, complex fluidics, hybrid components like membranes are necessary, valves should be part of the device etc. polymers will be the material of choice.

Furthermore, interfaces, reservoirs and different structural depths do not impact the price of the device in polymers, but partly are impossible to be implemented in a glass device or massively increase cost.

1.4 Polymers in microfluidics

Polymers used in microfluidic are mainly transparent thermoplastic polymers. Most popular are PMMA (Polymethylmetacrylate), Topas, Zeonor, PC (Polycarbonate) and PS (Polystyrene). Topas and Zeonor have outstanding optical characteristics, extremely low water uptake and extremely low permeability for water vapour. Furthermore, they withstand polar organic solvents like acetone and isopropanol frequently used in life sciences.

Table 3: Standard polymers used at *microfluidic ChipShop* – PMMA

Material	Grades	Description
PMMA – Polymethylmeta-crylate	**mcs-PMMA-03** **mcs foil 13** **(175 µm thickness)**	**PMMA** is a transparent thermoplastic, often used as a light-weight or shatter-resistant alternative to glass. It is sometimes called acrylic glass or Plexiglass. Chemically, it is the synthetic polymer of methyl methacrylate. PMMA is an acrylate polymer with an ester-group. This can be used to modify the surface chemically.
Chemical Resistance:		

Can be used with:	Not to be used with:
• Aqueous solutions including diluted acids and bases • Aldehydes • Amines • Oils and Fats	• Concentrated acids and bases • Alcohols • Esters • Ketones • Aromatics • halogenated hydrocarbons

Table 4: Standard polymers used at *microfluidic ChipShop* – PC

Material	Grades	Description
PC – Polycarbonate	**mcs-PC-013** **mcs foil 042** **(175 µm thickness)**	**PC** is thermoplastic polymer. Compared to other materials used in microfluidics like Zeonor or Topas it is less hydrophobic and therefore, the channels show a better filling behaviour. It has a higher T_g compared to PMMA and can be used for higher temperature applications like e.g. PCR. The drawback of this material is the relatively high intrinsic fluorescence in particular of the available foil material, compared e.g. to Topas, Zeonor or PMMA.
Chemical Resistance:		
Can be used with:		Not to be used with:
• Diluted acids • Oils, fats • Alcohols		• Bases • halogenated hydrocarbons • Esters • Ketones, Aldehydes • Amines • Aromatics

Table 5: Standard polymers used at *microfluidic ChipShop* – PS

Material	Grades	Description
PS – Polystyrene	**mcs-PS-09** **mcs foil 12** **(100 µm thickness)**	**PS** is a thermoplastic polymer. Polystyrene (PS) is an aromatic polymer made from the monomer styrene. Polystyrene can be rigid or foamed. General purpose polystyrene is clear, hard and brittle. It is a very inexpensive resin per unit weight. It is a rather poor barrier to oxygen and water vapor and has relatively low melting point. PS is one of the standard material conventionally used in the life sciences also due to is relatively low price. E.g. microtiter plates are usually made from PS.
Chemical Resistance:		
Can be used with:		Not to be used with:
• Bases • Butyl alcohol, ethylene glycol • Isopropanol (at room temperature) • Organic acids like citric acids, formic acids, tartaric acids • Diluted inorganic acids at lower temperatures (except hydrofluoric acids) • Mineral oil • Hydrogen oxide		• Ketones • Esters • Ethers • Halogenated organic reagents • Hydrocarbons (mineral oil works)

Table 6: Standard polymers used at *microfluidic ChipShop* – Topas (COC)

Material	Grades	Description
Topas (COC)	**mcs-Topas-03** **mcs foil 011** **(140 µm thickness)**	**Topas** is thermoplastic polymer. It is cyclo-olefin copolymer (COC). It is completely nonpolar and amorphous. It has a very low permeability for water vapour and a low capacity for the absorption of water. The current drawback of this material is that available foil material has a T_g around 70°C.

Chemical Resistance:	
Can be used with:	**Not to be used with:**
• Aqueous solutions including acids and bases • Polar solvents • Can be used with mcs-oil-04	• Nonpolar solvents • Oils • Fats • Halogenated hydrocarbons

Table 7: Standard polymers used at *microfluidic ChipShop* – Zeonor (COP)

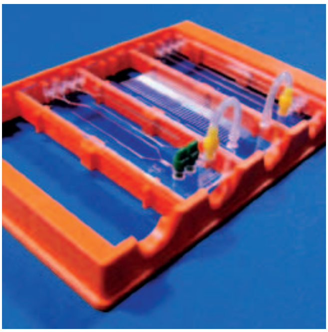
Material	Grades	Description
Zeonor (COP)	**mcs-COP-02** **mcs foil 005** **(188 µm thickness)**	**Zeonor** is a thermoplastic polymer. Zeonor is a cyclo-olefin polymer (COP). It is completely nonpolar and amorphous. It has a very low permeability for water vapour and a low capacity for the absorption of water.

Chemical Resistance:	
Can be used with:	**Not to be used with:**
• Aqueous solutions including acids and bases • Polar solvents • Can be used with mcs-oil-04	• Nonpolar solvents • Oils • Fats • Halogenated hydrocarbons

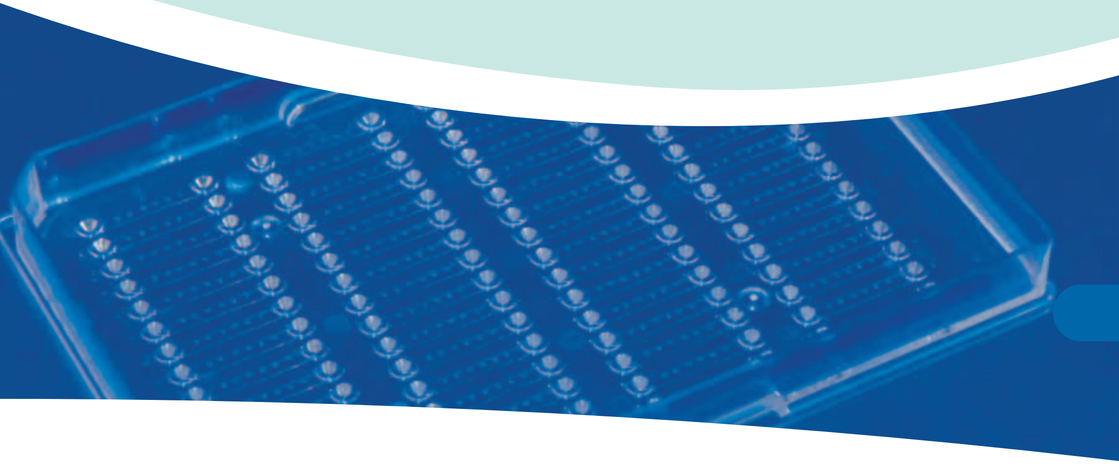
Table 8: Standard polymers used at *microfluidic ChipShop* – Zeonex (COP)

Material	Grades	Description
Zeonex (COP)	**mcs-COP-04**	**Zeonex** is thermoplastic polymer. Zeonex is a cyclo-olefin polymer (COP). It is completely nonpolar and amorphous. It has a very low permeability for water vapour and a low capacity for the absorption of water.

Chemical Resistance:	
Can be used with:	**Not to be used with:**
• Aqueous solutions including acids and bases • Polar solvents • Can be used with mcs-oil-04	• Nonpolar solvents • Oils • Fats • Halogenated hydrocarbons



2 Microfluidic chips – Polymers



Microfluidic chips – Polymers

Ready-to-go microfluidic chips – this chapter summarizes various kinds of standard chips such as simple straight channels, cross-shaped channel chips for electrophoresis, extractors, micro-mixers, droplet generators, and nanotiter plates. All chips are easy to use with a pipette or the fluidic interfaces and support kits offered as accessories in Chapter 5.

Taking our standardization principles into account, all these chips have the format of a microscopy slide or a microtiter plate. The spacing between the fluidic interfaces either corresponds with the spacing of a 96 or 384 well plate, namely 4.5 mm or 9 mm respective distance from center to center of the wells.

2.1 Straight channel chips – Microscopy slide format

On the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm), microfluidic channels in various widths and depths are available. The channel distance from center to center is 4.5 mm according to the spacing of a 384 microtiter plate. The fluidic chips are available with simple through-holes fitting to normal pipette tips, and Mini Luer interfaces that can be used with the respective counterpart (see Chapter 5, fluidic interfaces). Alternatively, standard Luer interfaces are convenient, as are olives integrated on the chip to be directly connected with silicone tubings, for example.

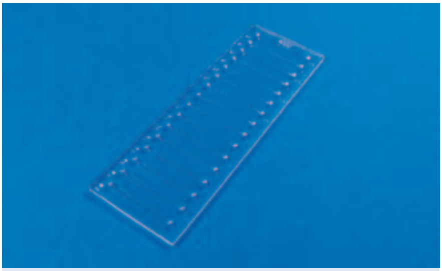


Fig. 1: Microfluidic chip – 16-channel through-hole chip family

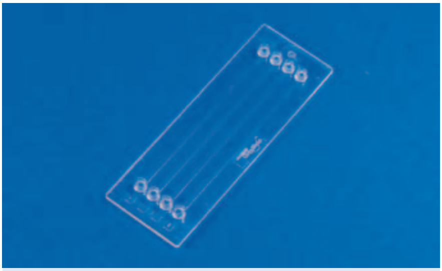


Fig. 2: Microfluidic chip – four-channel Mini Luer chip family

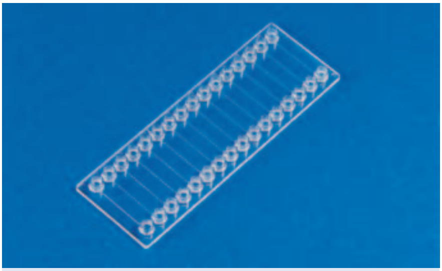


Fig. 3: Microfluidic chip – 16-channel Mini Luer chip family

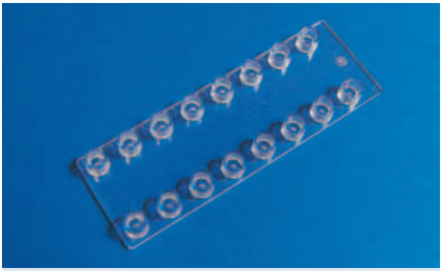


Fig. 4: Microfluidic chip – 8-channel Luer chip family

2.1.1 Straight channel chips – Fluidic interface: Through-holes

2.1.1.1 Straight channel chips – Fluidic interface: Through-holes – Four parallel channels

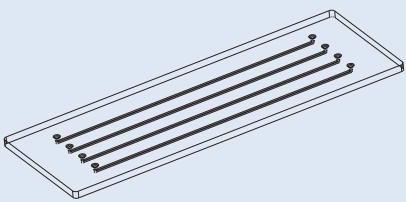


Fig. 5: Schematic drawing of the four-channel through-hole chip family

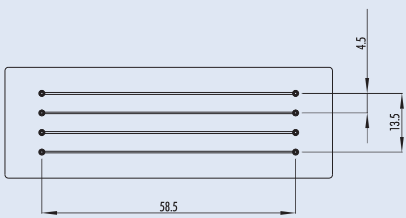


Fig. 6: Details of the four-channel through-hole chip family

Product Code	Channel			Cover Lid	Material	Price [€/chip]		
	Width [µm]	Depth [µm]	Length [mm]	Thickness [µm]		1+	10+	30+
01-0152-0143-01	20	20	58.5	175	PMMA	42.50	31.20	23.50
01-0153-0143-02	20	20	58.5	140	Topas	42.50	31.20	23.50
01-0154-0145-01	50	50	58.5	175	PMMA	42.50	31.20	23.50
01-0155-0145-02	50	50	58.5	140	Topas	42.50	31.20	23.50
01-0156-0144-01	100	100	58.5	175	PMMA	42.50	31.20	23.50
01-0157-0144-02	100	100	58.5	140	Topas	42.50	31.20	23.50
01-0158-0156-01	200	200	58.5	175	PMMA	36.20	24.30	18.10
01-0159-0156-02	200	200	58.5	140	Topas	36.20	24.30	18.10
01-0203-0180-01	800	20	58.5	175	PMMA	36.20	24.30	18.10
01-0204-0180-02	800	20	58.5	140	Topas	36.20	24.30	18.10
01-0160-0138-01	1,000	200	58.5	175	PMMA	36.20	24.30	18.10
01-0161-0138-02	1,000	200	58.5	140	Topas	36.20	24.30	18.10

2.1.1.2 Straight channel chips – Fluidic interface: Through-holes – 16 parallel channels

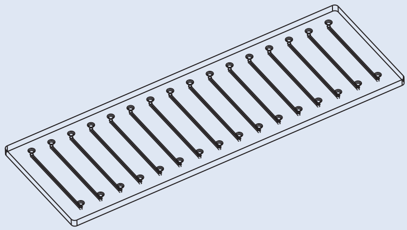


Fig. 7: Schematic drawing of the 16-channel through-hole chip family

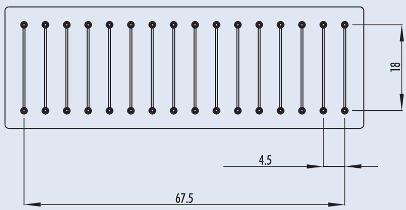


Fig. 8: Details of the 16-channel through-hole chip family

Product Code	Channel			Cover Lid	Material	Price [€/chip]		
	Width [µm]	Depth [µm]	Length [mm]	Thickness [µm]		1+	10+	30+
01-0162-0142-01	200	100	18.0	175	PMMA	36.20	24.30	18.10
01-0163-0142-02	200	100	18.0	140	Topas	36.20	24.30	18.10
01-0164-0152-01	1,000	200	18.0	175	PMMA	36.20	24.30	18.10
01-0165-0152-02	1,000	200	18.0	140	Topas	36.20	24.30	18.10

2.1.2 Straight channel chips – Fluidic interface: Olives

2.1.2.1 Straight channel chips – Fluidic interface: Olives – Four parallel channels

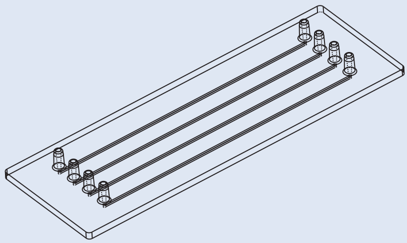


Fig. 9: Schematic drawing of the four-channel olive chip family

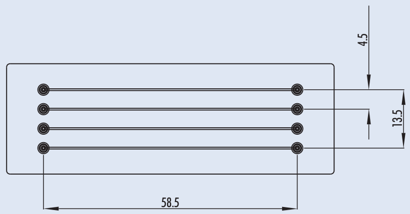


Fig. 10: Details of the four-channel olive chip family

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
01-0182-0143-01	20	20	58.5	175	PMMA	42.50	31.20	23.50
01-0183-0143-02	20	20	58.5	140	Topas	42.50	31.20	23.50
01-0184-0145-01	50	50	58.5	175	PMMA	42.50	31.20	23.50
01-0185-0145-02	50	50	58.5	140	Topas	42.50	31.20	23.50
01-0186-0144-01	100	100	58.5	175	PMMA	42.50	31.20	23.50
01-0187-0144-02	100	100	58.5	140	Topas	42.50	31.20	23.50
01-0188-0156-01	200	200	58.5	175	PMMA	36.20	24.30	18.10
01-0189-0156-02	200	200	58.5	140	Topas	36.20	24.30	18.10
01-0205-0180-01	800	20	58.5	175	PMMA	36.20	24.30	18.10
01-0206-0180-02	800	20	58.5	140	Topas	36.20	24.30	18.10
01-0190-0138-01	1,000	200	58.5	175	PMMA	36.20	24.30	18.10
01-0191-0138-02	1,000	200	58.5	140	Topas	36.20	24.30	18.10

2.1.2.2 Straight channel chips – Fluidic interface: Olives – 16 parallel channels

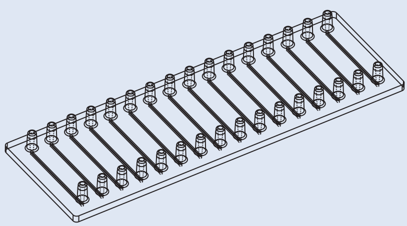


Fig. 11: Schematic drawing of the 16-channel olive chip family

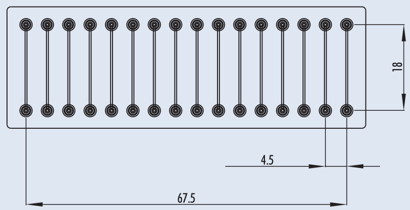


Fig. 12: Details of the 16-channel olive chip family

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
01-0192-0142-01	200	100	18.0	175	PMMA	36.20	24.30	18.10
01-0193-0142-02	200	100	18.0	140	Topas	36.20	24.30	18.10
01-0194-0152-01	1,000	200	18.0	175	PMMA	36.20	24.30	18.10
01-0195-0152-02	1,000	200	18.0	140	Topas	36.20	24.30	18.10

2.1.3 Straight channel chips – Fluidic interface: Mini Luer
2.1.3.1 Straight channel chips – Fluidic interface: Mini Luer – Four parallel channels

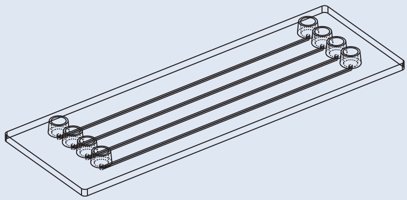


Fig. 13: Schematic drawing of the four-channel Mini Luer chip family

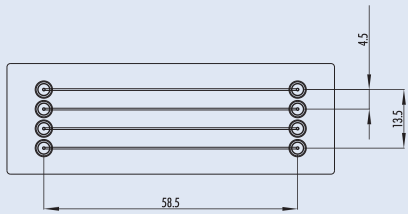


Fig. 14: Details of the four-channel Mini Luer chip family

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
01-0166-0143-01	20	20	58.5	175	PMMA	42.50	31.20	23.50
01-0167-0143-02	20	20	58.5	140	Topas	42.50	31.20	23.50
01-0168-0145-01	50	50	58.5	175	PMMA	42.50	31.20	23.50
01-0169-0145-02	50	50	58.5	140	Topas	42.50	31.20	23.50
01-0170-0144-01	100	100	58.5	175	PMMA	42.50	31.20	23.50
01-0171-0144-02	100	100	58.5	140	Topas	42.50	31.20	23.50
01-0172-0156-01	200	200	58.5	175	PMMA	36.20	24.30	18.10
01-0173-0156-02	200	200	58.5	140	Topas	36.20	24.30	18.10
01-0207-0180-01	800	20	58.5	175	PMMA	36.20	24.30	18.10
01-0208-0180-02	800	20	58.5	140	Topas	36.20	24.30	18.10
01-0174-0138-01	1,000	200	58.5	175	PMMA	36.20	24.30	18.10
01-0175-0138-02	1,000	200	58.5	140	Topas	36.20	24.30	18.10

2.1.3.2 Straight channel chips – Fluidic interface: Mini Luer – 16 parallel channels

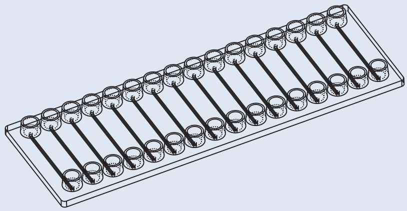


Fig. 15: Schematic drawing of the 16-channel Mini Luer chip family

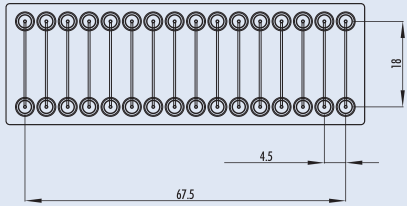


Fig. 16: Details of the 16-channel Mini Luer chip family

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
01-0176-0142-01	200	100	18.0	175	PMMA	36.20	24.30	18.10
01-0177-0142-02	200	100	18.0	140	Topas	36.20	24.30	18.10
01-0178-0152-01	1,000	200	18.0	175	PMMA	36.20	24.30	18.10
01-0179-0152-02	1,000	200	18.0	140	Topas	36.20	24.30	18.10

2.1.4 Straight channel chips – Fluidic interface: Luer

2.1.4.1 Straight channel chips – Fluidic interface: Luer – Eight parallel channels

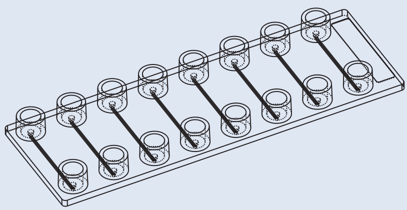


Fig. 17: Schematic drawing of the eight-channel Luer chip family

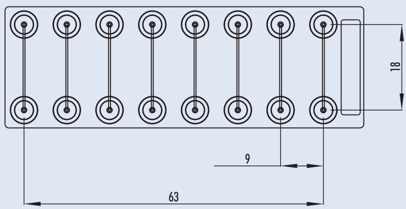


Fig. 18: Details of the eight-channel Luer chip family

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
01-0180-0157-01	100	100	18.0	175	PMMA	42.50	31.20	23.50
01-0181-0157-02	100	100	18.0	140	Topas	42.50	31.20	23.50
01-0190-0431-01	2,910	100	18.0	175	PMMA	42.50	31.20	23.50
01-0191-0431-05	2,910	100	18.0	188	Zeonor	42.50	31.20	23.50

2.1.4.2 Straight channel chips – Fluidic interface: Luer – One channel

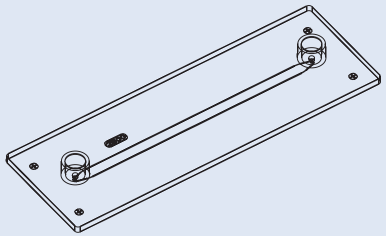


Fig. 19: Schematic drawing of the one channel chip with Luer interface

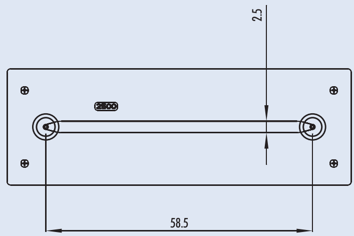


Fig. 20: Details of the one channel chip with Luer interface

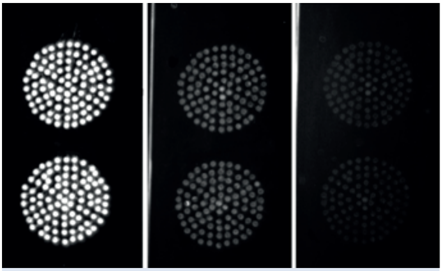


Fig. 21: Spotted fluorescent probes (spot diameter 80 µm) in channel of one channel Luer chip. Concentrations (left to right) 100 ng/µl, 10 ng/µl, 1 ng/µl

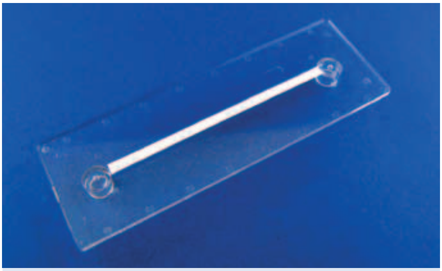


Fig. 22: One channel Luer chip with inserted lateral flow strip and spotted probes

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Lid Thickness [µm]	Material	Surface treatment	Price [€/chip] 1+	10+	100+
01-0182-0268-01	2,500	150	58.5	175	PMMA	-	36.20	24.30	18.10
01-0183-0268-05	2,500	150	58.5	188	Zeonor	-	36.20	24.30	18.10
01-0184-0268-01	2,500	150	58.5	175	PMMA	hydrophilized	46.20	29.30	19.98
01-0185-0268-05	2,500	150	58.5	188	Zeonor	hydrophilized	46.20	29.30	19.98

2.2 Straight channel chips – Microtiter-plate format – Fluidic interface: Through-holes

The SBS titer-plate format (85.48 mm x 127.76 mm) is a worldwide standard used by almost all pieces of equipment in the laboratory. To easily integrate a microfluidic development into existing lab environments, we have developed a microfluidic platform with the outer dimensions of a standard microtiter plate. The plate is equipped with four labeled sets of 16 microchannels each, with the dimensions 2 mm width, 150 μm height, and 18 mm length. Fluidic access is easily provided by conical openings of 2.5 mm diameter at either channel end. The plate is available in a variety of polymer materials like PC, PS, PMMA, or COP (Zeonor), either in its native state or hydrophilically primed for self-filling of the microchannels with aqueous solutions. It is possible to include surface functionalization in the channels like the spotting of DNA probes, etc. (see Fig. 26: Microfluidic titer plate with spotted probes). Applications include cell-based assays, hybridization assays, or small volume chemical synthesis.

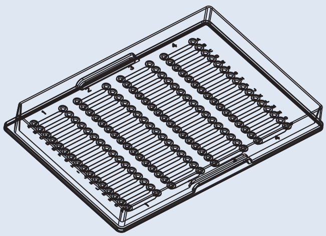


Fig. 23: Schematic drawing of the microfluidic titer plate

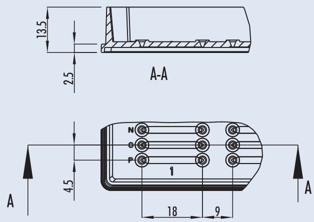


Fig. 24: Details of the microfluidic titer plate

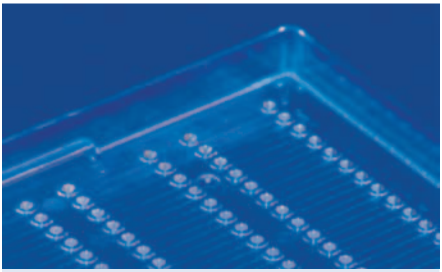


Fig. 25: Microfluidic titer plate

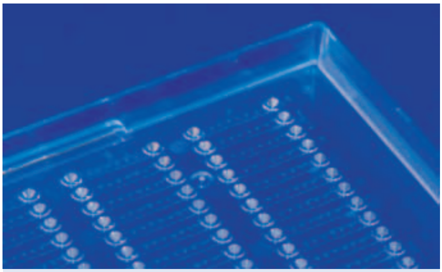


Fig. 26: Microfluidic titer plate with spotted probes

Product Code	Channel Dimensions Width [mm]	Depth [mm]	Length [mm]	Material	Surface Treatment	Price [€/chip] 1+	10+	30+
01-0242-0102-01	2	0.15	18	PMMA	-	79.00	59.00	29.00
01-0243-0102-03	2	0.15	18	PC	-	79.00	59.00	29.00
01-0244-0102-07	2	0.15	18	PS	-	79.00	59.00	29.00
01-0245-0102-05	2	0.15	18	Zeonor	-	79.00	59.00	29.00
01-0246-0102-01	2	0.15	18	PMMA	hydrophilized	98.00	78.00	38.00
01-0247-0102-03	2	0.15	18	PC	hydrophilized	98.00	78.00	38.00
01-0248-0102-07	2	0.15	18	PS	hydrophilized	98.00	78.00	38.00
01-0249-0102-05	2	0.15	18	Zeonor	hydrophilized	98.00	78.00	38.00

2.3 Straight channel chips with waste chamber

2.3.1 Straight channel chips with waste chamber – Single channel –Fluidic interface: Luer

This device features a single broad channel with an additional large chamber, for example to allow on-chip waste storage. As fluidic interfaces, female Luer connectors are attached.

For the colored chips, the structured part is dyed and the cover lid is transparent.

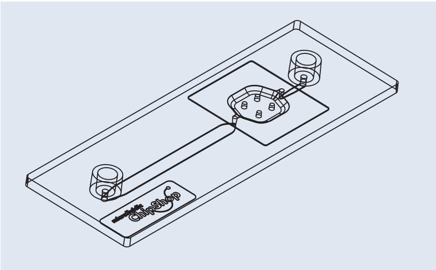


Fig. 27: Schematic drawing of a straight channel chip with additional large chamber

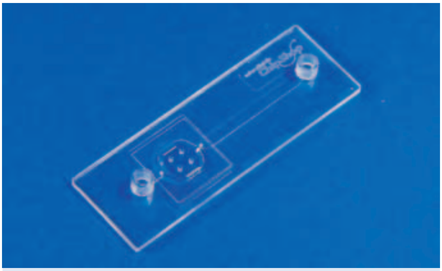


Fig. 28: Straight channel chip – transparent

Fig. 29: Straight channel chip – transparent with spotted probes

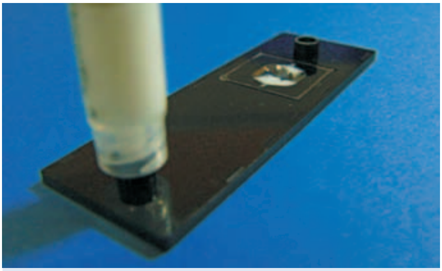


Fig. 30: Straight channel chip – black

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Volume chamber [µl]	Material	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 30+
01-0196-0095-01	3000	200	36.0	75	PMMA	44.50	31.20	23.50
01-0197-0095-02	3000	200	36.0	75	Topas	44.50	31.20	23.50
01-0198-0095-02b	3000	200	36.0	75	Topas, black	44.50	31.20	23.50
01-0199-0095-03	3000	200	36.0	75	PC	44.50	31.20	23.50
01-0200-0095-03.1	3000	200	36.0	75	PC, black	44.50	31.20	23.50
01-0201-0095-05	3000	200	36.0	75	Zeonor	44.50	31.20	23.50
01-0202-0095-05.1	3000	200	36.0	75	Zeonor, black	44.50	31.20	23.50

2.3.2 Straight channel chips with waste chamber – Double channel – Fludic interface: Mini Luer

In this chip, two large fluidic chambers are implemented at the top of the chip. Four fluidic interfaces for each of these chambers allow not only to apply the sample, but in particular to flow different reagent solutions in the chambers using connected pumps. Large waste reservoirs, allowing for a liquid uptake of roughly 500 μl each, enable to run assays without a need for waste management. A water-tight but air permeable membrane ensures that no contamination will take place through the waste reservoirs.

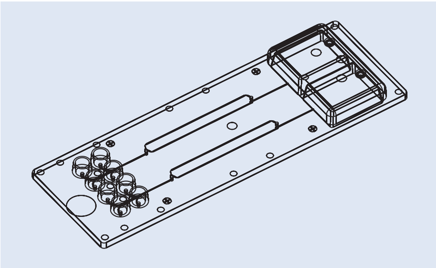


Fig. 31: Schematic drawing of a straight channel chip with waste chamber 0272

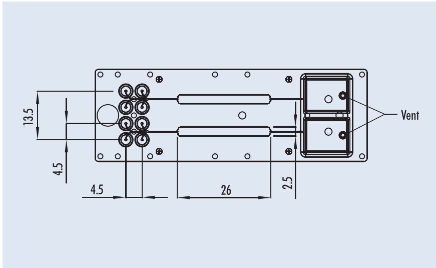


Fig. 32: Details straight channel chip with waste chamber 0272

Fig. 33: Straight channel chip 0272

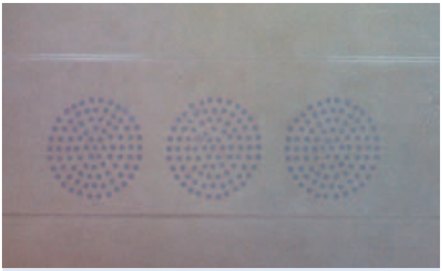


Fig. 34: Spotted probes (diameter 80 μm) in straight channel chip 0272

Product Code	Channel Width [μm]	Channel Depth [μm]	Channel Length [mm]	Lid Thickness [μm]	Material	Surface treatment	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 100+
01-0234-0272-01	2.500	200	26.0	175	PMMA	-	44.50	31.20	23.50
01-0235-0272-02	2.500	200	26.0	140	Topas	-	44.50	31.20	23.50
01-0236-0272-05	2.500	200	26.0	188	Zeonor	-	44.50	31.20	23.50
01-0237-0272-05.1	2.500	200	26.0	188	Zeonor black	-	44.50	31.20	23.50
01-0238-0272-05.2	2.500	200	26.0	188	Zeonor white	-	44.50	31.20	23.50
01-0239-0272-01	2.500	200	26.0	175	PMMA	hydrophilized	55.50	36.20	25.60
01-0240-0272-02	2.500	200	26.0	140	Topas	hydrophilized	55.50	36.20	25.60
01-0241-0272-05	2.500	200	26.0	188	Zeonor	hydrophilized	55.50	36.20	25.60

2.4 Cross-shaped channel chips

A variety of chips with crossing channels either with T or double-T junctions is offered in this chapter. Different outer formats ranging from the microscopy slide format, 25.5 mm x 75.5 mm, to extended size platforms with 95.5 mm x 16 mm x 1.5 mm or 141 mm x 16 mm x 1.5 mm respectively are possible. The maximum available standard channel length is 120 mm. As fluidic interfaces, simple through-holes for the filling with pipettes or female Luer adapters are available. One of the most common applications of this chip category is the use in capillary electrophoresis.

2.4.1 Cross-shaped channel chips – Extended size plaform I

2.4.1.1 Cross-shaped channel chips – Extended size platform I Fluidic interface: Through-holes

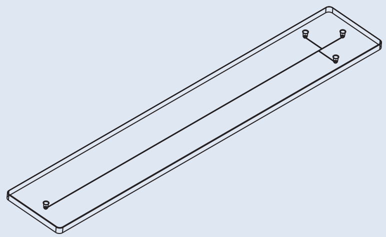


Fig. 35: Schematic drawing of the cross-shaped channel chip

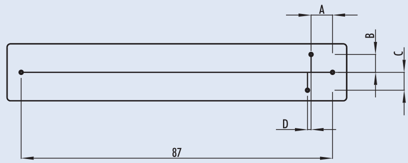


Fig. 36: Details of the cross-shaped channel chips

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Hole Diameter [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+	1000+
02-0758-0082-01	50	50	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0759-0082-02	50	50	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0760-0201-01	50	50	87.0	1.0	6.0	5.0	5.0	0.1	175	PMMA	42.35	31.19	25.18	9.98
02-0761-0201-02	50	50	87.0	1.0	6.0	5.0	5.0	0.1	140	Topas	42.35	31.19	25.18	9.98
02-0762-0106-01	75	75	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0763-0106-02	75	75	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0764-0166-01	100	100	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0765-0166-02	100	100	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98

2.4.1.2 Cross-shaped channel chips – Extended size platform I
Fluidic interface: Luer

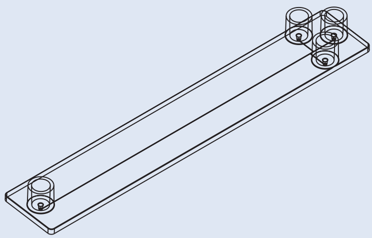


Fig. 37: Schematic drawing of the cross-shaped channel chip

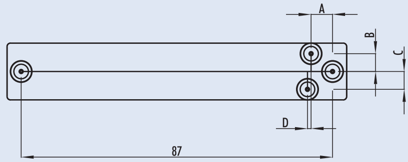


Fig. 38: Details of the cross-shaped channel chips with Luer interfaces

Fig. 39: Cross-shaped channel chip with Luer interfaces

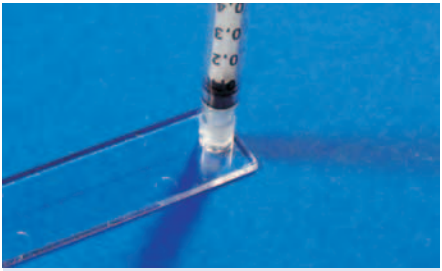


Fig. 40: Cross-shaped channel chip with female Luer interface and a syringe as male counterpart

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Hole-Diameter [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+	1000+
02-0750-0082-01	50	50	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0751-0082-02	50	50	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0769-0082-05	50	50	87.0	1.0	6.0	5.0	5.0	0	100	Zeonor	42.35	31.19	25.18	9.98
02-0752-0201-01	50	50	87.0	1.0	6.0	5.0	5.0	0.1	175	PMMA	42.35	31.19	25.18	9.98
02-0753-0201-02	50	50	87.0	1.0	6.0	5.0	5.0	0.1	140	Topas	42.35	31.19	25.18	9.98
02-0767-0201-05	50	50	87.0	1.0	6.0	5.0	5.0	0.1	100	Zeonor	42.35	31.19	25.18	9.98
02-0754-0106-01	75	75	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0755-0106-02	75	75	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0768-0106-05	75	75	87.0	1.0	6.0	5.0	5.0	0	100	Zeonor	42.35	31.19	25.18	9.98
02-0770-0202-01	75	75	87.0	1.0	6.0	5.0	5.0	0.1	175	PMMA	42.35	31.19	25.18	9.98
02-0771-0202-02	75	75	87.0	1.0	6.0	5.0	5.0	0.1	140	Topas	42.35	31.19	25.18	9.98
02-0772-0202-05	75	75	87.0	1.0	6.0	5.0	5.0	0.1	100	Zeonor	42.35	31.19	25.18	9.98
02-0756-0166-01	100	100	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0757-0166-02	100	100	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0766-0166-05	100	100	87.0	1.0	6.0	5.0	5.0	0	100	Zeonor	42.35	31.19	25.18	9.98

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Hole-Diameter [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+	1000+
02-0773-0394-01	200	200	87.0	1.0	6.0	5.0	5.0	0	175	PMMA	42.35	31.19	25.18	9.98
02-0774-0394-02	200	200	87.0	1.0	6.0	5.0	5.0	0	140	Topas	42.35	31.19	25.18	9.98
02-0775-0394-05	200	200	87.0	1.0	6.0	5.0	5.0	0	100	Zeonor	42.35	31.19	25.18	9.98
02-0776-0395-01	400	200	87.0	1.0	6.0	5.0	5.0	0.1	175	PMMA	42.35	31.19	25.18	9.98
02-0777-0395-02	400	200	87.0	1.0	6.0	5.0	5.0	0.1	140	Topas	42.35	31.19	25.18	9.98
02-0778-0395-05	400	200	87.0	1.0	6.0	5.0	5.0	0.1	100	Zeonor	42.35	31.19	25.18	9.98

2.4.1.3 Cross-shaped channel chips – Extended size platform I Fluidic interface: Thread for LabSmith interfaces

This cross shaped channel chip design includes integrated threads in all fluidic interface in order to allow to screw in the respective LabSmith one piece fittings (09-0599-0000-12). These fittings allow for high pressure connections.

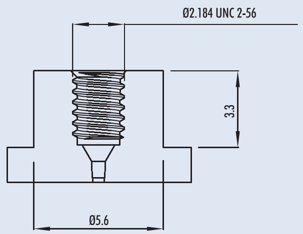


Fig. 41: Detail of thread in cross-shaped channel chip fluidic interface

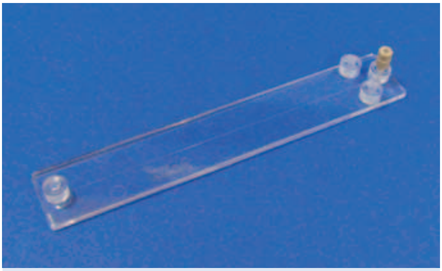


Fig. 42: Cross-shaped channel chips with embedded threads to connect with LabSmith's one piece fittings

Product Code	Description	Material	Price [€] 1+	10+
03-0780-0106-01	Cross-shaped channel chip with threads in the fluidic interface to connect with LabSmith one piece fitting (09-0598-0000-12)	PMMA	62.40	43.60

2.4.2 Cross-shaped channel chips – Extended size platform II

2.4.2.1 Cross-shaped channel chips – Extended size platform II Fluidic interface: Through-holes

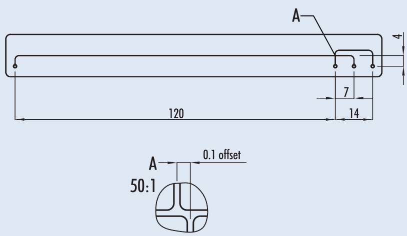


Fig. 43: Details of cross-shaped channel chip with through holes

Fig. 44: Cross-shaped channel chip with through-holes

Product Code	Channel Width [µm]	Channel Depth [µm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
02-1054-0189-01	50	50	175	PMMA	68.60	44.60	28.40
02-1055-0189-02	50	50	140	Topas	68.60	44.60	28.40

2.4.2.2 Cross-shaped channel chips – Extended size platform II Fluidic interface: Luer

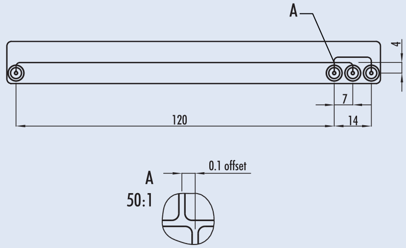


Fig. 45: Details of cross-shaped channel chip with Luer interfaces

Fig. 46: Cross-shaped channel chip with Luer interfaces

Product Code	Channel Width [µm]	Channel Depth [µm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
02-1056-0189-01	50	50	175	PMMA	68.60	44.60	28.40
02-1057-0189-02	50	50	140	Topas	68.60	44.60	28.40

2.4.3 Cross-shaped channel chips – Format: Microscopy slide – Fluidic interface: Mini Luer Connector

These chips offer two separate channel structures with crossing channels on each device. One of those with, one without a channel offset.

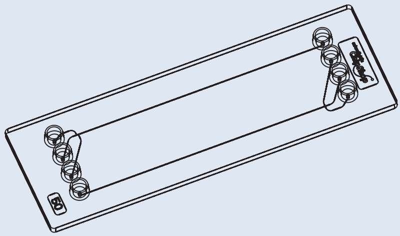


Fig. 47: Schematic drawing cross-shaped channel chips 0160 and 0161

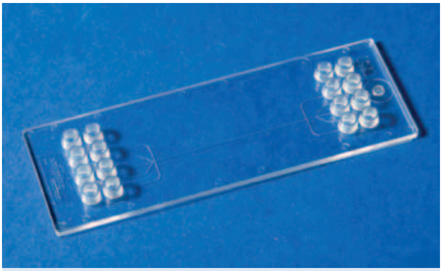


Fig. 48: Cross-shaped channel chip in the format of a microscopy slide with Mini Luer fluidic interfaces

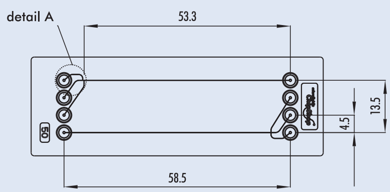


Fig. 49: Detail cross-shaped channel chip 0160

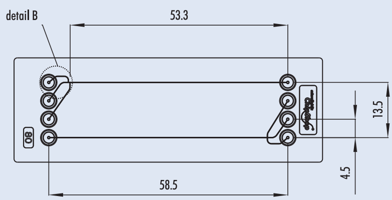


Fig. 50: Detail cross-shaped channel chip 0161

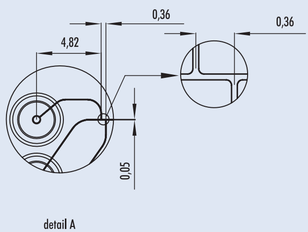


Fig. 51: Detail of channel offset in chip 0160

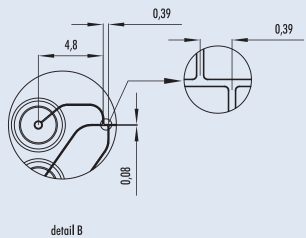


Fig. 52: Detail of channel offset in chip 0161

Product Code	Channel Width [µm]	Channel Depth [µm]	Cover Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	30+
02-1050-0160-01	50	50	175	PMMA	42.50	31.20	23.50
02-1051-0160-02	50	50	140	Topas	42.50	31.20	23.50
02-1052-0161-01	80	80	175	PMMA	42.50	31.20	23.50
02-1053-0161-02	80	80	140	Topas	42.50	31.20	23.50

2.4.4 Cross-shaped channel chips with electrodes (contact mode) – Fluidic interface: Through-holes

This variation of the cross-shaped channel chips includes electrodes that can be used for the detection of charged molecules, for example. The material of the electrodes is 10 nm titanium and 100–150 nm gold. The electrodes are placed on the cover lid and assembled towards the channel, resulting in a direct contact of the electrode material with the liquid to be analyzed.

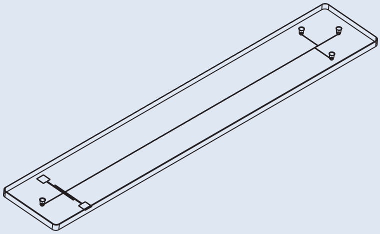


Fig. 53: Schematic drawing of the cross-shaped channel chip with electrodes

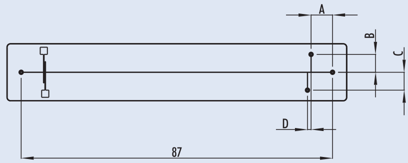


Fig. 54: Chip detail

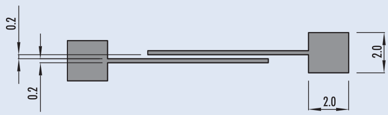


Fig. 55: Details of the electrodes

Fig. 56: Cross-shaped channel chips with through holes and electrodes

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Hole Diameter [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Geometry E [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 30+
03-0118-0082-01	50	50	87.8	1.0	6.0	5.0	5.0	0	0.2	175	PMMA	155.00	145.00	125.00
03-0120-0201-01	50	50	87.8	1.0	6.0	5.0	5.0	0.1	0.2	175	PMMA	155.00	145.00	125.00

2.4.5 Cross-shaped channel chips with electrodes (non-contact mode) – Fluidic interface: Luer

This variation of the cross-shaped channel chips includes electrodes that can be used for the detection of charged molecules, for example. The material of the electrodes is 10 nm titanium and 100–150 nm gold. The electrodes are placed on the cover lid and assembled towards the atmosphere, resulting in electrode and the liquid to be analyzed having no contact. The use of these chips with this electrode arrangement requires a special instrumentation set-up. This detection technology is called C^4D (capacitively coupled contactless conductivity detection). Chapter 7.2 highlights the respective instrument that allows for an easy use of these chips for several kinds of applications.

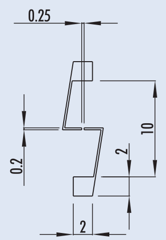


Fig. 57: Details of the electrodes

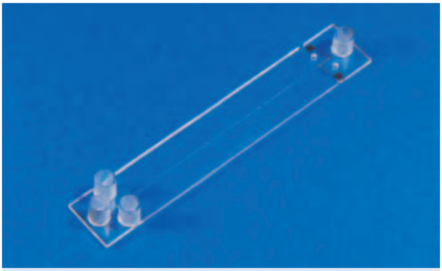


Fig. 58: Cross-shaped channel chip with electrodes for contactless conductivity detection

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Hole Diameter [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 100+
03-0110-0082-01	50	50	87.0	1.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0111-0201-01	50	50	87.0	1.0	6.0	5.0	5.0	0.1	60	PMMA	125.00	85.00	32.50
03-0798-0166-01	100	100	87.0	1.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0799-0166-05	100	100	87.0	1.0	6.0	5.0	5.0	0	50	Zeonor	125.00	85.00	32.50
03-0794-0394-01	200	200	87.0	1.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0795-0394-05	200	200	87.0	1.0	6.0	5.0	5.0	0	50	Zeonor	125.00	85.00	32.50
03-0796-0395-01	400	200	87.0	1.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0797-0395-05	400	200	87.0	1.0	6.0	5.0	5.0	0	50	Zeonor	125.00	85.00	32.50

2.5 H-shaped channel chips

The H-shaped channel chip family is placed on the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm). As fluidic interfaces, Mini Luer adapters are integrated on the chip. These chips can for example be used as extractors or to establish concentration gradients.

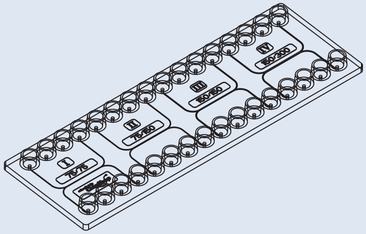


Fig. 59: H-shaped channel chip

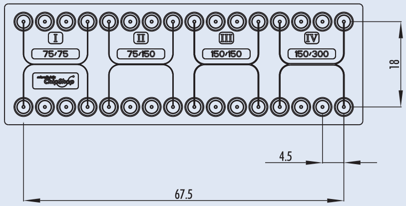


Fig. 60: Detail of H-shaped channel chip

Product Code	Channel Dimensions: I Width inlet & outlet / middle [µm]	II [µm]	III [µm]	IV [µm]	All Depth [µm]	Lid Thick-ness [µm]	Mate-rial	Price [€/chip] 1+	10+	30+
04-0129-0164-01	75/75	75/150	150/150	150/300	75	175	PMMA	42.50	31.20	23.50
04-0130-0164-02	75/75	75/150	150/150	150/300	75	140	Topas	42.50	31.20	23.50

2.6 Sample preparation chip – Fluidic interface: Mini Luer

The sample preparation chips have the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm) and are equipped with female Mini Luer connectors. Their key microfluidic elements are reaction chambers of various volumes in order to extract the target molecules out of a given sample in preparative quantities. These chips can for example be used as nucleic acid extraction devices via magnetic beads simply via applying beads and sample and by using an external magnet to hold the beads in place. These procedures can be done completely manually with a pipette – besides the magnet no additional equipment is necessary – or semi-automated with normal peristaltic pumps found in most life science labs.

Instrumentation: If you are interested in basic instruments for bead actuation and temperature control for the sample preparation chips illustrated in Fig. 63-68 please have a look at our ChipGenie edition P in Chapter 7.

Preloaded chips: If you are interested in chips preloaded with dried reagents for nucleic acid extraction and the respective buffer solutions, please do not hesitate to contact us.

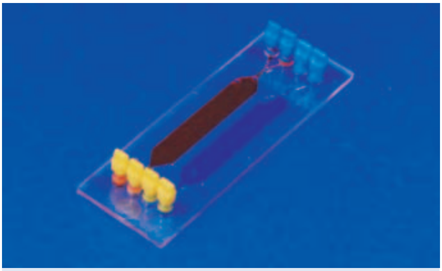


Fig. 61: Rhombic chamber chip filled

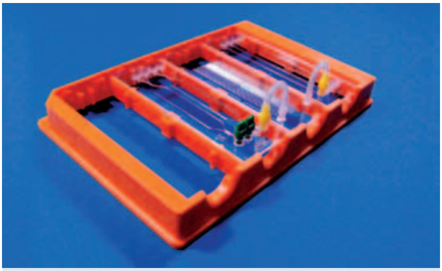


Fig. 62: Rhombic chamber chip in handling frame connected to PCR chip

2.6.1 Rhombic chamber chip eP1

The rhombic chamber chips eP1 can be used with our ChipGenie edition P instrument, see Chapter 7, page 99.

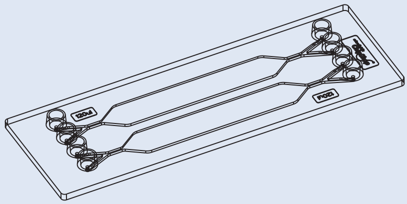


Fig. 63: Schematic drawing of the rhombic chamber chip

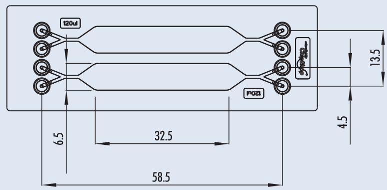


Fig. 64: Rhombic chamber chip – 120 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0901-0172-01	120	500	175	PMMA	-	36.20	24.30	16.10
12-0902-0172-02	120	500	140	Topas	-	36.20	24.30	16.10
12-0903-0172-03	120	500	175	PC	-	36.20	24.30	16.10
12-0904-0172-05	120	500	188	Zeonor	-	36.20	24.30	16.10
12-0905-0172-01	120	500	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0906-0172-02	120	500	140	Topas	hydrophilized	39.20	26.30	17.80
12-0907-0172-03	120	500	175	PC	hydrophilized	39.20	26.30	17.80
12-0908-0172-05	120	500	188	Zeonor	hydrophilized	39.20	26.30	17.80

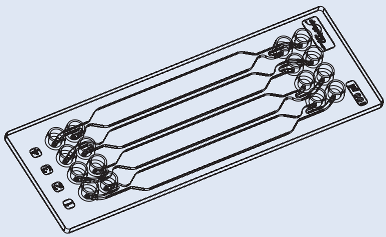


Fig. 65: Schematic drawing rhombic chamber chip

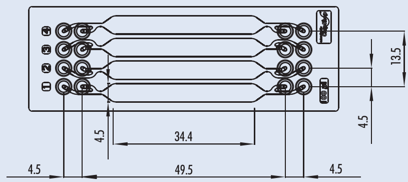


Fig. 66: Rhombic chamber chip – 100 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0909-0221-01	100	600	175	PMMA	-	36.20	24.30	16.10
12-0910-0221-02	100	600	140	Topas	-	36.20	24.30	16.10
12-0911-0221-05	100	600	188	Zeonor	-	36.20	24.30	16.10
12-0912-0221-01	100	600	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0913-0221-02	100	600	140	Topas	hydrophilized	39.20	26.30	17.80
12-0914-0221-05	100	600	188	Zeonor	hydrophilized	39.20	26.30	17.80

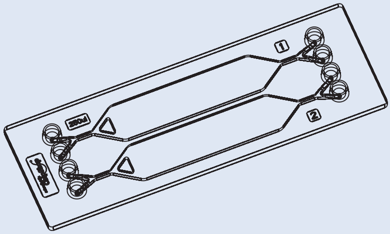


Fig. 67: Schematic drawing rhombic chamber chip

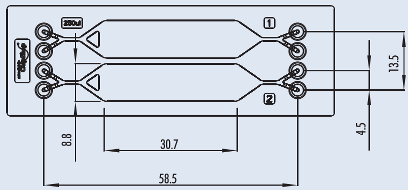


Fig. 68: Rhombic chamber chip – 250 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0915-0194-01	250	800	175	PMMA	-	36.20	24.30	16.10
12-0916-0194-02	250	800	140	Topas	-	36.20	24.30	16.10
12-0917-0194-05	250	800	188	Zeonor	-	36.20	24.30	16.10
12-0918-0194-01	250	800	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0919-0194-02	250	800	140	Topas	hydrophilized	39.20	26.30	17.80
12-0920-0194-05	250	800	188	Zeonor	hydrophilized	39.20	26.30	17.80

2.6.2 Rhombic chamber chip eP2

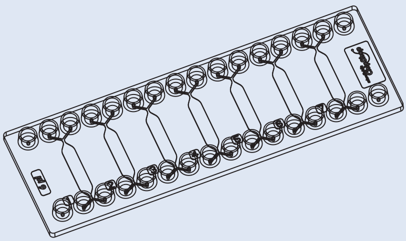


Fig. 69: Schematic drawing rhombic chamber chip

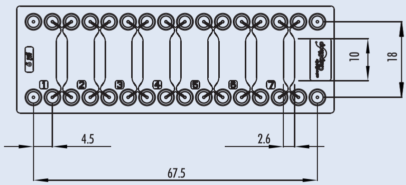


Fig. 70: Rhombic chamber chip – 6 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0921-0132-01	6	200	175	PMMA	-	36.20	24.30	16.10
12-0922-0132-02	6	200	140	Topas	-	36.20	24.30	16.10
12-0923-0132-05	6	200	188	Zeonor	-	36.20	24.30	16.10
12-0924-0132-01	6	200	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0925-0132-02	6	200	140	Topas	hydrophilized	39.20	26.30	17.80
12-0926-0132-05	6	200	188	Zeonor	hydrophilized	39.20	26.30	17.80

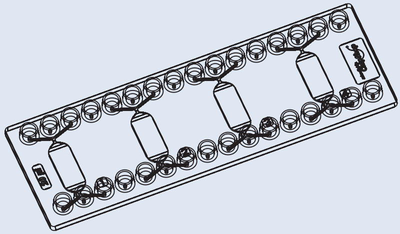


Fig. 71: Schematic drawing rhombic chamber chip

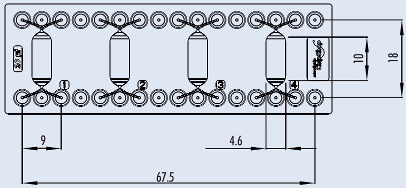


Fig. 72: Rhombic chamber chip – 20 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0927-0131-01	20	400	175	PMMA	-	36.20	24.30	16.10
12-0928-0131-02	20	400	140	Topas	-	36.20	24.30	16.10
12-0929-0131-05	20	400	188	Zeonor	-	36.20	24.30	16.10
12-0930-0131-01	20	400	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0931-0131-02	20	400	140	Topas	hydrophilized	39.20	26.30	17.80
12-0932-0131-05	20	400	188	Zeonor	hydrophilized	39.20	26.30	17.80

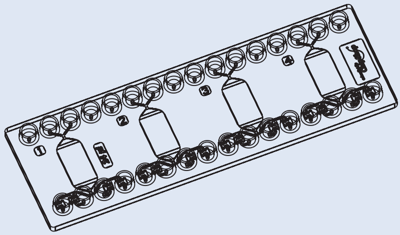


Fig. 73: Schematic drawing rhombic chamber chip

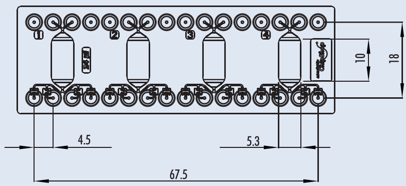


Fig. 74: Rhombic chamber chip – 24 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0933-133-01	24	400	175	PMMA	-	36.20	24.30	16.10
12-0934-133-02	24	400	140	Topas	-	36.20	24.30	16.10
12-0935-133-05	24	400	188	Zeonor	-	36.20	24.30	16.10
12-0936-133-01	24	400	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0937-133-02	24	400	140	Topas	hydrophilized	39.20	26.30	17.80
12-0938-133-05	24	400	188	Zeonor	hydrophilized	39.20	26.30	17.80

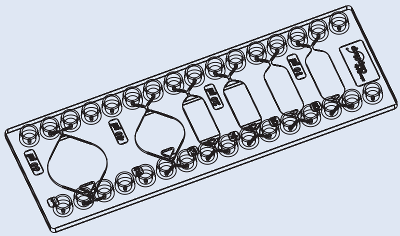


Fig. 75: Schematic drawing rhombic chamber chip

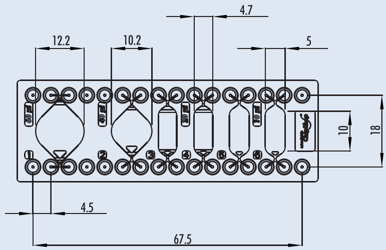


Fig. 76: Rhombic chamber chip – chamber volumes: 60 µl, 40 µl, 2 x 20 µl, 2 x 10 µl

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0939-0134-01	10/10 20/20 40/60	200/200 400/400 540/540	175	PMMA	-	36.20	24.30	16.10
12-0940-0134-02	10/10 20/20 40/60	200/200 400/400 540/540	140	Topas	-	36.20	24.30	16.10
12-0941-0134-05	10/10 20/20 40/60	200/200 400/400 540/540	188	Zeonor	-	36.20	24.30	16.10
12-0942-0134-01	10/10 20/20 40/60	200/200 400/400 540/540	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0943-0134-02	10/10 20/20 40/60	200/200 400/400 540/540	140	Topas	hydrophilized	39.20	26.30	17.80
12-0944-0134-05	10/10 20/20 40/60	200/200 400/400 540/540	188	Zeonor	hydrophilized	39.20	26.30	17.80

2.7 Droplet generators – Fluidic interfaces: Mini Luer

A family of droplet generator chips in various designs allows for generation of droplets in different sizes and frequencies. The chips can be operated in pumping or sucking mode. Standard oils that are released by *microfluidic ChipShop* not harming standard biological reactions can be found in the accessories chapter.

2.7.1 Droplet generator chips – One channel designs – Fluidic interfaces: Mini Luer

On the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm) with female Mini Luer fluidic interfaces a droplet generator structure is placed with several inlet and outlet interfaces. The droplet generator chips are available with two different channel widths in the droplet generation region.

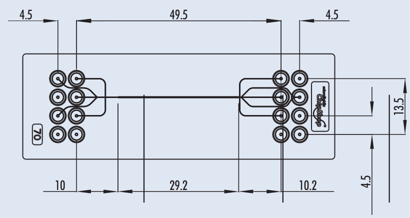


Fig. 77: Detail of droplet generator 0162

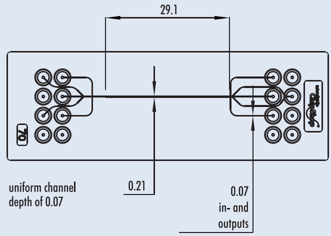


Fig. 78: Channel dimensions of droplet generator 0162

Product Code	Input Channel Width [µm]	Collection Channel Width [µm]	Channel Depth [µm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
13-1001-0162-02	70	210	70	140	Topas	42.20	34.30	26.10
13-1002-0162-03	70	210	70	175	PC	42.20	34.30	26.10

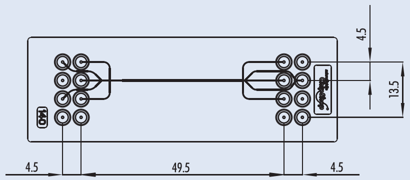


Fig. 79: Detail of droplet generator 0163

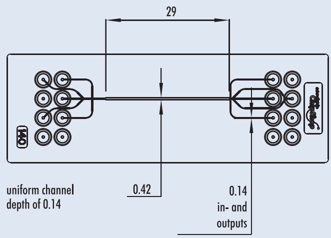


Fig. 80: Channel dimensions droplet generator 0163

Product Code	Input Channel Width [µm]	Collection Channel Width [µm]	Channel Depth [µm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
13-1003-0163-02	140	420	140	140	Topas	42.20	34.30	26.10
13-1004-0163-03	140	420	140	175	PC	42.20	34.30	26.10

2.7.2 Droplet generator chips – Multi channel designs – Fluidic interfaces: Mini Luer

2.7.2.1 Droplet generator chips – Multi channel design – Various design options

With this multichannel design several design options to generate droplets with different volumes are implemented. Main channel as well as entrance channel vary in diameter enabling a large set of experiments.

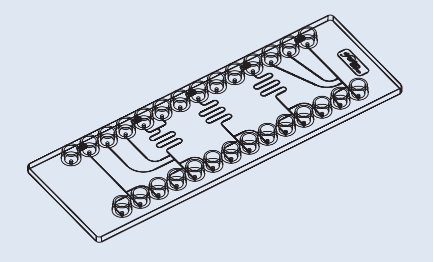


Fig. 81: Schematic drawing of droplet generator chip 0285

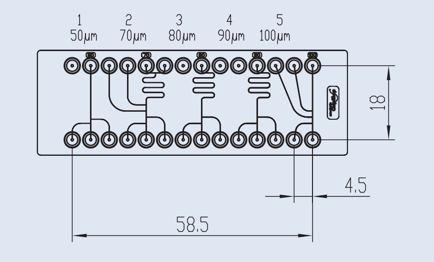


Fig. 82: Details droplet generator chip 0285

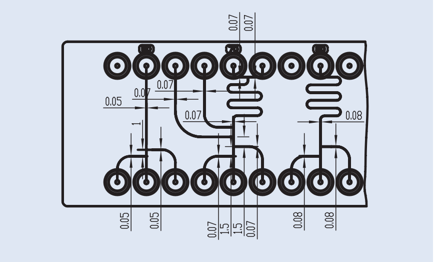


Fig. 83: Details of channel dimensions and off-sets of structures 1 – 3 of chip 0285

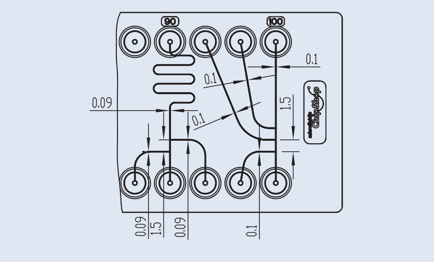


Fig. 84: Details of channel dimensions and off-sets of structures 4 – 5 of chip 0285

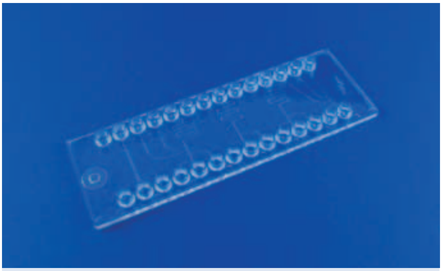


Fig. 85: Droplet generator 0285

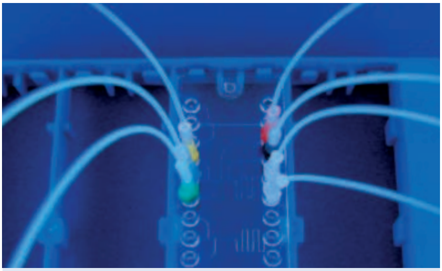


Fig. 86: Droplet generator chip 0285 in evaluation set-up

Product Code	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
13-1005-0285-02	140	Topas	42.20	34.30	26.10
12-1006-0285-03	175	PC	42.20	34.30	26.10

2.7.2.2 Droplet generator chips – Multi channel design – Droplet size variation

This droplet generator design combines size variations of one main design for the evaluation of generated droplet size under the desired conditions. There are eight droplet generators on each chip with channel dimensions at the droplet formation region of 80 µm, 70 µm, 60 µm and 50 µm channel width and height. Each size version comes with two different outlet channel width.

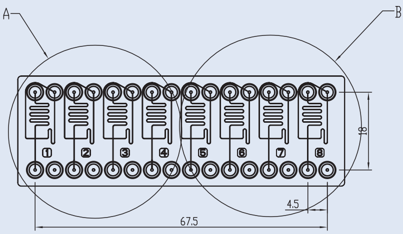


Fig. 87: Droplet generator – droplet size variation

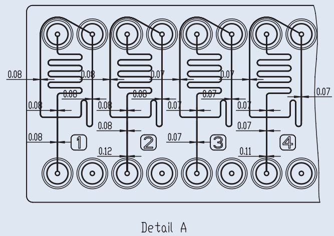


Fig. 88: Droplet generator – droplet size variation – details structures 1 - 4

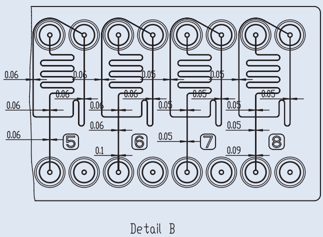


Fig. 89: Droplet generator – droplet size variation – details structures 5 - 8

Product Code	Lid Thickness [µm]	Material	Price [€/chip] 1+	10+	100+
13-1007-0440-02	140	Topas	42.20	34.40	26.10
13-1007-0440-03	175	PC	42.20	34.40	26.10

2.8 Field-flow fractionation chips

On the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm) with olives as fluidic interfaces, a field-flow fractionation structure is placed. The chips can be used for example for free-flow electrophoresis and free-flow magnetophoresis. The chips were developed within the BMBF-Project "Free-Flow-Chip", FKZ 01RI0643D.

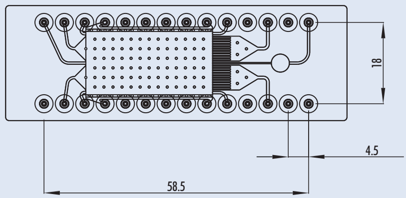


Fig. 90: Details of the field flow fractionation chip 0120

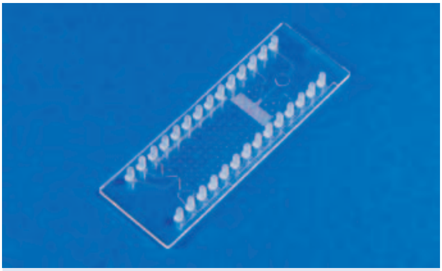


Fig. 91: Field flow fractionation chip 0120

Product Code	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
14-1020-0120-03	175	PC	-	42.20	34.30	26.10
14-1021-0120-05	188	Zeonor	-	42.20	34.30	26.10
14-1022-0120-03	175	PC	hydrophilized	45.20	36.30	27.80
14-1023-0120-05	188	Zeonor	hydrophilized	45.20	36.30	27.80

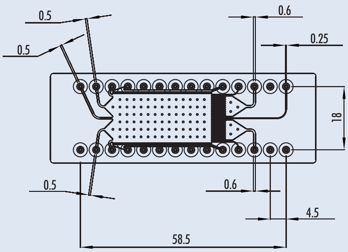


Fig. 92: Details of the field flow fractionation chip 0159

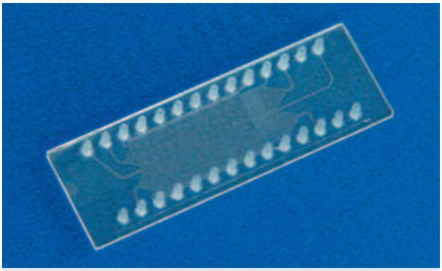


Fig. 93: Field flow fractionation chip 0159

Product Code	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
14-1024-0159-03	175	PC	-	42.20	34.30	26.10
14-1025-0159-05	188	Zeonor	-	42.20	34.30	26.10
14-1026-0159-03	175	PC	hydrophilized	45.20	36.30	27.80
14-1027-0159-05	188	Zeonor	hydrophilized	45.20	36.30	27.80

2.9 Meander and continuous-flow PCR chips

On the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm), long meandering channels are implemented. As interfaces, olives are used to directly connect tubing. If more than two interfaces are required, 28 interfaces are part of the platform.

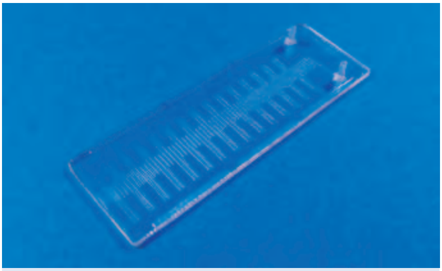


Fig. 94: 15-cycle chip

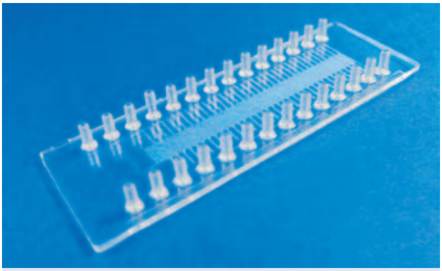


Fig. 95: 36-cycle chip

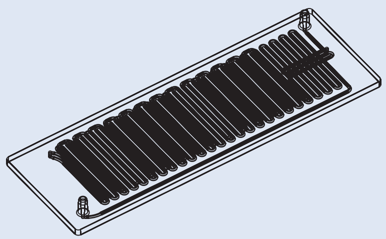


Fig. 96: Schematic drawing of 40 cycle continuous-flow PCR chip 0243

Fig. 97: 40 cycle continuous-flow PCR chip 0243

Product Code	Lid Thickness [µm]	Material	Comments Design Channel Dimensions Width / Depth / Length	Price [€/chip]			
				1+	10+	100+	1000+
08-0470-0047-03	250	PC	15 cycles (1 inlet, 1 outlet) 500 µm / 100 µm / 810 mm	42.50	32.50	25.50	12.00
08-0471-0065-03	250	PC	36 cycles (2 inlets, 3 outlets) 220 µm / 100 µm / 1,257 mm	42.50	32.50	25.50	12.00
08-0472-0061-03	250	PC	41 cycles (1 inlet, 1 outlet) 200 µm / 100 µm / 1,879 mm	42.50	32.50	25.50	12.00
08-0473-0243-03	250	PC	40 cycles (1 inlet, 1 outlet) 600 µm / 300 µm / 1,637 mm	42.50	32.50	25.50	12.00
08-0474-0243-05	188	Zeonor	40 cycles (1 inlet, 1 outlet) 600 µm / 300 µm / 1,637 mm	42.50	32.50	25.50	12.00

2.10 Titer plates – Microscopy slide format

Our micro- or nanowell plates have the format of a microscopy slide (75.5 mm x 25.5 mm x 1.5 mm) and include cavities with different shapes and volumes.

2.10.1 Nanotiter plate – Microscopy slide format

On our nanowell plates, three well arrays with wells of different edge lengths are placed. The arrays have 14 x 14 (well spacing of 1,125 µm), 28 x 28 (well spacing of 562.5 µm), and 60 x 60 (well spacing of 281.25 µm) single wells.


Fig. 98: Nanotiter plate

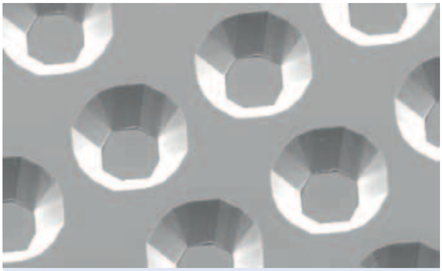


Fig. 99: Nanotiter plate – well detail

Product Code	Well Depth	Well Size [µm] Structure						Well Spacing [µm] Structure			Mate-rial	Price [€/chip]				
		1		2		3										
	[µm]	Top	Bot.	Top	Bot.	Top	Bot.	1	2	3		1+	10+	50+	100+	500+
05-0133-0018-01	20	124	96	224	196	424	396	281.25	562.5	1125	PMMA	40.00	30.00	9.00	7.00	5.20
05-0134-0018-02	20	124	96	224	196	424	396	281.25	562.5	1125	Topas	45.00	35.00	14.00	8.00	5.40
05-0137-0018-03	20	124	96	224	196	424	396	281.25	562.5	1125	PC	40.00	30.00	9.00	7.00	5.20
05-0138-0018-05	20	124	96	224	196	424	396	281.25	562.5	1125	Zeonor	45.00	35.00	14.00	8.00	5.40
05-0139-0018-04	20	124	96	224	196	424	396	281.25	562.5	1125	Zeonex	45.00	35.00	14.00	8.00	5.40

2.10.2 18-well titer plate – Microscopy slide format

The 18-well titer plate works with the spacing of a 96-well microtiter plate, namely 9 mm, and is available in different materials and in transparent and colored versions. It can be used with our adapter frame in microtiter-plate format that is made as a special adapter for microfluidic chips in microscopy slide format.

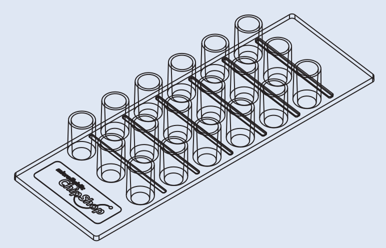


Fig. 100: Schematic drawing of the 18-well titer plate

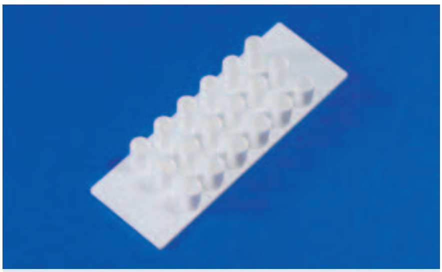


Fig. 101: 18-well microtiter-plate

Product Code	Well Volume [µl]	Material	Price [€/chip] 1+	10+	100+
05-0950-0141-05	119	Zeonor	20.00	15.00	5.40
05-0951-0141-05.2	119	Zeonor, white	20.00	15.00	5.40

2.10.3 65-well chip – microscopy slide format

This 65-well chip has the spacing of a 384 well plate, namely 4.5 mm. It can be used with the micro-titer plate sized adapter frames described in the accessories chapter. The chip can be used to carry out reactions or as a source plate for spotting experiments, e.g. with the instrumentTWO spotter shown in the instrument chapter.

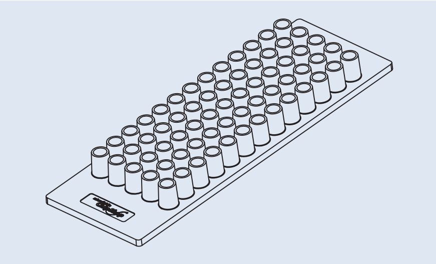


Fig. 102: 65-well chip – microscopy slide format – Fl. 0383

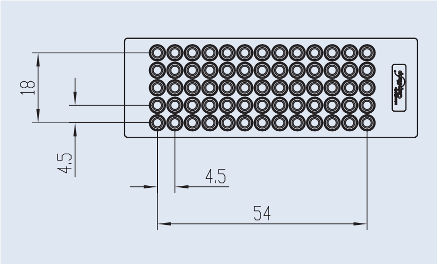


Fig. 103: Details 65-well chip – Fl. 0383

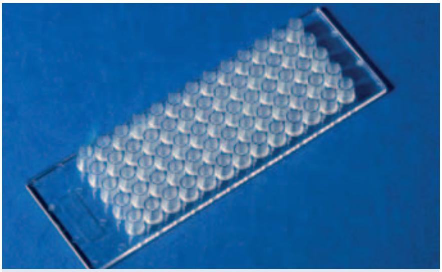


Fig. 104: 65-well chip – Fl. 0383

Fig. 105: 65-well chip used as source plate in spotter

Product Code	Well Volume [µl]	Material	Price [€/chip] 1+	10+	100+
05-0952-0383-05	25	Zeonor	20.00	15.20	5.45
05-0953-0383-09	25	PP	20.00	15.20	5.45

2.11 Membrane chips

2.11.1 Plasma/serum generation chips

Microscopy slide chips with 4 membranes for plasma/serum generation out of full blood. Each membrane can generate roughly 12 – 15 μl plasma/serum out of 25 μl full blood. Each unit of the plasma/serum generation chip consists of a Luer interface (1) for blood loading, a support channel with a cross-section of 300 μm × 100 μm (2) for the transfer of the blood on top of a separation membrane (3) that is fused into a chip-based chamber of 10 mm diameter, a plasma/serum collection channel (4) below the membrane, and a ventilation channel of 100 μm × 100 μm (5) also below the membrane. The vacuum is applied via the collection channel and a second interface (6) to the outer world. A third interface (7), which is closed during the sample loading, helps to smoothly release the slight vacuum if the membrane pores are blocked by the solid components of the blood such as erythrocytes, monocytes, platelets, or leucocytes.

The chips are offered without (membrane chip 0168) and with an additional venting line (membrane chip 200) to allow for an easier filling of the membrane chamber itself.

Upon request, the platform can be equipped with customer-specific membranes. Please contact us for feasibility and pricing.

Fig. 106: Plasma/serum generation chip

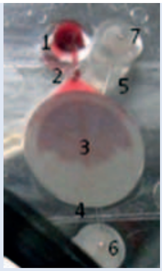


Fig. 107: Close-up of one plasma/serum generation unit

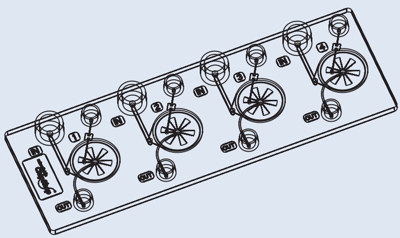


Fig. 108: Schematic drawing of membrane chip 0168

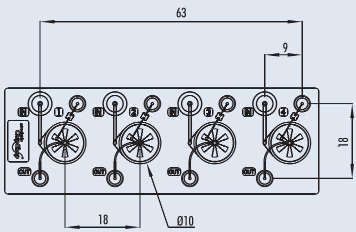


Fig. 109: Detail of membrane chip 0168

Product Code	Description	Material	Price [€/chip] 1+	10+	100+
15-1503-0168-02	Chip with 4 plasma generation membranes	Topas	79.50	63.50	49.50

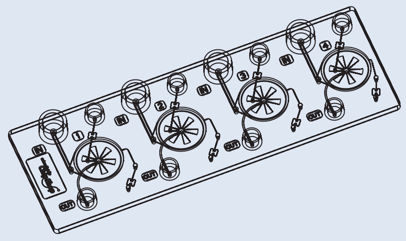


Fig. 110: Schematic drawing of membrane chip 0200

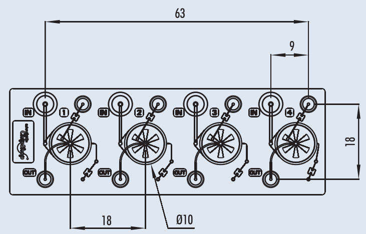


Fig. 111: Detail of membrane chip 0200

Product Code	Description	Material	Price [€/chip]		
			1+	10+	100+
15-1504-0200-02	Chip with 4 plasma generation membranes	Topas	79.50	63.50	49.50

2.11.2 Cross-flow membrane chip

The cross-flow membrane chip platform has two symmetric in- and outlets above and below a membrane which is suspended in a chamber with 10 mm diameter. This allows the performance of experiments such as small molecule transfer measurements or on-chip dialysis. Upon request, the platform can be equipped with customer-specific membranes. Please contact us for feasibility and pricing.

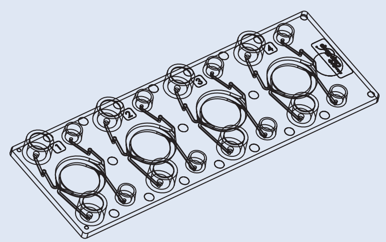


Fig. 112: Schematic drawing of cross-flow membrane chip 398

Product Code	Description	Material	Price [€/chip]		
			1+	10+	100+
15-1505-0398-02	Cross-flow membrane chip 398	Topas	79.50	63.50	49.50

2.12 Weir-filter chip

The chip contains four channels with weir structures for retaining particles (e.g. beads, cells etc.) of different sizes. The weirs have a residual weir slit height of 5 µm, twice 10 µm and 20 µm. The chip was developed within the project Cajal4EU.

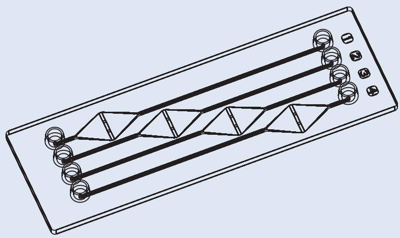


Fig. 113: Schematic drawing of weir chip

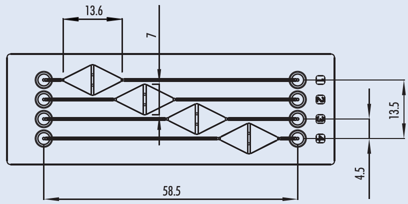


Fig. 114: Detail of weir chip

Product Code	Channel Depth [µm]	Channel Width [µm]	Material	Price [€/chip] 1+	10+	100+
14-1030-0220-03	500	500	PC	42.20	34.30	26.10
14-1031-0220-05	500	500	Zeonor	42.20	34.30	26.10

2.13 Micro mixer

Microfluidic micro mixers apply different mixing principles. This chapter includes mixers applying passive and active mixing principles. Passive mixing elements with elongated channels to enforce diffusion mixing or the so-called "herringbone" mixing structures are available. Active mixers with integrated stir bars give the option to generate mixtures with a wider range of mixing ratios, e.g. coping with 1:10 mixing ratios what is not feasible with the passively working devices.

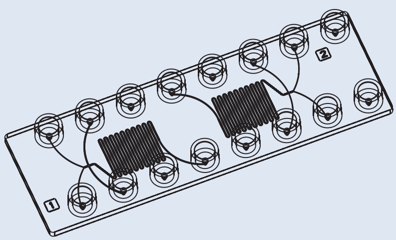


Fig. 115: Schematic drawing of diffusion mixer

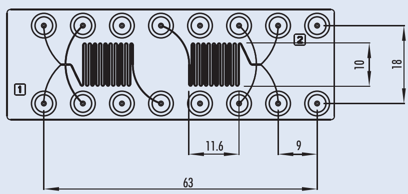


Fig. 116: Detail of diffusion mixer

Product Code	Lid Thickness [µm]	Channel Depth [µm]	Channel Width [µm]	Material	Price [€/chip]		
					1+	10+	100+
14-1035-0186-03	175	100	inlets 100 / 200 mixer 200 outlet 200	PC	42.20	34.30	26.10
14-1036-0186-05	188	100	intets 100 / 200 mixer 200 outlet 200	Zeonor	42.20	34.30	26.10

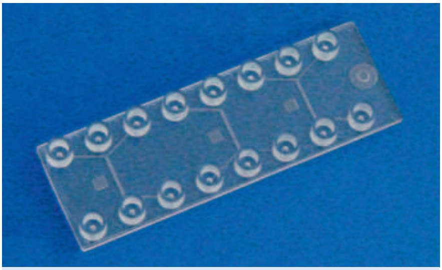


Fig. 117: Herringbone mixer

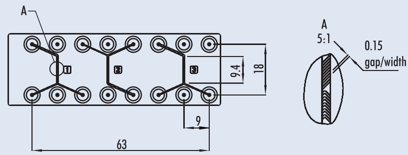


Fig. 118: Detail of herringbone mixer

Product Code	Lid Thickness [µm]	Channel Depth [µm]	Channel Width [µm]	Material	Price [€/chip]		
					1+	10+	100+
14-1037-0187-03	175	200	inlet 300 mixer 600 outlet 600	PC	42.20	34.30	26.10
14-1038-0187-05	188	200	inlet 300 mixer 600 outlet 600	Zeonor	42.20	34.30	26.10

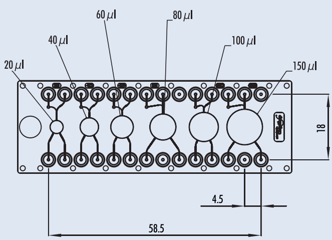


Fig. 119: Drawing of micro mixer chip with mixing chambers

Fig. 120: Micro mixer with stir bars for active mixing

Product Code	Chamber volume						Chamber depth	Lid Thickness	Material	Price [€/chip]	
	[µl]	[µl]	[µl]	[µl]	[µl]	[µl]	[mm]	[µm]		1+	10+
14-1039-0286-01	20	40	60	80	100	150	1.5	175	PMMA	82.50	63.50
14-1040-0286-05	20	40	60	80	100	150	1.5	140	Zeonor	82.50	63.50

2.14 Particle & cell sorting chips

Particle and cell sorting chips enable to separate cells, analyze them and optionally sort and collect the relevant cells. This can be done with basic set-ups on a microscope stage or with complete instruments.

All the chips shown in this chapter can be visualized on a standard microscope. Preferably fluids are introduced with syringe pumps showing extremely low pulsation.

2.14.1 Particle sorting chips – Sheath flow

The particle sorting chips applying a sheath flow should be used with pulsation free syringe pumps. Velocity of the sheath flow should be significantly higher than the one of the sample stream and two streams entering through side-channels provide a sheath flow. The sorting can be done either by applying positive or negative pressure via the sampling channels at the end of the main channel. Five outlet channels with two junctions for sorting give the option to collect at two different locations target cells.

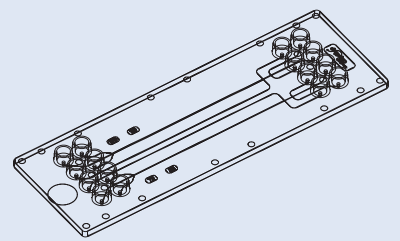


Fig. 121: Schematic drawing of cell sorting chip 0283

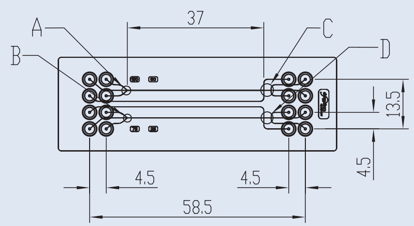


Fig. 122: Detail of cell sorting chip 0283

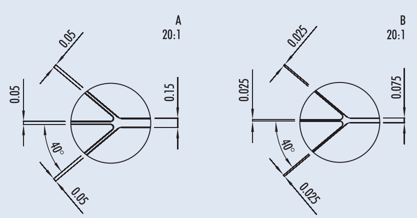


Fig. 123: Details of both entrance structures of cell sorting chip 0283

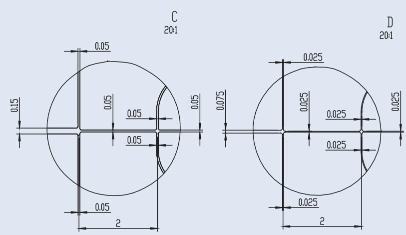


Fig. 124: Details of both outlet structures of cell sorting chip 0283

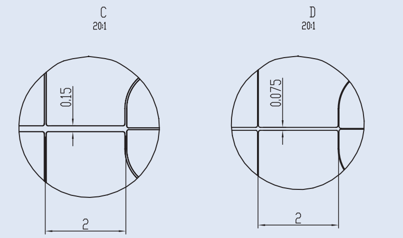


Fig. 125: Details of both outlet structures of cell sorting chip Fl. 0380 – only difference to chip 0283

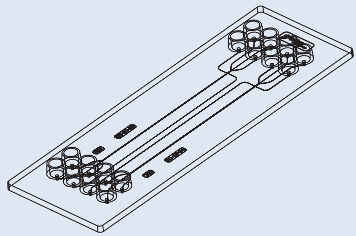


Fig. 126: Schematic drawing of cell sorting chip 0381

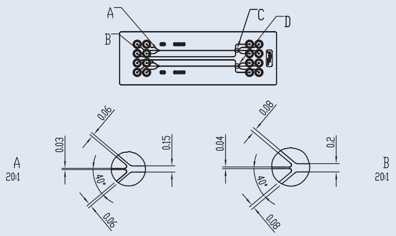


Fig. 127: Details of both inlet structures of cell sorting chip 0381

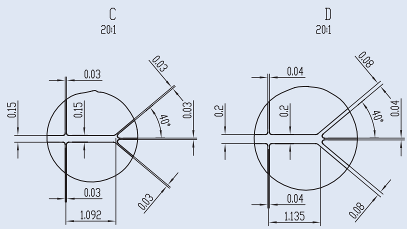


Fig. 128: Details of both outlet structures of cell sorting chip Fl. 0381 – only difference to chip 0283

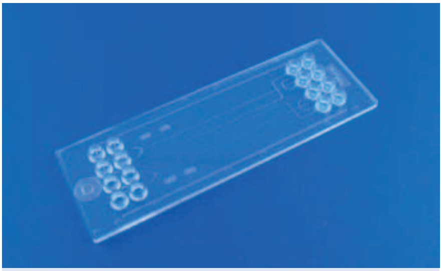


Fig. 129: Cell sorting chip 0283

Product Code	Lid Thickness [µm]	Material	Price [€/chip]		
			1+	10+	100+
18-1700-0283-01	175	PMMA	42.20	34.30	26.10
18-1701-0283-05	188	Zeonor	42.20	34.30	26.10
18-1702-0380-01	175	PMMA	42.20	34.30	26.10
18-1703-0380-05	188	Zeonor	42.20	34.30	26.10
18-1704-0381-01	175	PMMA	42.20	34.30	26.10
18-1705-0381-05	188	Zeonor	42.20	34.30	26.10

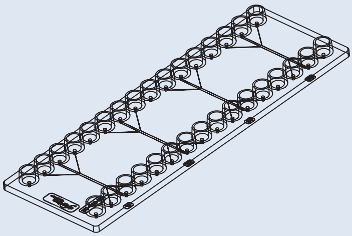


Fig. 130: Schematic drawing particle & cell sorter – Fl. 0386

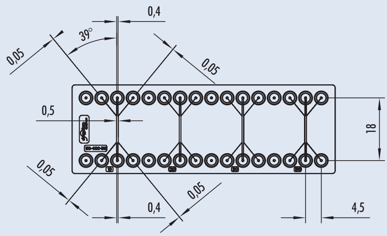


Fig. 131: Details particle & cell sorter – Fl. 0386

Product Code	Lid Thickness [µm]	Material	Price [€/chip]		
			1+	10+	100+
18-1706-0386-01	175	PMMA	42.20	34.30	26.10
18-1707-0386-05	188	Zeonor	42.20	34.30	26.10

2.14.2 Particle & cell sorting chips – Spiral sorter

Spirales can be used to separate particles according to their size to their size due to the so-called Dean forces. Channel dimension, number of spirales and diameter of the curvature influence the sorting effect. The sample is introduced through a central inlet and fractions with particles of different size can be received at the different outlet ports.

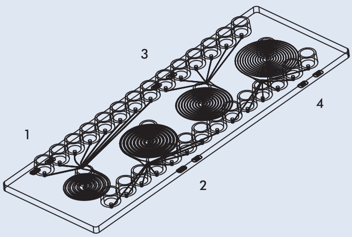


Fig. 132: Schematic drawing of the spirale sorter – Fl. 0382

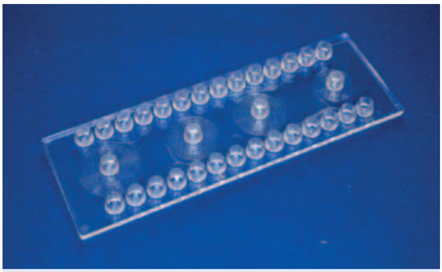


Fig. 133: Spiral sorter – Fl. 0382

Product Code	Lid Thickness [µm]	Material	Price [€/chip]		
			1+	10+	100+
18-1708-0382-01	175	PMMA	42.20	34.30	26.10
18-1709-0382-05	188	Zeonor	42.20	34.30	26.10

2.15 Pillar chips

The integration of pillars serves various needs. Such structures can be used to maintain particles at a certain area, to allow for self-filling of devices via capillary forces, to increase surface area, to have a sieving effect, or to use these structures for surface functionalization with high surface area regions in a microfluidic device..

2.15.1 Pillar chip – Complete cavities filled with pillars

In these pillar chips the pillars have a demolding angle of 10°. The table indicates the smallest diameter.

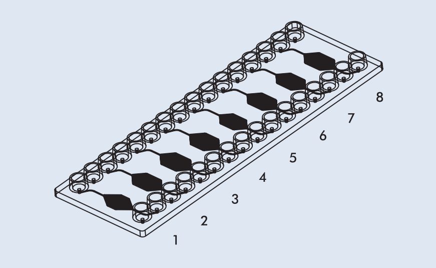


Fig. 134: Schematic drawing of pillar chip – Fl. 0261

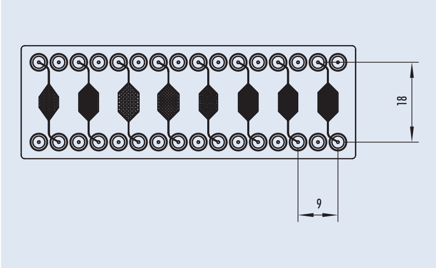


Fig. 135: Detail of pillar chip – Fl. 0261

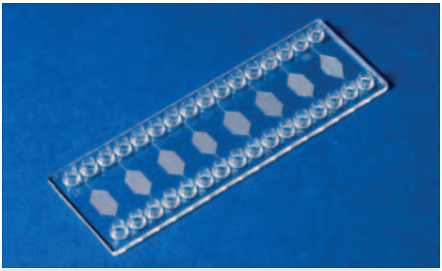


Fig. 136: Pillar chip – Fl. 0261

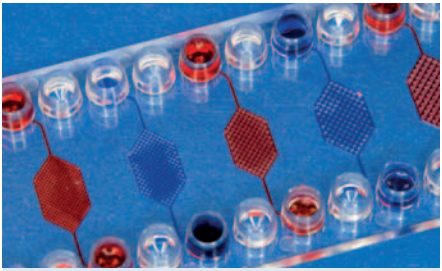


Fig. 137: Pillar chip filled – Fl. 0261

Product Code	Lid Thickness [µm]	Pillar No./diameter [µm]/ distance [µm]/depth	Material	Price [€/chip]		
				1+	10+	100+
19-1800-0261-01	175	1/100/350/150 2/150/400/150 3/200/500/200 4/250/600/200 5/300/700/250 6/350/800/250 7/150/500/300 8/150/500-700/300	PMMA	42.20	34.40	24.10
19-1801-0261-05	188	1/100/350/150 2/150/400/150 3/200/500/200 4/250/600/200 5/300/700/250 6/350/800/250 7/150/500/300 8/150/500-700/300	Zeonor	42.20	34.40	24.10

2.16 Turning valve chips

Turning valves embedded on microfluidic chip allow the targeted distribution of liquids and gases in channel networks, to actively open and close channels and to meter liquids. In instruments the valves are operated in an automated manner through turning the valve body in previously defined increments. Manually they can be operated with a little valve actuator helping to get a feeling for the operation of such devices.

2.16.1 Turning valve test chips

These chips allow for the evaluation of metering on chip and in the valve body with the help of the turning valve and for the directing of liquids on chip.

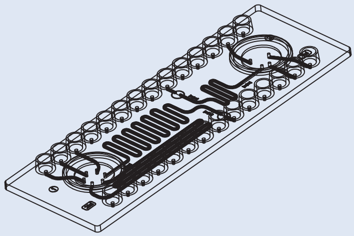


Fig. 138: Schematic drawing of turning valve test chip

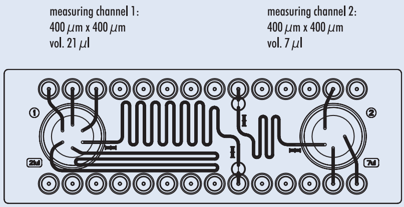


Fig. 139: Detail of turning valve test chip

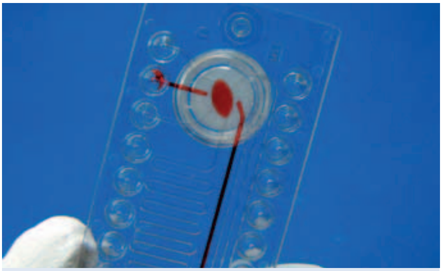


Fig. 140: Rotary valve with metering function

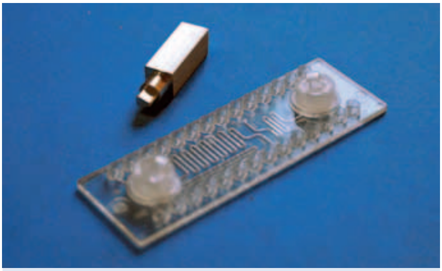
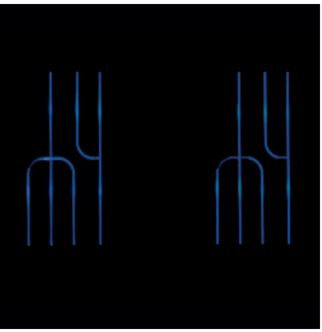
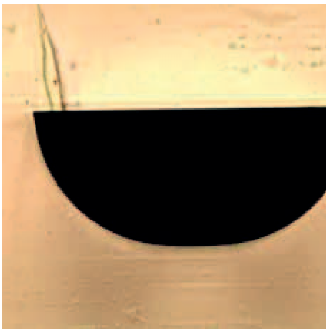


Fig. 141: Turning valve test chip with manual turning valve actuator

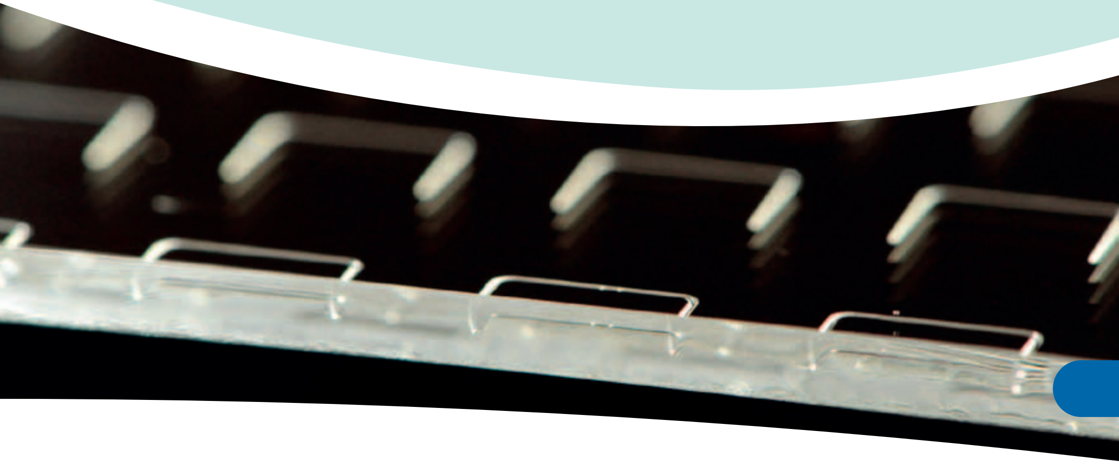
Product Code	Lid Thickness [µm]	Material	Price [€] 1+	10+
19-1850-0155-03	175	PC	128.50	79.60
19-1851-0155-05	188	Zeonor	128.50	79.60

Product Code	Description	Price [€] 1
19-1852-0000-00	Manual turning valve actuator	36.50





3 Microfluidic chips – Glass



Microfluidic chips – Glass

Glass is the material of choice if elevated temperatures or organic solvents come into place. This chapters shows standard chips in glass in the format of a microscopy slide with through holes as fluidic interface. Droplet generator chips or meander chips are off-the-shelf devices in glass. Custom-designs can be realized on demand.

3.1 Droplet generator chips

These off-the-shelf microfluidic devices are made for droplet generation on chip. Several microfluidic units embedded on one chip enable a parallel fabrication of droplets on chip.

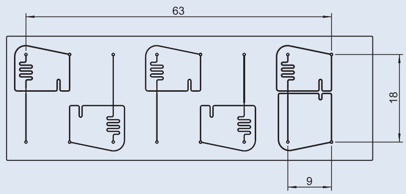


Fig. 142: Schematic drawing of droplet generator chip Fl. 0441

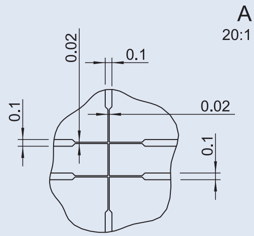


Fig. 143: Detail of droplet generator chip Fl. 0441

Product Code	Channel depth [µm]	Material
13-1300-0441-20	20	Glass

3.2 Meander chips

The meander chips can serve as reaction units as well as mixing device.

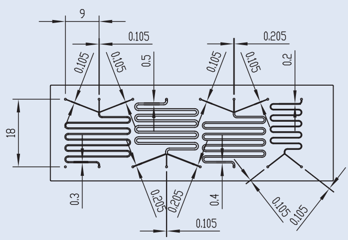


Fig. 144: Schematic drawing of meander chip Fl. 0442

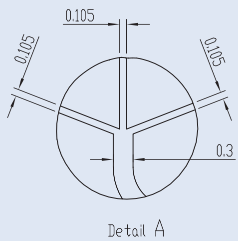
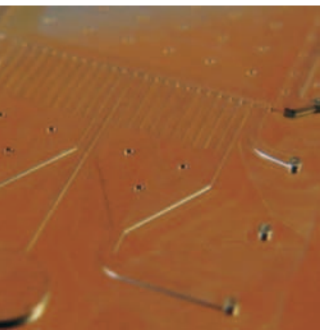
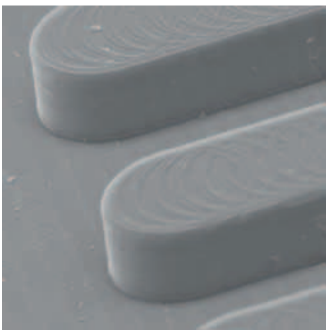
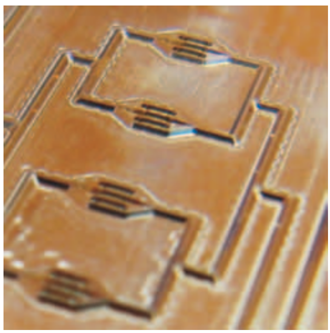
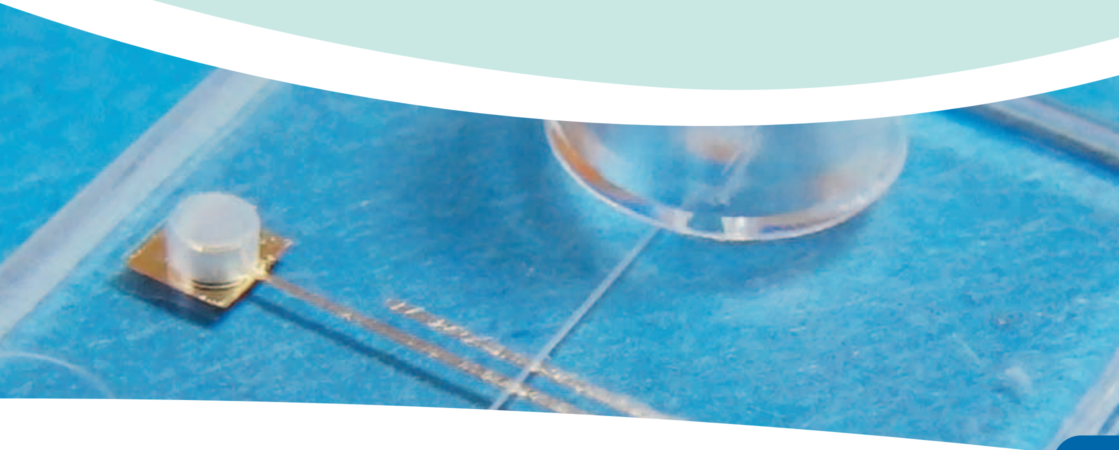


Fig. 145: Detail of meander chip Fl. 0442

Product Code	Channel depth [µm]	Material
13-1301-0442-20	50	Glass

4 Silicone chips



Silicone chips

Our product range in silicone covers standard designs as well as tailor-made microfluidic devices. Practically all microfluidic designs shown in this catalogue can be ordered in silicone.

The silicone parts can be delivered as silicone-only devices without a cover lid or bonded for example to glass, silicone, or polymers, including the various polymer platforms shown in this catalogue. This enables the simple combination of standard fluidic interfaces with user-specific fluidic designs.

If you are interested in this service, please tell us your requirements and we will provide you with a quote.

4.1 MicCell

The MicCell system from our partner GeSim is a modular and versatile system to create individual PDMS microchannel setups and run own rapid prototyping experiments under the microscope. Its fluidic system is made of PDMS elastomer (silicone) – precast microchannel layers can be bought (called PDMS Channel Plates) or they can be self-made at user side with a special casting station. The system is easy to use, and it the entire periphery can be reused with new microfluidic channel designs. Items needed for the new microfluidic design are a new master and PDMS solution.

The modularity of the system allows to start with a small setup (also using existing syringe pumps) and grow bigger as required. Standard MicCells can be purchased in the sizes 22 mm x 22 mm and 25 mm x 75 mm; special designs (e. g. with microelectrodes) are available on request.

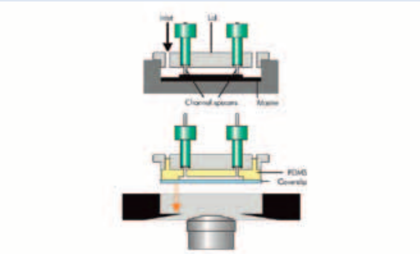


Fig. 146: Molding of the Channel Plate on a silicon master and subsequent mounting in an inverted microscope

4.1.1 PDMS Channel Plate flow cells (precast, ready to use)

The Channel Plate (CP) is a precast silicone gel layer that comes with a polycarbonate body (lid) containing all necessary threaded holes so that it is ready to use. The channel is closed by a coverslip (that can be plain or equipped with a microarray, nanostructures, cultured cells, etc.). The use of the system is simple: Add tubes, insert the Channel Plate into the MicCell support, and place it in an inverted microscope. Plasma activation of the PDMS to seal the channel is usually not necessary. Different channel shapes are available; the S-shape, for instance, is an unbranched channel running from one corner to the other, for shear stress or other experiments. Other designs are available on request.

The polycarbonate (PC) body above the PDMS Channel Plate that contains all fluidic connections can be recycled.

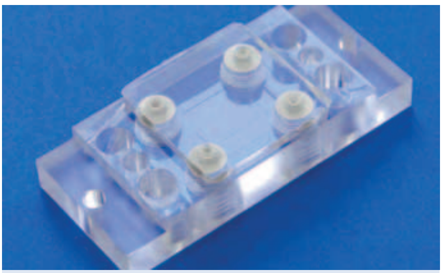


Fig. 147: Channel Plate 22 mm x 22 mm with S-shaped single channel, precast, ready to use

Fig. 148: Channel Plate 22 mm x 22 mm with double-Y-branched channel, precast, ready to use

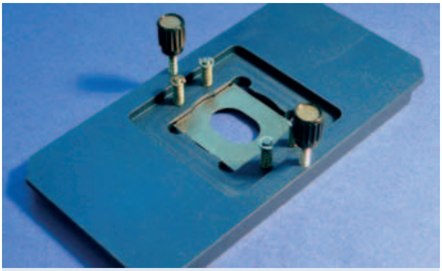


Fig. 149: MicCell support for 22x22 Channel Plates, to be placed in an inverted microscope via an adapter plate (not shown)

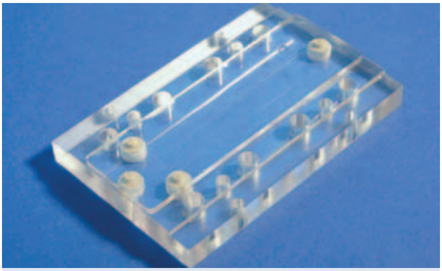


Fig. 150: Channel Plate 25x75 with crossed-shaped (T-junction) channel, different channel designs are available on request

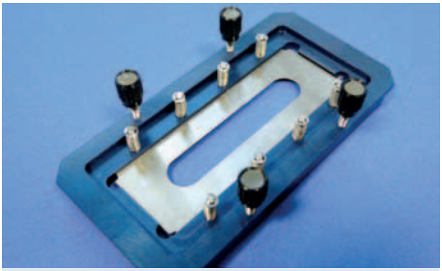


Fig. 151: MicCell support for 25x75 Channel Plate

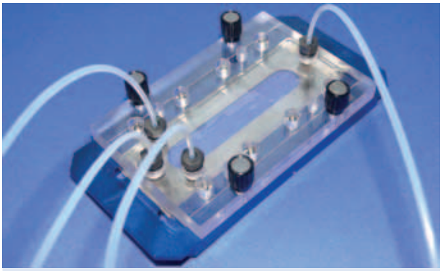


Fig. 152: Fully assembled MicCell with 25x75 Channel Plate, cross-shaped with 3 inlets and 1 outlet

Product Code	Description	Channel Design, Depth [µm]	Price [€/chip] 1+	5+	10+
07-0452-0000-06	PDMS-CP/22x22/S-100	S-shape, 100 µm deep	150.00	135.00	125.00
07-0453-0000-06	PDMS-CP/22x22/2Y-50	Double-Y-shape, 50 µm deep	150.00	135.00	125.00
07-0455-0000-06	PDMS-CP/25x75/Cross-50	Cross shape, 50 µm deep	260.00	235.00	215.00
07-0454-0000-00	MicCell support 22x22	to fix a PDMS-CP	780.00	699.00	650.00
07-0456-0000-00	MicCell support 25x75	to fix a PDMS-CP	780.00	699.00	650.00

4.1.2 Accessories for the PDMS Channel Plate

With these products individual flow cells can be cast. The casting station comes with an overview on the technology, detailed hands-on instructions, PC-bodies, channel spacers and one liter of Sylgard 184 two-component PDMS solution (base and curing agent); a microstructured master for molding must be ordered separately. You also need single-use glassware and syringes with needles to prepare and inject the PDMS mixture, a pump and desiccator for degassing, and an oven for curing. An initial set of mixing glasses, syringes and needles is included in the box.

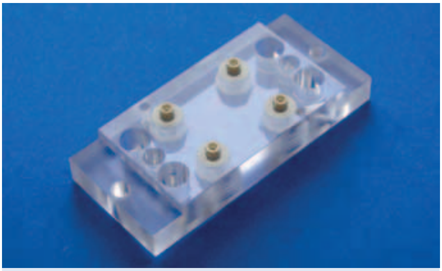


Fig. 153: Polycarbonate (PC) body 22 mm x 22 mm

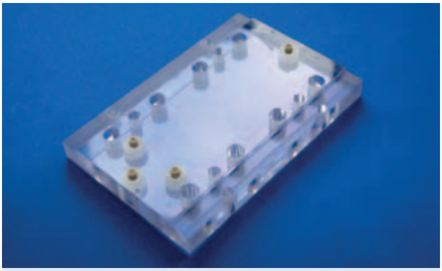


Fig. 154: Polycarbonate (PC) body 25 mm x 75 mm

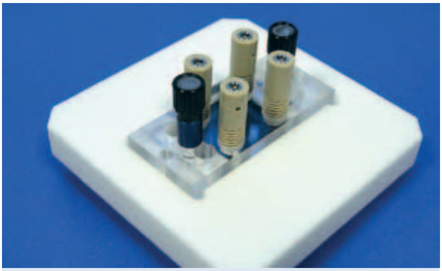


Fig. 155: Casting Station 22 mm x 22 mm. Top: assembled, including channel spacers (brown)

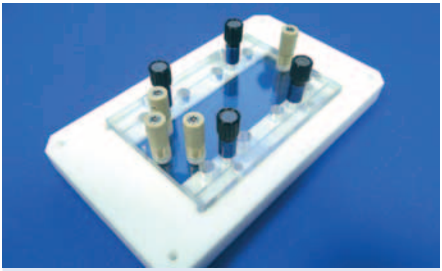


Fig. 156: Casting Station 25 mm x 75 mm

Fig. 157: Casting Station box

Product Code	Description	Design	Price [€] 1+	10+	20+
07-0457-0000-03	polycarbonate-body, 22 x 22 mm / 4	22 mm x 22 mm, 4 inlets 1/4-28 UNF	85.00	76.00	70.00
07-0458-0000-03	polycarbonate-body, 25 x 75 mm / 6	25 mm x 75 mm, 6 inlets 1/4-28 UNF	195.00	162.00	145.00
07-0459-0000-00	Casting station box 22 x 22 mm	casting station for 22 x 22 mm PDMS-CP, accessories*, technology description	2,070.00	1,850.00	1,750.00
07-0460-0000-00	Casting station box 25 x 75 mm	casting station for 25 x 75 mm PDMS-CP, accessories*, technology description	2,742.00	2,450.00	2,335.00
07-0461-0000-00	Custom specific silicon master structure	Channel design with depth 10-50 μm, width > height	2,490.00		

* Set of PDMS-CPs, channel spacers, mixing glasses, syringes, needles

5 Accessories

Accessories

With the help of our *Lab-on-a-Chip Catalogue*, it is our aim to ensure that you have all the necessary equipment for an easy and immediate start with our microfluidic products. This includes not only our wide variety of off-the-shelf microfluidic chips but also all accessories required to run microfluidic chips, such as fluidic interfaces, tubings, complete accessory kits, and special reagents.

If you have any additional wishes that might help you with your microfluidic work, please do not hesitate to contact us.

5.1 Fluidic interface

The use of lab-on-a-chip devices routinely requires interfaces between the chip and the macroscopic world. Our fluidic interfaces enable easy and well-proven chip-to-world interfacing.

Material matters: We offer the fluidic interfaces and plugs in different materials. Whereas PP is a harder material that is easy to use for interfacing with tubes, TPE as soft material allows for an easy closing of the interfaces without applying much pressure. Whilst to heavy forces applied by the user himself on the PP interfaces can damage the chip, the TPE interfaces will withstand such handling.

5.1.1 Male Mini Luer fluid connectors

In order to cope with minimized footprints, a merger of the miniaturization with well-proven fluidic interfaces from the medical world has been realized, resulting in our Mini Luer connectors. These allow *microfluidic ChipShop*'s Mini Luer fluidic platforms to connect with tubes or, integrated in an instrument, directly with the instrument.

The male Mini Luer fluid connectors are the means to connect the female Mini Luer platforms with tubing to connect for example pumps, valves, or waste reservoirs. They are offered as single interfaces, twins, or as rows of four. Furthermore, they are available in different colors for an easy differentiation between different liquids going in and out of the chip.

Male Mini Luer connectors have a dead volume of approximately 8 μl.

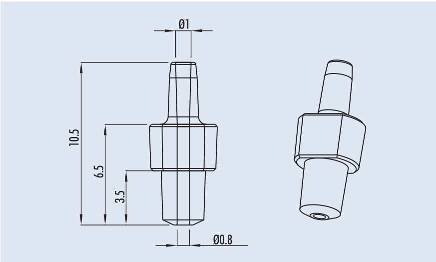


Fig. 158: Schematic drawing of a Mini Luer connector

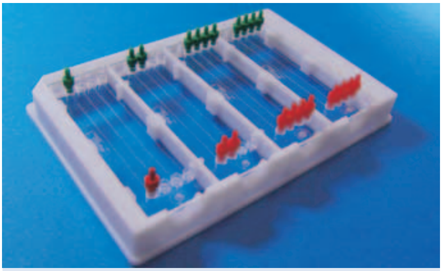


Fig. 159: Single, twin type Mini Luer connectors and row of four

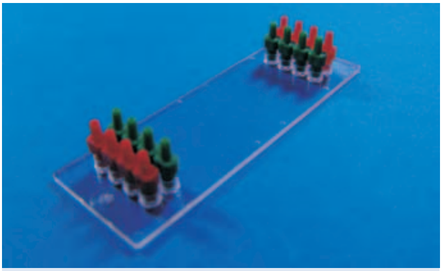


Fig. 160: Four times row of four Mini Luer connectors mounted on a Mini Luer platform

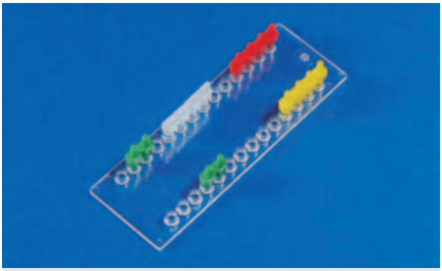


Fig. 161: Mini Luer connectors mounted on a Mini Luer fluidic platform

Product Code	Connector Type	Material	Color	Price [€/10 pieces] 1+	5+	10+	20+
09-0538-0331-09	Single	PP	Opaque	19.00	14.00	9.40	7.40
09-0539-0331-09	Single	PP	Yellow	19.00	14.00	9.40	7.40
09-0540-0331-09	Single	PP	Red	19.00	14.00	9.40	7.40
09-0541-0331-09	Single	PP	Green	19.00	14.00	9.40	7.40
09-0542-0331-09	Single	PP	Blue	19.00	14.00	9.40	7.40
09-0543-0331-09	Single	PP	Black	19.00	14.00	9.40	7.40
09-0532-0332-09	Twin	PP	Opaque	19.00	14.00	9.40	7.40
09-0533-0332-09	Twin	PP	Yellow	19.00	14.00	9.40	7.40
09-0534-0332-09	Twin	PP	Red	19.00	14.00	9.40	7.40
09-0535-0332-09	Twin	PP	Green	19.00	14.00	9.40	7.40
09-0536-0332-09	Twin	PP	Blue	19.00	14.00	9.40	7.40
09-0537-0332-09	Twin	PP	Black	19.00	14.00	9.40	7.40
09-0544-0333-09	Row of four	PP	Opaque	19.00	14.00	9.40	7.40
09-0545-0333-09	Row of four	PP	Yellow	19.00	14.00	9.40	7.40
09-0546-0333-09	Row of four	PP	Red	19.00	14.00	9.40	7.40
09-0547-0333-09	Row of four	PP	Green	19.00	14.00	9.40	7.40
09-0548-0333-09	Row of four	PP	Blue	19.00	14.00	9.40	7.40
09-0549-0333-09	Row of four	PP	Black	19.00	14.00	9.40	7.40
09-0562-0331-11	Single	TPE	Opaque	19.00	14.00	9.40	7.40
09-0563-0332-11	Twin	TPE	Opaque	19.00	14.00	9.40	7.40
09-0564-0333-11	Row of four	TPE	Opaque	19.00	14.00	9.40	7.40

5.1.2 Male Mini Luer plugs

The male Mini Luer plugs are the means to close the female Mini Luer interfaces on our fluidic platforms. As the Mini Luer fluid connectors, they are offered as single units, twins, or as rows of four. Furthermore, they are available in different colors for an easy differentiation between different input and output ports. They are offered in a hard polymer (PP) and a soft polymer (TPE).

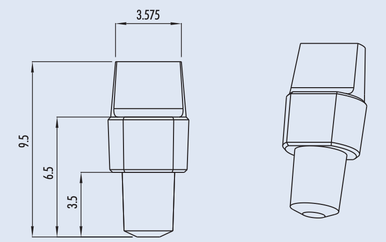


Fig. 162: Schematic drawing of a Mini Luer plug

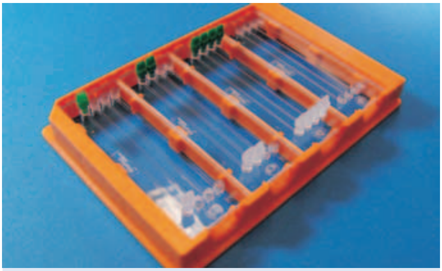


Fig. 163: Single, twin type Mini Luer plugs and row of four

Product Code	Plug Type	Material	Color	Price [€/10 pieces]			
				1+	5+	10+	20+
09-0550-0334-09	Single	PP	Opaque	19.00	14.00	9.40	7.40
09-0551-0334-09	Single	PP	Red	19.00	14.00	9.40	7.40
09-0552-0334-09	Single	PP	Green	19.00	14.00	9.40	7.40
09-0553-0335-09	Twin	PP	Opaque	19.00	14.00	9.40	7.40
09-0554-0335-09	Twin	PP	Red	19.00	14.00	9.40	7.40
09-0555-0335-09	Twin	PP	Green	19.00	14.00	9.40	7.40
09-0556-0336-09	Row of four	PP	Opaque	19.00	14.00	9.40	7.40
09-0557-0336-09	Row of four	PP	Red	19.00	14.00	9.40	7.40
09-0558-0336-09	Row of four	PP	Green	19.00	14.00	9.40	7.40
09-0559-0334-11	Single	TPE	Opaque	19.00	14.00	9.40	7.40
09-0560-0335-11	Twin	TPE	Opaque	19.00	14.00	9.40	7.40
09-0561-0336-11	Row of four	TPE	Opaque	19.00	14.00	9.40	7.40

5.1.3 Mini Luer to pipette adapter

The Mini Luer to pipette adapters allow a flush sealing of a pipette tip to a chip equipped with a Mini Luer connector. This allows the realization of higher applied fluidic pressures as well as a reduced contamination risk.

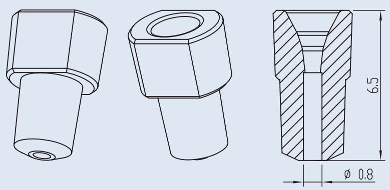


Fig. 164: Mini Luer to pipette adaptor

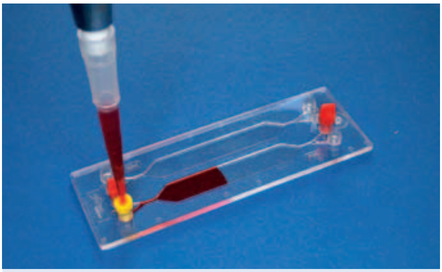


Fig. 165: Example of a Mini Luer to pipette adaptor in use with a Rhombic Chamber chip

Product Code	Description	Material	Price [€/10 pieces]	
			1+	10+
09-0565-0391-11	Mini Luer to pipette adapter	PP	19.00	9.40

5.1.4 Mini Luer to Luer adapter

The Mini Luer to Luer adapters allow the connection of devices with a standard male Luer connector (e.g. a syringe) to a chip with Mini Luer connectors. Due to the size of the Luer connector, only every second Mini Luer port can be utilized with this adapter.

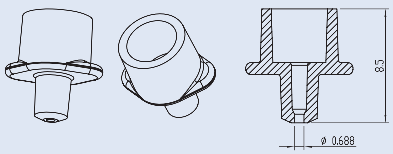


Fig. 166: Mini Luer to Luer adaptor

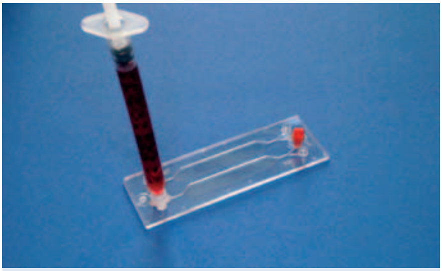


Fig. 167: Example of a Mini Luer to Luer adaptor in use with a Rhombic Chamber chip

Product Code	Description	Material	Price [€/10 pieces]	
			1+	10+
09-0566-0390-11	Mini Luer to Luer adapter	PP	19.00	9.40

5.1.5 Female Luer Lok compatible connectors

Our female Luer Lok compatible connectors are tools for chip prototyping. These devices can be mounted on the fluidic chips and are compatible with standard male Luer and Luer Lok adapters as for example used for syringes. This enables also prototyped chips, usually chips with directly milled structures, or glass and silicon microfluidic devices to make use of standard fluidic interfaces. The diameter of the through hole is 1.3 mm.
The connectors are available with a wide base for easier glueing (product code 09-0501-0303-01, see Fig. 168 or straight walls (product code 09-0500-0302-01).

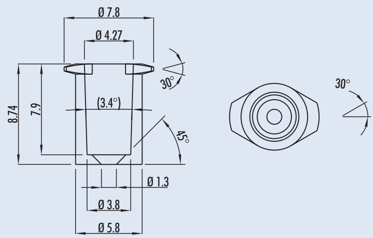


Fig 168: Schematic drawing of the Luer Lok compatible adapter

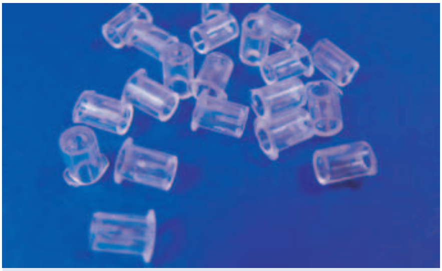


Fig. 169: Female Luer Lok adapters with wide base

Product Code	Material	Price [€/10 pieces]			
		1+	5+	10+	20+
09-0500-0302-01	PMMA	30.00	25.00	20.00	15.00
09-0501-0302-02	Topas	30.00	25.00	20.00	15.00
09-0502-0302-03	PC	30.00	25.00	20.00	15.00

5.1.6 Female Luer Lok compatible connectors with wide base

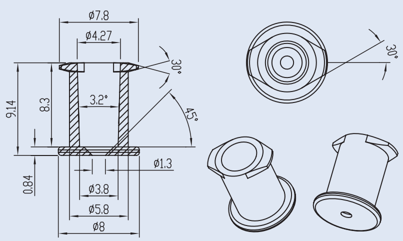


Fig. 170: Schematic drawing of female Luer Lok compatible connectors with wide base

Fig. 171: Diagnostic platform with Luer-Lok adapters

Product Code	Material	Price [€/10 pieces] 1+	5+	10+	20+
09-0512-0303-01	PMMA	30.00	25.00	20.00	15.00
09-0513-0303-02	Topas	30.00	25.00	20.00	15.00
09-0514-0303-03	PC	30.00	25.00	20.00	15.00

5.1.7 Male Luer plugs

The male Luer plugs enable to close the female Luer and Luer Lok interfaces on our fluidic platforms. With the help of these plugs, liquid can be moved with the female Luer interface into the fluidic channels on chip, and the fluidic interface itself is safely closed in order to avoid a contamination risk.

A version with retaining strip allows to directly attach the Male Luer plug to a lab-on-a-chip device with a suitable counterpart for the pin at the end of the strip. This is a convenient method to ensure an easy handling of the overall device.

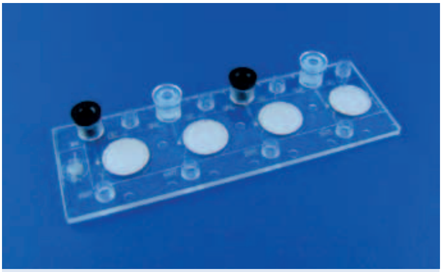


Fig. 172: Male Luer plug

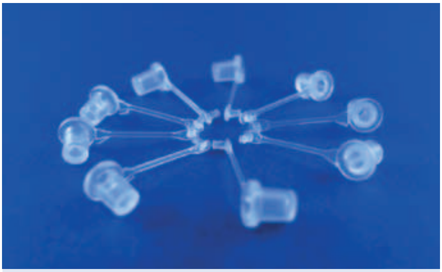


Fig. 173: Male Luer plug with retaining strip

Alternatively, a version of the Luer plug is available which has a reduced plug length and thus displaces less volume in the Luer interface when applied. While the standard Luer plug displaces a volume of approx. 55 μl, the reduced height Luer plug only displaces 20 μl.

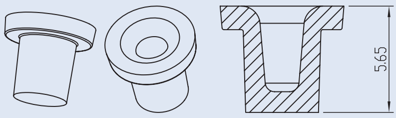


Fig. 174: Luer plug with reduced displaced volume

Fig. 175: Mini Luer plugs

Product Code	Description	Price [€/10 pieces] 1+	10+
09-0503-0270-09	Male Luer plug, opaque	19.00	9.40
09-0504-0270-09	Male Luer plug, black	19.00	9.40
09-0505-0264-09	Male Luer plug with retaining strip, opaque	25.00	14.40
09-0506-0264-09	Male Luer plug with retaining strip, black	25.00	14.40
09-0507-0270-11	Male Luer plug with reduced displaced volume, opaque	25.00	14.40

5.1.8 Male Luer fluid connectors

The male Luer fluid connectors are the tool to couple the female Luer interfaces on the fluidic platforms with tubing deriving from pumps, valves or reservoirs.

An important feature of these connectors is the massively reduced death volume compared to conventional interfaces. This also allows for smooth pumping from the liquid reservoir to the chip without huge pressure drops due to massively different channel diameters on and off chip.

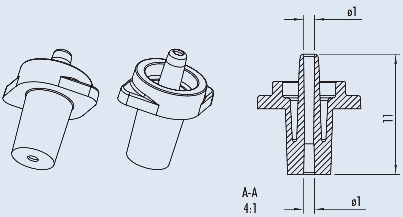


Fig. 176: Male Luer fluid connector

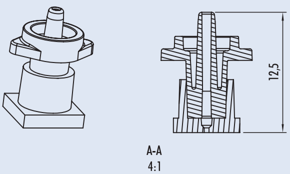


Fig. 177: Male Luer fluid connector coupled with the female counterpart on chip

Fig. 178: Male Luer fluid connector with olive interface

Fig. 179: Male Luer fluid connector with olive interface mounted on chip

Product Code	Description	Price [€/10 pieces] 1+	10+
09-0508-0263-09	Male Luer fluid connector, opaque	25.00	14.40
09-0509-0263-09	Male Luer fluid connector, green	25.00	14.40

5.1.9 Upchurch Nanoports

The Upchurch Nanoports N-126H allow for chip holes up to 1/16″ (1.57 mm) and for tubing with an outer diameter of 1/32″ (0.79 mm). They can be used with capillary peek tubing with an outer diameter of 1/32″. Please be aware when you make your fluidic design that the footprint of these Nanoports is 8.4 mm.

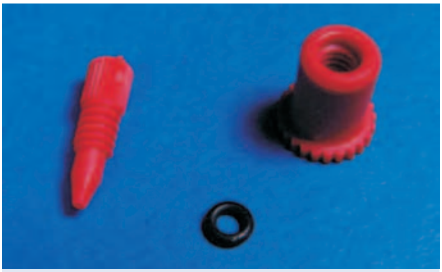


Fig. 180: Upchurch Nanoports assembly set

Fig. 181: Prototyped analytical platforms with Upchurch Nanoports

Product Code	Comment	Price [€/piece] 1+	20+
09-0510-0000-00	Upchurch Nanoports N-126H	16.90	15.80

5.1.10 LabSmith CapTite™ components for fluidic interfaces

CapTite components are designed for high-pressure and low dead volumes. They can be used on microfluidic chips containing simple holes as access ports such as the straight channel chips in chapter 2.1.1.1 (product codes 01-0152-0143-01 to 01-0161-0138-02) or cross-shaped channel chips in chapter 2.4.1.1 (product codes 02-0758-0082-01 to 02-0765-0166-02). They can be interfaced directly with LabSmith's hardware such as syringe pumps and valves (for hardware details see www.labsmith.com). An example of a cross-shaped channel chip with three bonded port connectors and three chip reservoirs is shown below.

A choice of different components is available allowing for various connection options. This includes:

- **Bonded port connectors:** Bonds to port on chip for capillary-chip interface. Compatible with approx. 1 mm port size. Material: Ultem
- **Chip reservoir:** Threads into bonded port connector to provide 85 µl fluid reservoir. Also connects to Luer tip syringe for low pressure connection.
- **Luer Lok adapter:** Female fitting for connecting syringe to 360 µm OD capillary. Material: PEEK.
- **One piece fitting:** For connecting 360 µm OD capillary to CapTite components. Material: PEEK.
- **One piece plug:** For plugging unused CapTite ports. Material: PEEK.
- **Complete LabSmith connection kit:** The kit contains besides 15 **bonded port connectors**, 15 **one piece fittings**, 5 **one piece plugs**, 5 **chip reservoirs** and 2 **Luer Lok adaptors** all accessories needed to mount the devices on a chip such as **epoxy adhesive** and a **wrench** for the CapTite connectors as well as **360 µm OD capillary** to connect the chip to peripherals.
- **Cross-shaped channel chips** with integrated threads.

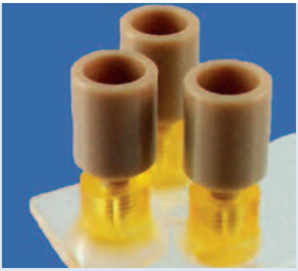


Fig. 182: Cross-shaped channel chip with three bonded port connectors and three chip reservoirs

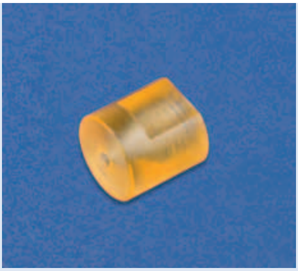


Fig. 183: Bonded port connector

Fig. 184: Female Luer Lok adapter

Fig. 185: One piece plug (left) and one piece fitting (right)

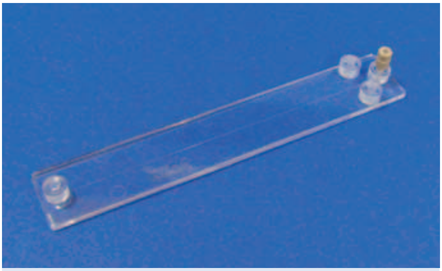


Fig. 186: Cross-shaped channel chips with embedded threads to connect with LabSmith's one piece fittings

Product Code	Description	Material	Price [€] 1+	10+
09-0595-0000-13	Bonded Port Connector	Ultem	8.50	7.95
09-0596-0000-12	Chip Reservoir	PEEK	9.90	9.00
09-0597-0000-12	Luer Lok Adapter	PEEK	29.00	26.00
09-0598-0000-12	One piece fitting	PEEK	9.90	9.00
09-0599-0000-12	One piece plug	PEEK	7.50	6.90
09-0600-0000-00	Complete LabSmith connection kit. Contains 15 bonded port connectors, 15 one piece fittings, 5 one piece plugs, 5 chip reservoirs, 2 Luer-Lock adaptors, 1 m 360 µm OD PEEK capillary, 12 ml epoxy adhesive, 1/8" hex wrench		365.00	320.00
03-0780-0106-01	Cross-shaped channel chip with threads in the fluidic interface to connect with LabSmith one piece fitting (09-0598-0000-12)	PMMA	62.40	43.60

5.2 Liquid storage

One problem that often occurs with microfluidics is the storage of liquid reagents on the chip. This often conflicts with either dry-stored reagents on the chip, the available space, or the volume of the liquid. For this reason, *microfluidic ChipShop* has developed several solutions to deal with this task, including our so-called "tank" solution as well as blister pouches.

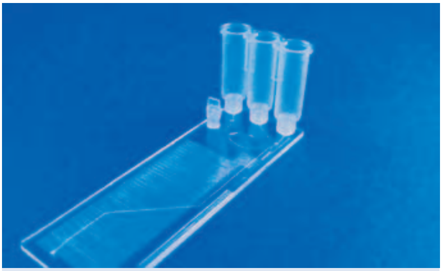


Fig. 187: Tanks mounted on a microfluidic chip

Fig. 188: Blister pouches integrated in a microfluidic chip

5.2.1 Tank

The "tank" solution allows the storage of liquids in separate tanks which are simply plugged onto the chip. The openings can be sealed with a heat-sealing aluminum foil which is piercable. Liquid actuation can also be done via the tanks either by a mechanical piston or pneumatic pressure.

5.2.1.1 Tank 500 µl with piercing interface

This tank version, which exists in single, double, and triple tank versions, has a volume of 500 µl and is 25 mm high. The sealed tank is clipped onto a chip which has to have a suitable piercing interface to pierce the sealing film. Examples for the application of these tanks can be seen in Figs. 396, 402 and 403.

Fig. 189: Single, double, and triple tank

Fig. 190: Filled tanks sealed with alumina foil

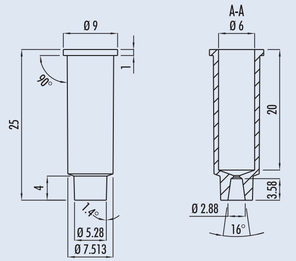


Fig. 191: Single tank

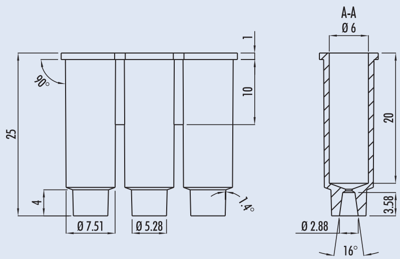


Fig. 192: Triple tank

Product Code	Description	Material	Price [€/10 pieces] 1+	10+	100+
16-0601-0229-09	Single Tank	PP	25.00	10.20	5.40
16-0602-0230-09	Double Tank	PP	26.00	11.80	5.80
16-0603-0231-09	Triple Tank	PP	27.00	12.40	6.10

5.2.1.2 Tank 500 µl with Luer interface

This tank version with a tank volume of 500 µl has a male Luer interface to connect to any chip with a female Luer port. If the tank has sealed output, the chip has to have a piercing element to breach the sealing film. The 500 µl Luer tank is available in a single, double or triple tank version.

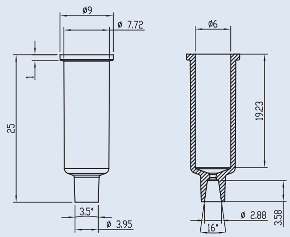


Fig. 193: 500 μl single tank with Luer interface

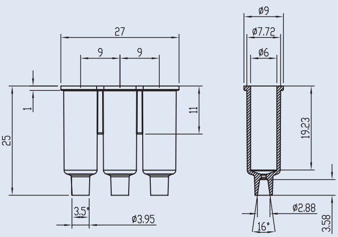


Fig. 194: 500 μl triple tank with Luer interface

5.2.1.3 Tank 4.5 ml

A larger tank version was created in order to allow for liquid storage up to 4.5 ml. This tank is offered as pure reservoir or with a cap allowing for a pneumatic actuation of the fluids. The fluidic interface is realized as male Luer connector.

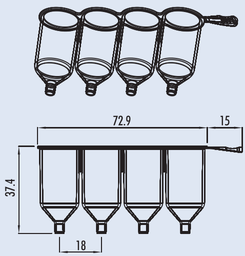


Fig. 195: Schematic tank layout – fluidic interface: male Luer

Fig. 196: Liquid reservoir: 4.5 ml tank

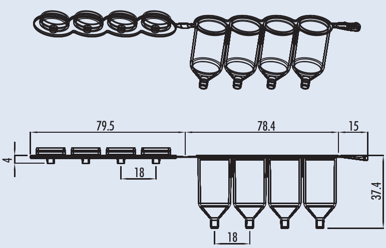


Fig. 197: Schematic tank layout with cap for pneumatic actuation

Fig. 198: Tank with cap for pneumatic actuation

Product Code	Description	Material	Price [€/10 pieces] 1+	10+	100+
16-0604-0232-09	Row of 4 tanks	PP	35.00	22.00	9.40
16-0605-0233-09	Row of 4 tanks with cap	PP	38.00	25.00	11.40

5.2.2 Blister pouches

A convenient method for storing liquids on-chip is the use of blister pouches made out of coated aluminum foil or special hybrid polymer foil assemblies. They are available in a variety of sizes with internal volumes of up to 1.000 µl.

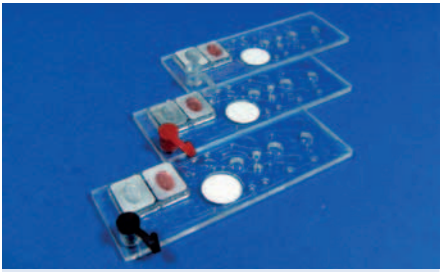


Fig. 199: Blister pouch with 25 µl liquid volume

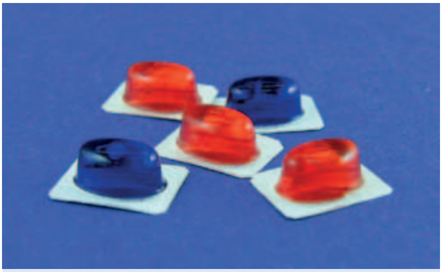


Fig. 200: Blister pouch with 150 µl liquid volume

Fig. 201: DNA analysis chip with blister and integrated lateral flow strip

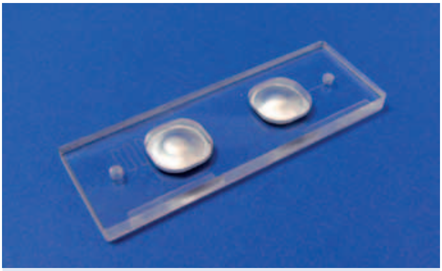


Fig. 202: Blister test chip with aluminum foil pouches

5.3 Sampling vessels

Liquid or dry sample take up is a critical element not only in microfluidics. The sampling vessels allow for dry and liquid sample take up.

5.3.1 Sampling vessels without septum

A piercable aluminum tape can be used to close the sampling vessel at its bottom. Either liquid can be pipetted inside or a vessel prefilled with buffer can be used in which a swab is introduced after a sample take up.

A male Luer interface acts as fluidic interface. The sampling vessel can be mounted on female Luer interfaces on chip. The aluminum tape is pierced via embedded needles in the female Luer interface of specially designed chips.

On top of the sampling vessel a cap with embedded thread and O-ring ensures a liquid-tight sealing.

The total volume is 6.5 ml.

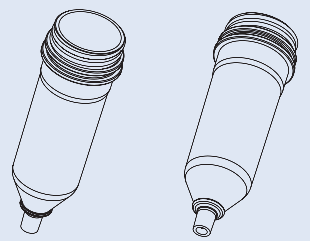


Fig. 203: Schematic drawing of sampling vessel

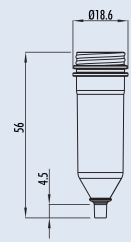


Fig. 204: Detail of sampling vessel

Fig. 205: Sampling vessel prefilled with liquid mounted on a chip

Fig. 206: Sampling vessel prefilled with buffer and inserted swab

Product Code	Description	Material	Price [€/10 pieces] 1+	10+
16-0620-0275-09	Sampling vessel 6.5 ml	PP	72.60	48.40

5.3.2 Sampling vessels with integrated septum

An integrated needle piercable and self-healing septum is integrated in the sampling vessel interface to the microfluidic chip. The sampling vessels with integrated septum allow for a safe sampling, interfacing with a Luer on a microfluidic chip and the removal of the sampling vessel from the chip after transfer of a certain amoutn of sample on chip. A needle embedded on chip allows the liquid transfer from the septum on the chip. After the removal of the sampling vessel from the chip not liquid can pour out from the septum. An additional cap to close the Luer interface of the septum further ensures that contamination cannot occur.

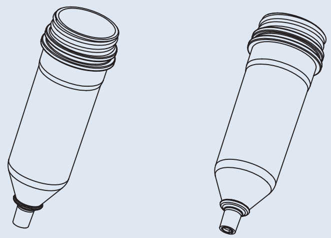


Fig. 207: Schematic drawing of sampling vessel with septum 0276

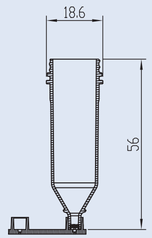


Fig. 208: Detail of sampling vessel with septum 0276 with counterpart on chip

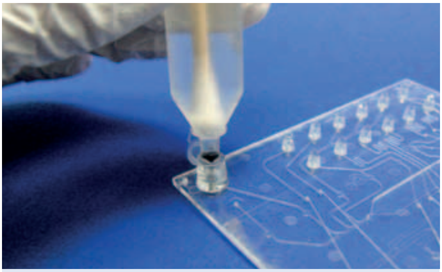


Fig. 209: Sampling vessel with septum on piercing interface on chip

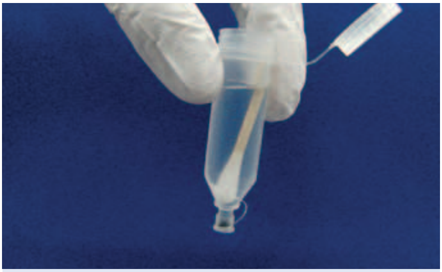


Fig. 210: Sampling vessel prefilled with buffer and inserted swab

Product Code	Description	Material	Price [€/10 pieces] 1+	10+
16-0621-0276-09	Sampling vessel 6.5 ml with septum	PP	92.60	58.40

5.4 Valving

On chip valving gives the possibility to direct and meter fluids freely according to the respective needs. Simple membrane valves embedded in the fluidic design allow for an on-off functionality whereas rotary valves enable to conduct fluids in different pathways or to meter liquids in loops on a chip or directly in the valve itself.

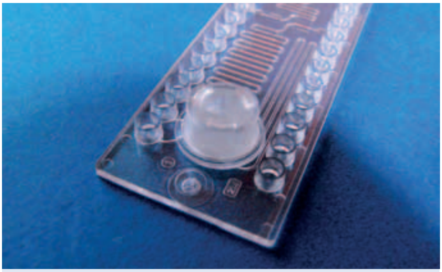


Fig. 211: Fluidic chip with embedded rotary valve

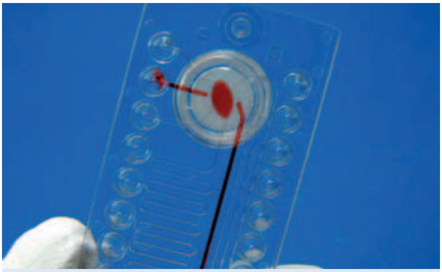


Fig. 212: Rotary valve with metering function

Product Code	Lid Thickness [µm]	Material	Description	Price [€]	
				1+	10+
19-1850-0155-03	175	PC	Turning valve test chip	128.50	79.60
19-1851-0155-05	188	Zeonor	Turning valve test chip	128.50	79.60

5.5 Tubing

5.5.1 Capillary PEEK tubing

The capillary PEEK tubing is intended to be used with the Upchurch Nanoports but is also suited for various other applications. One package contains 10 capillaries with a length of 12” (30.48 cm).

Fig. 213: Capillary PEEK tubing

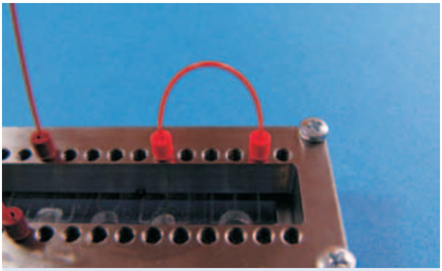


Fig. 214: Capillary PEEK tubing in use with nuts of the Upchurch Nanoport set in combination with a chip adapter frame

Product Code	Description	Price [€/10 pieces] 1+
09-530-0000-00	Capillary PEEK tubing 1575-12x OD: 795 µm (0.0313"), ID: 200 µm (0.008")	60.10

5.5.2 PTFE tubing

PTFE tubings are standard tubings to connect pumps with the microfluidic chips in order to deliver to or to remove liquid from the chip. These tubings can be connected with the microfluidic chip with a silicone sleeve in which the PTFE tubing is introduced, and the silicone sleeve can be either mounted on the olive of a Mini Luer fluid connector or directly on olives integrated on chip.

Product Code	Description	Quantity	Price [€]
11-0803-0000-00	Micro tubes, PTFE, ID: 0.5 mm, wall thickness: 0.25 mm	5 m	42.50

5.5.3 Silicone tubing

Silicone tubes are used to connect hard plastic tubes like PTFE tubings with pumps or the microfluidic chips and the respective interfaces. The silicone tubes in this catalogue can be mounted on the olives embedded on the chips and on the olives being part of the Mini Luer fluid connectors.

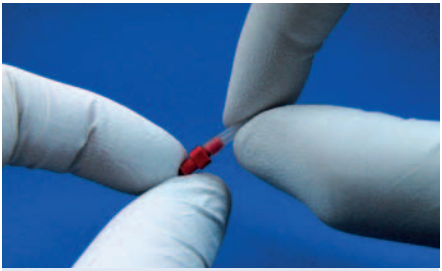


Fig. 215: Silicone sleeve mounted on a male Mini Luer fluid connector

Fig. 216: PTFE tube connected via silicone sleeves to Mini Luer fluid connector

Product Code	Description	Quantity	Price [€]
09-0610-0000-00	Silicone tube, ID: 0.76 mm, OD: 1.65 mm	2 m	16.20
09-0611-0000-00	Silicone tube, ID: 0.5 mm, OD: 2.5 mm	2 m	16.85

5.6 Microfluidic chip support kits – Microfluidic and chip-PCR support kits

The **microfluidic support kits** comprise different components necessary for running microfluidic systems. This includes tubes to bring the fluid into the chip, and silicone tubes to enable the interconnection between for example a microfluidic ChipShop fluidic platform chip and tubing, or between tubing and a syringe. Forceps can be used to stop a flow by clamping a silicone tube and syringes to fill chips manually.

These small kits allow you to directly start with your microfluidic experiments without losing time searching for suitable components.

Comparable to the **microfluidic support kits**, the **chip-PCR support kits** enable you to directly start with your continuous-flow PCR from the fluidic side. They include tubes and mineral oil to drive the PCR. Besides this and the PCR system consisting of chip and thermocycler, only your own biological reagents are needed to start the PCR.

For further microfluidic kits, please have a look at our selection in Chapter 9.1.

Fig. 217: Microfluidic support kit 1

Fig. 218: Chip-PCR support kit 1

Product Code	Kit Type	Product Description	Price [€/kit]
11-0800-0000-00	Microfluidic support kit 1	**Microfluidic support kit 1:** - Silicone tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 2 m) - forceps (3) - single-use syringes (3) - syringe adapter (3)	27.80
11-0850-0000-00	PCR support kit 1	**Chip-PCR support kit 1:** *ChipGenie edition T* support kit - Silicone tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 2 m) - forceps (1) - mineral oil (3 ml) - mcs foil 007 – adhesive Al-tape (3 sheets)	32.90

5.7 Handling frames

To interface our microscopy-slide-sized microfluidic chips, we have developed stackable handling frames which comply with the SBS microtiter plate standard. They can therefore be handled with standard laboratory automation equipment and support the integration of microfluidic devices into your lab workflow. Four microscopy-slide-sized chips can be securely fixed in the frames.

5.7.1 Handling frames for the spacing of a 1536 microtiter plate

These handling frames to be equipped with microfluidic devices allow to use all standard equipment being able to cope with the well spacing of a 1536 microtiter plate for pipetting and read out of the microfluidic chips. The frames are available in different colors for a safe differentiation of different applications.

Furthermore, they are available in two versions: One handling frames has the standard skirt of the microtiter plate, the second one is version with reduced height, still complying with standard robots but allowing for a read out of the chips in plate readers or inverted optical microscopes with a reduced optical working distance.

Fig. 219: Handling frame

Fig. 220: Handling frame with different chip types connected with each other

Product Code	Description	Color	Price [€/pieces] 1+	5+	20+
15-4000-0000-12	Handling frame with high skirt	Yellow	22.00	15.00	12.40
15-4001-0000-12	Handling frame with high skirt	Orange	22.00	15.00	12.40
15-4002-0000-12	Handling frame with high skirt	Red	22.00	15.00	12.40

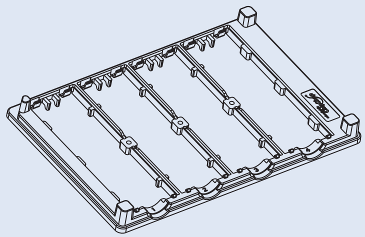


Fig. 221: Schematic drawing of handling frame with flat skirt

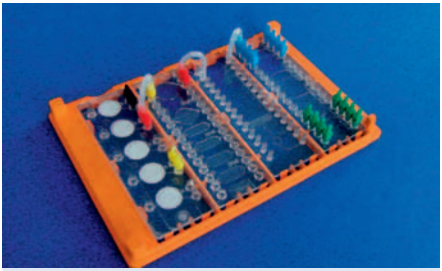


Fig. 222: Handling frame with flat skirt with different chip types connected with each other

Product Code	Description	Color	Price [€/pieces] 1+	10+	100+
15-4003-0000-12	Handling frame with reduced skirt height	Orange	22.00	15.00	12.40

5.7.2 Handling frames for the spacing of a 384 microtiter plate

These handling frames place microfluidic device on the positions of the wells of a 384 well microtiter plate and enable the use of standard robots and readers for the 384 well plates.

Product Code	Description	Price [€] 1+
15-4004-0000-00	Handling frame for spacing of 384 well microtiter plate	128.50

5.7.3 Handling frames for the spacing of a 96 microtiter plate

These handling frames place microfluidic device on the positions of the wells of a 96 well microtiter plate and enable the use of standard robots and readers for the 96 well plates.

Product Code	Description	Price [€] 1+
15-4005-0000-00	Handling frame for spacing of 96 well microtiter plate	128.50

5.8 Microfluidic connector probes

Microfluidic connector probes (formerly available from Cascade Microtech) allow an easy, bubble-free, reusable, and non-destructive fluidic and electrical contacting of planar microfluidic chips. Applications include chip-based electrophoresis, electrokinetic pumping or mixing. The microfluidic probes contain fluidic and/or electrical connections and are available in three different versions. The probes have a 6.35 mm diameter hole for connection to a fixture (not included):

MFP:
Provides fluidic contact via a planar sealing face.
Fluidic input is provided by a standard Upchurch Nanoport connector.

EBP:
Provides electrical contact for up to 5 kV to a chip through a platinum wire tip.
The holder provides insulation between the probe tip and positioner.

MFP-HV:
Combines fluidic and electrical contacts (up to 5 kV). Ideal for chip-based electrophoresis experiments in case of planar chips with holes as fluidic reservoirs.

Fig. 223: MFP – fluidic probe

Fig. 224: EBP – electrical probe

Fig. 225: MFP-HV – fluidic and electrical probe

Product Code	Description	Price [€/per probe] 1	2+	4+	10+
09-0520-0000-00	MFP – fluidic probe	255.00	235.00	215.00	195.00
09-0521-0000-00	EBP – electrical probe	415.00	385.00	355.00	320.00
09-0522-0000-00	MFP-HV – fluidic and electrical probe	495.00	450.00	395.00	355.00
09-0523-0000-00	Spare electrode for MFP electrical probe	19.00	18.00	17.00	15.00

5.9 Reagents

In order to enable a convenient use of our microfluidic systems, reagents are offered to fulfill special requirements. This includes for instance reagents usable with different polymer materials offered in the catalogue or being compatible with reactions carried out on chip.

5.9.1 Oil

Special oils are used in microfluidic systems e.g. in droplet generator chips to generate and separate individual droplets, in PCR chips to avoid evaporation or the separation of sample plugs. The right choice of the oil is crucial since viscosity, material and reaction compatibility have to be taken into consideration.

Product Code	Description	Material compatibility	Application	Price [€/10 ml]
20-5002-0000-00	mcs-oil-02	PC	PCR compatible	28.50
20-5004-0000-00	mcs-oil-04	PC, PMMA, COC (Topas), COP (Zeonor)	PCR compatible	35.40
20-5005-0000-00	mcs-oil-10	PC, PMMA, COC (topas), COP (Zeonor)	Droplet generation	22.40

5.10 Microfluidic device – storage & transport boxes

Despite that most of the standard microfluidic modules come in standard formats like the microscopy slide or microtiter-plate format, standard storage solutions do not necessary cope with the demand either in respect of clean handling or the special format of the microfluidic devices that have e.g. a different thickness than their "standard" counterpart or have integrated fluidic interfaces that also might interfere with conventional solutions.

microfluidic ChipShop's chip storage solutions are specially adapted to the design features of microfluidic devices.

Two storage box types are available. Both allow for an easy uptake of the chip by sliding the top cover. One box type allows for the storage of microfluidic devices in the size of a microscopy slide with thickness ranging from 1 – 2 mm, the other option copes with thicker devices from 3 to 4 mm thickness.

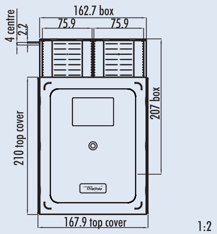


Fig. 226: Microfluidic chip storage box for devices with 1.0 – 2.0 mm thickness

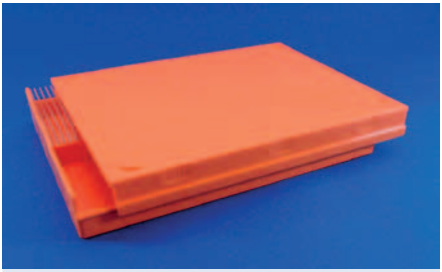


Fig. 227: Microfluidic chip storage box for devices with 1.0 – 2.0 mm thickness

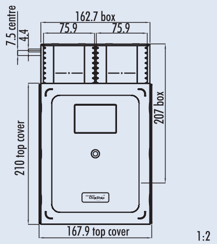


Fig. 228: Microfluidic chip storage box for devices with 3.0 – 4.0 mm thickness

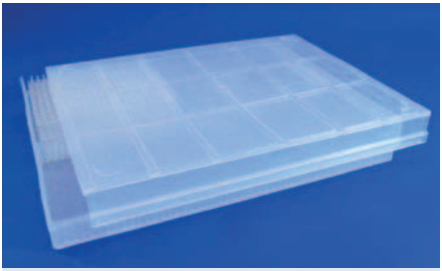
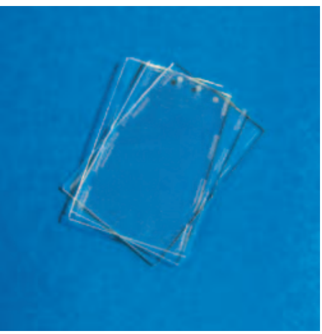
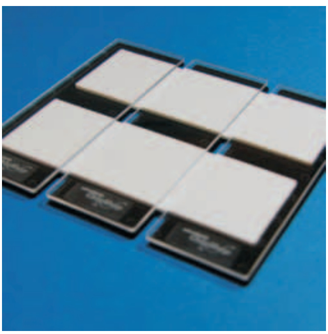
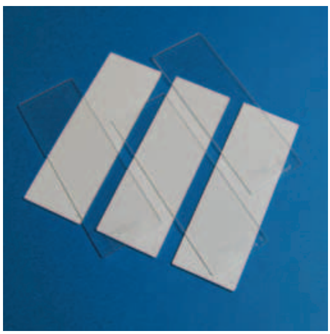


Fig. 229: Microfluidic chip storage box for devices with 3.0 – 4.0 mm thickness

Product Code	Description	Price [€/Box] 1+	10+
25-2000-0000-09	Microfluidic chip storage box **For chip formats:** Microscopy slide format (25.5 mm x 75.5 mm) **For chip thicknesses:** 1.0 –2.0 mm **Color:** Orange	19.10	12.90
25-2001-0000-09	Microfluidic chip storage box **For chip formats:** Microscopy slide format (25.5 mm x 75.5 mm) **For chip thicknesses:** 3.0 – 4.0 mm **Color:** Opaque	19.10	12.90







6 Polymer substrates & foils

Polymer substrates & foils

Some interesting materials that are useful in microfluidics, in particular a range of different polymers, are either not commercially available as plate materials or not of sufficient quality for the special requirements of microfabrication. If you are in need of plain substrate material, e.g. for hot embossing experiments or as unstructured platform for surface chemistry experiments, we can provide you with substrates in our standard formats like the microscopy-slide, the ¼-microtiterplate (43 mm x 64 mm) or round substrates with a diameter of 115 mm. Wafers, to be used, for instance, as substrates for hot embossing, come in several units in one package. If surface quality matters, each wafer is separately packaged.

The dimensions of the substrates may differ in the range of 0.5 % depending on the material.

If the material or the color you require is not listed, we are happy to provide you with a special quote for substrate for your material needs.

Besides the thicker polymer substrates in various formats special foil materials in different thickness are available.

6.1 Wafer format – 115 mm diameter

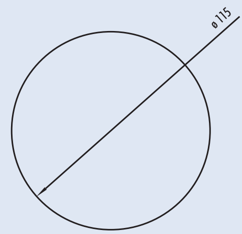


Fig. 230: Schematic drawing of 115 mm diameter wafer

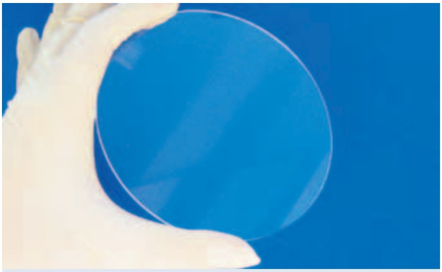


Fig. 231: 115 mm diameter wafer

Product Code	Material	Comment	Price [€/per unit*] 1+	10+	50+
10-0646-0000-02	Topas	thickness 2.0 mm, individually wrapped	75.00	62.00	36.00
10-0647-0000-03	PC		75.00	62.00	36.00
10-0648-0000-04	Zeonex		75.00	62.00	36.00
10-0649-0000-05	Zeonor		75.00	62.00	36.00
10-0656-0000-02	Topas	thickness 1.5 mm, individually wrapped	75.00	62.00	36.00
10-0657-0000-03	PC		75.00	62.00	36.00
10-0658-0000-04	Zeonex		75.00	62.00	36.00
10-0659-0000-05	Zeonor		75.00	62.00	36.00

* 1 unit consists of 10 wafers

6.2 Microscopy slide format (75.5 mm x 25.5 mm)

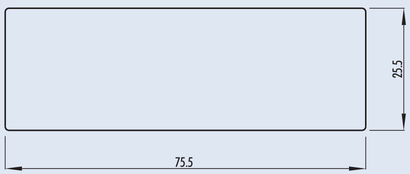


Fig. 232: Schematic drawing of the slide substrate

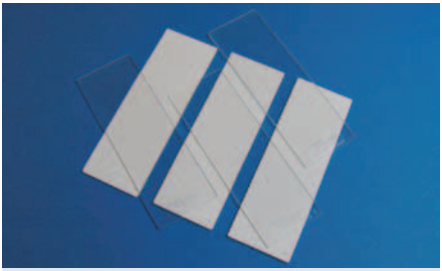


Fig. 233: Various polymeric substrates in the format of a microscopy slide

Product Code	Material	Comment	Price [€/per unit*] 1+	10+	50+
10-0671-0000-01	PMMA	thickness 1.0 mm, individually wrapped or packed in microscopy slide boxes	55.00	30.00	22.00
10-0665-0000-01.1	PMMA black		55.00	30.00	22.00
10-0662-0000-02	Topas		55.00	30.00	22.00
10-0663-0000-03	PC		55.00	30.00	22.00
10-0664-0000-04	Zeonex		55.00	30.00	22.00
10-0672-0000-05	Zeonor		55.00	30.00	22.00
10-0676-0000-05.1	Zeonor black		55.00	30.00	22.00
10-0673-0000-01	PMMA	thickness 1.5 mm, individually wrapped or packed in microscopy slide boxes	55.00	30.00	22.00
10-0675-0000-02	Topas		55.00	30.00	22.00
10-0666-0000-03	PC		55.00	30.00	22.00
10-0667-0000-04	Zeonex		55.00	30.00	22.00
10-0674-0000-05	Zeonor		55.00	30.00	22.00
10-0668-0000-02	Topas	thickness 4.0 mm, individually wrapped or packed in microscopy slide boxes	75.00	35.00	26.00
10-0669-0000-03	PC		75.00	35.00	26.00
10-0670-0000-04	Zeonex		75.00	35.00	26.00

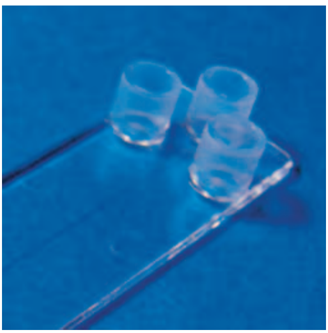
* 1 unit consists of 10 wafers

6.3 Foils

For special needs thin foils in various materials are offered. This includes pure polymer foils as well as pressure sensitive adhesive tapes.

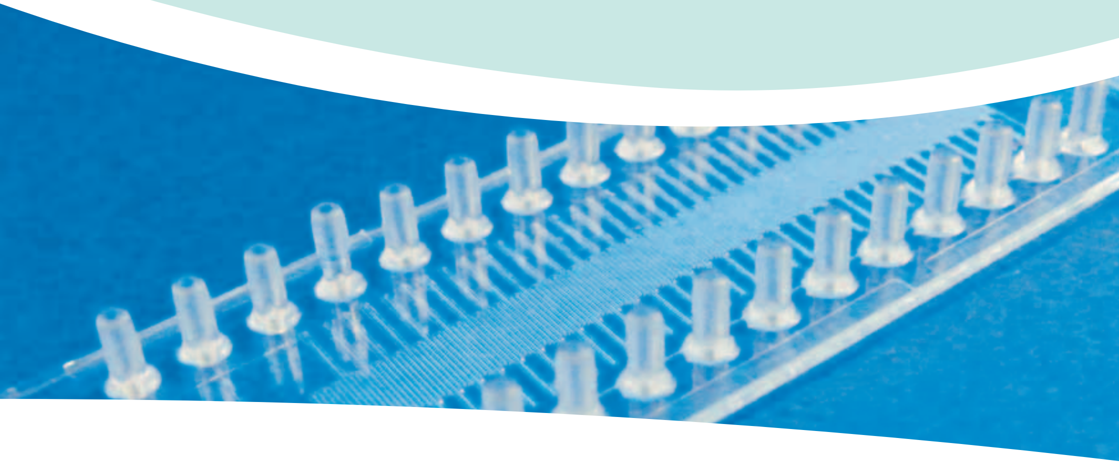
Product Code	Description	Material	Thickness [µm]	Price [€/m²] 1+	5+	10+
10-0680-0000-05	mcs foil 005	Zeonor	188	120.00	104.00	98.00
10-0681-0000-05	mcs foil 015	Zeonor	100	120.00	104.00	98.00
10-0682-0000-05	mcs foil 051	Zeonor	50	110.00	94.00	88.00
10-0683-0000-05	mcs foil 049	Zeonor	40	110.00	94.00	88.00
10-0684-0000-02	mcs foil 028	Topas	300	78.00	52.50	38.50
10-0685-0000-02	mcs foil 029	Topas	240	78.00	52.50	38.50
10-0686-0000-02	mcs foil 011	Topas	140	78.00	52.50	38.50
10-0687-0000-00	mcs foil 008	Double sided pressure sensitive adhesive tape	140	78.00	52.50	38.50

Precise dimensions of the foils may vary and are available on request.


SYSTEM 1


ChipGenie

7 Instruments and applications



Instruments and applications

Using microfluidic systems in the daily laboratory life usually requires not only the chips but also the relevant instrumentation. Here, our ChipGenie® editions come into play.

ChipGenie® edition T, for instance, consists of both chips in a variety of formats and a matching temperature control unit to enable you to directly start your reactions/amplifications in a fraction of the time compared to conventional instruments.

ChipGenie® edition E, an extremely compact electrophoresis system, allows the label-free detection of small ions thanks to its contactless conductivity detection scheme. Again, the instrument is complemented by a variety of chips ideally suited for the system.

ChipGenie® edition P is a compact versatile instrument for on-chip magnetic bead-handling and heating, e.g. for sample preparation like DNA extraction.

This chapter also features instruments for a variety of applications from our partner companies.

7.1 Continuous-flow-chip-PCR ChipGenie® edition T

microfluidic ChipShop and Clemens GmbH offer an innovative system for PCR on the chip. Different from conventional PCR with heating-up and cooling-down cycles, in this chip-PCR system the complete reaction vessel is temperature controlled: The PCR solution flows through separated temperature zones, winding itself through the temperature profile. The time-determining step in PCR – the carrying out of the repeated heating and cooling cycles – is no longer necessary since the temperature in the heating zones remains constant and only the liquid undergoes the temperature cycling.

The PCR system comprises the PCR chip and the thermocycler (or better: thermal control unit, as no cycling in the conventional sense is involved) that has been specially developed for Lab-on-a-Chip applications. A pump moves the PCR solution through the chips. In comparison to conventional systems, this lab-on-a-chip PCR system allows for a significant reduction of the PCR reaction time: Without much optimization, a 15-cycle PCR can be completed in less than five minutes.

In order to allow you easy use of the PCR system we offer **chip-PCR support kits** (that include tubes and mineral oil for pumping the PCR solution) as well as **pumps** for the driving of the fluids.

Product Code	Lid Thickness [µm]	Material	Comments Design Channel Dimensions Width / Depth / Length	Price [€/chip] 1+	10+	100+	1000+
08-0470-0047-03	250	PC	15 cycles (1 inlet, 1 outlet) 500 µm / 100 µm / 810 mm	42.50	32.50	25.50	12.00
08-0471-0065-03	250	PC	36 cycles (2 inlets, 3 outlets) 220 µm / 100 µm / 1,257 mm	42.50	32.50	25.50	12.00
08-0472-0061-03	250	PC	41 cycles (1 inlet, 1 outlet) 200 µm / 100 µm / 1,879 mm	42.50	32.50	25.50	12.00
08-0473-0243-03	250	PC	40 cycles (1 inlet, 1 outlet) 600 µm / 300 µm / 1,637 mm	42.50	32.50	25.50	12.00
08-0474-0243-05	188	Zeonor	40 cycles (1 inlet, 1 outlet) 600 µm / 300 µm / 1,637 mm	42.50	32.50	25.50	12.00

Product Code	Description	Price [€]
08-0493-0000-00	***ChipGenie edition T+* instrument**	14,980.00
11-0850-0000-00	***ChipGenie edition T* support kit:** - Silicone tube (ID: 0.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, 2 m) - mineral oil (3 ml) - mcs foil 007 – adhesive Al-tape (3 sheets) - forceps (1)	32.90

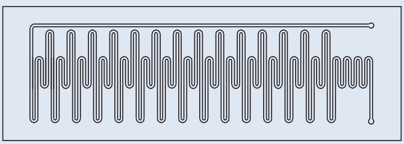


Fig. 234: Schematic drawing of 15-cycle continuous-flow PCR chip

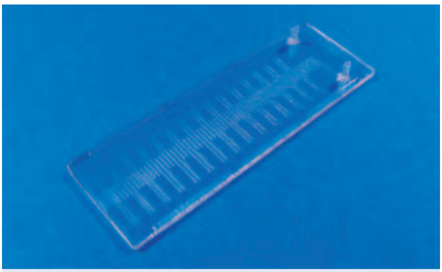


Fig. 235:15-cycle continuous-flow PCR-chip

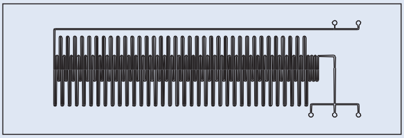


Fig. 236: Schematic drawing of 36-cycle continuous-flow PCR chip

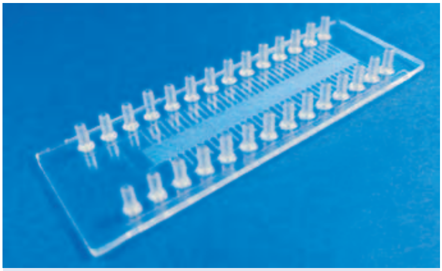


Fig. 237: 36-cycle continuous-flow PCR chip

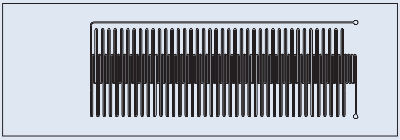


Fig. 238: Schematic drawing of 41-cycle continuous-flow PCR chip

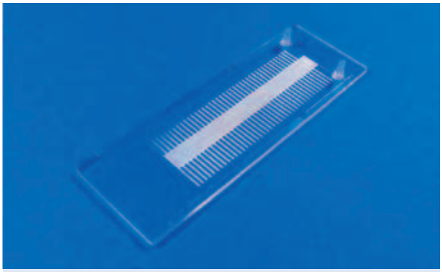


Fig. 239: 41-cycle continuous-flow PCR chip

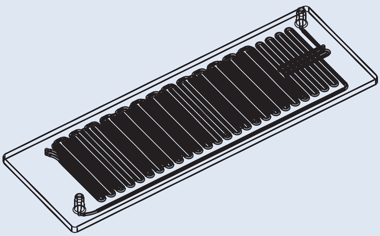


Fig. 240: Schematic drawing of 40 cycle continuous-flow PCR chip 0243


Fig. 241: 40 cycle continuous-flow PCR chip 0243


Fig. 242: Chip-PCR support kit

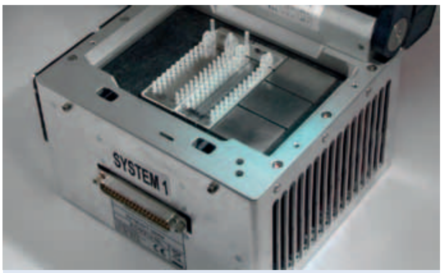


Fig. 243: ChipGenie® edition T^+ instrument

7.2 Capillary electrophoresis system with contactless conductivity detection – ChipGenie® edition E

ChipGenie® edition E is an extremely compact electrophoresis system that allows the label-free detection of small ions thanks to its capacitively coupled contactless conductivity detection (C4D) scheme. The extremely rugged instrument with the size of a cigar box contains a bipolar high-voltage supply for the separation of both anions and cations and a high-frequency detection circuit. It is controlled through an easy-to-use software program and is powered through its USB port. The instrument is complemented by a variety of chips ideally suited for the system. Applications include the analysis of foodstuffs, water, or other sources of small ions as well as larger molecules from biological samples.

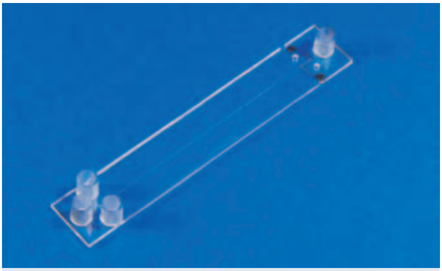


Fig. 244: Microfluidic chips for the ChipGenie® edition E series

Fig. 245: ChipGenie® edition E capillary electrophoresis unit

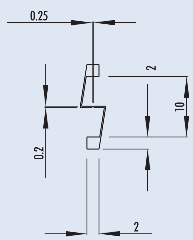


Fig. 246: Details of the electrodes

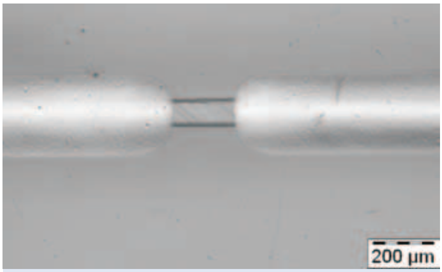


Fig. 247: Microscopy image of electrodes over microchannel

Product Code	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Geometry A [mm]	Geometry B [mm]	Geometry C [mm]	Geometry D [mm]	Lid Thickness [µm]	Material	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 100+
03-0110-0082-01	50	50	87.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0111-0201-01	50	50	87.0	6.0	5.0	5.0	0.1	60	PMMA	125.00	85.00	32.50
03-0798-0166-01	100	100	87.0	6.0	5.0	5.0	0	60	PMMA	125.00	85.00	32.50
03-0799-0166-05	100	100	87.0	6.0	5.0	5.0	0	50	Zeonor	125.00	85.00	32.50

Product Code	Description	Price [€/instrument]
08-0486-0000-00	*ChipGenie® edition E* instrument	3,780.00

7.3 On-chip sample-preparation system – ChipGenie® edition P

ChipGenie® edition P is an instrument for on-chip sample preparation steps like DNA-extraction or cell lysis. The instrument in the size of a cigar box features a click–in holder frame for microscope slide format chips and contains a linearly moving magnet as well as a temperature control. The heating element as well as the permanent magnet is located underneath the chip as shown in Fig. 199. LED signals indicate the current operating status and a LCD display indicates the set temperature, alternatively the actual temperature. The arrangement of the switches provides a comfortable handling for pipetting in manual use. The instrument is a bench top instrument with a 5V DC power supply.

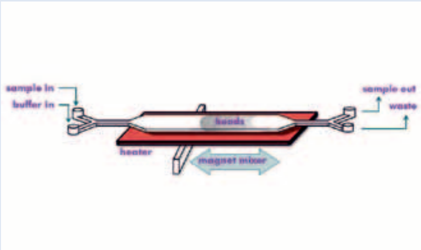


Fig. 248: Principle of a bead-based assay with the ChipGenie® edition P instrument

Fig. 249: ChipGenie® edition P instrument with bead-filled sample-prep chip

Product Code	Description	Price [€/instrument]
80-0487-0000-00	*ChipGenie® edition P* instrument	695.00

7.3.1 Chips eP1 – chips for ChipGenie® edition P

The chips highlighted below are suited to be run with the ChipGenie® edition P instruments.

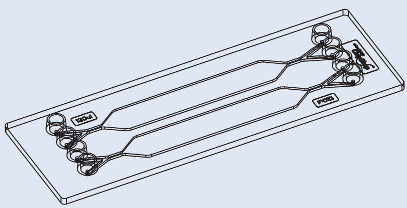


Fig. 250: Schematic drawing of the rhombic chamber chip

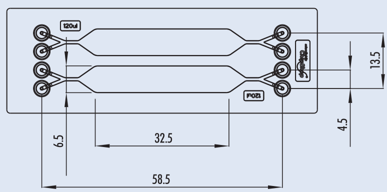


Fig. 251: Rhombic chamber chip – 120 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0901-0172-01	120	500	175	PMMA	-	36.20	24.30	16.10
12-0902-0172-02	120	500	140	Topas	-	36.20	24.30	16.10
12-0903-0172-03	120	500	175	PC	-	36.20	24.30	16.10
12-0904-0172-05	120	500	188	Zeonor	-	36.20	24.30	16.10
12-0905-0172-01	120	500	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0906-0172-02	120	500	140	Topas	hydrophilized	39.20	26.30	17.80
12-0907-0172-03	120	500	175	PC	hydrophilized	39.20	26.30	17.80
12-0908-0172-05	120	500	188	Zeonor	hydrophilized	39.20	26.30	17.80

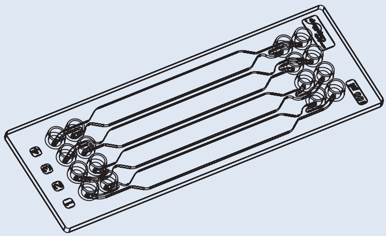


Fig. 252: Schematic drawing rhombic chamber chip

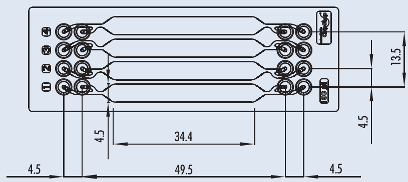


Fig. 253: Rhombic chamber chip – 100 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	10+	100+
12-0909-0221-01	100	600	175	PMMA	-	36.20	24.30	16.10
12-0910-0221-02	100	600	140	Topas	-	36.20	24.30	16.10
12-0911-0221-05	100	600	188	Zeonor	-	36.20	24.30	16.10
12-0912-0221-01	100	600	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0913-0221-02	100	600	140	Topas	hydrophilized	39.20	26.30	17.80
12-0914-0221-05	100	600	188	Zeonor	hydrophilized	39.20	26.30	17.80

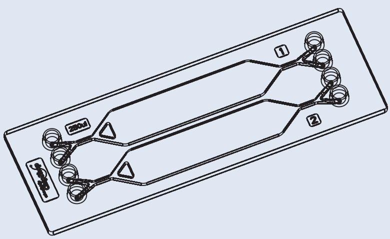


Fig. 254: Schematic drawing rhombic chamber chip

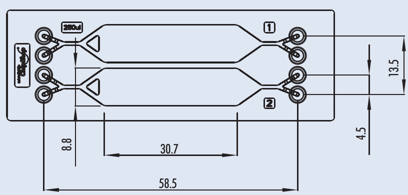


Fig. 255: Rhombic chamber chip – 250 µl chamber volume

Product Code	Chamber Volume [µl]	Chamber Depth [µm]	Lid Thickness [µm]	Material	Surface Treatment	Price [€/chip] 1+	Price [€/chip] 10+	Price [€/chip] 100+
12-0915-0194-01	250	800	175	PMMA	-	36.20	24.30	16.10
12-0916-0194-02	250	800	140	Topas	-	36.20	24.30	16.10
12-0917-0194-05	250	800	188	Zeonor	-	36.20	24.30	16.10
12-0918-0194-01	250	800	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0919-0194-02	250	800	140	Topas	hydrophilized	39.20	26.30	17.80
12-0920-0194-05	250	800	188	Zeonor	hydrophilized	39.20	26.30	17.80

7.4 Dielectrophoresis system DEP

With this system, which comprises an 8-channel high frequency signal generator (DEP1) and a microfluidic chip (DFC1) with integrated electrodes (see Fig. 256), single suspension cells can be trapped (up to two at a time) in a laminar flow of a given aqueous solution without any physical contacts to solid objects. An ensemble of eight microelectrodes (an electric field cage) produces a high-frequency electromagnetic field that acts on the cells and forces them with micrometer precision to a defined position in the micofluidic channel of the chip. The forces acting on the cells are sufficiently strong to maintain the position of the cell against the flow of the solution in the channel. By adding a reagent of interest (ligands, antibodies, signal molecules etc.) to the solution, the cell can be exposed to the reagent with high temporal resolution while the cellular response to it can be monitored by optical microscopy. As tested under various experimental conditions, cell viability is maintained for hours, under optimal conditions even for up to days.
Specifications DEP1: weight 360 g, size WxDxH = 18 x 9 x 5.5 cm
The system comes with connecting cable for the electrical contacts.
Fluid connection to the chip is realized by olive connectors with OD of 1.6 mm and ID 0.7 mm

Fig. 256: Dielectrophoresis system DEP consisting of high frequency signal generator DEP1, microfluidic chip DFC1 and connecting cable

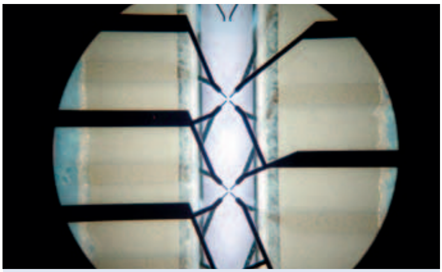


Fig. 257: Image of the field cage region of the chip DFC1

Product Code	Description	Price [€/instrument]
11-0866-0000-00	DEP1 High frequency signal generator for dielectrophoresis applications	2,275.00
11-0867-0000-00	DFC1 Dielectrophoresis chips. Set of 6 chips	1,500.00

7.5 High power voltage supply – Synergy Power™

The Synergy Power™ from MicroLab Devices is a high voltage power supply instrument ideally suited for electrophoresis and electro-osmotic flow applications.

It can be configured as a dual channel unipolar or single channel bipolar instrument, and each channel can be used in local or remote mode. Each module is delivered with the Synergy Composer™ software. This software allows the user full control over each channel, the creation of custom voltage profiles, constant current or constant voltage mode etc.

The Synergy Switch™ compliments the Synergy Power™ unit by providing 4 programmable channels of high voltage switching. Each switch is rated to 7.5 kV and can be programmed to form complex switching sequences (voltage, float, 0 V).

All Synergy Series™ instruments are designed to operate in synergy with each other. Therefore, all instruments can be purchased in two forms; a desktop version or a rack slot version. For this task a 19'' rack housing, the Synergy Series Rack System™, is available. Each rack can house up-to 8 instruments, and multiple rack housings can be networked to larger systems.

Fig. 258: Synergy Power™ instrument

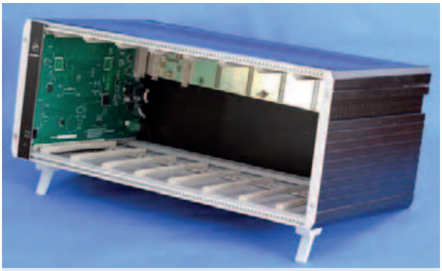
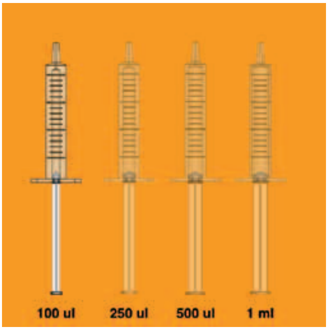


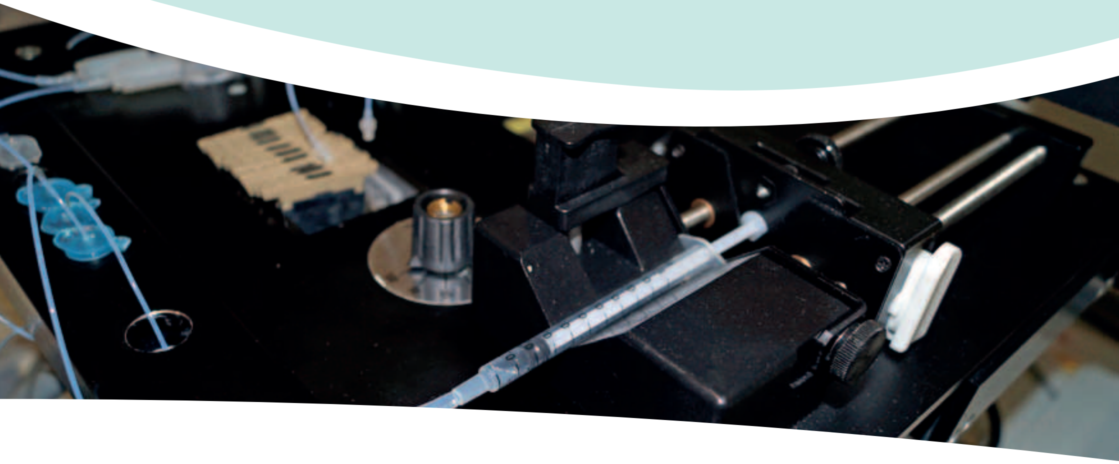
Fig. 259: Synergy Series Rack System™

Product Code	Product description Voltage	Description	Detail	Price [€/ instrument]
11-1510-0000-00	6kV	Synergy PowerSingle4W	Single channel 4W	1,800.00
11-1511-0000-00	6kV	Synergy PowerSingle30W	Single channel 30 W	2,000.00
11-1512-0000-00	6kV	Synergy PowerDual4W4W	Dual channel 4W	2,250.00
11-1513-0000-00	6kV	Synergy PowerDual30W30W	Dual channel 30W	2,850.00
11-1514-0000-00	6kV	Synergy PowerDual4W30W	Dual channel mixed	2,500.00
11-1515-0000-00	2kV	Synergy PowerSingle4W	Single channel 4W	1,700.00
11-1516-0000-00	2kV	Synergy PowerSingle30W	Single channel 30 W	1,950.00
11-1517-0000-00	2kV	Synergy PowerDual4W4W	Dual channel 4W	2,125.00
11-1518-0000-00	2kV	Synergy PowerDual30W30W	Dual channel 30W	2,700.00
11-1519-0000-00	2kV	Synergy PowerDual4W30W	Dual channel mixed	2,350.00

Product Code	Product description	Price [€/ instrument]
11-1520-0000-00	Synergy Switch™	1,150.00
11-1521-0000-00	Synergy Rack™	950.00


100 ul
250 ul
500 ul
1 ml

8 Pumps and pressure controllers



Pumps and pressure controllers

For most microfluidic experiments, external systems to actively move liquids are needed. Depending on the application, different methods to actuate the fluids are available. In principle, one can differentiate between pumps and pressure controllers. Pumps such as syringe or peristaltic pumps shown in the following pages generate a constant flow rate while pressure generators generate a constant pressure by pressurizing a reservoir which is connected to the microfluidic device. We have selected a range of instruments to be able to offer the best solution for a given application.

8.1 Syringe pumps

The cetoni neMESYS syringe pumps are high-end syringe pumps for extremely precise dosing and pumping of fluids. The pumps can be easily controlled by the user-friendly software with a comfortable user interface.

Major benefits are that a) fluids can be pumped and sucked, b) the valve allows switching between sample taking and sample dosing, and c) the pumps operate nearly pulsation free.

The cetoni neMESYS syringe pumps always require a starter unit as basic module necessary for the control of the pumps and one or more pumping modules. A dosing module for up to 3 bar and a module for medium pressure up to 198 bar are available to be combined with the basic module.

Fig. 260: cetoni neMESYS starter unit


Fig. 261: cetoni neMESYS dosing module


Fig. 262: cetoni neMESYS medium pressure module

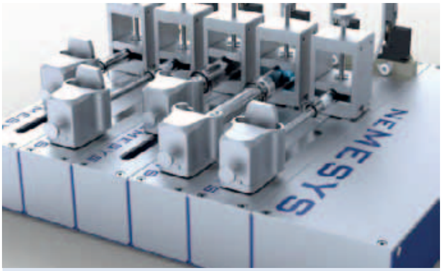


Fig. 263: Starter unit combined with different syringe pumps

Product Code	Description	Price [€/instrument]
11-0897-0000-00	cetoni neMESYS starter unit	1,400.00
11-0898-0000-00	cetoni neMESYS dosing module for pressures up to 3 bar	3,150.00
11-0899-0000-00	cetoni neMESYS medium pressure module for pressures up to 198 bar	5,000.00
11-0895-0000-00	Connector kit - 4 fittings ¼ 28-UNF - O-rings - tubing	30.00

Several high precision glass syringes with volumes between 10 µl and 50 ml are available upon request.

8.2 MicCell Fluid Processor

The MicCell Fluid Processor system contains all macroscopic actuators that control liquid handling: syringe pump(s), macrovalves (either turn/selector valves or simple on/off valves), and/or the control electronics for hydrogel microvalve(s). It can be controlled by a graphics-oriented Windows software.

The picture shows the MicCell FP-1-1-standard Fluid Processor that contains a syringe pump with 3-way valve (left), a hydrogel valve control and a 2/2 macrovalve (middle) and a 4/1-selector valve (right). Other configurations are available.

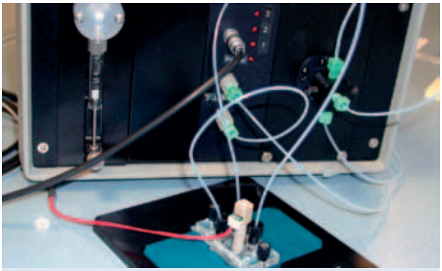


Fig. 264: MicCell FP-1-1-standard Fluid Processor.
Foreground: MicCell with hydrogel valve in its blue support and black adapter plate

Product Code	System Type	Product description	Price [€/instrument]
08-0489-0000-00	MicCell FP-1-1-standard	1x syringe pump, 1x 1/4-selector valve, 1x 2/2-macrovalve, 1x hydrogel valve control	5,300.00
08-0490-0000-00	MicCell FP-2-0	2x syringe pumps (no 1/4-selector valve, no 2/2-macrovalve, no hydrogel valve control)	5,300.00
08-0491-0000-00	MicCell FP-2-1	2x syringe pumps, 1x 1/4-selector valve (no 2/2-macrovalve, no hydrogel valve control)	7,050.00
08-0492-0000-00	MicCell FC1 Software	For the interactive control of 1-8 syringe pumps	970.00

8.3 Hydrogel micro valves

The GeSiM hydrogel valves are small silicon chambers filled with hydrogel particles of defined size that dramatically shrink upon heating to more than 34°C, therefore opening the normally closed microvalves. Different valve designs are available, the standard PV6 valve being vertically flown through by the liquid. By mounting it inside a standard UNF fitting, a microfludic injector is obtained that controls an inlet channel of a branched (e.g. T/Y-shaped) MicCell fluid system. In an alternative design, the hydrogel valve is connected to a reservoir via a tube. The valve is controlled by an electronic module in the Fluid Processor.

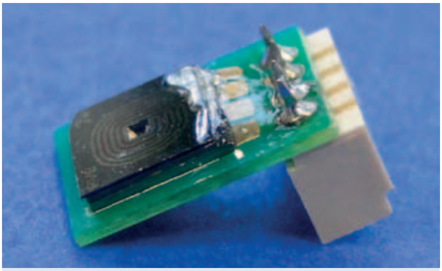


Fig. 265: PV6 hydrogel-containing silicon chip on a printed circuit board (top view)

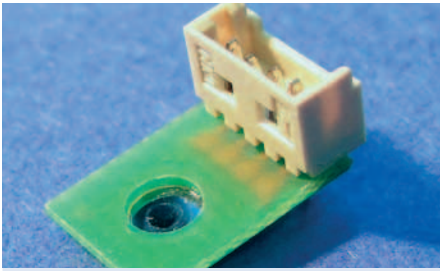


Fig. 266: PV6 hydrogel-containing silicon chip on a printed circuit board (bottom view)

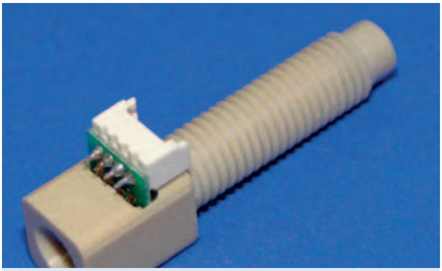


Fig. 267: PV6 injector, ready to use, in UNF 1/4-28 fitting

Product Code	Description	Features	Price [€/chip] 1+	5+	10+
07-461-0000-00	Hydrogel-Valve PV6, tube	Valve chip on PCB in PEEK fitting 1/4-28 UNF; inlet: Teflon tube OD=1.58 mm with Upchurch ferrule, electrical connector DC input 3.5 V/0.1 A	550.00	495.00	455.00
07-462-0000-00	Hydrogel-Valve PV6, injector	Valve chip on PCB in PEEK fitting 1/4-28 UNF; inlet: open funnel, electrical connector DC input 3.5 V/0.1 A	550.00	495.00	455.00

8.4 Cellix syringe pump systems

Cellix offers precision microfluidic pumps for a wide range of applications. Key features and benefits of these microfluidic pumps include:

- Pulse free syringe pumps
- Single and multichannel control
- Multiple independent channel pumping
- Patented active flow control for accurate sample delivery
- Simple, easy-to-use control via iPad mini, iPod Touch, PC
- Ideal for microfluidics, shear stress, precision mixing and cell culture studies.

8.4.1 ExiGo Microfluidic Syringe Pump with iPad mini control

Features:

- Precise flow control with active feedback via integrated flow sensor.
- Flow rate: 50 nL/min – 10 mL/min ±0.5%
- Standard syringes: 50µL – 5mL.
- Wash mode or programmable perfusion mode (constant, ramp, step, sine) with reversible flow direction
- Rapid flow change (ms range)
- Excellent long-term flow stability.
- Includes iPad mini which can control/program up to 4 pump modules independently
- Wi-Fi communication
- Use standard tubing for connection to any microfluidic biochip.

Applications:

Microfluidics, precise multichannel mixing; electrophysiology; single cell analysis; analytical biochemistry; RNA/DNA analysis.

Fig. 268: ExiGo Pump, controlled by iPad mini

Fig. 269: iPad mini App for ExiGo pump showing sample volume to be dispensed from each pump

8.4.2 Kima Pump with iPod Touch control

Features:

- Fits inside standard CO2 incubators – maintaining temp., humidity etc.
- Recirculating long term perfusion pump.
- Wash mode or pump mode
- Flow rate: 15 – 35 mL/hr ±4%
- Dead volume: < 300 µL
- Includes iPod Touch which can control up to 4 pump modules independently
- Wi-Fi communication
- Includes tubing kit for Vena8 biochips or alternative tubing kits for other biochips available.

Applications:

Cell culture under shear stress/flow; Biofilm studies; cell culture in biochips with adherent cells (HUVECs), stem cells, HepG2 cells.

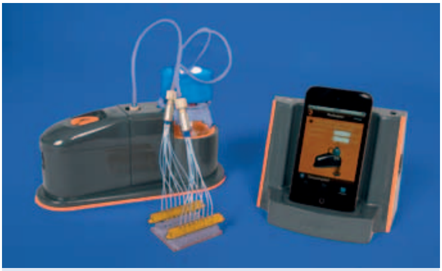


Fig. 270: Kima pump, controlled by iPod Touch

8.4.3 Mirus Evo Nanopump with PC control via VenaFlux Assay software

Features:

- Includes MultiFlow8 for precision flow splitting with equal flow rate in each channel.
- MultiFlow8 contains 8 valves which can be switched on/off independently.
- Higher throughput enabling 8 assays in parallel.
- Patented flow damper to decrease syringe pump pulses.
- Flow rate: 100nL/min – 10 mL/min ±1% (syringes available: 50uL – 5mL).
- Dead volume: ~ 600 μL
- Flow direction reversible
- PC controlled via VenaFlux Assay software.

Applications:

Microfluidic applications; Single Cell analysis; Microfluidic syringe pump for cell analysis under shear flow in biochips. Suitable for cell samples and whole blood samples.

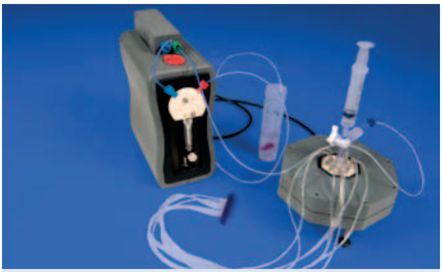


Fig. 271: Mirus Evo Nanopump with MultiFlow8; controlled by PC software, VenaFluxAssay (included)

Product Code	Description	Price [€/instrument]
11-0855-0000-00	EXIGO-PUMP-2.0, 1x pump; 1x iPad mini with ExiGo App; 1 x tubing kit; power supply and cables; 1x sensor for active feedback	3,759.00
11-0856-0000-00	EXIGO-PUMP-2.1, 1x pump; 1x tubing kit; power supply and cables; 1x sensor for active feedback	3,149.00
11-0857-0000-00	EXIGO-PUMP-1.0, 1x pump; 1x iPad mini with ExiGo App; 1x tubing kit; power supply and cables	3,229.00
11-0858-0000-00	EXIGO-PUMP-1.1, 1x pump; 1x tubing kit; power supply and cables	2,619.00
11-0859-0000-00	KIMA-PUMP-1.0, 1x pump; 1x iPod Touch with Kima App; 1x iPod Dock; 1x tubing kit; 1x 100 mL bottle with GL45 cap; power supply and cables; Velcro strips to secure iPod Dock to CO2 incubator	2,695.00
11-0860-0000-00	KIMA-PUMP-1.1, 1x pump; 1x tubing kit; 1x 100 mL bottle with GL45 cap; power supply and cables	1,195.00
11-0861-0000-00	MIRUS-PUMP-EVO, 1x syringe pump; 1x MultiFlow8; 1x VenaFluxAssay Software; 1 x tubing kit; power supply and cables	9,595.00

8.5 CorSolutions peristaltic pumps

The CorSolutions PeriWave pump is a high performance peristaltic-based pump with an integrated flow sensor and closed-loop feedback technology. As the pump measures the actual flow rate and provides the information back to the motor, smooth pulse-less flow as well as programmable wave functions are possible. The pump's high performance derives from the fact that fluid is measured, as compared to syringe and traditional peristaltic pumps where only a fixed theoretical displacement mechanism is used. The PeriWave pump may be operated in a positive or negative flow direction. Since the pump is peristaltic-based, fluid may be recycled back to the fluid source container. This feature is particularly useful and cost effective when delivering expensive cell culture media such as with cell/body/organ-on-a-chip applications. Additionally the waveform control allows for the unique capability of shear flow cell growth experiments. Two or more PeriWaves can be connected with a tee, and used together in concert.

The PeriWave pump comes in 3 models for aqueous-based solutions and includes PC-based software:
40-7000 nanoLiters /min
1-50 microLiters/min
30-1000 microLiter/min

Maximum delivery pressure is 2 Bar
Calibrated for aqueous solutions

Product Code	Description	Price [€/instrument]
11-0854-0000-00	CorSolution PeriWave peristaltic pump	4,850.00

Please indicate the volume flow rate in your order.

Fig. 272: PeriWave peristaltic pump system

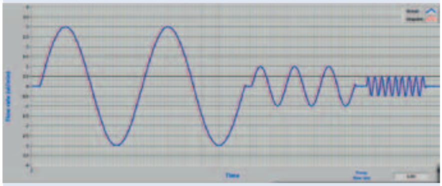


Fig. 273: Flow rate diagram for PeriWave pump

8.6 Elveflow Pressure Generators

Elveflow Pressure Generators integrate pressure controller and pressure source and thus provide you with an autonomous source to generate and control pressure for your microfluidic chip – no further pressure or vacuum lines or pumps are required. Based on their low weight (1.2 kg) and small footprint (15 cm x 15 cm), these instruments are highly transportable and allow you to set up your experiments at a convenient place within minutes: Typically it takes approx. 5 min for the first installation and about 2 minutes prior to every experiment. In addition, these units provide accurate, stable, and quickly responding pressure settings.

The pressure generator system comprises the following instruments:

AF1, single channel pressure and vacuum pump, either in manual (standard) or USB control (premium) with a very fast flow control (80 ms response time) and a high precision flow control with 0.05% stability if coupled with the flow sensor MFS. Using a feedback loop, you can monitor and control flow rate in your microfluidic setup while keeping stability and responsiveness of pressure driven flow. The OB1 is a USB-controlled four channel pressure controller which combines the performance of four AF1 controllers. MUX is a microfluidic flow multiplexer consisting of a matrix of PEEK flow switches controlled through the Elveflow® USB software. This type of flow switch box is particularly dedicated to fast and clean sample injection and quake valves control. It is designed for instantaneous flow stop and low volume sample injection into microchannels and features a switching time of 25 ms.

Fig. 274: Elveflow Pressure Generators

Product Code	Description	Price [€/instrument]
11-0862-0000-00	AF1 pressure controller	starting from 1,900.00
11-0863-0000-00	OB1, four channel USB pressure controller	starting from 3,500.00
11-0864-0000-00	MFS flow sensor (single channel)	1,500.00
11-0865-0000-00	MUX flow multiplexer	starting from 2,500.00

8.7 Micropumps from Bartels Mikrotechnik

Micropumps transporting the tiniest amounts of gases or liquids can be considered the heart of microfluidics. In many sectors they have become indispensable. Dosing lubricants, feeding fuel cells with methanol or mixing starch into the steam of flat irons are only a few of the manifold tasks they fulfill. Many further fields of application for example are located in medical technologies and analytics. Extremely small in size and low in weight, with good particle tolerance and temperature resistance, Bartels micropumps are well prepared to be used in any of these sectors. As they are almost completely made of plastics, large quantities of these pumps can be produced at low cost and may well be used as disposables. These piezo-driven membrane pumps are available in starter kits to quickly enable the user to familiarize themselves with the technology. The kits contain three mp6 micropumps, a controller/controller board and suitable tubing.

Fig. 275: mp6-go! set for pump evaluation

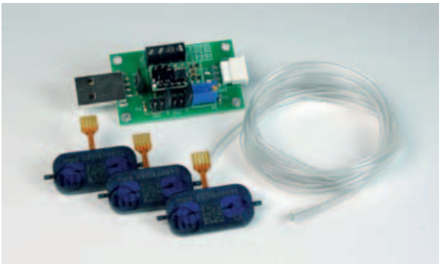
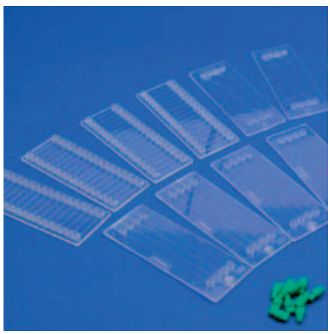


Fig. 276: mp6 basic set for pump evaluation

Product Code	Description	Price [€/instrument]
11-0880-0000-00	mp6-go! set, consisting of 3 mp6 pumps, controller and tubing	499.00
11-0881-0000-00	mp6-basic set, consisting of 3 mp6 pumps, controller board and tubing	199.00





9 Microfluidic kits

Microfluidic kits

To run microfluidic experiments some basics like tubes, connectors, or reagents are necessary, or different options of tubes and fluidic interfaces might be of interest. In order to allow for a choice between the options, this chapter has several selections of kits comprising interfaces, chips with instrument, selection of chip types, handling frames or further accessories.

9.1 Microfluidic chip support kits – Microfluidic and chip-PCR support kits

The **microfluidic support kits** comprise different components necessary for running microfluidic systems. This includes tubes to bring the fluid into the chip, and silicone tubes to enable the interconnection between for example a *microfluidic ChipShop* fluidic platform chip and tubing, or between tubing and a syringe. Forceps can be used to stop a flow by clamping a silicone tube and syringes to fill chips manually.

These small kits allow you to directly start with your microfluidic experiments without losing time searching for suitable components.

Comparable to the **microfluidic support kits**, the **chip-PCR support kits** enable you to directly start with your continuous-flow PCR from the fluidic side. They include tubes and mineral oil to drive the PCR. Besides this and the PCR system consisting of chip and thermocycler, only your own biological reagents are needed to start the PCR.

Fig. 277: Microfluidic support kit 2

Fig. 278: Microfluidic support kit 3

Product Code	Kit Type	Product Description	Price [€/kit]
11-0800-0000-00	Microfluidic support kit 1	**Microfluidic support kit 1:** - Silicone tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 2 m) - forceps (3) - single-use syringes (3) - syringe adapter (3)	27.80
11-0850-0000-00	PCR support kit 1	**Chip-PCR support kit 1:** *ChipGenie edition T* support kit - Silicone tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 2 m) - forceps (1) - mineral oil (3 ml) - mcs foil 007 – adhesive Al-tape (3 sheets)	32.90
11-0812-0000-00	Microfluidic support kit 2	**Microfluidic support kit 2** - Silicone tube (ID: 0.76 mm, OD: 1.65 mm, 1 m) - Silicone tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - Micro tube, PTFE (ID: 0.5 mm, OD: 1 mm, 1 m) - Single use syringes, 10 ml, 3 pieces - Syringe adapter, 3 pieces - Forceps, 1 piece - Male Mini Luer fluid connectors, red, material PP; 10 pieces - Male Mini Luer fluid connectors, blue, material PP, 10 pieces - Male Mini Luer fluid connectors, opaque, material TPE, 10 pieces - Male Mini Luer plugs, green, material PP, 10 pieces - Male Mini Luer plugs, opaque, material TPE, 10 pieces	96.50

Product Code	Kit Type	Product Description	Price [€/kit]
11-0813-0000-00	Microfluidic support kit 3	**Microfluidic support kit 3** Microfluidic support kit 2 (11-0812-0000-00) plus: - Female Luer Lok compatible connectors, PMMA, 10 pieces - Male Luer Plug, opaque, 10 pieces	146.20

9.2 Microfluidic starter kits

The microfluidic starter kits comprise several standard chips as well as necessary accessories for a quick start with microfluidics. With these kits, a first series of experiments allows to get familiar with the use of microfluidic devices.

Fig. 279: Microfluidic starter kit 1

Fig. 280: Microfluidic starter kit 2

Product Code	Kit Type	Product Description	Price [€/kit]
11-0811-0000-00	Microfluidic starter kit 1	Microfluidic support kit 1 (11-0800-0000-00) plus: - Handling frame with high skirt, yellow (15-4000-0000-12), 1 piece - Male Mini Luer fluid connectors, red, material PP (09-0540-0000-09), 10 pieces - Straight channel chip, 4 parallel channels, 200 µm width / 200 µm depth, material: Topas, (01-0173-0156-02), 2 pieces - Straight channel chip, channel cross-section: 100 µm width / 100 µm depth, 4 parallel channels, material: PMMA (01-0170-0144-01), 2 pieces - Straight channel chip, channel cross-section: 1.000 µm width / 200 µm depth, material: Topas (01-0179-0152-02), 1 piece - H-shaped extractor chip, material: Topas (04-0130-0164-02), 1 piece - Droplet generator chip, material: PC (13-1004-0163-03), 1 piece - 36 cycles PCR meander chip, material: PC (080471-0065-03), 1 piece - 15 cycles PCR meander chip, material: PC (080470-0047-03), 1 piece - Rhombic chamber chip, chamber volume: 120 µl, material: Zeonor, (12-0904-0172-05), 1 piece	369.00

Product Code	Kit Type	Product Description	Price [€/kit]
11-0814-0000-00	Microfluidic starter kit 2	Microfluidic support kit 2 (11-0811-0000-00) plus: - Straight channel chip, 4 parallel channels, channel cross section: 200 µm width / 200 µm depth, material: PMMA, (01-0172-0156-01), 2 pieces - Straight channel chip, 4 parallel channels, channel cross section: 200 µm width / 200 µm depth, material: Topas, (01-0173-0156-02), 2 pieces - Straight channel chip, 16 parallel channels, channel cross section: 200 µm width / 100 µm depth, material: PMMA, (01-0176-0142-01), 2 pieces - Straight channel chip, 16 parallel channels, 200 µm width / 100 µm depth, material: Topas (01-0177-0142-02), 2 pieces - Rhombic chamber chip, chamber volume: 120 µl, material: Zeonor, (12-0904-0172-05), 2 pieces	432.00

9.3 Microfluidic interface kits

Various microfluidic interfaces to be used with *microfluidic ChipShop*'s microfluidic platforms are arranged as special kits, e.g. to be used with the female Mini Luer microfluidic platforms, or the female Luer microfluidic platforms.

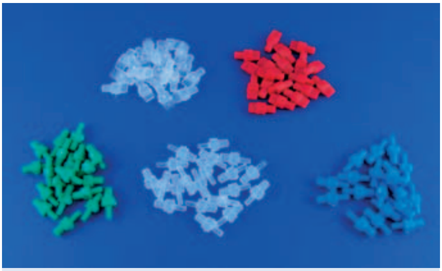


Fig. 281: Microfluidic interface kit 1 – Mini Luer plugs and connectors

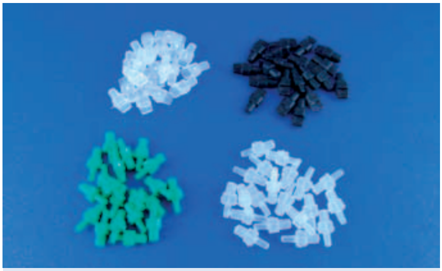


Fig. 282: Microfluidic interface kit 2 – Luer plugs and connectors

Product Code	Kit Type	Product Description	Price [€/kit]
11-0819-0000-00	Microfluidic interface kit 1	- Male Mini Luer fluid connectors, green, material PP; 20 pieces, (09-0541-0000-09) - Male Mini Luer fluid connectors, blue, material PP, 20 pieces, (09-0542-0000-09) - Male Mini Luer fluid connectors, opaque, material TPE, 20 pieces, (09-0562-0000-11) - Male Mini Luer plugs, red, material PP, 20 pieces, (09-0551-0000-09) - Male Mini Luer plugs, opaque, material TPE, 20 pieces, (09-0559-0000-11)	110.50 €
11-0820-0000-00	Microfluidic interface kit 2	- Male Luer fluid connector, opaque, 20 pieces, (09-0508-0000-09) - Male Luer fluid connector, green, 20 pieces, (09-0509-0000-09) - Male Luer plug, opaque, 20 pieces, (09-0503-0000-09) - Male Luer plug, black, 20 pieces, (09-0504-0000-09)	82.60 €

9.4 ChipGenie® edition P starter kits

The ChipGenie® edition P starter kits comprise several standard chips that can be used with the ChipGenie® edition P instrument as well as accessories that can be combined with the system.

Depending on users' preferencies, the chips can be either operated manually with a pipette or with a pump that can be connected to the chip with the male Mini Luer fluid connectors.

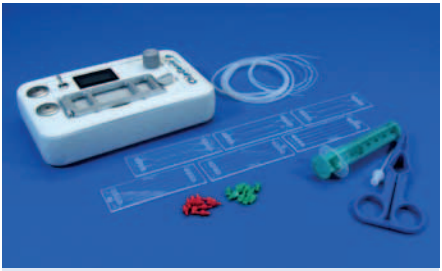


Fig. 283: *ChipGenie® edition P* starter kit 1

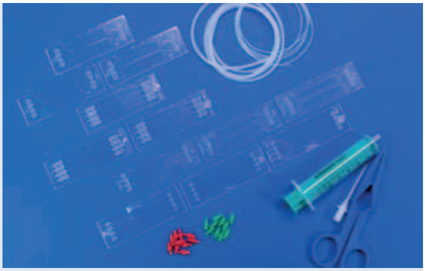
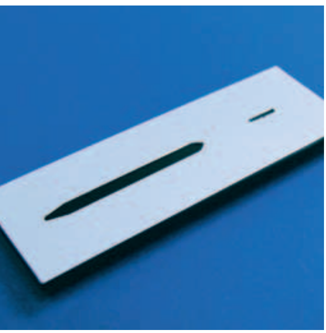
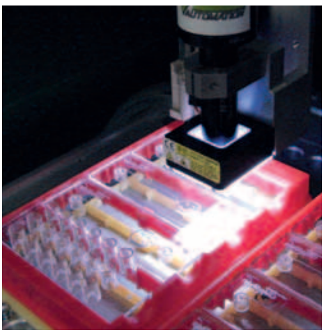
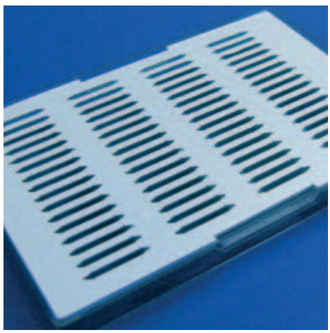


Fig. 284: *ChipGenie® edition P* starter kit 2

Product Code	Kit Type	Product Description	Price [€/kit]
11-0810-0000-00	*ChipGenie® edition P* starter kit 1	- *ChipGenie® edition P* instrument (08-0487-0000-00) - Rhombic chamber chip, chamber volume: 120 µl, material: Zeonor (12-0904-0172-05), 3 pieces - Straight channel chip, cross section: 1000 µm width / 200 µm depth, material: Topas (01-0175-0138-02), 3 pieces	759.00
11-0815-0000-00	*ChipGenie® edition P* starter kit 2	Microfluidic support kit 1 (11-0800-0000-00) - Male Mini Luer fluid connectors, red, material PP (09-0540-0000-09), 10 pieces - Male Mini Luer plugs, green, material PP (09-0552-0000-09), 10 pieces - Rhombic chamber chip, chamber volume: 120 µl, material: Zeonor (12-0904-0172-05), 3 pieces - Rhombic chamber chip, chamber volume: 100 µl, material: Zeonor (12-0911-0221-05), 3 pieces - Rhombic chamber chip, chamber volume: 250 µl, material: Zeonor (12-0917-0194-05), 3 pieces - Straight channel chip, cross section: 1000 µm width / 200 µm depth, material: Topas (01-0175-0138-02), 3 pieces	384.00
11-0816-0000-00	*ChipGenie® edition P* starter kit 3 – DNA extraction	- Male Mini Luer fluid connectors, red, material PP (09-0540-0000-09), 10 pieces - Male Mini Luer plugs, green, material PP (09-0552-0000-09), 10 pieces - Rhombic chamber chip, chamber volume: 120 µl, material: Zeonor (12-0904-0172-05) with integrated magnetic beads, 10 pieces - Buffer set for *ChipGenie® edition P* starter kit 3 – DNA extraction	440.00







10 Customize standard chips

Customize standard chips

With our Lab-on-a-Chip catalogue, a wide variety of off-the-shelf devices is at hand allowing for a customization at the user's side. On the one hand side this allows to combine different modules with each other in order to achieve certain fluidic functionalities via a series of chips, on the other hand this implies a modification of the chips themselves. This modification mainly refers to the integration of further functionalities or the integration of special surface functions. This chapter highlights the tools like microfluidic chips and spotter but it should help to generate new ideas to start a customization at the user's side with existing chip modules.

10.1 Customize your chips – spotting

The integration of protein- or DNA-arrays on a chip is one frequently requested option from research settings. Although a spotting service is offered from us, many research labs would like to evaluate special targets and functionalization methods and do their own spotting.

For these users, several chip types are at hand, having an integrated fluidic channel that remains open for the spotting at customer's side. A double-sided adhesive tape with approximately 140 μm thickness is mounted on the delivered chip with open channels. That means after the spotting just the protective foil needs to be removed and either a thin foil of the same material of a glass slide can be mounted on top.

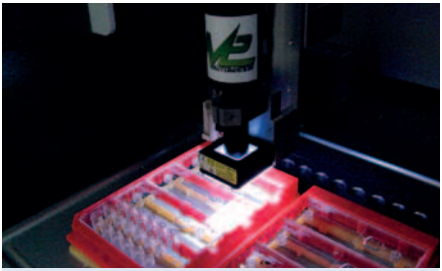


Fig. 285: Spotting in microfluidic devices – M2-Automation instrumentTWO in action

Fig. 286: DNA-array embedded in a microfluidic channel

M2-Automation offers an easy to use and robust micro-dispensing (spotting) solution. The spotter instrumentTWO is recommended in order to start right away with your own spotting tasks.

As chip modules for self-assembling of the cover lid on spotted devices, several straight channel chips are available.

Product Code	Description	Price per instrument [€]
11-0896-0000-00	instrumentTWO spotter	40,000.00

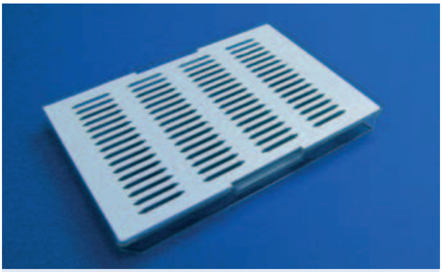


Fig. 287: Titer-plate sized microfluidic device for customization

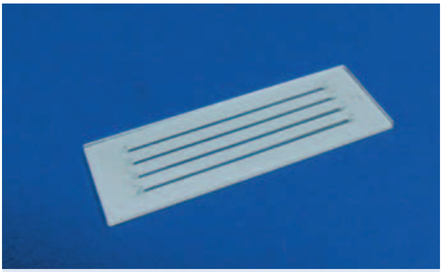


Fig. 288: Straight channel chip Fl. 0138 with double-sided adhesive tape

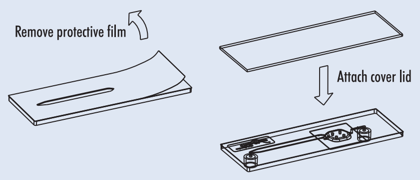


Fig. 289: Principle set-up of chip and double-sided adhesive tape

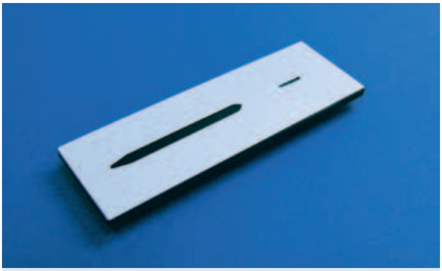


Fig. 290: Straight channel chip Fl. 95 with double-sided adhesive tape and waste reservoir

Product Code	Description	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Material	Price [€/chip] 1+	Price [€/chip] 10+
17-1600-0138-01	4 channel chip Fl. 0138	1,000	340	58.5	PMMA	48.50	36.50
17-1601-0138-02	4 channel chip Fl. 0138	1,000	340	58.5	Topas	48.50	36.50
17-1602-0095-01	1 channel chip Fl. 95	2,000	440	36	PMMA	52.50	36.60
17-1603-0095-02	1 channel chip Fl. 95	2,000	440	36	Topas	52.50	36.60
17-1604-0095-02.1	1 channel chip Fl. 95	2,000	440	36	Topas, black	52.50	36.60

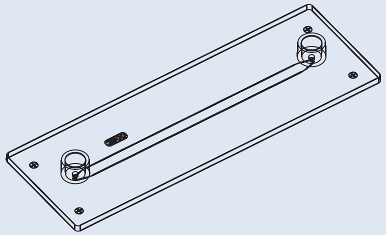


Fig. 291: Schematic drawing of the one channel chip with Luer interface 0268 to be equipped with double-sided adhesive tape

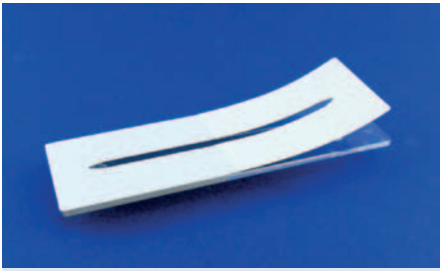


Fig. 292: Straight channel chip 0268 with double-sided adhesive tape

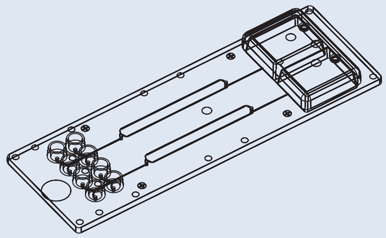


Fig. 293: Schematic drawing of a straight channel chip with waste chamber 0272 to be equipped with double-sided adhesive tape

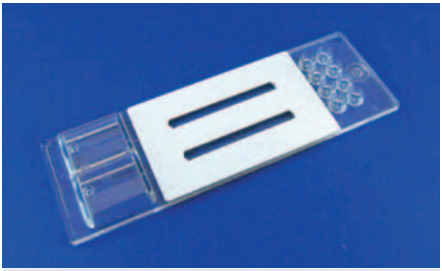
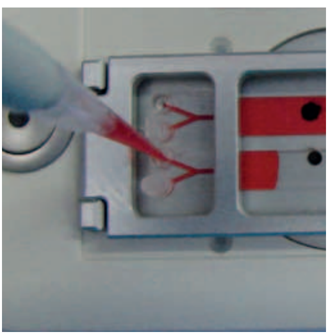


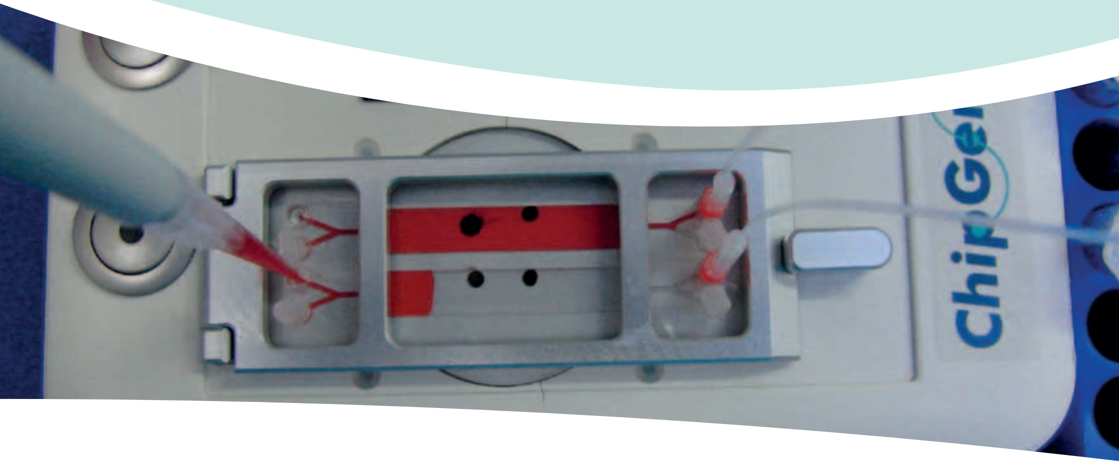
Fig. 294: Straight channel chip 0272 with double-sided adhesive tape

Product Code	Description	Channel Width [µm]	Channel Depth [µm]	Channel Length [mm]	Material	Price [€/chip] 1+	Price [€/chip] 10+
17-1605-0268-01	1 channel chip Fl. 0268	2,500	290	26	PMMA	48.50	36.50
17-1606-0268-02	1 channel chip Fl. 0268	2,500	290	26	Topas	48.50	36.50
17-1607-0272-01	2 channel chip with waste reservoir Fl. 0272	2,500	340	58.5	PMMA	52.50	36.60
17-1608-0272-02	2 channel chip with waste reservoir Fl. 0272	2,500	340	58.5	Topas	52.50	36.60




55.0

11 Application notes



Application notes

Handling procedures, protocols, and exemplary applications: This chapter gives advice to run specific experiments with lab-on-a-chip systems.

11.1 Chips interfaces and handling – first steps

This chapter describes first basic steps to start with microfluidic standard chips. It introduces the different fluidic interfaces on chip and their counterpart off chip, tubes to be used and the connection to pumps.

Fluidic interfaces on chip

Referring to standard equipment and nomenclature deriving from laboratory automation and routine laboratory use, a short glossary for the various microfluidic accessories being applied is convenient for a common use of microfluidics. This refers mainly to the fluidic interfaces using the Luer and Luer Lok adapters in female and male version as plugs or fluid connectors commonly spread in medical technology, the shrunk versions thereof specially designed for microfluidics called Mini Luer fluid connectors and Mini Luer plugs, olives embedded on chip as well as simple through holes. Examples of these fluid connectors are shown in the figures below.
In all chapters explaining the use of the different interfaces, a choice of accessories being suited to carry out the experiments is summarized in order to start right away with the practical work.

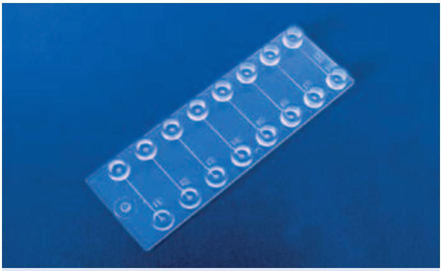


Fig. 295: Chip with female Luer fluidic interfaces

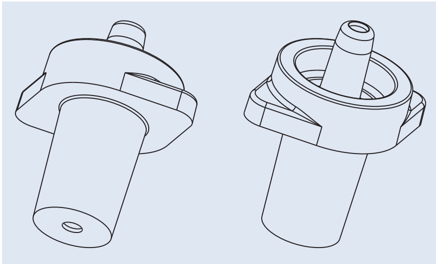


Fig. 296: Male Luer connector

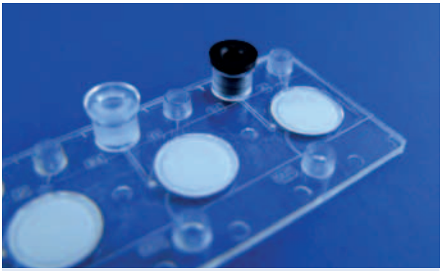


Fig. 297: Cap to close female Luer interfaces

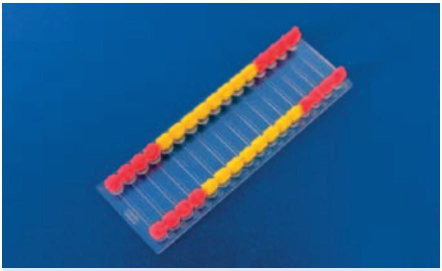


Fig. 298: Mini Luer connectors and plugs mounted on a Mini Luer fluidic platform

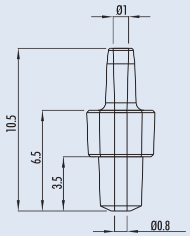


Fig. 299: Schematic drawing of a Mini Luer connector

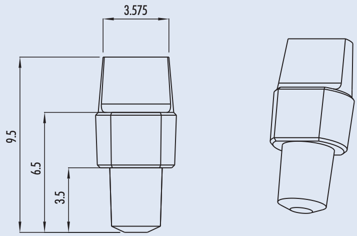


Fig. 300: Schematic drawing of a Mini Luer Plug

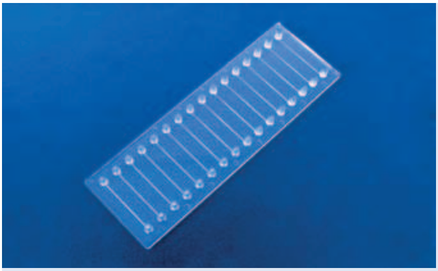


Fig. 301: Microfluidic platform with olives as fluidic interface

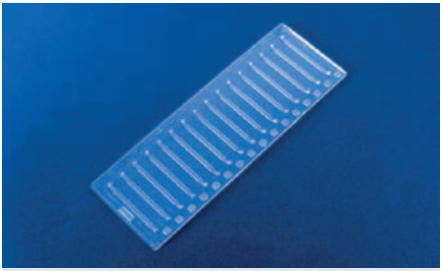


Fig. 302: Microfluidic platform with through holes as fluidic interface

11.1.1 How to work with Mini Luer interfaces

This chapter introduces how to work with Mini Luer interfaces and how to operate chips with such interfaces.

Hints to work with female Mini Luer interfaces on chip:

Option 1: Female Mini Luer interface as pipetting interface or reservoir

The most simple option how to use chips with female Mini Luer interface is to insert the liquid with a pipette or to use the female Mini Luer interfaces as reservoirs.

Required item:

1. Microfluidic chip with Mini Luer interface
2. Conventional pipette

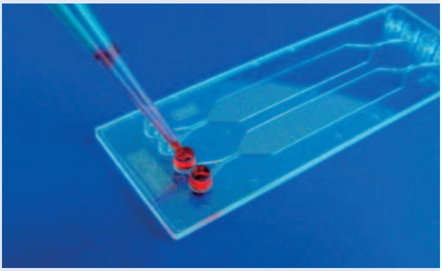


Fig. 303: Microfluidic chip with Mini Luer interfaces filled with a pipette and interfaces used as reservoir

Hints to work with female Mini Luer interfaces on chip:

Option 2: Female Mini Luer interface combined with male Mini Luer counterpart

Required item:

1. Microfluidic chip with Mini Luer interface, e.g. micro mixer chip (14-1039-0286-01)
2. Handling frame, e.g. orange (15-4001-0000-12)
3. Male Mini Luer fluid connectors, e.g. the green version (09-0541-0000-09)
4. Male Mini Luer plugs, e.g. the red version (09-0551-0000-09)
5. Silicone tube, e.g. ID: 0.5 mm (09-0802-0000-00)
6. PTFE tube, e.g. ID: 0.5 mm (09-0803-0000-00)
7. Peristaltic pump
8. Tube for peristaltic pump
9. Eppendorf vessel

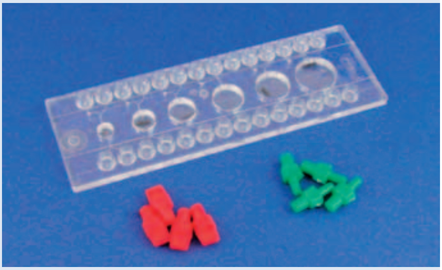


Fig. 304: Microfluidic chip with Mini Luer interfaces with Mini Luer fluid connectors and plugs

Step 1: Chip & handling frame

1. Insert the microfluidic chip in a handling frame for microfluidic chips in microscopy slide format

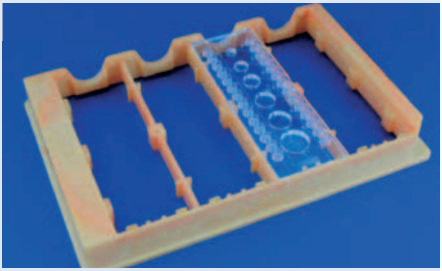


Fig. 305: Micromixer inserted in handling frame

Step 2: Mini Luer connector & silicone sleeve

2. Interface the Mini Luer fluid connector with a small piece of silicon tube

Fig. 306: Green Mini Luer fluid connector attached to silicone sleeve

Step 3: Silicone sleeve & PTFE tube

3. Interface the Mini Luer fluid connector with the mounted silicone sleeve with the PTFE tube

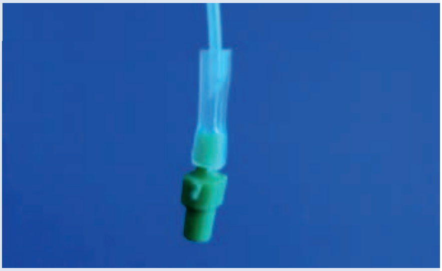


Fig. 307: Connection of Mini Luer fluid connector with mounted silicone sleeve with a PTFE tube

Step 4: Insert connector on chip

4. Insert the Mini Luer fluid connector connected with silicone sleeve and PTFE tubing with a twist on the female interface on chip

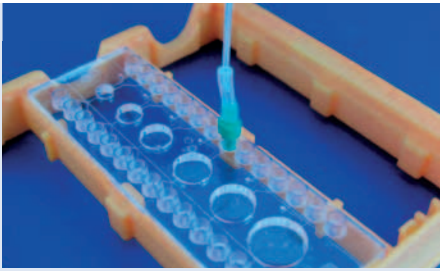


Fig. 308: Insertion of the Mini Luer with tubings in fluid entrance of the chip

Step 5: Insert connector on exit & connect to collection vessel

5. Insert a second Mini Luer fluid connector connected with silicone sleeve and PTFE tubing with a twist on the female interface on chip and place the end of the PTFE tube in an Eppendorf vessel for sample or waste collection

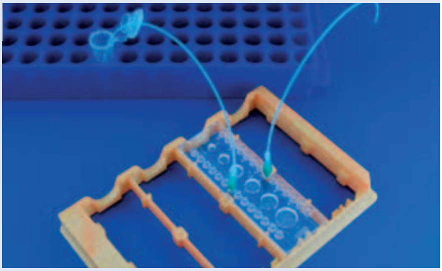


Fig. 309: Insertion of the Mini Luer with tubings in fluid exit of the chip and connection of tube with sampling vessel

Step 6: Close unused ports with plugs

6. Close all unused fluid entrance and fluid exit ports of the fluidic pathway used on chip with Mini Luer plugs.

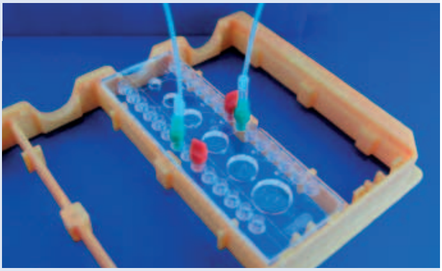


Fig. 310: Closed unused fluid ports on chip with red Mini Luer plugs

Step 7: Connect chip with pump

7. Connect the PTFE tube with the tube inserted in the pump

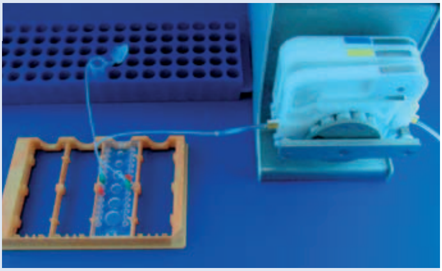


Fig. 311: Connection of the chip via the PTFE tube with the pump

Step 8: Connect pump with reservoir and start pumping

8. Connect the end of the pump tube with a further PTFE tube, insert the PTFE tube in your reagent vessel and start pumping.

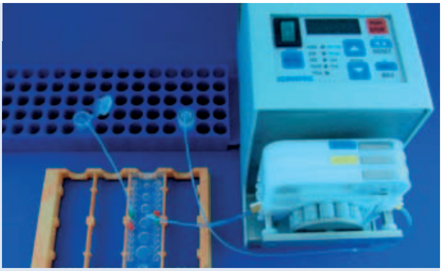


Fig. 312: Connection of pump via a PTFE tube with a liquid reservoir

11.1.2 How to work with Luer interfaces

This chapter summarizes the different options to work with Luer interfaces on chip and how to operate chips with such interfaces.

Hints to work with female Luer interfaces on chip:

Option 1: Female Luer interface as pipetting interface or reservoir

The most simple option how to use chips with female Luer interface is to insert the liquid with a standard syring.

Required item:

1. Microfluidic chip with Luer interface
2. Standard syringe

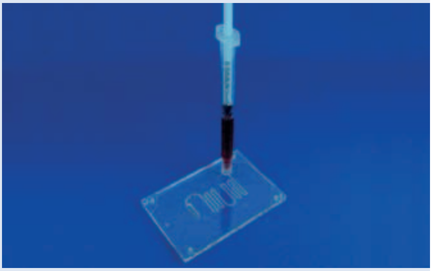


Fig. 313: Microfluidic chip with Luer interfaces filled with a standard syringe

Hints to work with female Luer interfaces on chip:

Option 2: Female Luer interface as pipetting interface or reservoir

Another option how to use chips with female Luer interface is to insert the liquid with a pipette or to use the female Mini Luer interfaces as reservoirs.

Required item:

1. Microfluidic chip with Luer interface
2. Conventional pipette

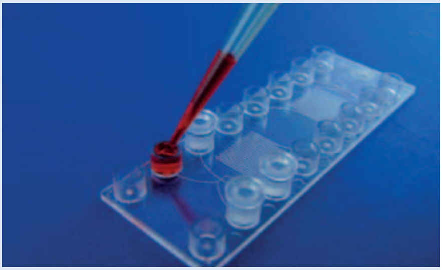


Fig. 314: Microfluidic chip with Luer interfaces filled with a pipette and interfaces used as reservoir

Hints to work with female Luer interfaces on chip:

Option 3: Female Luer interface combined with male Luer counterpart

Required item:

1. Microfluidic chip with Luer interface, e.g. micro mixer chip (14-1035-00186-01)
2. Handling frame, e.g. orange (15-4001-0000-12)
3. Male Luer fluid connectors, e.g. the green version (09-0509-0000-09)
4. Male Luer plugs, e.g. the black version (09-0504-0000-09)
5. Silicone tube, e.g. ID: 0.5 mm (09-0802-0000-00)
6. PTFE tube, e.g. ID: 0.5 mm (09-0803-0000-00)
7. Peristaltic pump
8. Tube for peristaltic pump
9. Eppendorf vessel

Fig. 315: Microfluidic chip with Luer interfaces with Luer fluid connectors and plugs

Step 1: Chip & handling frame

1. Insert the microfluidic chip in a handling frame for microfluidic chips in microscopy slide format

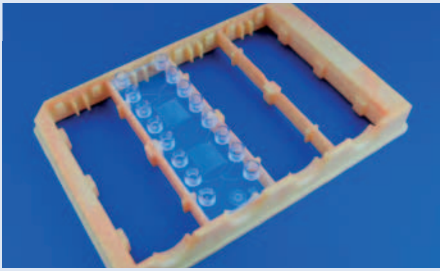


Fig. 316: Micromixer inserted in handling frame

Step 2: Luer connector & silicone sleeve

2. Interface the Luer fluid connector with a small piece of silicon tube

Fig. 317: Green Luer fluid connector attached to silicone sleeve

Step 3: Silicone sleeve & PTFE tube

3. Interface the Luer fluid connector with the mounted silicone sleeve with the PTFE tube

Fig. 318: Connection of Luer fluid connector with mounted silicone sleeve with a PTFE tube

Step 4: Insert connector on chip

4. Insert the Luer fluid connector connected with silicone sleeve and PTFE tubing with a twist on the female interface on chip

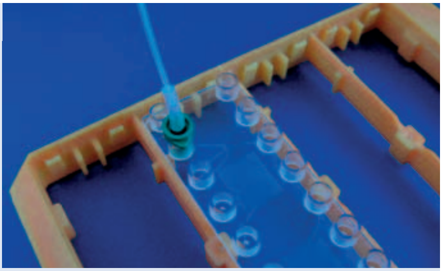


Fig. 319: Insertion of the Luer with tubings in fluid entrance of the chip

Step 5: Insert connector on exit & connect to collection vessel

5. Insert a second Luer fluid connector connected with silicone sleeve and PTFE tubing with a twist on the female interface on chip and place the end of the PTFE tube in an Eppendorf vessel for sample or waste collection

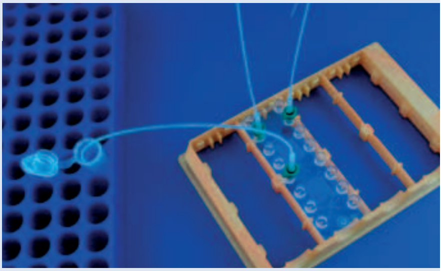


Fig. 320: Insertion of the Luer with tubings in fluid exit of the chip and connection of tube with sampling vessel

Step 6: Close unused ports with plugs

6. Close all unused fluid entrance and fluid exit ports of the fluidic pathway used on chip with Luer plugs.

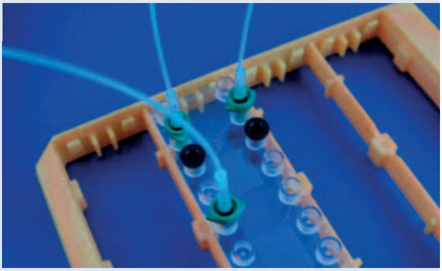


Fig. 321: Close unused fluid ports on chip with red Luer plugs

Step 7: Connect chip with pump

7. Connect the PTFE tube with the tube inserted in the pump

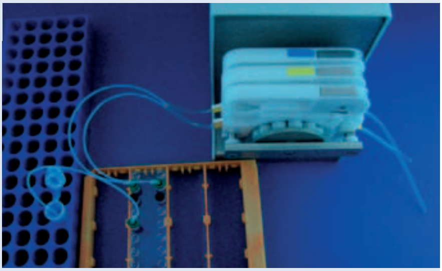


Fig. 322: Connection of the chip via the PTFE tube with the pump

Step 8: Connect pump with reservoir and start pumping

Female Luer interface combined with male Luer counterpart

8. Connect the end of the pump tube with a further PTFE tube, insert the PTFE tube in your reagent vessel and start pumping.

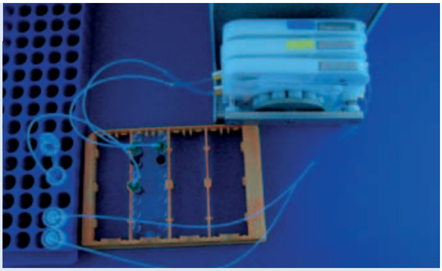


Fig. 323: Connection of pump via a PTFE tube with a liquid reservoir

11.1.3 How to work with olive interfaces

Olive interfaces are simple connectors to be manually connected with tubes like the best known example of our daily life, the hose pipes. Tubes can be directly connected to such chips. They are well suited for manual handling, but automated approaches moving the silicone sleeve over the olive are possible as well, even if difficult to realize. This chapter summarizes the different options to work with olive interfaces on chip and how to operate chips with such interfaces.

Hints to work with olive interfaces on chip:

Olive interfaces connected through silicones sleeves and PTFE tube to pump

Required item:

1. Microfluidic chip with Luer interface, e.g. micro mixer chip (01-0190-0138-01)
2. Handling frame, e.g. orange (15-4001-0000-12)
3. Silicone tube, e.g. ID: 0.5 mm (09-0802-0000-00)
4. PTFE tube, e.g. ID: 0.5 mm (09-0803-0000-00)
5. Peristaltic pump
6. Tube for peristaltic pump
7. Eppendorf vessel

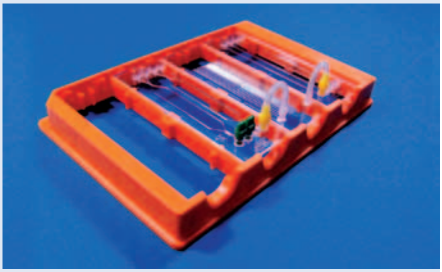


Fig. 324: Microfluidic chip with olive connected to different chip types

Step 1: Chip & handling frame

1. Insert the chip in a handling frame

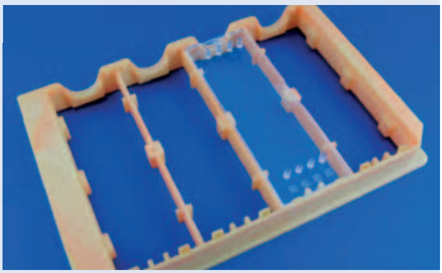


Fig. 325: Microfluidic chip with olive interfaces inserted in a microfluidic chip handling frame

Step 2: Connect PTFE tubes with silicone sleeves

2. Connect two times a short silicone tube with a longer PTFE tube

Fig. 326: Short pieces of silicone tubes connected with PTFE tube

Step 3: Interface chip & tube

3. Interface the olives on chip through the silicone sleeves with the PTFE tube

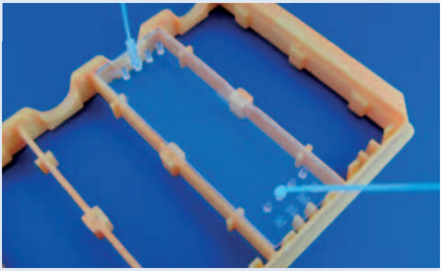


Fig. 327: Chip with olive interfaces connected with tubes

Step 4: Insert tube in pump tube

4. Insert the PTFE tube in the tube of the pump

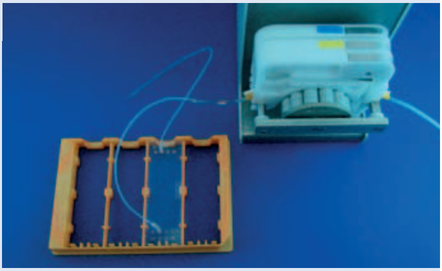


Fig. 328: Chip with olives connected via tubes to a peristaltic pump

Step 5: Tube, pump & reservoir vessel

5. Connect the tube of the pump with a PTFE tube with the reservoir vessel

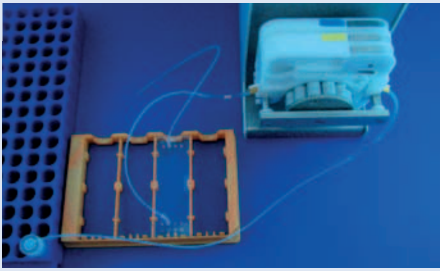


Fig. 329: Pump tube connected to reservoir vessel

Step 6: Connection collection vessel & start pumping

6. Connect the exit tube with a collection vessel and start pumping

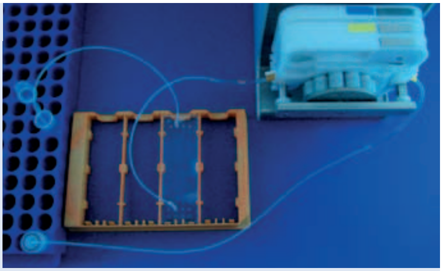


Fig. 330: Chip with olives connected via tubes to pump addressing a reservoir vessel and the exit port tube is inserted in a collection vessel

11.2 Droplet generator chip – options to use the chip

Droplet generator chips offer a lot of possibilities how to use them and to optimize the results. Besides the structure itself, the operation mode matters. Sample inlet and main stream channel might be varied, a hydrophobic surface coating may be applied, or simple variation of the flow velocity or the injection volume can be modified, resulting in different droplet patterns. The following description aims to give an idea how to start with such devices followed by a set of further experiments.

Hints to work with droplet generator:

Droplet generator chip 0162

Required item:

1. Droplet generator chip, material PC (polycarbonate), (13-1002-0162-03)
2. Handling frame, e.g. orange (15-4001-0000-12)
3. Male Mini Luer fluid connectors, e.g. the green version (09-0541-0000-09)
4. Male Mini Luer fluid connectors, e.g. the opaque version (09-0538-0000-09)
5. Male Mini Luer plugs, e.g. the red version (09-0551-0000-09)
6. Silicone tube, e.g. ID: 0.5 mm (09-0802-0000-00)
7. PTFE tube, e.g. ID: 0.5 mm (09-0803-0000-00)
8. Oil, e.g. 20-5004-0000-00
9. T-piece for tubing
10. Fluorescence dye
11. Peristaltic pump
12. Tube for peristaltic pump
13. Two channel syringe pump or two syringe pumps
14. Eppendorf vessel
15. Microscope
16. Computer

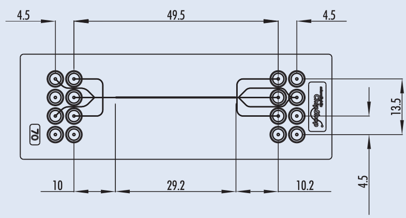


Fig. 331: Droplet generator chip 0162

Step 1: Chip & handling frame

1. Insert the chip in a handling frame

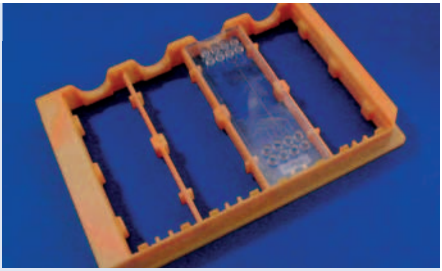


Fig. 332: Droplet generator 0162 placed in handling frame

Step 2: Interface chip & pump for aqueous phase

2. Connect the central entrance for the aqueous phase via an opaque Mini Luer connector, a silicone sleeve, a PTFE tube, the pump tube and a further PTFE to the pump containing the aqueous phase (e.g. sample with dyed).

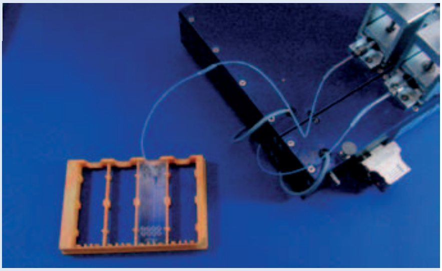


Fig. 333: Central entrance of the droplet generator chip conneted to the pump

Step 3: Interface chip & pump for oil phase

3. Connect the ports for the oil phase via green Mini Luer connectors, silicone sleeves, PTFE tube, the splitting T-piece, the pump tube and a further PTFE to the pump containing the oil phase.

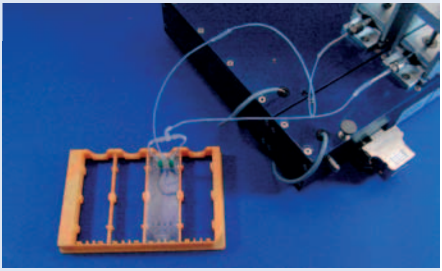


Fig. 334: Side ports for oil phase of the droplet generator chip connected to the pump

Step 4: Close redundant exit ports

4. Plug all unused entrance ports and exit ports of the chip with Mini Luer plugs besides the central exit port.

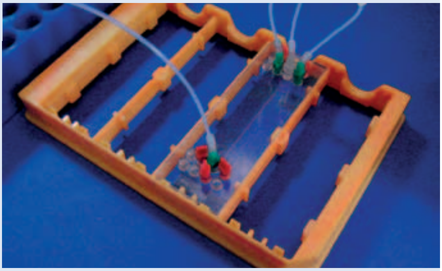


Fig. 335: Droplet generator with all redundant exit ports closed

Step 5: Interface chip & collection vessel

5. Connect the exit port via a Mini Luer connector, a silicone sleeve, and a PTFE tube to the Eppendorf waste reservoir

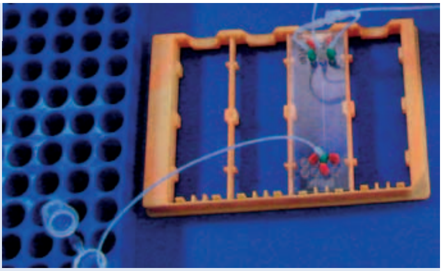


Fig. 336: Exit port of the droplet generator connected to a collection vessel

Step 6 – 7: Carry out experiment

6. Start pumping the oil and wait for a stable flow.
7. Start pumping the aqueous phase and observe droplet generation. You have to eventually vary the flow rate of the aqueous phase to generate droplets of the desired size.

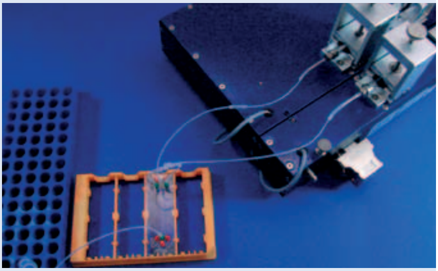


Fig. 337: Complete experimental set-up

Step 8: Visualisation of the experiments

8. Visualize the experiment with a fluorescence microscope and characterize the droplet size.

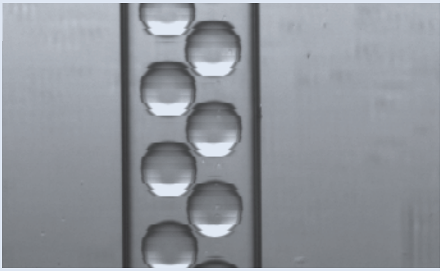


Fig. 338: Droplets generated on chip

11.3 ChipGenie® edition P: On-chip DNA-isolation with magnetic beads

This procedure describes the generation of genomic DNA e.g. for downstream PCR out of a variety of samples such as blood or pathogen-containing liquids. Magnetic beads inside a microfluidic chip bind the DNA from cells (blood cells or bacteria) lysed inside the chip. Washed, pure DNA is extracted from beads and the chip.

Depending on sample and application the single steps vary slightly.

11.3.1 On-chip DNA-isolation from full blood with ChipGenie® edition P starter kit 4

Starting with full blood the **ChipGenie® edition P starter kit 4** allows for an on-chip isolation of PCR-competent genomic DNA in less than 15 minutes.

Required tools & ingredients:
1. ChipGenie® edition P instrument (08-0487-0000-00, 695.00 €)
2. ChipGenie® edition P starter kit 3 – DNA extraction – THREE STEP PROCEDURE (11-0817-0000-00, 460.00 €)
3. A waste reservoir

The application procedure includes:
1. The preparation steps for the chip
2. The on-chip lysis and purification
3. The DNA elution

Preparation steps 1:
1. Close one inlet and one outlet port of the chamber with a Mini Luer plug.

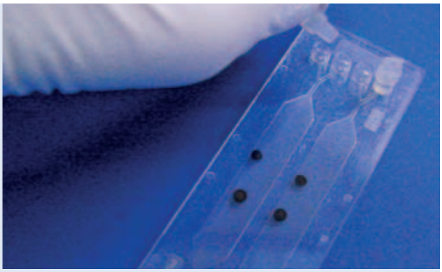


Fig. 339: Chip for 120 µl sample volume with ready-made beads

Preparation steps 2:
2. Place chip into the ChipGenie® P instrument.
3. If you would like to work with a pump: After closure of the frame, insert Mini Luer-connectors into the open outlet ports of the chip.

Fig 340: Chip inserted in ChipGenie® edition P

Lysis and purification:

4. Incubate 40 µl whole blood, 60 µl mcs lysis & binding buffer & 20 µl mcs wash buffer 2 off-chip.
5. Fill the complete reaction mixture into one of the two rhombic chambers of the chip.
6. Start the magnet and run mixing for 5 min.
7. Stop magnet.
8. Empty the chamber with air with the help of a pipette.
9. Fill the chamber with 120 µl mcs wash buffer 1.
10. Start magnet for 30 sec.
11. Stop magnet.
12. Repeat steps 9-11 two more times.

Fig 341: Chip and ChipGenie® edition P during sample loading

DNA elution:

13. Fill the chamber with 50 µl mcs elution buffer.
14. Set the temperature to 55 °C.
15. Start magnet for 5 min.
16. Stop magnet.
17. Disconnect the Mini Luer-connector from the outlet port and aspirate the eluate with the help of a pipette.

Fig. 342: Beads on chip during clean-up and elution

11.4 Membrane chip

microfluidic ChipShop membrane chips can be equipped with various membranes to be used for simple filtration tasks, for the implementation of assays on the membrane, or for plasma generation.

11.4.1 On-chip plasma generation out of whole blood

The membrane chip enables you to generate blood plasma from 20-40 µl of whole blood (stabilized or non-stabilized) within less than 2 minutes. The yield is roughly 50% of plasma. A special membrane inside the chip retains all blood cells. The pure plasma migrates through the filter.

Required tools & ingredients

1. Chip with 4 plasma generation membranes (15-1504-0200-02)
2. Mini Luer plugs (09-0550-0000-09)
3. Eppendorf vessel

The application procedure includes three steps:

1. Preparation of the chip
2. Sample loading
3. Filtration

Preparation steps:
The ventilation ports of the membrane chip are closed with Mini Luer plugs and the chip is placed on a bench in the shown orientation.

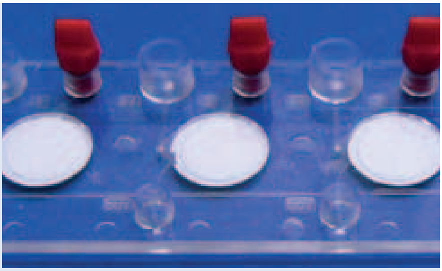


Fig 343: Membrane chip Fl. 200 with Mini Luer plugs

Sample loading:
Pipette the designated volume (between 20 and 40 µl) of whole blood into Luer-inlet-port of the membrane chip.

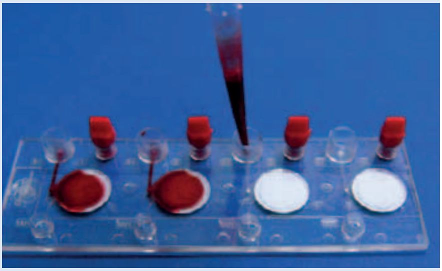


Fig 344: Insertion of blood in membrane chip

Filtration:
Use a pipette (for yellow tips) with a set volume of 100 µl. Press the pipette tip tightly into the sample outlet port and suck slowly for ~30 sec. Formation of air bubbles during filtration is normal and has no effect on the generated plasma. Fill the filtrated plasma into a fresh Eppendorf tube.

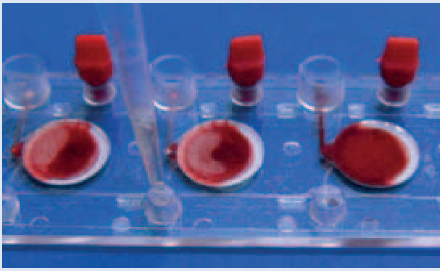
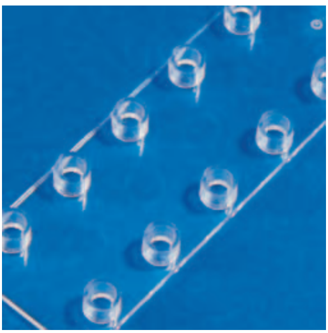
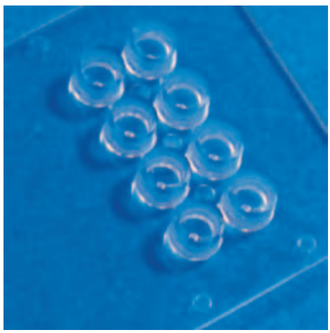


Fig 345: Plasma take up

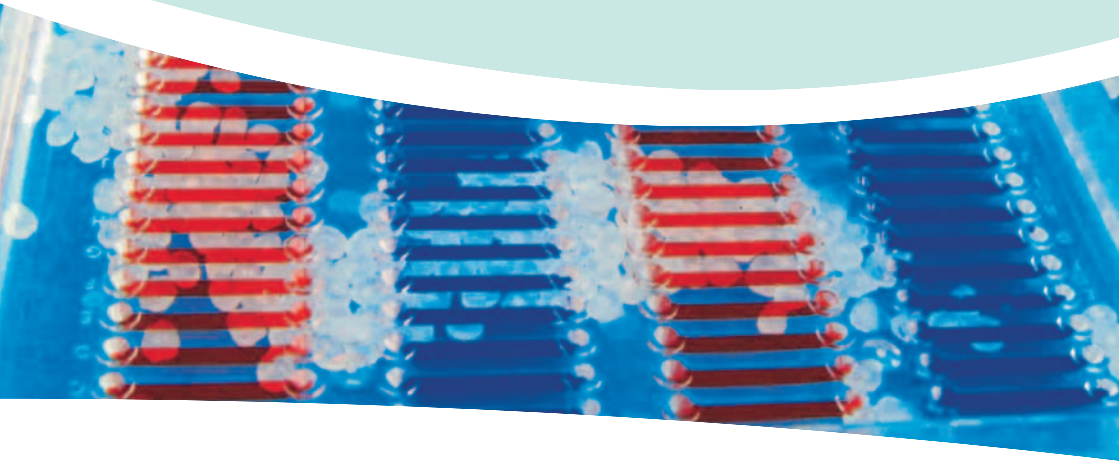
Results:
Based on your starting volume, between 10 and 20 µl of blood plasma will be generated. It should be clear, light yellow and free of blood cells.

Fig 346: On-chip generated plasma





12 Fabrication services



Fabrication services

The main part of our work is dedicated to the realization of custom-designed chips. We assist in the proper microfluidic design, the adoption of the design to fabrication needs, as well as the choice of the appropriate fabrication technology.

In order to assist you in your design work, chapter **12.1 General design guidelines for polymer-based microfluidic devices** helps you to judge the feasibility of design features of microfluidic chips.

Chapter **12.2 Fluidic platforms for custom design** helps you in making the proper choice of, for example, proprietary microfluidic chip formats versus standard formats or of the appropriate fluidic interface, also considering cost and functional aspects.

12.1 General design guidelines for polymer-based microfluidic devices

The manufacturability of a device depends on the individual design and the interaction between its various design elements. In this respect, the following design guidelines for polymer-based microfluidic devices give the user a better understanding of possible limitations in the design of a specific structure. For the microfluidic design, two aspects besides the functionality have to be considered right at the start of the design process: It must firstly be checked whether the design can be realized by replicative technologies – allowing for low-cost mass-manufacturing – like injection molding, and secondly whether the back-end processes, in particular the assembly (usually the secure sealing of the fluid with a cover lid), can be ensured.

Besides the purely technical constraints, cost considerations can also have an influence on the chosen manufacturing route, as different methods for mold insert fabrication have different technical constraints (minimum feature size, maximum height, surface roughness, etc.) as well as different cost ranges.

a) Feature density

In order to allow for a good bond between a structured part and a cover foil, two adjacent channels or similar features should be separated by at least twice their width, but not less than 200 μm.
Not more than 50% of the overall surface area should be covered with structural elements.

b) Distance to device edges

In order to allow for a good bond, features should have a minimum distance from the edge of the device of 2 mm. The larger the device and the feature size, the larger this distance should be.

c) Minimum feature depth

Structures should have a minimum depth of 5 μm for features < 100 μm. For features between 100 and 1000 μm, the minimum depth is 15 μm.

d) Minimum residual thickness of the device

The minimum residual thickness of the device in structured areas (see Fig. 347) is 500 μm for areas > 1 cm^2. For smaller areas, a lower residual thickness might be possible, depending on the overall device layout.

e) Maximum feature width

There is no practical limit to the feature width, however in the case of features wider than 4 mm, support structures to prevent the cover lid from sagging might have to be included in the design.

f) Aspect ratio

For injection molded parts, the aspect ratio for microstructured elements should be less than 2.

g) Through-holes

The minimum diameter of through-holes realized by standard core pins is 500 μm. Smaller holes can be realized with additional means upon request.

h) Open areas

Open areas (see Fig. 347) are possible.

Fig. 347: Through-holes, open and structured areas

12.1.1 General design guidelines for mechanically machined mold inserts

For mold inserts fabricated using precision machining for example in brass or stainless steel), the following design restraints are valid in addition to the ones given above:

a) Minimum feature size

The minimum feature size for sunk features (i.e. features where the mold insert material has to be removed; see Fig. 348) is 50 µm. For features in the range between 50 and 100 µm, the aspect ratio is limited to 1.5.

b) Minimum radius of curvature

At intersecting features (e.g. channel crossings), a radius of curvature of 40 µm occurs as standard. Smaller radii down to 10 µm are available upon request and depend on the aspect ratio of the respective structure

c) Feature heights

Different height steps as well as slopes of up to 45°–90° (depending on absolute feature size) are possible.

d) Surface roughness

Mechanical machining results in a surface roughness of the order of 0.5–1 µm RMS. The features can be polished if protruding (e.g. channel floors in the polymer part which are ridges in the mold insert; see Fig. 348), to create an optical finish (roughness < 50 nm RMS).

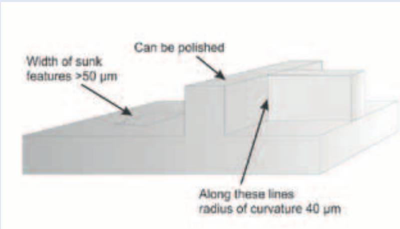


Fig. 348: Features of a milled mold insert

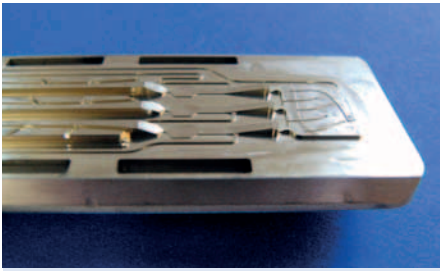


Fig. 349: Mold insert realised using ultraprecision mechanical machining

12.1.2 General design guidelines for mold inserts fabricated using lithography and electroplating

For mold inserts fabricated using lithography and electroplating (either e.g. from a silicon or glass master), the following design restraints are valid in addition to the ones given above:

a) Minimum feature size

The minimum feature size is 10 µm. For features in the range between 10 and 100 µm, the aspect ratio is limited to 1.5.

b) Maximum height

For lithography-based mold inserts, the maximum feature height is 100 µm.

12.2 Fluidic platforms for custom design

The investment in an injection-molding tool is quite frequently between the choice of a chip in a unique outer format and an existing format. *microfluidic ChipShop's* unique "Design-your-Lab Concept" enables you to benefit from existing injection-molding tools for quite common microfluidic chip formats like the microscopy slide, the microtiter plate, or the CD, avoiding the costs of investing in your own injection-molding tool.

Within this chapter, our standard formats, including various kinds of fluidic interfaces, are summarized. The interfacing side of the device has a fixed geometry while the bottom part is free for your individual design. All platforms are available as blank slides with the respective interfaces. This allows a rapid prototyping of structures e.g. by direct mechanical machining of the microstructures into the slides. This method of prototyping yields devices which have an identical "look&feel" to a molded part including the fluidic interfaces and the chemical properties. The only difference to a molded part is the slightly increased surface roughness which gives the machined areas a matt appearance.

12.2.1 Microscopy slide format

The microscopy slide format (75.5 mm x 25.5 mm x 1.5 mm) is now an accepted standard in the lab-on-a-chip field and has several advantages: A handy format that makes manual manipulation easy, not too big and not too small, it fits perfectly onto any microscope, and handling frames can be used in order to place the microscopy slide inside and to work with existing laboratory equipment systems, for example for filling or read-out.

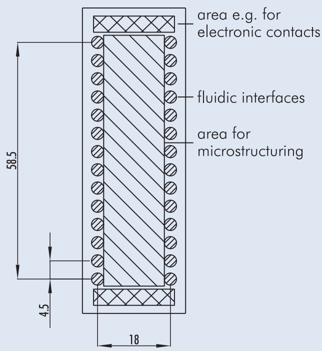


Fig. 350: Principle drawing of a microscopy slide with fluidic interfaces – in this version, fluidic interfaces are grouped along the long sides of the chip.

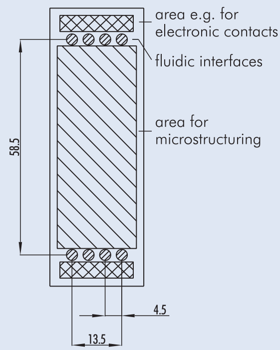


Fig. 351: Principle drawing of a microscopy slide with fluidic interfaces – in this version,fluidic interfaces are grouped along the short sides of the chip

The chip-to-world interface frequently remains a challenge – and standard solutions and solutions optimized for microfluidic applications are directly at hand. This raises two questions that are promptly answered by *microfluidic ChipShop's* fluidic platforms:

I. The kind of fluidic interface:

microfluidic ChipShop's microscopy slide formats are available with:
- Simple through holes
- Olives as tube interfaces
- Female Luer connectors
- Female mini Luer connectors

II. The position of the fluidic interface:
- Grouped along the long side with 9 mm spacing, corresponding to the spacing of a 96-well plate
- Grouped along the long side with 4.5 mm spacing, corresponding to the spacing of a 384-well plate
- Grouped along the short side with 4.5 mm spacing, corresponding to the spacing of a 384-well plate

As highlighted above, the range of fluidic interfaces offered with the microscopy slide format includes simple through-holes, olives, and Luer and Mini Luer connectors. All connectors are spaced according to the well-spacing of a 384-well microtiter plate, e.g. with a center-center distance of 4.5 mm between connectors except for the standard Luer connectors working with the spacing of a 96-well plate of 9 mm in order to allow pipetting robots or other automated equipment to be used.
One of the microscopy slide chip families is characterized by 16 interfaces with 4.5 mm spacing along the long side, which allows two rows of eight reagents from a microwell plate to be pipetted and the use of a conventional eight-times multipipette.

12.2.1.1 Microscopy slide platforms – Fluidic interface: Through holes

The **through-hole platforms** are frequently used with O-rings or membranes integrated in an instrument in order to give a proper sealing via press fittings. They are also a good interface for pipettes. One additional advantage of this interface besides the ease of application is the potential storage of the chips after use, as the interfaces can be sealed with tape to prevent contamination or evaporation. A drawback of this kind of interface is the low pressure stability on the chip-side of the connection, which has to be countered with a suitable counterpart on the instrument side. Standard diameter for the through-holes is 0.8 mm (top) and 0.5 mm (bottom); other diameters are available upon request.

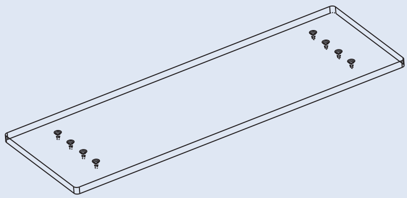


Fig. 352: Microscopy slide through-hole platform – version with eight fluidic interfaces

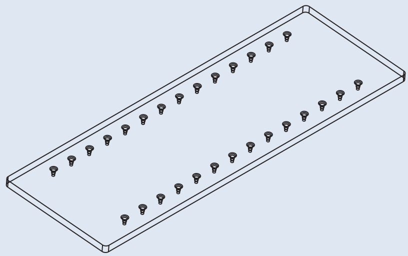


Fig. 353: Microscopy slide through-hole platform – version with 28 fluidic interfaces

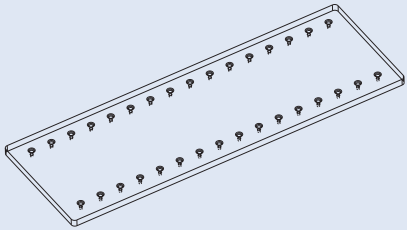


Fig. 354: Microscopy slide through-hole platform – version with 32 fluidic interfaces

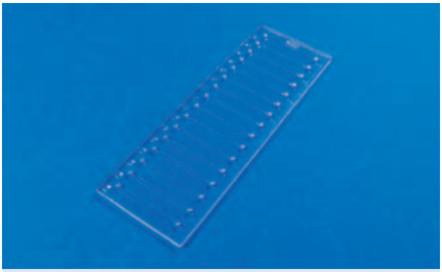


Fig. 355: Example of microscopy slide through-hole platform with 32 through-holes

Product Code	Description	Material	Price [€] 1+	10+
10-1100-0338-01	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	PMMA	55.00	30.00
10-1101-0338-03	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	PC	55.00	30.00
10-1102-0338-02	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	Topas	55.00	30.00
10-1103-0338-05	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	Zeonor	55.00	30.00
10-1104-0435-01	Microscopy slide platform 2 x 14 through-holes, pack of 10 slides	PMMA	55.00	30.00
10-1105-0435-03	Microscopy slide platform 2 x 14 through-holes, pack of 10 slides	PC	55.00	30.00
10-1106-0435-02	Microscopy slide platform 2 x 14 through-holes, pack of 10 slides	Topas	55.00	30.00
10-1107-0435-05	Microscopy slide platform 2 x 14 through-holes, pack of 10 slides	Zeonor	55.00	30.00
10-1108-0345-01	Microscopy slide platform 2 x 16 through-holes, pack of 10 slides	PMMA	55.00	30.00
10-1109-0345-03	Microscopy slide platform 2 x 16 through-holes, pack of 10 slides	PC	55.00	30.00
10-1110-0345-02	Microscopy slide platform 2 x 16 through-holes, pack of 10 slides	Topas	55.00	30.00
10-1111-0345-05	Microscopy slide platform 2 x 16 through-holes, pack of 10 slides	Zeonor	55.00	30.00

12.2.1.2 Microscopy slide platforms – Fluidic interface: Olives

Our **olive microfluidic platforms** enable a direct interface of tubing and microfluidic chips. For example, silicone tubes can be used to connect the olives with standard PE or PTFE tubing or PEEK capillaries. The silicone tubing easily slides over the tapered olives and guarantees a hermetic seal up to pressures of approximately 3 bar (42 psi). This connector is especially suited to non-automated experiments where syringes or other external pumps are to be connected to the chip. To minimize experimental variations due to the pressure-induced expansion of a longer silicone tube, short sections of silicone tubing can be used to connect stiff tubes (e.g. PTFE, PEEK, or PE tubing) with either the chip or the pump. This interface results in a dead volume of roughly 2 μl due to the internal volume of the olives which is added to the dead volume of the tubing.

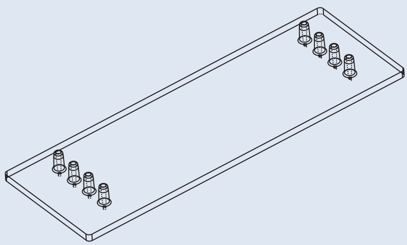


Fig. 356: Microscopy slide olive platform – version with eight fluidic interfaces

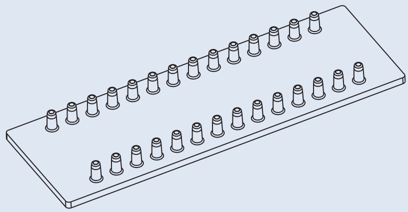


Fig. 357: Microscopy slide olive platform – version with 28 fluidic interfaces

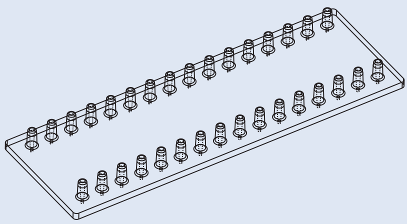


Fig. 358: Microscopy slide olive platform – version with 32 fluidic interfaces

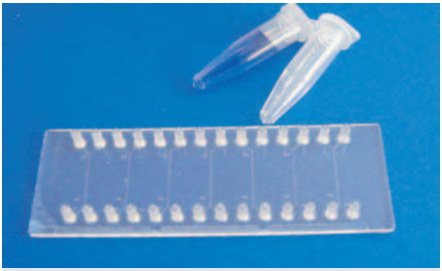


Fig. 359: Example of microscopy slide olive platform with 28 olive fittings

Product Code	Description	Material	Price [€] 1+	10+
10-1112-0337-01	Microscopy slide platform 2 x 4 olives, pack of 10 slides	PMMA	55.00	30.00
10-1113-0337-03	Microscopy slide platform 2 x 4 olives, pack of 10 slides	PC	55.00	30.00
10-1114-0337-02	Microscopy slide platform 2 x 4 olives, pack of 10 slides	Topas	55.00	30.00
10-1115-0337-05	Microscopy slide platform 2 x 4 olives, pack of 10 slides	Zeonor	55.00	30.00
10-1116-0341-01	Microscopy slide platform 2 x 14 olives, pack of 10 slides	PMMA	55.00	30.00
10-1117-0341-03	Microscopy slide platform 2 x 14 olives, pack of 10 slides	PC	55.00	30.00
10-1118-0341-02	Microscopy slide platform 2 x 14 olives, pack of 10 slides	Topas	55.00	30.00
10-1119-0341-05	Microscopy slide platform 2 x 14 olives, pack of 10 slides	Zeonor	55.00	30.00
10-1120-0343-01	Microscopy slide platform 2 x 16 olives, pack of 10 slides	PMMA	55.00	30.00
10-1121-0343-03	Microscopy slide platform 2 x 16 olives, pack of 10 slides	PC	55.00	30.00
10-1122-0343-02	Microscopy slide platform 2 x 16 olives, pack of 10 slides	Topas	55.00	30.00
10-1123-0343-05	Microscopy slide platform 2 x 16 olives, pack of 10 slides	Zeonor	55.00	30.00

12.2.1.3 Microscopy slide platforms – Fluidic interface: Luer

Our **Luer platforms** are equipped with standard Luer connectors known from the medical field and are especially suited for operations working with a male Luer counterpart, as is found in conventional syringes. This opens the way for manual operations and the direct transfer of samples taken with a syringe to the chip. Furthermore, they are perfectly suited as press-fittings to connect with an instrument. Luer microfluidic platforms are available with either Luer connectors on either side with a symmetrical arrangement and 9 mm spacing or five Luer connectors on either side with a spacing of 13.5 mm and an offset of 2.5 mm from the center. The Luer connectors ensure leak-tight connections up to pressures of several bar, enough for complex chips with comparatively high back-pressures.

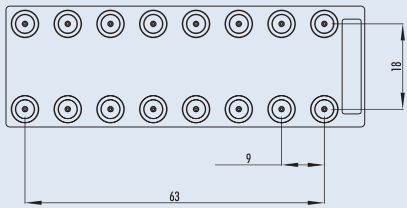


Fig. 360: Microscopy slide Luer platform – version 16 fluidic interfaces

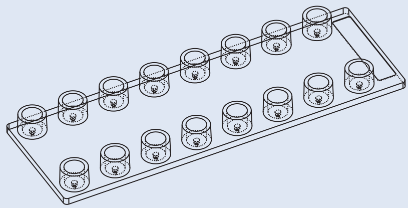


Fig. 361: Microscopy slide Luer platform – version 16 fluidic interfaces

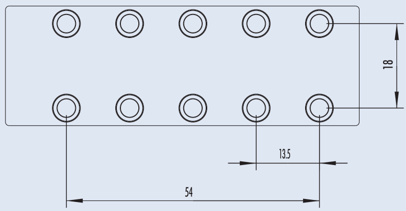


Fig. 362: Detail of the microscopy slide Luer platform with ten fluidic interfaces

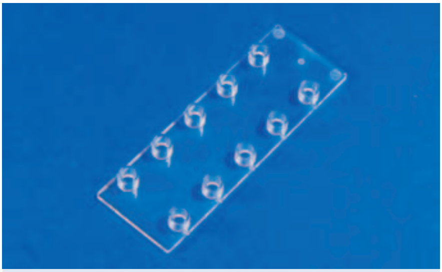


Fig. 363: Example of microscopy slide Luer platform with ten Luer interfaces

Product Code	Description	Material	Price [€] 1+	10+
10-1124-0348-01	Microscopy slide platform 2 x 5 Luer connectors, pack of 10 slides	PMMA	55.00	30.00
10-1125-0348-03	Microscopy slide platform 2 x 5 Luer connectors, pack of 10 slides	PC	55.00	30.00
10-1126-0348-02	Microscopy slide platform 2 x 5 Luer connectors, pack of 10 slides	Topas	55.00	30.00
10-1127-0348-05	Microscopy slide platform 2 x 5 Luer connectors, pack of 10 slides	Zeonor	55.00	30.00
10-1128-0346-01	Microscopy slide platform 2 x 8 Luer connectors, pack of 10 slides	PMMA	55.00	30.00
10-1129-0346-03	Microscopy slide platform 2 x 8 Luer connectors, pack of 10 slides	PC	55.00	30.00
10-1130-0346-02	Microscopy slide platform 2 x 8 Luer connectors, pack of 10 slides	Topas	55.00	30.00
10-1131-0346-05	Microscopy slide platform 2 x 8 Luer connectors, pack of 10 slides	Zeonor	55.00	30.00

12.2.1.4 Microscopy slide platforms – Fluidic interface: Mini Luer

The Mini Luer microfluidic platforms combine the same advantages as their larger counterparts, with reduced dimensions (outer diameter 4 mm instead of 6 mm), thus allowing for more connectors on the chip. Up to 16 ports along the long side of a microscopy slide can thus be realized. Male Mini Luer plugs for closing the Mini Luer interface are available as well as adapter pins to connect silicone tubing to these chips, which increases the versatility of the various Mini Luer platforms.

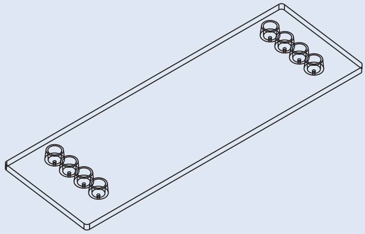


Fig. 364: Microscopy slide Mini Luer platform – version with eight fluidic interfaces

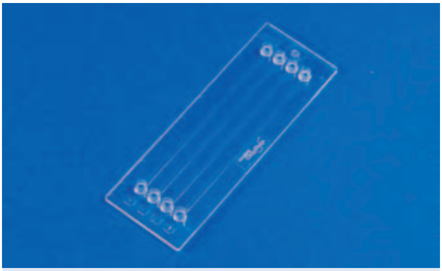


Fig. 365: Microscopy slide Mini Luer platform – version with eight fluidic interfaces

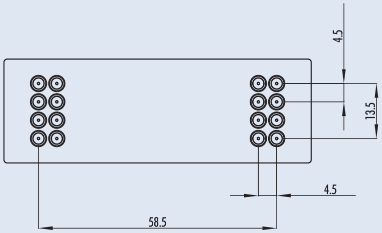


Fig. 366: Microscopy slide Mini Luer platform – version with 16 fluidic interfaces on the short edges

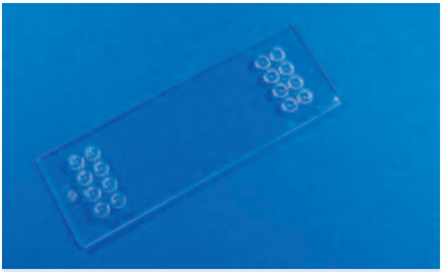


Fig. 367: Microscopy slide Mini Luer platform – version with 16 fluidic interfaces on the short edges

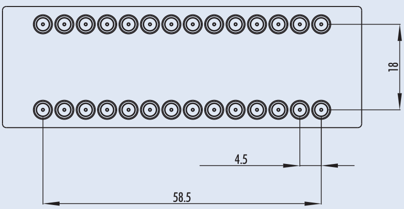


Fig. 368: Microscopy slide Mini Luer platform – version with 28 fluidic interfaces on the long edges

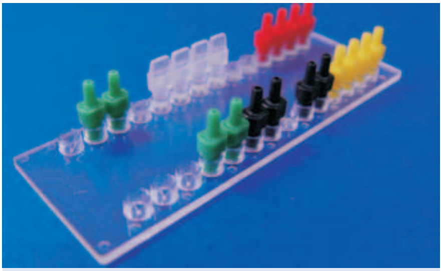


Fig. 369: Microscopy slide Mini Luer platform – version with 28 fluidic interfaces on the long edges

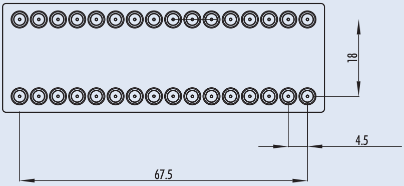


Fig. 370: Microscopy slide Mini Luer platform – version with 32 fluidic interfaces on the short edges

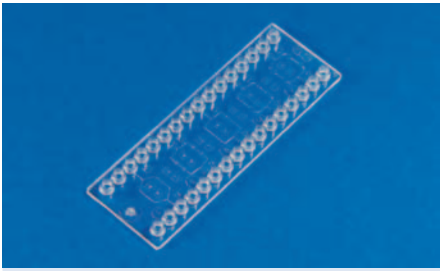


Fig. 371: Microscopy slide Mini Luer platform – version with 32 fluidic interfaces on the short edges

Product Code	Description	Material	Price [€] 1+	10+
10-1132-0338-01	Microscopy slide platform 2 x 4 Mini Luer, pack of 10 slides	PMMA	55.00	30.00
10-1133-0338-03	Microscopy slide platform 2 x 4 Mini Luer, pack of 10 slides	PC	55.00	30.00
10-1134-0338-02	Microscopy slide platform 2 x 4 Mini Luer, pack of 10 slides	Topas	55.00	30.00
10-1135-0338-05	Microscopy slide platform 2 x 4 Mini Luer, pack of 10 slides	Zeonor	55.00	30.00
10-1136-0340-01	Microscopy slide platform 2 x 8 Mini Luer, pack of 10 slides	PMMA	55.00	30.00
10-1137-0340-03	Microscopy slide platform 2 x 8 Mini Luer, pack of 10 slides	PC	55.00	30.00
10-1138-0340-02	Microscopy slide platform 2 x 8 Mini Luer, pack of 10 slides	Topas	55.00	30.00
10-1139-0340-05	Microscopy slide platform 2 x 8 Mini Luer, pack of 10 slides	Zeonor	55.00	30.00
10-1140-0342-01	Microscopy slide platform 2 x 14 Mini Luer, pack of 10 slides	PMMA	55.00	30.00
10-1141-0342-03	Microscopy slide platform 2 x 14 Mini Luer, pack of 10 slides	PC	55.00	30.00
10-1142-0342-02	Microscopy slide platform 2 x 14 Mini Luer, pack of 10 slides	Topas	55.00	30.00
10-1143-0342-05	Microscopy slide platform 2 x 14 Mini Luer, pack of 10 slides	Zeonor	55.00	30.00
10-1144-0344-01	Microscopy slide platform 2 x 16 Mini Luer, pack of 10 slides	PMMA	55.00	30.00
10-1145-0344-03	Microscopy slide platform 2 x 16 Mini Luer, pack of 10 slides	PC	55.00	30.00
10-1146-0344-02	Microscopy slide platform 2 x 16 Mini Luer, pack of 10 slides	Topas	55.00	30.00
10-1147-0344-05	Microscopy slide platform 2 x 16 Mini Luer, pack of 10 slides	Zeonor	55.00	30.00

12.2.2 Microtiter plate format

The combination of the microfluidic world with its advantages with the well-known world of laboratory automation is the merger of microfluidics with the SBS standard microtiter plate (85.48 mm x 127.76 mm). Directly available from *microfluidic ChipShop* are several injection-molding tools to allow for the fabrication of microfluidic networks on the microtiter plate, ensuring the outer rim of the SBS pattern also fits with existing automation set-ups. Taking laboratory automation into consideration during the design phase, namely by incorporating fluidic interfaces and optical detection areas according to the well spacing of the microtiter plates, allows the use of, for example, pipetting robots or conventional plate readers for optical detection.

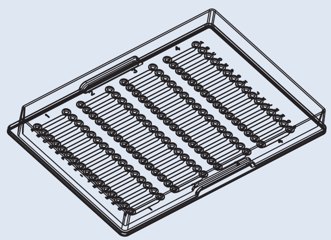


Fig. 372: Schematic drawing of one microfluidic microtiter plate

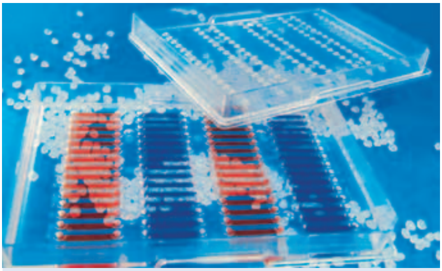


Fig. 373: Example of one of *microfluidic ChipShop's* microfluidic microtiter plates

12.2.3 ¼ Microtiter-plate format

For those applications which do not require the full size of a microtiter plate, a variation with a footprint of one-quarter of the titerplate is also available. This is particularly relevant for instruments with tighter size restrictions.

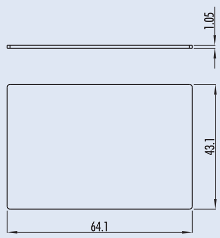


Fig. 374: Schematic drawing of 1/4 microtiter-plate

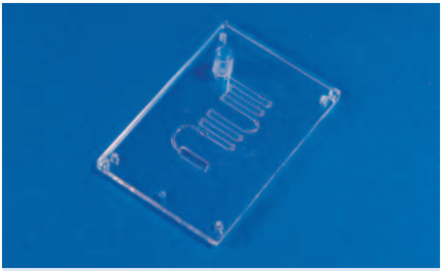


Fig. 375: Example for 1/4 microtiter-plate, realized within EU-FP7 project "CD-Medics", No. 216031. Design: IMM

12.2.4 Extended size I platform format

This platform is for those who require chips in a long and narrow format (95 mm x 16 mm). Microstructured examples in this chip format are our electrophoresis chips. The platform is available with through-holes as well as with Luer connectors.

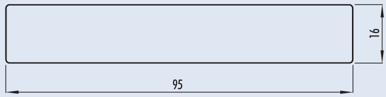


Fig. 376: Schematic drawing of the extended size I platform with simple through-holes

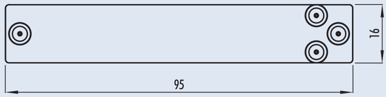


Fig. 377: Schematic drawing of the extended size I platform with Luer interfaces

12.2.5 CD-format

For applications making use of liquid transport by centrifugal forces, a CD-sized tool is available. Please note that for this format, the central hole with a diameter of 15 mm is required plus the CD clamping region with diameter of 25 mm centered around the hole which cannot be used for structuring. Only open-hole fluidic access is possible in this format.

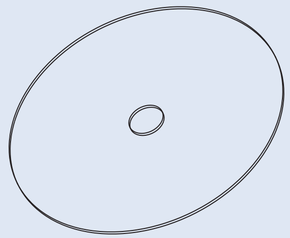


Fig. 378: Schematic drawing of the CD-platform

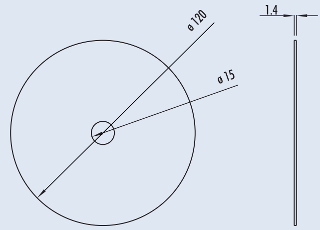


Fig. 379: CD-platform with measures

12.2.6 Pie-slice plate

A variation of the centrifugal platform is the pie-slice plate. This is a 60-degree sector of a circle and allows the modular assembly of different functions in different sectors of a disc. This format allows for higher fluidic volume applications than the CD format as it has a maximum thickness of 4 mm.

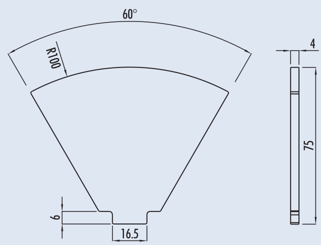


Fig. 380: Geometrical layout of the pie slice plate

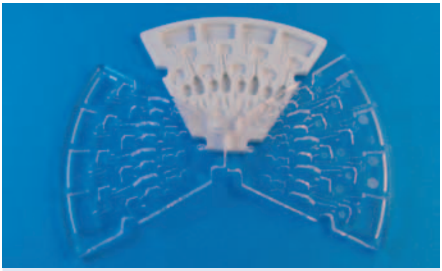
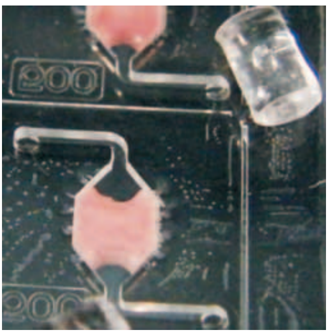
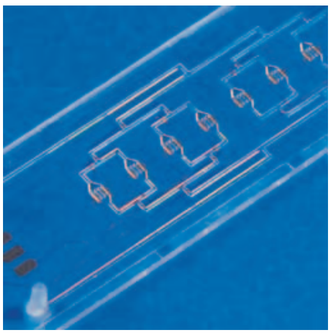


Fig. 381: Examples of pie slice plate chips.
The chips were developed within the BMBF-Project "ZentriLab", FKZ 16SV2350.





13 Finally – Some examples

Examples

Hopefully you were delighted by our *Lab-on-a-Chip Catalogue* and we were either able to serve you with standard microfluidic chips or we could provide you with a roadmap to your custom-made design. Finally, we would like to round up our Lab-on-a-Chip Catalogue with some examples of fluidic chips that might be an inspiration to you and also provide a good impression of our technological capabilities.

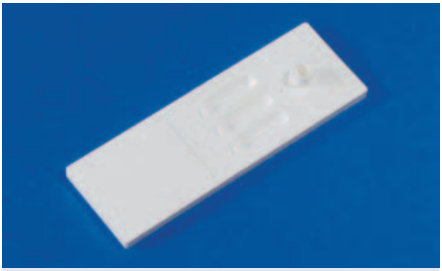


Fig. 382: Diagnostic platform with Luer connectors

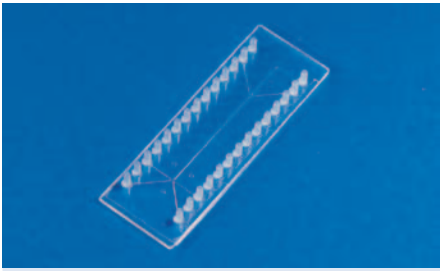


Fig. 383: Cell sorting chip

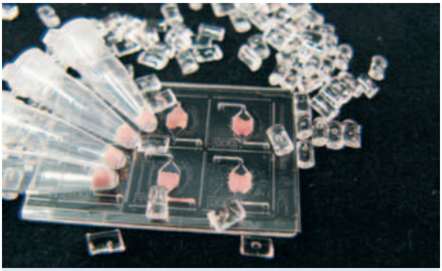


Fig. 384: PCR chip with integrated freez-dried master mix

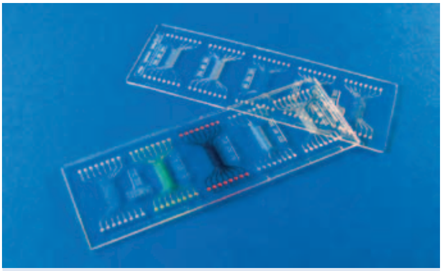


Fig. 385: Channel-array chip

Fig. 386: Hybrid chip consisting of polymer and filters for plasma generation

Fig. 387: Continuous-flow PCR chip, chip, realized within the BMBF-Project "ChipFlussPCR", FKZ 13N9556

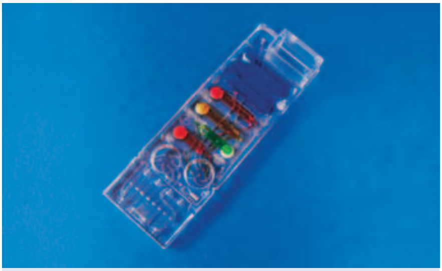


Fig. 388: Hybrid chip for immunoassays with electrochemical detection, realized within the EU-FP6 project "SmartHEALTH", No. 016817

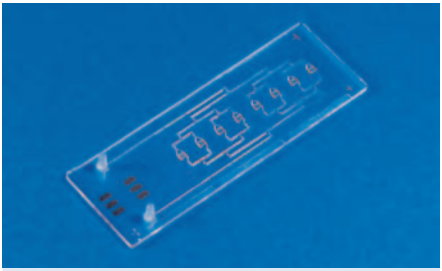


Fig. 389: Cell culture chips with integrated thin film electrodes, realized within the BMBF-Project "HepaChip", FKZ 01GG0728

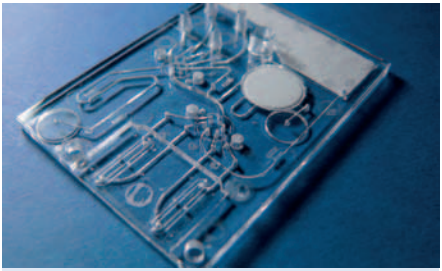


Fig. 390: Hybrid chip for immunoassays with plasma generation unit for electrochemical detection, realized within EU-FP6 project "SmartHEALTH", No. 016817

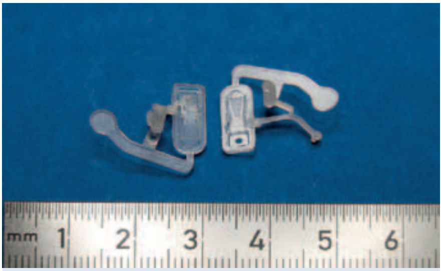


Fig. 391: Two component microinjection molding – Device for agglutionation based assays, realized within the BMBF project FASAMOS, FKZ 02PC2001

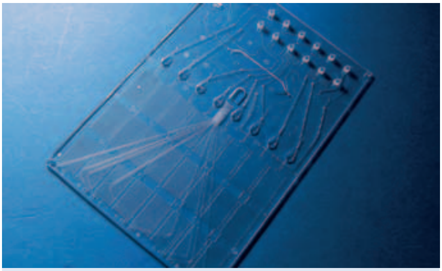


Fig. 392: Sample-in-result-out DNA-analysis chip, realized within the BMBF project ChipFlussPCR, FKZ 13N9556

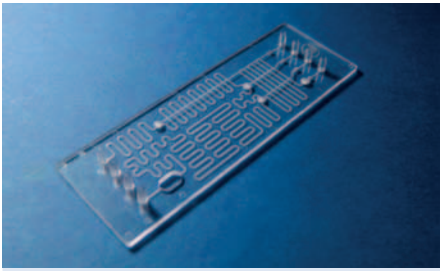


Fig. 393: Microfluidic chip for a complete SELEX-cycle, realized within the ETB project Artamis, FKZ 03139428

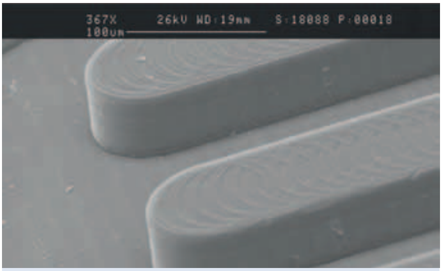


Fig. 394: Microchannel with nanostructured channel floor. The nanostructures have a 1.2 μm period and 200 nm height

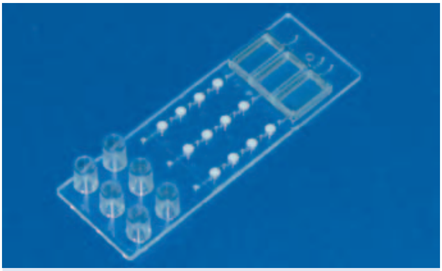


Fig. 395: Microfluidic chip for immunoassay applications with reagent reservoirs and antibody-coated frits for three assays, realized within the BMBF project IFSA, FKZ 16SV5417

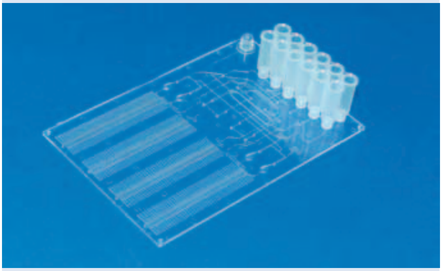


Fig. 396: Sample-in-result-out DNA-analysis chip with hybridisation zone for optoelectronic read-out, realized within the project PathoID Chip, A-102-RT-GC

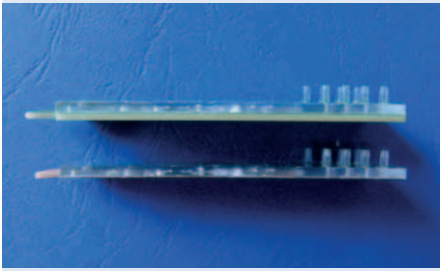


Fig. 397: Microfluidic chip coupled to conventional (top) and flex (bottom) PCBs, realized within the BMBF-project "SafeIS", FKZ 0315574C

Fig. 398: Filtration chip with liquid reservoir

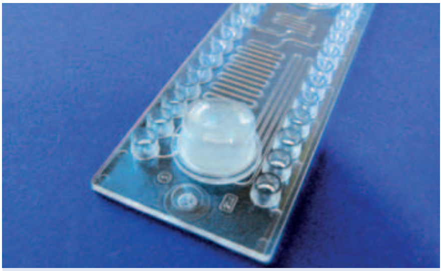


Fig. 399: Fluidic chip with rotary valve

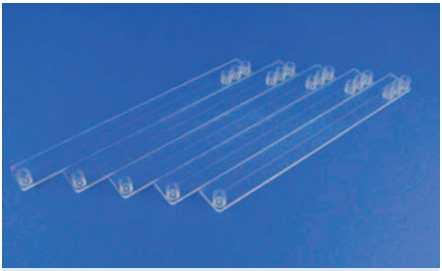


Fig. 400: Extended size electrophoresis chip for sequencing

Fig. 401: Immunoassay chip with plasma generation unit and blister pouches

Fig. 402: HLA typing chip for the detection of coeliac disease, realized within the FP 7 project "CD-Medics", No. 216031

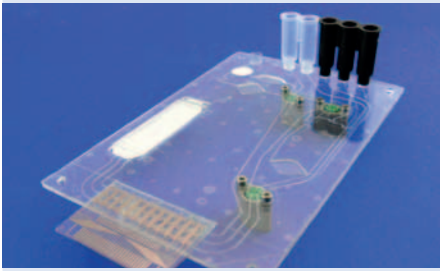


Fig. 403: Serology test chip for the detection of coeliac disease, realized within the FP 7 project "CD-Medics", No.216031

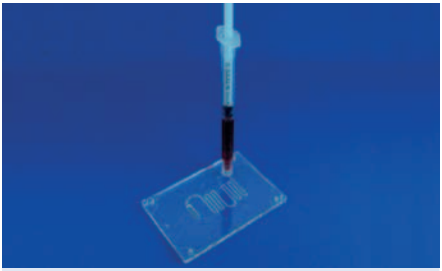


Fig. 404: Boyle-Mariotte PCR chip for ultrafast PCR, design: IMM, realized within the FP 7 project "CD-Medics", No. 216031

Fig. 405: Enyzme-assay development chip, realized within the FP 7 project Multisense Chip, No. 261810

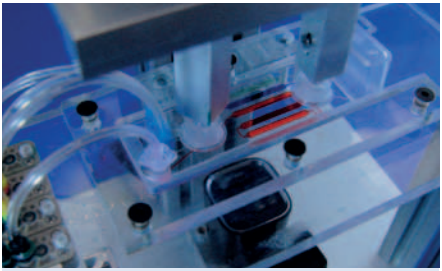


Fig. 406: Enzyme-assay development chip in bread board instrument, realized within FP 7 project Multisense Chip, No. 261810

Fig. 407: Microfluidic chip with lateral flow strip based detection and implemented blister for liquid storage

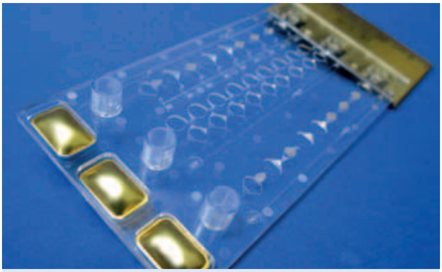


Fig. 408: PCR cartridge with TMR-sensor-based read-out , BMBF projekct MiniLab, No. 16SV4029

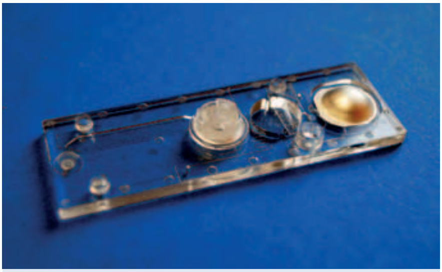


Fig. 409: Particle counting chip with integrated turning valve and staining solution, TAB project No. 2009 FE 0134

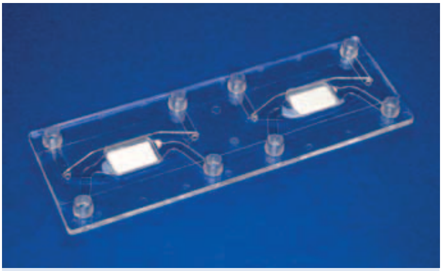


Fig. 410: : Cell culture chip with integrated membrane, TAB project No. 2011 FE 9014

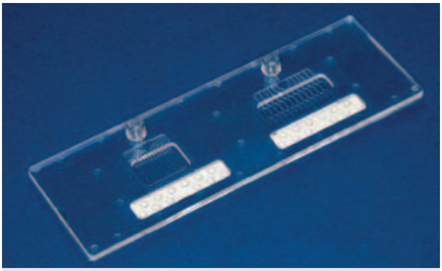


Fig. 411: Parallel PCR chip, FP 7 project Multisense Chip, No. 261810

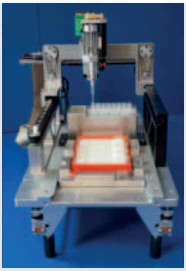
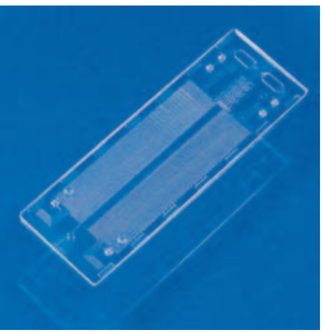
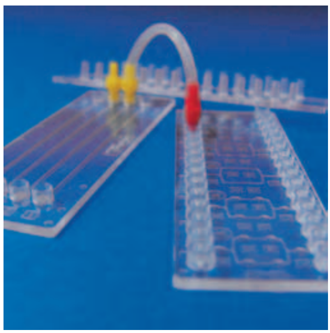


Fig. 412: Merger of standard liquid handling and lab-on-a-chip technology – LOC pipettor & xy-stage for optical read out, TAB project No. 2011 FE 9023




ChipShop



14 Order form

FAX: + 49 (0) 36 41 347 05 90 • E-Mail: sales@microfluidic-chipshop.com
Stockholmer Str. 20 • 07747 Jena • Germany

Company Information		
Company:	Department:	
Contact Name:	Email:	
Shipping Address:		
City, State:	Zip Code:	Country:
Phone Number:	Fax Number:	
VAT Number (EU only):	Order Number:	

Product Number	Product Description	Material	Quantity	Unit Price	Total Price
Total amount without shipping cost and potential minimum quantity surcharge:					*
Minimum quantity surcharge for orders below € 250: € 15.00					
Shipping charges (please choose): ☐ Provide courier account number: ☐ *microfluidic ChipShop* prepay and add to invoice (see estimation below**)					
Credit card fee: 3.5% on total invoice amount					
Total amount:					

* Minimum order volume: € 250 (below this amount we charge a € 15 minimum quantity surcharge)
**Estimated shipping charges: Germany: € 15-30 / EU: € 20-60 / RoW: € 60-120

- The prices quoted above are net amounts and do not include packaging, transport, and tax.
- For larger quantities, other materials, or custom designs please ask for a quote.
- Slight variations in the microstructures by +/- 3 – 4 μm may occur.

Credit Card Payment:		
A credit card fee of 3.5% of the invoice amount applies.		
☐ VISA ☐ MasterCard Card Number:		
Expiration Date (MM/YY):	Security Code:	
Name of Cardholder:		
Billing Address:		
City, State:	Zip Code:	Country:

Date, name in block letters, signature

microfluidic ChipShop GmbH

Stockholmer Str. 20
07747 Jena
Germany

Phone: + 49 (0) 36 41 - 347 05 0
Fax: + 49 (0) 36 41 - 347 05 90
info@microfluidic-ChipShop.com
www.microfluidic-ChipShop.com