



# microfluidic ChipShop

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 picrofluidic ChipShophas 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  $\pm$  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



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# 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 assemb- ling process of a non-glass-component
Direct integration of e.g. reservoirs	Easy – directly in the injection molded part	Limited. Large structures cannot be inte- grated 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	<ul> <li>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).</li> <li>Microstructuring</li> <li>Assembly</li> </ul>

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

Material

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.

I Description

Table 3: Standard polymers used at microfluidic ChipShop – PMMA

| Grades

		'	
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 syn- thetic 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 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:
<ul><li>Diluted acids</li><li>Oils, fats</li><li>Alcohols</li></ul>		Bases Inalogenated hydrocarbons Esters Ketones, Aldehydes Amines Aromatics

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

Material	Grades	Description
PS – Polystryrene	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)	<b>Topas</b> 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 <sub>g</sub> around 70°C.

### Chemical Resistance:

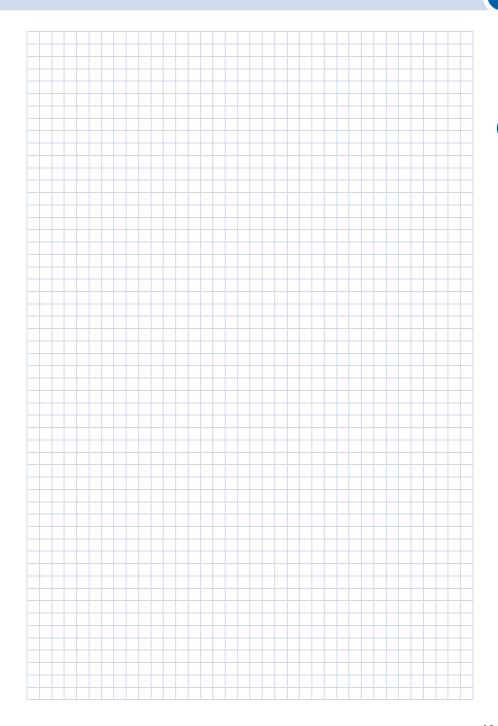
Can be used with:	Not to be used with:
Aqueous solutions including acids and bases     Polar solvents     Can be used with mcs-oil-04	Nonpolar solvents     Oils     Fats     Halogenated hydrocarbons

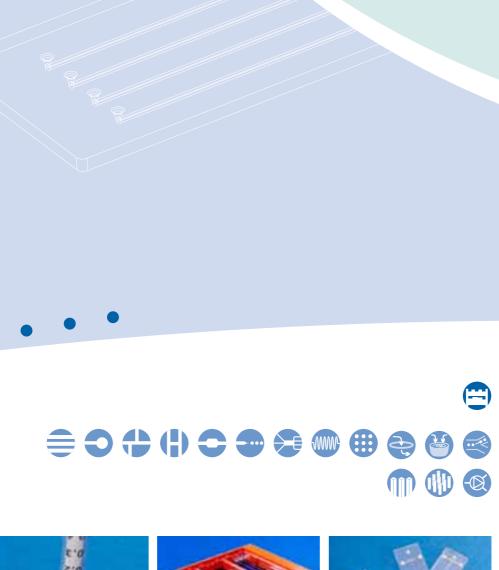
# **Table 7**: Standard polymers used at microfluidic ChipShop – Zeonor (COP)

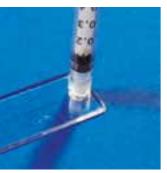
Material	Grades	Description
Zeonor (COP)	mcs-COP-02 mcs foil 005 (188 μm thickness)	Zeonor is a thermoplastic polymer. Zeonor is a cyclo-olefin polymer (COP). It is completely nonpolar and amorphous. It has a very low permeability for water vapour and a low capacity for the absorption of water.
Chemical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



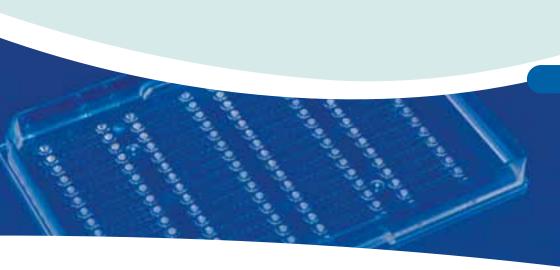








# 2 Microfluidic chips - Polymers



# 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 6.

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. All polymer chips have the fluidic interconnects on the top and the microfludic structure on the bottom side. The micro structures are sealed with a cover lid of identical material. The thickness of the respective cover lid is indicated in the product.



### 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 6, 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 – 4-channel Mini Luer chip family

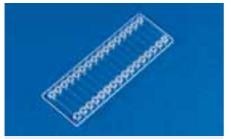


Fig. 3: Microfluidic chip - 16-channel Mini Luer chip family



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

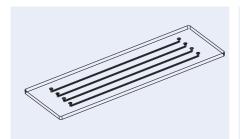


Fig. 5: Schematic drawing of the four-channel through-hole chip family

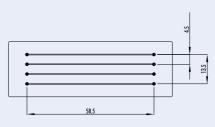


Fig. 6: Details of the four-channel through-hole chip family



Product Code	\ \ /: -lul-	Channe		Cover Lid   Material		Price [€/chip]			
	Width [µm]	Depth [µm]	Length [mm]	[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

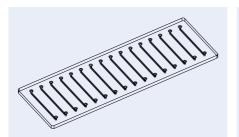


Fig. 7: Schematic drawing of the 16-channel through-hole chip family

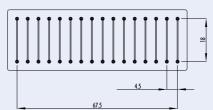


Fig. 8: Details of the 16-channel through-hole chip family

Product Code	Width	Channe Depth	l Length	Cover Lid	Price [€/chip]			
	[µm]	[μm]	[mm]	[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 4-parallel channels

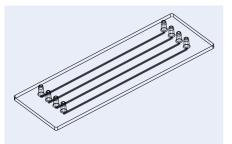


Fig. 9: Schematic drawing of the 4-channel olive chip family

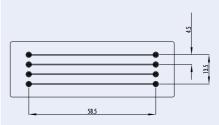


Fig. 10: Details of the 4-channel olive chip family

Product Code	Channel   Width Depth Length		Cover Lid	Cover Lid   Material   Thickness		Price [€/chip]			
	[µm]	[µm]	[mm]	[µm]		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

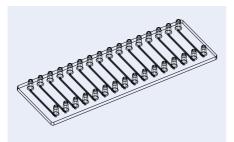


Fig. 11: Schematic drawing of the 16-channel olive chip family

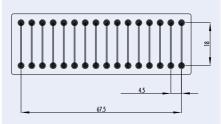


Fig. 12: Details of the 16-channel olive chip family



Product Code	Channel     Width Depth Length			Cover Lid	Cover Lid   Material   Thickness			Price [€/chip]			
	[µm]	[µm]	[mm]	[µm]		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

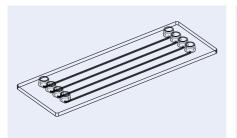


Fig. 13: Schematic drawing of the four-channel Mini Luer chip family  ${\sf Mini}$ 

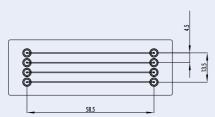


Fig. 14: Details of the four-channel Mini Luer chip family

Product Code	Width	Channe		Cover Lid	Material	Price [€/chip]			
	[µm]	Depth [µm]	Length [mm]	[µm]		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

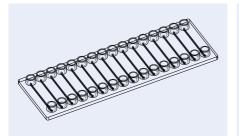


Fig. 15: Schematic drawing of the 16-channel Mini Luer chip family

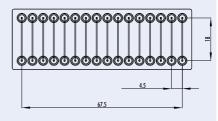


Fig. 16: Details of the 16-channel Mini Luer chip family

Product Code	Width [µm]	Channe Depth [µm]	l Length [mm]	Cover Lid Thickness [µm]	Material	Pri 1+	ce [€/cł	nip] 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

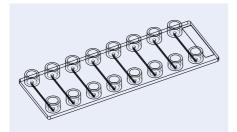


Fig. 17: Schematic drawing of the eight-channel Luer chip family

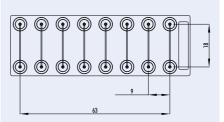


Fig. 18: Details of the eight-channel Luer chip family

Product Code	Width	Channe Depth	l Length	Cover Lid	Price [€/chip]			
	[µm]	[µm]	[mm]	[µm]		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

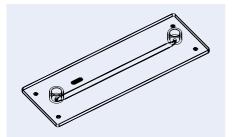


Fig. 19: Schematic drawing of the one channel chip with Luer interface  $% \left( 1\right) =\left( 1\right) \left( 1\right) \left($ 

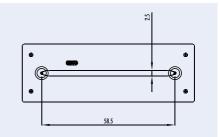


Fig. 20: Details of the one channel chip with Luer interface

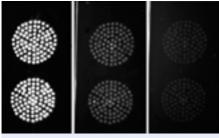


Fig. 21: Spotted fluorescent probes (spot diameter 80  $\mu$ m) in channel of one channel Luer chip. Concentrations (left to right) 100 ng/ $\mu$ l, 10 ng/ $\mu$ l, 1 ng/ $\mu$ l



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

Product Code	Channel Width Depth Length			Lid Thickness	Material	Surface Price (4			' '
	[µm]	[ <i>µ</i> m]	[mm]	[µm]			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. A family of microfluidic microtiter plates having the spacing of the fluidic access holes of the laboratory standard and being compatible with the respective readers allows for a wide variety of different assays, including cell-based assays, hybridization assays, or small volume chemical synthesis.

The plates are available in various 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, poly-L-lysin or collagen coating, etc.

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.

# 2.2.1 Straight channel chips – Microtiter-plate format – 64 channel plate

The plate is equipped with four labeled sets of 16 microchannels each, with the dimensions 2 mm width,  $150~\mu$ m height, and 18 mm length. Fluidic access is easily provided by conical openings of 2.5 mm diameter at either channel end.



Fig. 23: Schematic drawing of the microfluidic titer plate

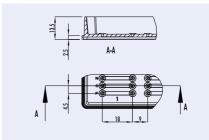


Fig. 24: Details of the microfluidic titer plate

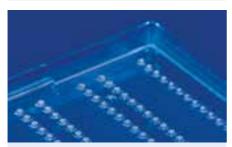


Fig. 25: Microfluidic titer plate



Fig. 26: Microfluidic titer plate with spotted probes

Product Code	Chan Width	nel Dime Depth	ensions Length	Material	Surface Treatment	Price [€/chip]			
	[mm]	[mm]	[mm]		irediffieffi		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	

### 2.2.2 Straight channel chips – Microtiter-plate format – 96 channel plates

These microfluidic microtiter plate devices are designed to have the fluidic access holes at the positions of a 384 well plate having a 4.5 mm spacing. Read out positions comply with the positions of 96 well plate readers.



Fig. 27: Schematic drawing of the microfluidic microtiter plate top view – Fluidic 600

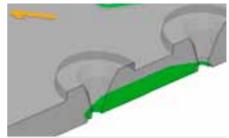


Fig. 28: Detail of the microfluidic microtiter plate with 1.9  $\mu$ l channel volume – Fluidic 600



Fig. 29: Schematic drawing of the microfluidic microtiter plate top view – Fluidic 627

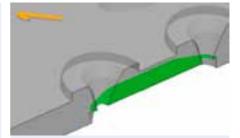
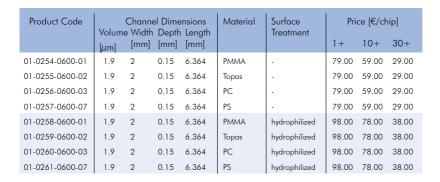


Fig. 30: Detail of the microfluidic microtiter plate with 7.6  $\mu l$  channel volume – Fluidic 627





Product Code	Volum	Channe o Width			Material Surface	Surface Treatment	[-/		
	[μm]	[mm]	Width Depth Length [mm] [mm]			neamen	1+	10+	30+
01-0262-0627-01	7.6	2	0.6	6.364	PMMA	-	79.00	59.00	29.00
01-0263-0627-02	7.6	2	0.6	6.364	Topas	-	79.00	59.00	29.00
01-0264-0627-03	7.6	2	0.6	6.364	PC	-	79.00	59.00	29.00
01-0265-0627-07	7.6	2	0.6	6.364	PS	-	79.00	59.00	29.00
01-0266-0627-01	7.6	2	0.6	6.364	PMMA	hydrophilized	98.00	78.00	38.00
01-0267-0627-02	7.6	2	0.6	6.364	Topas	hydrophilized	98.00	78.00	38.00
01-0268-0627-03	7.6	2	0.6	6.364	PC	hydrophilized	98.00	78.00	38.00
01-0269-0627-07	7.6	2	0.6	6.364	PS	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.

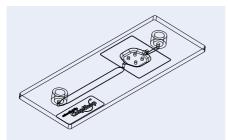


Fig. 31: Schematic drawing of a straight channel chip with additional large chamber



Fig. 32: Straight channel chip – transparent



Fig. 33: Straight channel chip – transparent with spotted probes

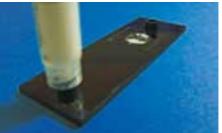


Fig. 34: Straight channel chip - black

Product Code	Channel   Width Depth Length		Volume chamber	Material	Price [€/chip]			
	[µm]	[µm]	[mm]	[µI]		1+	10+	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
01-0198-0095-02.1	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  $500\,\mu l$  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.

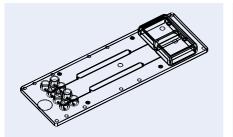


Fig. 35: Schematic drawing of a straight channel chip with waste chamber 0272

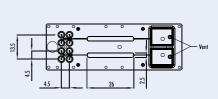


Fig. 36: Details straight channel chip with waste chamber 0272

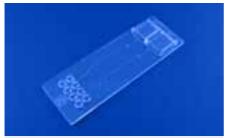


Fig. 37: Straight channel chip 0272

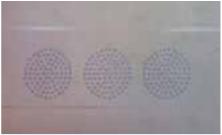


Fig. 38: Spotted probes (diameter 80  $\mu\mathrm{m})$  in straight channel chip 0272

Product Code	Channel Width Depth Length		Lid Thickness	Material	Surface treatment	Price [€/chip]			
	[µm]	[µm]	[mm]	[µm]			1+	10+	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

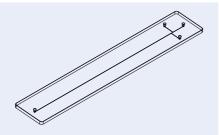


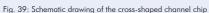
### 2.4 Cross-shaped channel chips

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





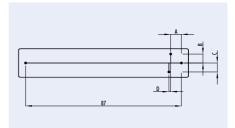


Fig. 40: Details of the cross-shaped channel chips

Product Code		Chann Depth	iel i Length	Hole Dia- meter	A	Geor B	netry C	D	Lid Thick- ness	Mate- rial		Price	[€/chip	]
	[µm]	[µm]	[mm]	[mm]		[mi	m]		[µm]		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

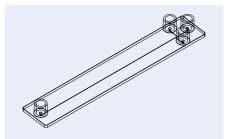


Fig. 41: Schematic drawing of the cross-shaped channel chip

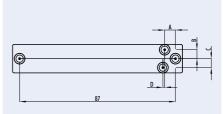


Fig. 42: Details of the cross-shaped channel chips with Luer interfaces  $% \left( 1\right) =\left( 1\right) \left( 1\right) \left($ 



Fig. 43: Cross-shaped channel chip with Luer interfaces



Fig. 44: Cross-shaped channel chip with female Luer interface and a syringe as male counterpart

Product Code		Chanr Depth	iel Length	Hole- Geometry Dia- A B C D meter		Lid Thick- ness	Mate- rial	Price [€/chip]			]			
	[µm]	$[\mu m]$	[mm]	[mm]		[mı	m]		[µm]		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	Width	Chanr Depth	el Length	Hole- Dia- meter	A	Geon B	netry C	D	Lid Thick- ness	Mate- rial		Price	[€/chip	]
	[µm]	[µm]	[mm]	[mm]		[mı	m]		[µm]		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	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	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	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.

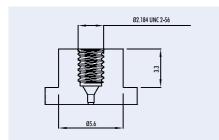


Fig. 45: Detail of thread in cross-shaped channel chip fluidic interface



Fig. 46: 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

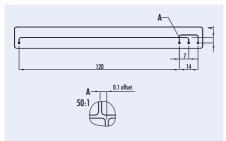


Fig. 47: Details of cross-shaped channel chip with through holes



Fig. 48: Cross-shaped channel chip with through-holes

Product Code	Cho Width [µm]	annel Depth [µm]	Cover Lid Thickness [µm]	Material	Pri 1 +	ce [€/cł 10+	nip] 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

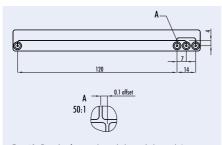


Fig. 49: Details of cross-shaped channel chip with Luer interfaces



Fig. 50: Cross-shaped channel chip with Luer interfaces

Product Code	Cho Width [µm]	innel Depth [μm]	Cover Lid Thickness [µm]	Material	Pri	ce [€/cł 10+	nip]
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 – Microscopy slide format – Fluidic interface: Mini Luer

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

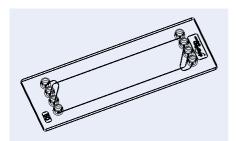


Fig. 51: Schematic drawing cross-shaped channel chips 0160 and 0161



Fig. 52: Cross-shaped channel chip in the format of a microscopy slide with Mini Luer fluidic interfaces

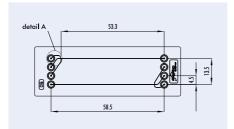


Fig. 53: Detail cross-shaped channel chip 0160

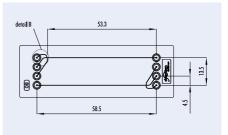


Fig. 54: Detail cross-shaped channel chip 0161

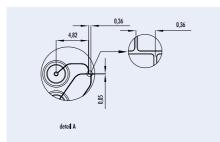
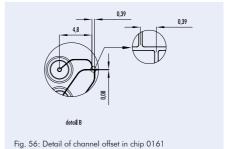


Fig. 55: Detail of channel offset in chip 0160



Product Code	Cho Width [µm]	innel Depth [μm]	Cover Lid Thickness [µm]	Material	Pri 1+	ce [€/cł 10+	nip] 30+
02-1050-0160-01	50	50	175	PMMA	42.50	31.20	23.50
02 1051 0160 02	50	50	140	Tongs	42.50	31.20	23.50

		Width [µm]	Depth [µm]	Thickness [µm]		1+	10+	30+
0	2-1050-0160-01	50	50	175	PMMA	42.50	31.20	23.50
0	2-1051-0160-02	50	50	140	Topas	42.50	31.20	23.50
0	2-1052-0161-01	80	80	175	PMMA	42.50	31.20	23.50
0	2-1053-0161-02	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.

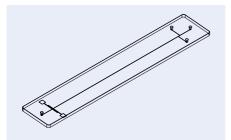


Fig. 57: Schematic drawing of the cross-shaped channel chip with electrodes

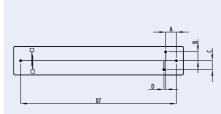


Fig. 58: Detail of cross-shaped channel chip with electrodes

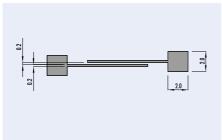


Fig. 59: Details of the electrodes



Fig. 60: Cross-shaped channel chips with through holes and electrodes

Product Code	Widtl	Chanr h Deptl	nel n Length	Hole Dia- meter			netry C		Е	Lid Thick- ness	Mate- rial	Price	[€/chip]	
	[µm]	[µm]	[mm]	[mm]		[m	m]			[µm]		1+	10+	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:

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<sup>4</sup>D (capacitively coupled contactless conductivity detection). Chapter 8.2 highlights the respective instrument that allows for an easy use of these chips for several kinds of applications.





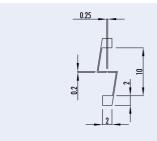


Fig. 61: Details of the electrodes



Fig. 62: Cross-shaped channel chip with electrodes for contactless conductivity detection

Product Code	Width	Chanr n Depth	nel n Length [mm]	Hole Dia- meter	Geometry A B C D	Lid Thick- ness [µm]	Mate- rial	Prio	ce [€/ch	nip]
03-0110-0082-01	50	50	87.0	1.0	6.0 5.0 5.0 0	60	РММА	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.

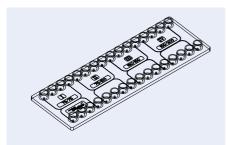


Fig. 63: Schematic drawing of the H-shaped channel chip Fluidic 164

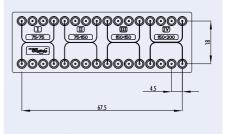


Fig. 64: Detail of H-shaped channel chip





Product Code	Channel Dimensions   II III IV Width inlet & outlet / middle  µm]  µm]  µm]  µm]	All Depth [µm]	Lid Thick- ness [µm]	Mate- rial	Price [€/chip]
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 and reaction cavity chips – 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 8.

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.

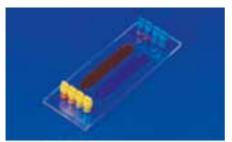


Fig. 65: Rhombic chamber chip filled



Fig. 66: Rhombic chamber chip in handling frame connected to PCR chip

### Rhombic chamber chip eP1

The rhombic chamber chips eP1 can be used with our ChipGenie edition P instrument, see Chapter 8, page 115.



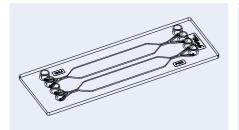


Fig. 67: Schematic drawing of the rhombic chamber chip Fluidic  $172\,$ 

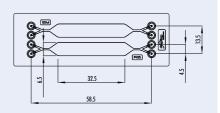


Fig. 68: Rhombic chamber chip  $-120~\mu$ l chamber volume

Product Code	Chamber		Lid Thickness	Material	Surface Treatment	Price [€/chip]			
	Volume [µl]	Depth [µm]	[µm]		ireatment	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	

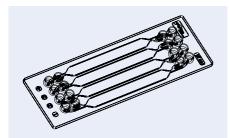


Fig. 69: Schematic drawing of the rhombic chamber chip Fluidic  $221\,$ 

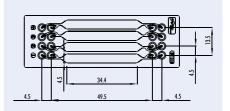


Fig. 70: Rhombic chamber chip – 100  $\mu$ l chamber volume

Product Code	Char Volume		Lid Thickness	Material   Surface		[2,		
	volume [μl]	Depth [µm]	[µm]		ireaimeni	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



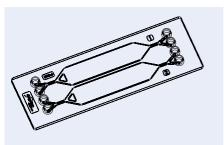


Fig. 71: Schematic drawing of the rhombic chamber chip Fluidic 194

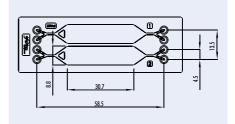


Fig. 72: Rhombic chamber chip – 250  $\mu$ l chamber volume

Product Code		Chamber   Volume Depth		Lid   Material		Price [€/chip]		
	[μl]	[μm]	[µm]		Treatment	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

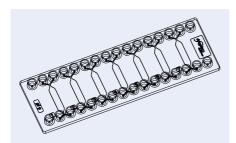


Fig. 73: Schematic drawing of the rhombic chamber chip Fluidic  $132\,$ 

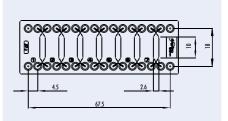


Fig. 74: Rhombic chamber chip – 6  $\mu$ l chamber volume

Product Code   Cha		nber Depth			Surface Treatment	Price [€/chip]			
	[μl]	[µm]	[µm]		neumem	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	



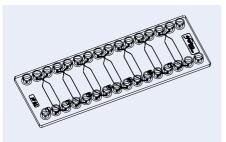


Fig. 75: Schematic drawing of the rhombic chamber chip Fluidic 439

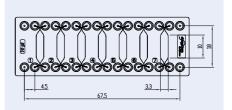


Fig. 76: Rhombic chamber chip – chamber volume 10  $\mu$ l

Product Code	oduct Code   Chamber   Volume Depth		Lid   Material   Thickness		Surface     Treatment	Price [€/chip]		
	[μl]	[µm]	[µm]		rredimeni	1+	10+	100+
12-0960-0439-01	10	250	175	PMMA	-	36.20	24.30	16.10
12-0961-0439-02	10	250	140	Topas	-	36.20	24.30	16.10
12-0962-0439-05	10	250	188	Zeonor	-	36.20	24.30	16.10
12-0963-0439-01	10	250	175	PMMA	hydrophilized	39.20	26.30	17.80
12-0964-0439-02	10	250	140	Topas	hydrophilized	39.20	26.30	17.80
12-0965-0439-05	10	250	188	Zeonor	hydrophilized	39.20	26.30	17.80

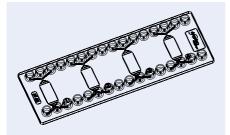


Fig. 77: Schematic drawing of the rhombic chamber chip Fluidic 131

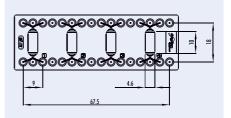


Fig. 78: Rhombic chamber chip – 20  $\mu$ l chamber volume

Product Code	Chamber     Volume Depth		Lid   Thickness	Material	Material   Surface		Price [€/chip]			
	volume [μl]	Depin [μm]	[µm]		realment	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		



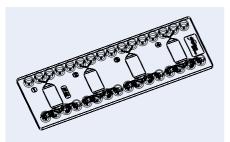


Fig. 79: Schematic drawing of the rhombic chamber chip Fluidic 133

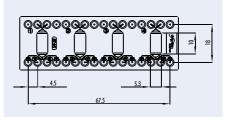


Fig. 80: Rhombic chamber chip – 24  $\mu$ l chamber volume

Product Code	Chamber Volume Depth		Lid Thickness	Material	Surface Treatment	Price [€/chip]			
	νοιοιπ <b>ε</b> [μΙ]	[µm]	[µm]		ireaimeni	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	

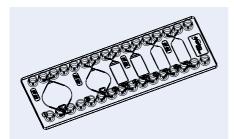


Fig. 81: Schematic drawing of the rhombic chamber chip Fluidic 134

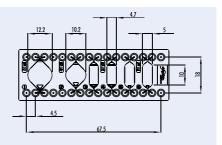


Fig. 82: Rhombic chamber chip – chamber volumes: 60  $\mu\text{I}$  , 40  $\mu\text{I}$  , 2 x 20  $\mu\text{I}$  , 2 x 10  $\mu\text{I}$ 



Product Code	Chamber     Volume Depth		Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	[μl]	[µm]	[µm]		iredillielli	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	

# 2.6.3 Reaction chamber chips

# 2.6.3.1 Reaction chamber chips – 10 $\mu$ l volume

# 2.6.3.1.1 Reaction chamber chips – 10 $\mu$ l volume – 350 $\mu$ m chamber depth

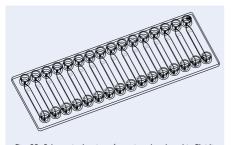


Fig. 83: Schematic drawing of reaction chamber chip Fluidic 561 – chamber volume 10  $\mu \rm l$ 

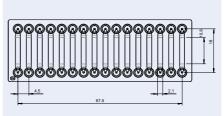


Fig. 84: Reaction chamber chip Fluidic 561 – chamber volume 10  $\mu \rm l$ 

Product Code	Chamber   Lid   Volume Depth   Thickne		Lid   Thickness	Material	Surface	Price [€/chip]			
	[μl]	[µm]	[µm]		ireaimeni	1+	10+	100+	
12-0972-0561-02	10	350	140	Topas	-	36.20	24.30	16.10	
12-0973-0561-03	10	350	175	PC	÷	36.20	24.30	16.10	
12-0974-0561-05	10	350	188	Zeonor	-	36.20	24.30	16.10	
12-0975-0561-02	10	350	140	Topas	hydrophilized	39.20	26.30	17.80	
12-0976-0561-03	10	350	175	PC	hydrophilized	39.20	26.30	17.80	
12-0977-0561-05	10	350	188	Zeonor	hydrophilized	39.20	26.30	17.80	



# 2.6.3.1.2 Reaction chamber chips – 10 $\mu$ l volume – 500 $\mu$ m chamber depth

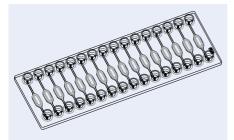


Fig. 85: Schematic drawing of reaction chamber chip Fluidic 585 – chamber volume 10  $\mu$ l

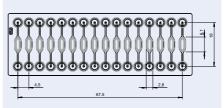


Fig. 86: Reaction chamber chip Fluidic 585 – chamber volume 10  $\mu$ l

Product Code	Chamber   Volume Depth		Lid   Thickness	Material	Surface Treatment	Price [€/chip]		
	νοισιπε [μΙ]	[µm]	[µm]		rredimeni	1+	10+	100+
12-0978-0585-02	10	500	140	Topas	-	36.20	24.30	16.10
12-0979-0585-03	10	500	175	PC	-	36.20	24.30	16.10
12-0980-0585-05	10	500	188	Zeonor	-	36.20	24.30	16.10
12-0981-0585-02	10	500	140	Topas	hydrophilized	39.20	26.30	17.80
12-0982-0585-03	10	500	175	PC	hydrophilized	39.20	26.30	17.80
12-0983-0585-05	10	500	188	Zeonor	hydrophilized	39.20	26.30	17.80

# 2.6.3.1.3 Reaction chamber chips – 10 $\mu$ l volume – 700 $\mu$ m chamber depth

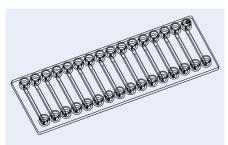


Fig. 87: Schematic drawing of reaction chamber chip Fluidic 558 – chamber volume 10  $\mu l$ 

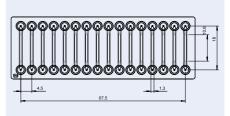


Fig. 88: Reaction chamber chip Fluidic 558 – chamber volume 10  $\mu$ l

Product Code	Chamber   Volume Depth		Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	[μl]	[μm]	[µm]		lieuilleill	1+	10+	100+	
12-0984-0558-02	10	700	140	Topas	-	36.20	24.30	16.10	
12-0985-0558-03	10	700	175	PC	=	36.20	24.30	16.10	
12-0986-0558-05	10	700	188	Zeonor	=	36.20	24.30	16.10	
12-0987-0558-02	10	700	140	Topas	hydrophilized	39.20	26.30	17.80	
12-0988-0558-03	10	700	175	PC	hydrophilized	39.20	26.30	17.80	
12-0989-0558-05	10	700	188	Zeonor	hydrophilized	39.20	26.30	17.80	



# 2.6.3.2 Reaction chamber chips – 20 $\mu$ l volume

# 2.6.3.2.1 Reaction chamber chips – 20 $\mu$ l volume – 350 $\mu$ m chamber depth

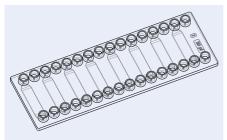


Fig. 89: Schematic drawing of reaction chamber chip Fluidic 559 – chamber volume 20  $\mu l$ 

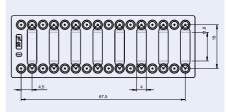


Fig. 90: Reaction chamber chip Fluidic 559 – chamber volume 20  $\mu$ l

Product Code	Chamber Volume Depth		Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	volume [μl]	[µm]	[µm]		ireaimeni	1+	10+	100+	
12-0990-0559-02	20	350	140	Topas	-	36.20	24.30	16.10	
12-0991-0559-03	20	350	175	PC	-	36.20	24.30	16.10	
12-0992-0559-05	20	350	188	Zeonor	-	36.20	24.30	16.10	
12-0993-0559-02	20	350	140	Topas	hydrophilized	39.20	26.30	17.80	
12-0994-0559-03	20	350	175	PC	hydrophilized	39.20	26.30	17.80	
12-0995-0559-05	20	350	188	Zeonor	hydrophilized	39.20	26.30	17.80	

# 2.6.3.2.2 Reaction chamber chips – 20 $\mu$ l volume – 500 $\mu$ m chamber depth

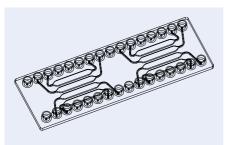


Fig. 91: Schematic drawing of the reaction chamber chip Fluidic 478

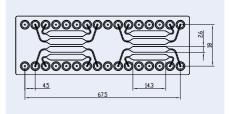


Fig. 92: Rhombic chamber chip – chamber volume 20  $\mu$ l



Product Code			Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	[μl]	[μm]	[µm]		Iredifficili	1+	10+	100+	
12-0966-0478-01	20	500	175	PMMA	-	36.20	24.30	16.10	
12-0967-0478-02	20	500	140	Topas	-	36.20	24.30	16.10	
12-0968-0478-05	20	500	188	Zeonor	-	36.20	24.30	16.10	
12-0969-0478-01	20	500	175	PMMA	hydrophilized	39.20	26.30	17.80	
12-0970-0478-02	20	500	140	Topas	hydrophilized	39.20	26.30	17.80	
12-0971-0478-05	20	500	188	Zeonor	hydrophilized	39.20	26.30	17.80	

# 2.6.3.2.3 Reaction chamber chips – 20 $\mu$ l volume – 500 $\mu$ m chamber depth

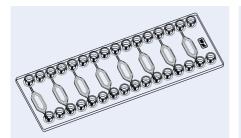


Fig. 93: Schematic drawing of the reaction chamber chip Fluidic 584

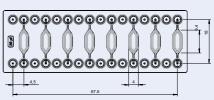


Fig. 94: Reaction chamber chip Fluidic 584 – chamber volume 20  $\mu$ l

Product Code   Chamber   Volume Depth		Lid   Thickness			Price [€/chip]			
	[µl]	[µm]	[µm]		Treatment	1+	10+	100+
12-0996-0584-02	20	500	140	Topas	-	36.20	24.30	16.10
12-0997-0584-03	20	500	175	PC	=	36.20	24.30	16.10
12-0998-0584-05	20	500	188	Zeonor	=	36.20	24.30	16.10
12-0999-0584-02	20	500	140	Topas	hydrophilized	39.20	26.30	17.80
12-1000-0584-03	20	500	175	PC	hydrophilized	39.20	26.30	17.80
12-1400-0584-05	20	500	188	Zeonor	hydrophilized	39.20	26.30	17.80

# 2.6.3.2.4 Reaction chamber chips – 20 $\mu$ l volume – 700 $\mu$ m chamber depth

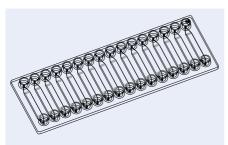


Fig. 95: Schematic drawing of the reaction chamber chip Fluidic 556

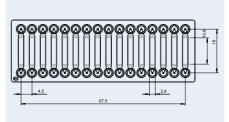


Fig. 96: Reaction chamber chip Fluidic 556 – chamber volume 20  $\mu \rm l$ 



Product Code	addi dada   Cilanisti   Lia		Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	[μl]	[μm]	[µm]		Iredifficili	1+	10+	100+	
12-1401-0556-02	20	700	140	Topas	-	36.20	24.30	16.10	
12-1402-0556-03	20	700	175	PC	-	36.20	24.30	16.10	
12-1403-0556-05	20	700	188	Zeonor	=	36.20	24.30	16.10	
12-1404-0556-02	20	700	140	Topas	hydrophilized	39.20	26.30	17.80	
12-1405-0556-03	20	700	175	PC	hydrophilized	39.20	26.30	17.80	
12-1406-0556-05	20	700	188	Zeonor	hydrophilized	39.20	26.30	17.80	

# 2.6.3.3 Reaction chamber chips – 50 $\mu$ l volume

# 2.6.3.3.1 Reaction chamber chips – $50~\mu l$ volume – $350~\mu m$ chamber depth

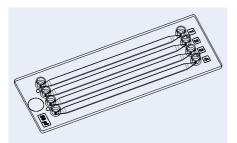


Fig. 97: Schematic drawing of the reaction chamber chip Fluidic 560

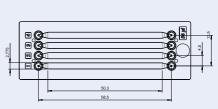


Fig. 98: Reaction chamber chip Fluidic 560 – chamber volume 50  $\mu l$ 

Product Code			Lid   Thickness	Material   Surface		[-/		
	[µI]	[µm]	[µm]		ireaimeni	1+	10+	100+
12-1407-0560-02	50	350	140	Topas	-	36.20	24.30	16.10
12-1408-0560-03	50	350	175	PC	-	36.20	24.30	16.10
12-1409-0560-05	50	350	188	Zeonor	-	36.20	24.30	16.10
12-1410-0560-02	50	350	140	Topas	hydrophilized	39.20	26.30	17.80
12-1411-0560-03	50	350	175	PC	hydrophilized	39.20	26.30	17.80
12-1412-0560-05	50	350	188	Zeonor	hydrophilized	39.20	26.30	17.80



#### 2.6.3.3.2 Reaction chamber chips – 50 $\mu$ l volume – 500 $\mu$ m chamber depth

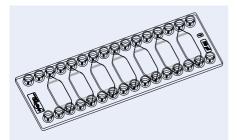


Fig. 99: Schematic drawing of the reaction chamber chip Fluidic 557

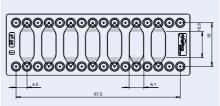


Fig. 100: Reaction chamber chip Fluidic 557 – chamber volume 50  $\mu$ l

Product Code   Chamber   Volume Depth		Lid   Thickness	Material	Surface Treatment	Price [€/chip]			
	[μl]	[µm]	[µm]		Irealmeni	1+	10+	100+
12-1413-0557-02	50	500	140	Topas	-	36.20	24.30	16.10
12-1414-0557-03	50	500	175	PC	-	36.20	24.30	16.10
12-1415-0557-05	50	500	188	Zeonor	-	36.20	24.30	16.10
12-1416-0557-02	50	500	140	Topas	hydrophilized	39.20	26.30	17.80
12-1417-0557-03	50	500	175	PC	hydrophilized	39.20	26.30	17.80
12-1418-0557-05	50	500	188	Zeonor	hydrophilized	39.20	26.30	17.80

#### 2.6.3.4 Reaction chamber chips – various volume chambers

The reaction chamber chips with an arrangement of chambers having the same dimensions besides the cavity depth and different volumes allow for the direct comparison of the channel depth influence on the assay and the measurement. These chips assist in the choice of the right channel dimensions in the design process of integrated microfluidic devices.

#### 2.6.3.4.1 Reaction chamber chips – various volume chambers – fluidic interfaces: Mini Luer

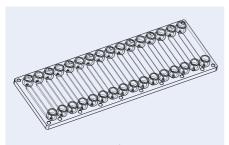


Fig. 101: Schematic drawing of the reaction chamber chip Fluidic 620

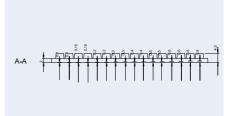


Fig. 102: Schematic drawing of reaction chamber chip – Fluidic 620



Product Code	Chamber Volume Depth [µI] [µm]	Lid Thickness [µm]	Material	Surface Treatment	Pri	ice [€/cl	hip] 100+
12-1419-0620-01	3.6 – 28.8 100 - 800	175	PMMA	-	36.20	24.30	16.10
12-1420-0620-02	3.6 – 28.8 100 - 800	140	Topas	-	36.20	24.30	16.10
12-1421-0620-07	3.6 – 28.8 100 - 800	125	PS	-	36.20	24.30	16.10
12-1422-0620-01	3.6 – 28.8 100 - 800	175	PMMA	hydrophilized	39.20	26.30	17.80
12-1423-0620-02	3.6 – 28.8 100 - 800	140	Topas	hydrophilized	39.20	26.30	17.80
12-1424-0620-07	3.6 – 28.8 100 - 800	125	PS	hydrophilized	39.20	26.30	17.80

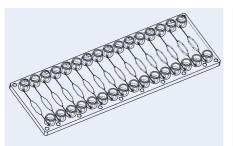


Fig. 103: Schematic drawing of the reaction chamber chip Fluidic 621



Fig. 104: Schematic drawing of reaction chamber chip – Fluidic 621

Product Code   Chamber   Volume Depth		Lid Thickness			Price [€/chip]		
	[μl] [μm]	[µm]		Treatment	1+	10+	100+
12-1425-0621-01	1.2 – 10.2 100 - 800	175	PMMA	-	36.20	24.30	16.10
12-1426-0621-02	1.2 – 10.2 100 - 800	140	Topas	-	36.20	24.30	16.10
12-1427-0621-07	1.2 – 10.2 100 - 800	125	PS	-	36.20	24.30	16.10
12-1428-0621-01	1.2 – 10.2 100 - 800	175	PMMA	hydrophilized	39.20	26.30	17.80
12-1429-0621-02	1.2 – 10.2 100 - 800	140	Topas	hydrophilized	39.20	26.30	17.80
12-1430-0621-07	1.2 – 10.2 100 - 800	125	PS	hydrophilized	39.20	26.30	17.80

# 2.6.3.4.2 Reaction chamber chips – various volume chambers – Pipetting interfaces

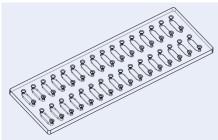


Fig. 105: Schematic drawing of the reaction chamber chip Fluidic  $622\,$ 

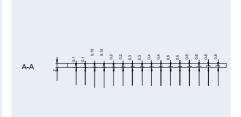


Fig. 106: Schematic drawing of reaction chamber chip – Fluidic  $622\,$ 



Product Code	Product Code   Chamber   Volume Depth		Lid   Material   Thickness		Price [€/chip]		
	[µl] [µm]	[µm]		Treatment	1+	10+	100+
12-1431-0622-01	1.2 – 10.2 100 - 800	175	PMMA	-	36.20	24.30	16.10
12-1432-0622-02	1.2 – 10.2 100 - 800	140	Topas	-	36.20	24.30	16.10
12-1433-0622-07	1.2 – 10.2 100 - 800	125	PS	-	36.20	24.30	16.10
12-1434-0622-01	1.2 – 10.2 100 - 800	175	PMMA	hydrophilized	39.20	26.30	17.80
12-1435-0622-02	1.2 – 10.2 100 - 800	140	Topas	hydrophilized	39.20	26.30	17.80
12-1436-0622-07	1.2 – 10.2 100 - 800	125	PS	hydrophilized	39.20	26.30	17.80

#### 2.7 Droplet generator chip and integrated droplet generation solutions

A family of droplet generator chips in various designs allows for the generation of droplets in different sizes and frequencies. Integrated chips exceeding the droplet generation function e.g. with combining droplet generation with droplet storage for an afterwards separate optical analysis allowing a wide variety of experiments.

The chips can be operated in pumping or sucking mode. Application notes can be found in the respective chapter.

As fluidic interfaces female Mini Luer and female Luer adapters are integrated. The female Luer adapter due to their large volume not only allow to serve as fluidic interface but also as liquid reservoir. Standard oils that are released by *microfluidic ChipShop* neither harming standard biological reactions nor the microfluidic chip materials can be found in the accessories chapter with recommendation for different chip materials.

#### 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.

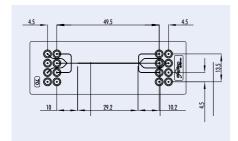


Fig. 107: Detail of droplet generator Fluidic 162

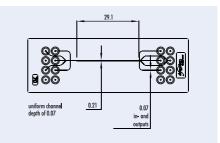


Fig. 108: Channel dimensions of droplet generator Fluidic 162

Product Code	Input Channel Width [µm]	Collection Channel Width [µm]	Channel Depth [µm]	Lid Thickness [µm]	Material	Pri  1+	ce [€/cł 10+	nip] 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

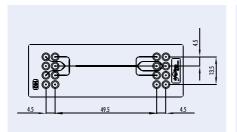


Fig. 109: Detail of droplet generator Fluidic 163

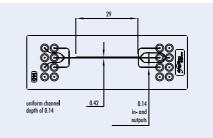


Fig. 110: Channel dimensions droplet generator Fluidic 163

Product Code	Input Channel Width [µm]	Collection Channel Width [µm]	Channel Depth [µm]	Lid Thickness [µm]	Material	Pr  1+	ice [€/cl 10+	hip] 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.

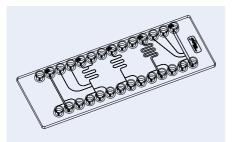


Fig. 111: Schematic drawing of droplet generator chip Fluidic 285

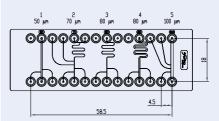


Fig. 112: Details droplet generator chip Fluidic 285

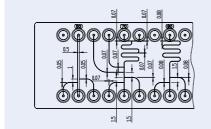


Fig. 113: Details of channel dimensions and off-sets of structures 1-3 of chip Fluidic 285

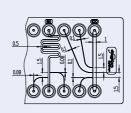


Fig. 114: Details of channel dimensions and off-sets of structures 4-5 of chip Fluidic 285

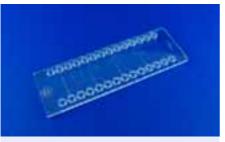


Fig. 115: Droplet generator Fluidic 285



Fig. 116: Droplet generator chip Fluidic 285 in evaluation set-up

Product Code	Lid Thickness [µm]	Material		ice [€/cl 10+	
13-1005-0285-02	140	Topas	42.20	34.30	26.10
13-1006-0285-03	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  $80\,\mu\text{m}$ ,  $70\,\mu\text{m}$ ,  $60\,\mu\text{m}$  and  $50\,\mu\text{m}$  channel width and height. Each size version comes with two different outlet channel width.

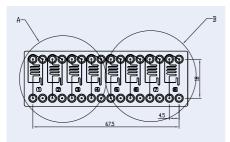


Fig. 117: Droplet generator Fluidic 440 – droplet size variation

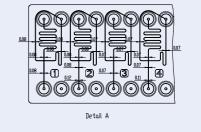


Fig. 118: Droplet generator – droplet size variation – details structures 1 - 4

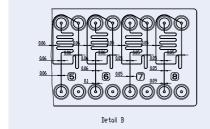


Fig. 119: Droplet generator – droplet size variation – details structures 5 - 8

Product Code	Lid Thickness	Material		ice [€/cl 10+	
13-1007-0440-02	140	Topas	42.20	34.40	26.10
13-1008-0440-03	175	PC	42.20	34.40	26.10

# 2.7.2.3 Droplet generator chip – Four elements on one chip design

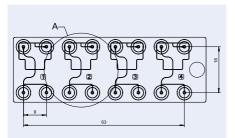


Fig. 120: Schematic drawing of droplet generator chip Fluidic 537

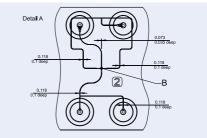


Fig. 121: Droplet generator chip Fluidic 537 – detail channel dimensions

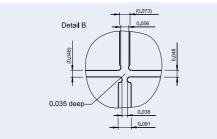


Fig. 122: Droplet generator chip Fluidic 537 – detail cross element

Product Code 13-1009-0537-02	Lid Thickness	Material	Pri	ce [€/cł 10+	nip] 100+	
	13-1009-0537-02	140	Topas	42.20	34.40	26.10
	13-1010-0537-03	175	PC	42.20	34.40	26.10



# 2.7.2.4 Double emulsion (Droplet in droplet) generator chip – Three elements on one chip design

This droplet generator chip with a double-cross geometry allows for the generation of double emulsions such as the inclusion of droplets or cells deriving from the first channel intersection in a further droplet shell at the second channel intersection.

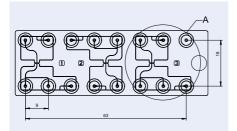


Fig. 123: Schematic drawing of droplet in droplet generator chip Fluidic 536

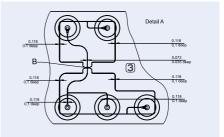


Fig. 124: Droplet in droplet generator chip Fluidic 536 – channel dimension

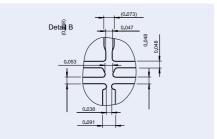


Fig. 125: Droplet in droplet generator chip Fluidic 536 – detail channel intersection element

Product Code	Lid Thickness [µm]	Material		ice [€/cl 10+	nip] 100+
13-1011-0536-02	140	Topas	42.20	34.40	26.10
13-1012-0536-03	175	PC	42.20	34.40	26.10

#### 2.7.3 Droplet generation and storage chip

This droplet generation chip combines the generation of the droplets with the storage and capture of single droplets for optical analysis.

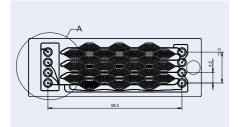


Fig. 126: Schematic drawing of droplet in droplet generator and storage chip Fluidic 488

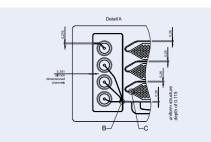


Fig. 127: Droplet in droplet generator and storage chip Fluidic 488 – detail channel dimensions

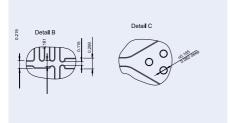


Fig. 128: Droplet in droplet generator and storage chip Fluidic 488 – detail channel intersection and storage element



Fig. 129: Droplet in droplet generator chip Fluidic 488

Product Code	Lid Thickness [µm]	Material	Price [€/chip] 1+ 10+ 100+				
13-1013-0488-02	140	Topas	42.20	34.40	26.10		
13-1014-0488-03	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 01Rl0643D.

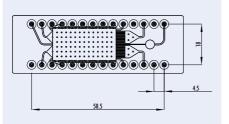


Fig. 130: Details of the field flow fractionation chip Fluidic 120



Fig. 131: Field flow fractionation chip Fluidic 120

Product Code	Lid Thickness [µm]	Material	Surface Treatment	Pri	ice [€/cl	nip] 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

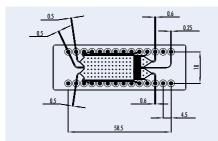


Fig. 132: Details of the field flow fractionation chip Fluidic 159



Fig. 133: Field flow fractionation chip Fluidic 159

Product Code	Lid Thickness [µm]	Material	Surface Treatment	Pri	ice [€/cl 10+	nip] 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.

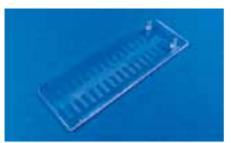


Fig. 134: 15-cycle chip Fluidic 47



Fig. 135: 36-cycle chip Fluidic 65



Fig. 136: Schematic drawing of 40 cycle continuous-flow PCR chip Fluidic 243

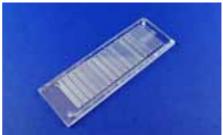


Fig. 137: 40 cycle continuous-flow PCR chip Fluidic 243

Product Code	Lid Thickness	Material	rial   Comments Design   Channel Dimensions		Price [€/chip]				
	[µm]	Width / Depth / Length		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  $14 \times 14$  (well spacing of  $1,125 \mu m$ ),  $28 \times 28$  (well spacing of  $562.5 \mu m$ ), and  $60 \times 60$  (well spacing of  $281.25 \mu m$ ) single wells.







Fig. 139: Nanotiter plate - well detail

Product Code	Well   Depth		'ell Size [µ Structure 2			Spacing [µm] ructure	_	Mate- rial	:-   F		rice [€/chip]		
	[µm]	Top Bot.	Top Bot.	Top Bot.	1	2 3			1+	10+	50+	100-	-500+
05-0133-0018-0	20	124 96	224 196	424 396	281.25	562.5 1	125	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 1	125	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 1	125	PC	40.00	30.00	9.00	7.00	5.20
05-0138-0018-0	20	124 96	224 196	424 396	281.25	562.5 1	125	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 1	125	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.

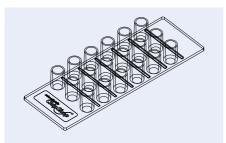


Fig. 140: Schematic drawing of the 18-well titer plate Fluidic 141



Fig. 141: 18-well microtiter-plate

Product Code	Well Volume [μΙ]	Material	Pri 1+	ce [€/cł 10+	nip] 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 microtiter 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.

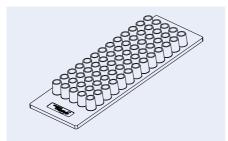


Fig. 142: 65-well chip Fluidic 383 - microscopy slide format

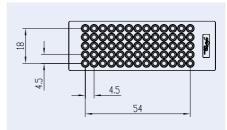


Fig. 143: Details 65-well chip Fluidic 383

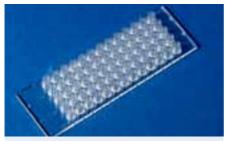


Fig. 144: 65-well chip Fluidic 383



Fig. 145: 65-well chip used as source plate in spotter

Product Code	Well Volume [μΙ]	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

One application of the membrane chips is the generation of plasma/serum from whole blood. While this application is rather prominent, these chips can be used for various filtering application by exchanging the membrane material and using various pore sizes. A range of different membranes is available at microfluidic ChipShop and can be integrated on request.

Please ask our team at sales@microfluidic-ChipShop.com by indicating your application and special needs.

#### 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  $12-15~\mu l$  plasma/serum out of  $25~\mu l$  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  $300~\mu m \times 100~\mu m$  (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  $100~\mu m \times 100~\mu m$  (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.

# 2.11.1.1 Plasma/serum generation chips - 10 mm diameter membrane



Fig. 146: Plasma/serum generation chip Fluidic 168



Fig. 147: Close-up of one plasma/serum generation unit

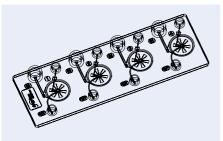
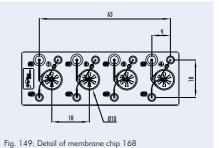


Fig. 148: Schematic drawing of membrane chip 168



58



Product Code   Description		Material	Pri 1 +	ice [€/cł 10+	
15-1503-0168-02	Chip with 4 plasma generation membranes	Topas	79.50	63.50	49.50

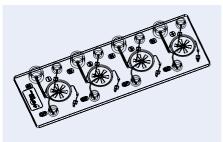


Fig. 150: Schematic drawing of membrane chip Fluidic 200

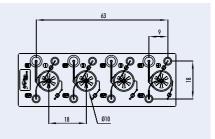


Fig. 151: Detail of membrane chip Fluidic 200

Product Code   Description		Material		ice [€/cł 10+	1.3
15-1504-0200-02	Chip with 4 plasma generation membranes	Topas	79.50	63.50	49.50

# 2.11.1.2 Plasma/serum generation chips - High capacity membrane chips

Due to a massively enlarged footprint of the membrane, these chips allow for the generation of larger volumes of plasma/serum. Depending on the blood sample achievable volumes ranges from 20-35  $\mu$ l.

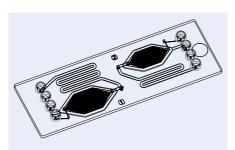


Fig. 152: Schematic drawing of membrane chip Fluidic 535



Fig. 153: Membrane chip Fluidic 535



Product Code	Description	Lid Thickness [µm]	Surface Treatment	Material	Pr	ice [€/cl 10+	nip] 100+
15-1507-0535-02	Membrane chip with 2 membrane generation units – Fluidic 535	140	-	Topas	79.50	63.50	42.50
15-1508-0535-07	Membrane chip with 2 membrane generation units – Fluidic 535	175	-	PS	79.50	63.50	42.50
15-1509-0535-02	Membrane chip with 2 membrane generation units – Fluidic 535	140	hydrophilized	Topas	89.50	69.40	47.10
15-1522-0535-07	Membrane chip with 2 membrane generation units – Fluidic 535	175	hydrophilized	PS	89.50	69.40	47.10

# 2.11.2 Cross-flow membrane chip

The cross-flow membrane chips have two in- and outlet ports above and below the membrane. This allows for experiments such as small molecule transfer measurements, on-chip dialysis or cell culture experiments. Upon request, the platform can be equipped with customer-specific membranes. Please contact us for feasibility and pricing.



Fig. 154: Schematic drawing of cross-flow membrane chip 398



Fig. 155: Cross-flow membrane chip 398

Product Code	Description	Lid Thickness [µm]	Material	Price [€/chip] 1+ 10+ 100+
15-1505-0398-02	Cross-flow membrane chip 398	140	Topas	79.50 63.50 49.50

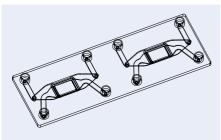


Fig. 156: Schematic drawing of cross-flow membrane chip 480



Fig. 157: Cross-flow membrane chip 480

# 2 Microfluidic chips - Polymers

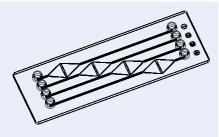


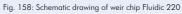


Product Code	Description	Lid Thickness [µm]	Surface Treatment	Material	Pr	ice [€/cł 10+	nip] 100+
15-1506-0480-02	Cross-flow membrane chip 480	140	-	Topas	79.50	63.50	42.50
15-1523-0480-07	Cross-flow membrane chip 480	175	-	PS	79.50	63.50	42.50
15-1524-0480-02	Cross-flow membrane chip 480	140	hydrophilized	Topas	89.50	69.40	47.10
15-1425-0480-07	Cross-flow membrane chip 480	175	hydrophilized	PS	89.50	69.40	47.10

#### 2.12 Weir-filter chip

The chip contains four channels with weir structures for retaining particles (e.g. beads, cells etc.) of different sizes.





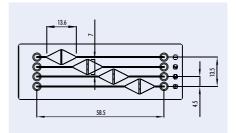


Fig. 159: Detail of weir chip Fluidic 220

Product Code	Slit   width /height	Lid   Thickness	-	Channel Width	Material	Surface Treat-	Price	[€/chip	o]
	[mm] [ $\mu$ m]	[µm]	[µm]	[µm]		ment	1+	10+	100+
14-1030-0220-03	7 20/10/10/5	175	500	500	PC	-	42.20	34.30	26.10
14-1031-0220-05	7 20/10/10/5	188	500	500	Zeonor	-	42.20	34.30	26.10
14-1032-0220-02	7 20/10/10/5	140	500	500	Topas	-	42.20	34.30	26.10
14-1033-0220-03	7 20/10/10/5	175	500	500	PC	hydrophilized	45.20	36.30	27.80
14-1034-0220-05	7 20/10/10/5	188	500	500	Zeonor	hydrophilized	45.20	36.30	27.80
14-1029-0220-02	7 20/10/10/5	140	500	500	Topas	hydrophilized	45.20	36.30	27.80

#### 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.



#### 2.13.1 Passive mixer

#### 2.13.1.1 Passive mixer – Diffusion mixer

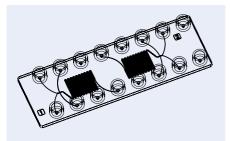


Fig. 160: Schematic drawing of diffusion mixer chip Fluidic 186

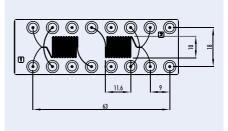


Fig. 161: Detail of diffusion mixer

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

# 2.13.1.2 Passive mixer - Herringbone mixer



Fig. 162: Herringbone mixer chip Fluidic 187

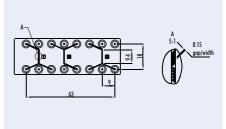


Fig. 163: Detail of herringbone mixer

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



# 2.13.1.3 Passive mixer – Phase guide mixer

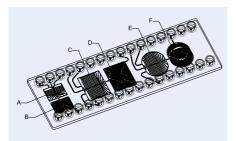


Fig. 164: Schematic drawing of phase guide mixer chip Fluidic 533

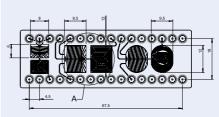


Fig. 165: Phase guide mixer chip Fluidic 533

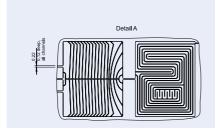


Fig. 166: Detail drawing of phase guide mixer chip Fluidic 533



Fig. 167: Phase guide mixer chip Fluidic 533

Product Code	Description	Chamber volumes	Lid Thickness [µm]	Surface Treatment	Material	Pri 1+	ce [€/cł 10+	nip] 100+
14-1041-0533-02	Phase guide mixer chip – Fluidic 533	A & B: 5.6 μl C & D: 13.2 μl E & F: 11.1 μl	140	-	Topas	42.20	34.30	26.10
14-1042-0533-02	Phase guide mixer chip – Fluidic 533	A & B: 5.6 μl C & D: 13.2 μl E & F: 11.1 μl	140	hydrophilized	Topas	46.20	37.60	28.60

# 2.13.2 Active mixer - Stir bar actuated mixer

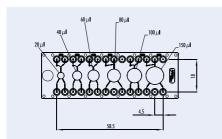


Fig. 168: Drawing of micro mixer chip with mixing chambers Fluidic 286



Fig. 169: Micro mixer with stir bars for active mixing



Product Code   Chamber volume				Chamber   Lid   depth   Thickness	Material	Price [€/chip]					
	[μl]	$[\mu I]$	$[\mu I]$	$[\mu I]$	$[\mu I]$	$[\mu I]$	[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	188	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.

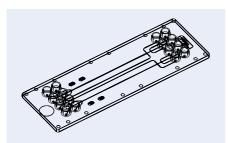


Fig. 170: Schematic drawing of cell sorting chip Fluidic 283

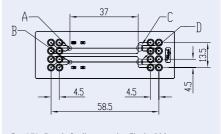


Fig. 171: Detail of cell sorting chip Fluidic 283

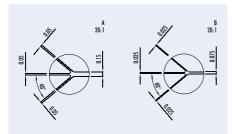


Fig. 172: Details of both entrance structures of cell sorting chip Fluidic 283

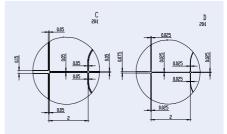


Fig. 173: Details of both outlet structures of cell sorting chip Fluidic 283



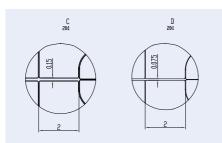


Fig. 174: Details of both outlet structures of cell sorting chip Fluidic 380 – only difference to chip 283

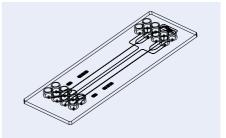


Fig. 175: Schematic drawing of cell sorting chip Fluidic 381

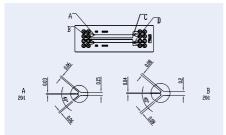


Fig. 176: Details of both inlet structures of cell sorting chip Fluidic  $381\,$ 

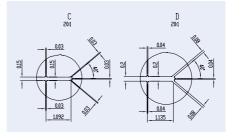


Fig. 177: Details of both outlet structures of cell sorting chip Fluidic 381 – only difference to chip 283



Fig. 178: Cell sorting chip Fluidic 283

Product Code	luct Code   Channel Depth   Structure 1 Structure 2		Cover Lid	Material	Pri	ce [€/cŀ	nip]
		[μm]	[µm]		1+	10+	30+
18-1700-0283-01	50	25	175	РММА	42.20	34.30	26.10
18-1701-0283-05	50	25	188	Zeonor	42.20	34.30	26.10
18-1702-0380-01	50	25	175	PMMA	42.20	34.30	26.10
18-1703-0380-05	50	25	188	Zeonor	42.20	34.30	26.10
18-1704-0381-01	30	30	175	PMMA	42.20	34.30	26.10
18-1705-0381-05	30	30	188	Zeonor	42.20	34.30	26.10

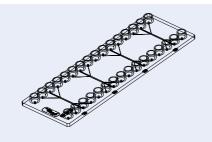


Fig. 179: Schematic drawing particle & cell sorter – Fl. 386

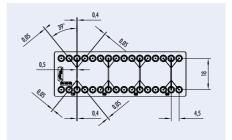


Fig. 180: Details particle & cell sorter – Fluidic 386

Product Code		Channel Depth Structure 1 Structure 2 Structure 3 Structure 4				Material	Pri	ce [€/cł	nip]
	[μm] [μm]	[µm]			[µm]		1+	10+	30+
18-1706-0386-01	10	20	30	50	175	PMMA	42.20	34.30	26.10
18-1707-0386-05	10	20	30	50	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.

The chip contains four sorting structures with the following parameters:

Structure	No. of turns	No. of outlets	Channel Width	Channel Depth
1	4	8	500	120
2	8	8	300	80
3	9	6	150	70
4	12	6	80	50

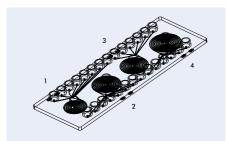


Fig. 181: Schematic drawing of the spirale sorter – Fl. 382



Fig. 182: Spiral sorter - Fluidic 382

Product Code	Lid Thickness [µm]	Material	Pri	ice [€/cl	nip] 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.

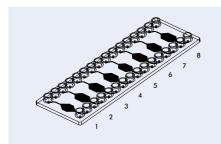


Fig. 183: Schematic drawing of pillar chip – Fluidic 261

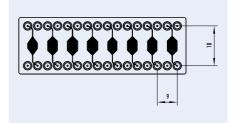


Fig. 184: Detail of pillar chip - Fluidic 261



Fig. 185: Pillar chip - Fluidic 261

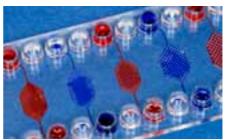


Fig. 186: Pillar chip filled - Fluidic 261

Product Code	Lid Thickness [µm]	Pillar No./diameter [µm]/ distance [µm]/depth	Material	Pri	ice [€/cl	nip] 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	РММА	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.

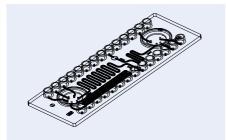


Fig. 187: Schematic drawing of turning valve test chip Fluidic 155

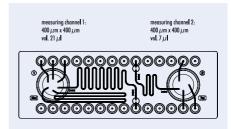


Fig. 188: Detail of turning valve test chip

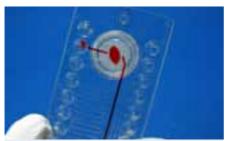


Fig. 189: Rotary valve with metering function



Fig. 190: Turning valve test chip with manual turning valve actuator

Product Code	Lid Thickness [µm]	Material	Price [€	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 [€]		
	19-1852-0000-00	Manual turning valve actuator	36.50		



#### 2.17 Blister test chip

The blister test chips are intended to evaluate liquid storage in blister pouches on chip. These chips can be obtained with and without blisters. Blisters are mounted on these chips with double sided adhesive tape that comes with the blister test chips.

Standard blisters are filled with dyed water and are available in different volumes.

#### 2.17.1 Blister test chip - Emptying and volume evaluation

This blister test chip equipped with two blisters followed by a straight channel or a channel with five cavities in line allowing for a measuring of 50  $\mu$ l each.

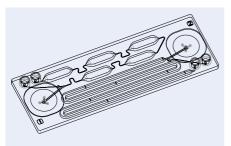


Fig. 191: Schematic drawing of blister test chip Fluidic 522



Fig. 192: Blister test chip Fluidic 522

Product Code	Description	Blister volume [µl]	Volume Measure- ment [µ1]	Lid Thickness	Surface treatment	Material	Pri 1+	ce [€/cł 10+	nip] 100+
23-1900-0522-02	Blister test chip – Fluidic 522	2x100	250	140	-	Topas	84.20	42.50	28.90
23-1901-0522-02	Blister test chip – Fluidic 522	2x 150	250	140	-	Topas	84.20	42.50	28.90
23-1902-0522-02	Blister test chip – Fluidic 522	2x 200	250	140	=	Topas	84.20	42.50	28.90
23-1903-0522-02	Blister test chip – Fluidic 522	2x 250	250	140	-	Topas	84.20	42.50	28.90
23-1904-0522-02	Blister test chip – Fluidic 522	2x 100	250	140	hydrophi- lized	Topas	87.20	45.50	31.90
23-1905-0522-02	Blister test chip – Fluidic 522	2x 150	250	140	hydrophi- lized	Topas	87.20	45.50	31.90
23-1906-0522-02	Blister test chip – Fluidic 522	2x 200	250	140	hydrophi- lized	Topas	87.20	45.50	31.90
23-1907-0522-02	Blister test chip – Fluidic 522	2x 250	250	140	hydrophi- lized	Topas	87.20	45.50	31.90



#### 2.18 Cuvette chips

The chip has different chamber depths within the measurement window allowing to enlarge the dynamic range of the analytical process.

# 2.18.1 Cuvette chip - Fluidic 527

Chip with eight parallel measurement cavities with three chamber depths.

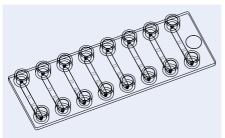
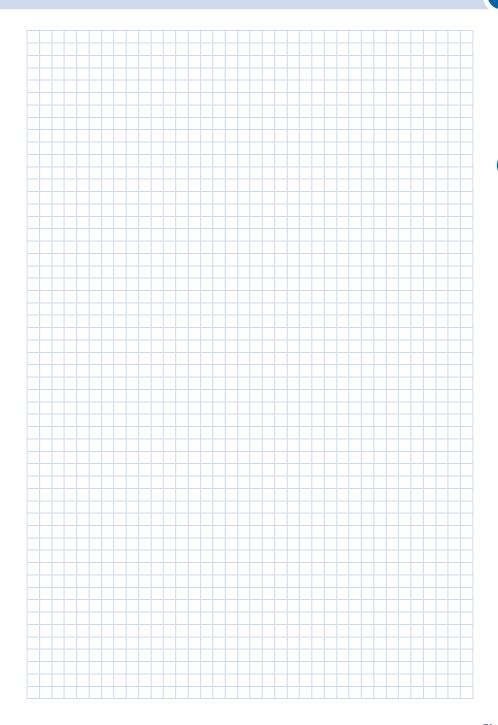


Fig. 193: Schematic drawing of cuvette chip – Fluidic 527



Fig. 194: Cuvette chip - Fluidic 527

Product Code	Description	Chamber- volume [µl]	depth [µm]		Thickness		Material	Pri 1+	ce [€/ch 10+	nip] 100+	
24-1950-0527-02	Cuvette chip – Fluidic 527	6,5	50	100	500	140	-	Topas	36.20	24.30	16.10
24-1951-0527-02	Cuvette chip – Fluidic 527	6,5	50	100	500	140	hydrophi- lized	Topas	39.20	26.30	17.80











# 3 Microfluidic chips – Integrated chips



## Microfluidic chips – Integrated chips

This chapter summarizes various integrated chips combining different fluidic functions. Depending on the operator's choice, these chips can be used for a variety of applications ranging from immunoassays, molecular based assays to the detection of small molecules. On request the surface can be modified or for hybridization assays DNA or protein arrays can be integrated. For any custom modification of these devices, please contact us for feasibility and pricing.



### 3.1 Assay chip 1 – on board metering, mixing and reaction

This integrated chip allows for the development of biological assays on chip. The chip enables for onchip metering, mixing and the detection of the reaction in a separate chamber.

For this purpose the chip is equipped with the following main elements:

- Metering cavity with 15 μl volume
- Metering loop with 17 μl volume
- Mixing chamber with 102 μl volume
- Reaction & detection chamber with 20  $\mu$ l volume
- Two turning valves

The liquids are controlled with the help of two turning valves, overfilling of the detection chamber is prevented through a liquid tight membrane, the sample can be introduced through the female Luer interface and further reagents or air pressure can be supplied through the female Mini Luer interfaces. To operate this chip Luer and Mini Luer male fluid connectors, Luer and Mini Luer plugs as well as silicone and Teflon tubings are of use to allow for the connection of the chip with pumps. Direct filling of the chip with a pipette is possible, the use of pipette connectors is appreciated by several operators. The turning valves can be rotated with a special manual turning valve manipulator. All these accessories are combined in the **integrated chip support kit 1**.

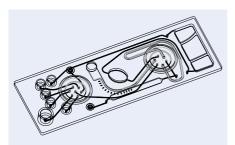


Fig. 195: Schematic drawing of assay chip 1 - Fluidic 429

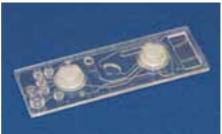


Fig. 196: Assay chip 1 – Fluidic 429 with on-chip metering, mixing, reaction and detection chamber and two integrated turning valves

Product Code	Description	Material   Lid Thickness		Price [€/chip]		
			[µm]	1+	10+	100+
21-6000-0429-02	Assay chip 1	Topas	140	128.50	69.60	38.98

Product Code	Kit Type	Product Description	Product Code	Price [€/kit]
11-0821-0000-00	Integrated chip support kit 1	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10) - Male Luer fluid connectors, green, material: PP (10) - Male Luer fluid connectors, green, material: PP (10) - Male Luer plugs, opaque, material: PP (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1) - Handling frame with high skirt, yellow (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0509-0263-09 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 19-1852-0000-00 15-4000-0000-12	197.14



## 3.2 Assay chip 2 – turning valve assisted fluid control with separate assay and reference cavities

# 3.2.1 Assay chip 2 – turning valve assisted fluid control with separate assay and reference cavities

This integrated chip allows for the development of hybridization assays on chip. Six 12  $\mu$ l cavities with 200  $\mu$ m depth can be used for spotting different kinds of arrays. Four of these chambers are are operated in row, two further separately. The separate chambers allow e.g. for control or quantification reactions and have pre-cavities to store dry reagents.

Sample injection is foreseen through a female Luer interface, reagent supply or air pressure through the female Mini Luer interfaces.

The chip is equipped with the following main elements:

- 6 reaction & detection chambers with 12  $\mu$ l volume
- 2 pre-storage chambers with 12  $\mu$ l volume
- 2 turning valves

The liquids are controlled with the help of two turning valves, sample injection is foreseen through a female Luer interface, reagent supply or air pressure through the female Mini Luer interfaces.

To operate this chip Luer and Mini Luer male fluid connectors, Luer and Mini Luer plugs as well as silicone and Teflon tubings are of use to allow for the connection of the chip with pumps. Direct filling of the chip with a pipette is possible, the use of pipette connectors is appreciated by several operators. The turning valves can be rotated with a special manual turning valve manipulator. All these accessories are combined in the **integrated chip support kit 1** (see kit description on page 74).

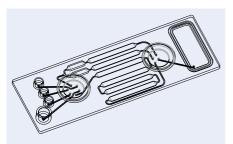


Fig. 197: Schematic drawing of assay chip 2 - Fluidic 292



Fig. 198: Assay chip 2- Fluidic 292 with hybridization chamber and integrated turning valve for fluid actuation

Product Code	Description	Material	Lid Thickness	Price [€/chip]		
			[µm]	1+	10+	100+
21-6001-0292-02	Assay chip 2	Topas	140	88.50	49.45	28.98
21-6002-0292-02.1	Assay chip 2	Topas, black	140	88.50	49.45	28.98



# 3.2.2 Assay chip 2 – turning valve assisted fluid control with separate assay and reference cavities including integrated arrays

The assay chip 2 as described in the previous chapter can be ordered with integrated arrays. microfluidic ChipShop will spot the desired molecules (e.g. DNA probes, antibodies, antigens etc.) on the polymer surface and will cover the chip with the thin cover foil. Reagents like antibodies or antigens and reference material have to be provided by the customer or will be charged separately. For the order of a special array a process set-up needs to be ordered in advance.

Product Code	Description	Price [€]
22-7000-0000-00	Process set-up custom array integration	1,980.00

Product Code	Description	Material	Lid Thickness	Price [€/chip]		
			[µm]	1+	10+	100+
21-6003-0292-02	Assay chip 2 with custom array	Topas	140	197.50	98.45	59.98
21-6004-0292-02.1	Assay chip 2 with custom array	Topas, black	140	88.50	49.45	28.98



Fig. 199: Assay chip 2 – Fluidic 292 with embedded DNA array

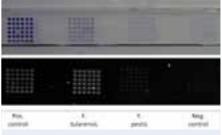


Fig. 200: Array integrated on chip



# 3.3 Assay chip 3 – Assay development chip for magnetic bead based or hybridization assays

A 300  $\mu$ m deep central chamber with 30  $\mu$ l inner volume is the reaction cavity of this chip. To keep the components in the chamber either magnetic beads can be used which need to be operated by an external magnet or catcher molecules have to be immobilized on the surface of the cavity. Controlled by two turning valves liquids can be supplied and removed, air pressure can be applied and venting can be ensured.

Liquid supply and air pressure are foreseen through the female Mini Luer interfaces on chip. The chip is equipped with the following main elements:

- Cavity with 30  $\mu$ l volume
- 2 turning valves

To operate this chip Mini Luer male fluid connectors, Mini Luer plugs as well as silicone and Teflon tubings are of use to allow for the connection of the chip with pumps. Direct filling of the chip with a pipette is possible, the use of pipette connectors is appreciated by several operators. The turning valves can be rotated with a special manual turning valve manipulator. All these accessories are combined in the **integrated chip support kit 3**.

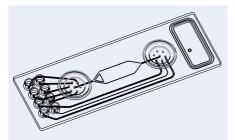


Fig. 201: Schematic drawing of assay chip 3 - Fluidic 490



Fig. 202: Assay chip 3 – Fluidic 490 with central reaction chamber and integrated turning valve for fluid actuation

	Product Code	Description	Material	Lid   Thickness  µm]	Pri	ice [€/cl	nip] 100+
Ī	21-6005-0490-02	Assay chip 3	Topas	140	75.40	42.45	26.37

Product Code	Kit Type	Product Description	Product Code	Price [€/kit]
11-0823-0000-00	Integrated chip support kit 3	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: PFE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1) - Handling frame with high skirt, yellow (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 19-1852-0000-00 15-4000-0000-12	159.64



### 3.4 Continuous-flow PCR chip with integrated sample preparation – Inline Chip

This integrated microfluidic chip combines the sample preparation, namely the extraction of DNA, and the later amplification of the DNA through continuous-flow-PCR. Reagents can be freely supplied through the various Mini Luer interfaces.

As accessories Mini Luer interfaces, Mini Luer plugs, silicone and PTFE tubes and the manual turning valve actuator are of use. The chip can be operated with the ChipGenie edition T2 (heating only) and ChipGenie edition T2O (with optical read-out) instruments.

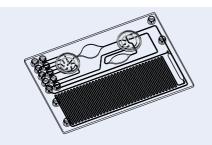


Fig. 203: Schematic drawing of integrated continuous flow PCR chip with sample preparation – Fluidic 501

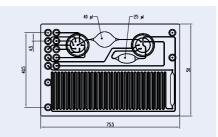


Fig. 204: Integrated continuous flow PCR chip with sample preparation – with dimensional measures



Fig. 205: ChipGenie edition T2



Fig. 206: ChipGenie edition T2O

Product Code	Lid Thickness [µm]	Material	Comments Design, Channel Dimensions	Prio	ice [€/chip]	
	μιτη			1.1	101	1001
08-0475-0501-03	200	PC	Integrated continuous flow chip, 35 cycles, PCR meander 200 µm deep & 400 µm wide, one 40 µl, one 25 µl cavity	132.98	64.60	39.76
08-0475-0501-02/05	100	Topas/Zeonor	Integrated continuous flow chip, 35 cycles, PCR meander 200 µm deep & 400 µm wide, one 40 µl, one 25 µl cavity	132.98	64.60	39.76

Product Code	Short product description	Product Description	Price [€/instrument]
08-0494-0000-00	ChipGenie edition T2	ChipGenie edition T2 instrument with 14 independent heating zones	22,295.00
08-0495-0000-00	ChipGenie edition T2O	ChipGenie edition T2O instrument with 14 independent heating zones and optical read-out for detection purposes	29,498.00



Product Code	Kit Type	Product Description	Product Code	Price [€/kit]
11-0830-0000-00	Integrated chip support kit 4	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0565-0391-09 29-0611-0000-08	144.64
		- PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1)	29-0803-0000-16 19-1852-0000-00	

# 3.5 Immunofiltration System for Analytical Applications: IFSA 1 Immunoassay Chip – Fritbased enrichment and detection system for immunoassays

The IFSA chip family combines lab-on-a-chip technology with the advantages of frit-based assays, namely the enrichment of the sample through filtration and specific binding on the frit surface. Detection takes place directly on the frit surface as colorimetric or fluorescence detection depending on the chosen dye.

The IFSA 1 Immunoassay Chip can be equipped either with specific antibodies or antigens coated on the frits or with anti-haptene surface allowing for an afterwards specific functionalization of the IFSA 1 Immunoassay Chip by the user himself.

As a perfect merger of lab-on-a-chip and labautomation, the chip can be pre-equipped with dry or liquid reagents to be operated by a standard pipetting robot. Read-out can be done in standard 1536 well plate readers. Alternatively the ChipGenie® edition I instrument combining the pipettor with the read-out function can be used.

Chip-based frit technology is a collaborative work within the project IFSA together with the FZMB and Senova GmbH.

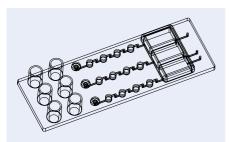


Fig. 207: Schematic drawing of IFSA 1 Immunoassay Chip -249



Fig. 208: IFSA 1 Immunoassay Chip – Equipped for three different samples with two measurement frits, one positive and one negative control frit





Fig. 209: Detail of stained frit area of IFSA 1 Immunoassay Chip

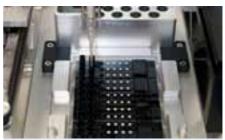


Fig. 210: IFSA 1 Immunoassay Chip in ChipGenie® edition I instrument

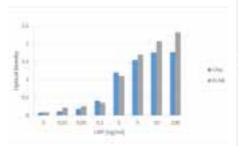


Fig. 211: Comparison of IFSA 1 Immunoassay Chip with standard ELISA for CRP detection (polyHRP / TMB) based on colorimetric read-out.

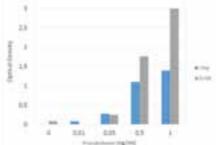


Fig. 212: Comparison of IFSA 1 Immunoassay Chip with standard ELISA for Procalcitonin detection (polyHRP / TMB) based on colorimetric read-out.

Product Code	Description	Price [€]
22-7001-0000-00	Process set-up custom immunoassay on chip – pilot study – antibodies / antigens for immobilization will be charged separately or delivered by customer	22,980.00



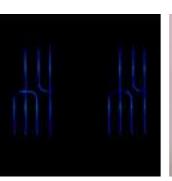
Product Code	Short product description	Product Description	Price [€]
08-0496-0000-00	ChipGenie® edition I instrument	Pipetting system with optical read-out e.g. for IFSA 1 Immunoassay Chips	14,240.00

Product Code	Embedded Frits	Functional Description	Chip Material	Price [€/chip]* 1+ 10+ 100+
21-6006-0249-02	Negative control     Positive control (anti POD)     Anti hapten 1     Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with two generic frits for custom immunoassay and positive and negative control Application note	Topas	134.76 58.60 29.45
21-6007-0249-02	- Negative control - Streptavidin - Anti hapten 1 - Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with three generic frits for custom immunoassay and negative control	Topas	134.76 58.60 29.45
21-6008-0249-02	- Negative control - Biotin - Anti hapten 1 - Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with three generic frits for custom immunoassay and negative control	Topas	134.76 58.60 29.45
21-6009-0249-02	Negative control     Positive control (anti hapten 1)     Streptavidin     Streptavidin	IFSA 1 Immunoassay Chip pre-equipped with two frits for the same analyte as du- plicate for <u>broard dynamic</u> range. Positive and negative control included.	Topas	134.76 58.60 29.45
21-6010-0249-02	Negative control     Positive control (anti POD)     Anti CRP     Anti Procalcitonin	Application note  IFSA 1 Immunoassay Chip pre-equipped with two target frits and positive and negative control as demonstration kit.	Topas	134.76 58.60 29.45

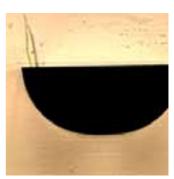
<sup>\*</sup>For production quantities, please ask for a quote.

Product Code	Description	Detail	Price [€]
20-5104-0000-00	IFSA 1 Immunoassay Chip Reagent Kit 1	IFSA 1 Immunoassay Chip Reagent Kit 1 – for 50 chips  - Washing buffer  - Substrate buffer  - Conjugate (Streptavidin-HRP)  - Trigger (TMB)  - Hapten 1 (optional)  - Sample Dilution Buffer  - Antibody Stabilization Buffer	167.00
20-5105-0000-00	Standards for Demonstration	Standards for Demonstration kit 21-6010-0249-02 - CRP - Procalcitonin	64.50

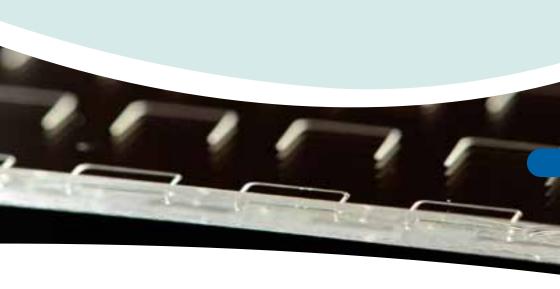








# 4 Microfluidic chips – Glass



## 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.



This chapter summarizes a variety of off-the-shelf glass devices. In order to facilitate the handling of these glass chips, respective accessories like handling frames are part of this section.

## 4.1 Standard microfluidic chips – glass

### 4.1.1 Straight channel chips - glass

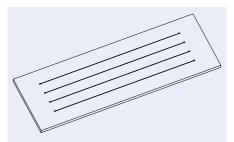


Fig. 213: Schematic drawing of straight channel chip – Fluidic 581

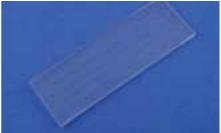


Fig. 214: Straight channel chip – Fluidic 581

Product Code	Description	Chan Width [µm]		Length	Lid Thickness [µm]	Material	1+	Pri	ce [€/ch 5+	nip] 10+
13-1302-0581-20	Straight channel chip	50	50	58.5	150	Glass	143.70	109.75	99.78	89.70

### 4.1.2 Chamber chips - glass

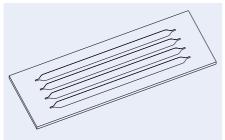


Fig. 215: Schematic drawing of chamber chip - Fluidic 582

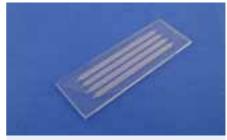


Fig. 216: Chamber chip - Fluidic 582

Product Code	Description	Chan Width [µm]		Length	Lid Thickness [µm]	Material	1+	Pri 3+	ce [€/cŀ 5+	nip] 10+
13-1303-0582-20	Chamber chip	3	100	58.5	150	Glass	143.70	109.75	99.78	89.70



## 4.1.3 Droplet generator chips – glass

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.

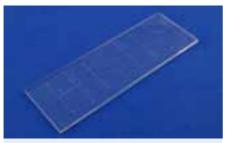


Fig. 217: Glass droplet generator chip Fluidic 441

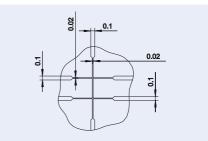


Fig. 218: Glass droplet generator chip Fluidic 441 – detail of cross element

Product Code	Description	Channel Depth	Material	1+	Price [€ 3+	/chip] 5+	10+
13-1300-0441-20	Droplet generator chip	20	Glass	143.70	109.75	99.78	89.70

### 4.1.4 Meander chips- glass

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

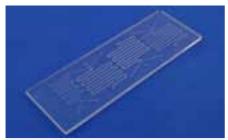


Fig. 219: Meander chip Fluidic 442

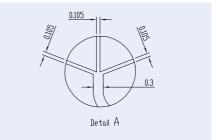


Fig. 220: Meander chip Fluidic 442 – channel details

Product Code	Description	Channel Depth	Material	1+	Price [€ 3+	/chip] 5+	10+
14-1301-0442-20	Meander chip	20	Glass	143.70	109.75	99.78	89.70



### 4.2 Accessories for standard glass chips

This chapter highlights some basic accessories making the direct use of *microfluidic ChipShop* glass chip series convenient.

### 4.2.1 Handling frame - glass

This handling frame allows for the insertion of *microfluidic ChipShop's* standard glass chips in the format of a micoscopy slide, namely 75.5 mm x 25.5 mm x 1.65 mm. The fluidic interconnect is easily achieved by the fluidic interfaces integrated in the frame. For a standard use the fluidic interfaces – through holes on the chip, fluid connectors in the handling frame, are placed at standard positions having the spacing of a 386 well plate, namely 4.5 mm. This allows for a "one-fits-all" handling frame.

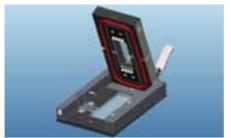
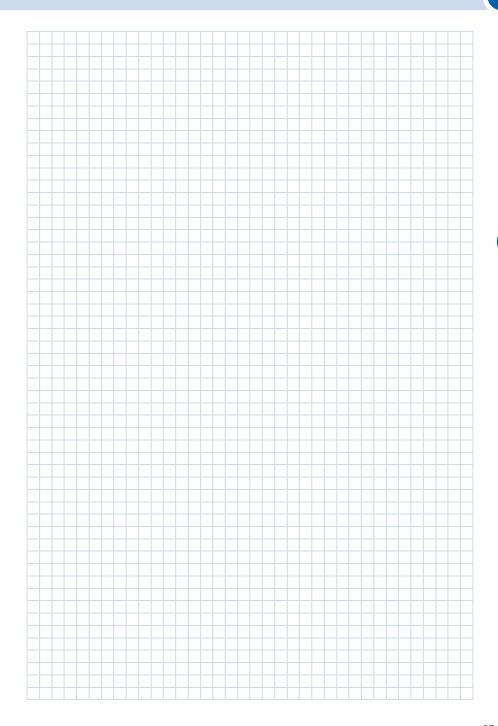


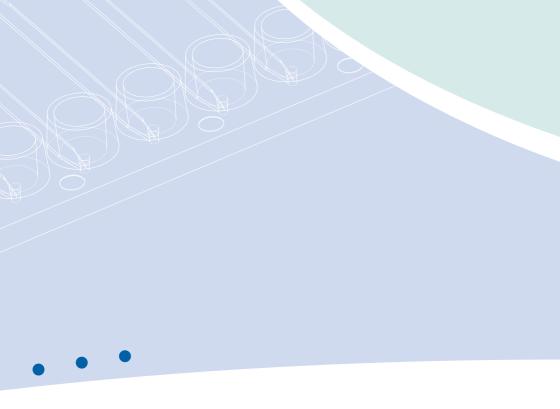
Fig. 221: Layout ChipGenie Slide Frame Glass 01 – Handling frame for chips in the format of a microscopy slide



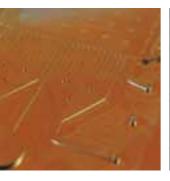
Fig. 222: ChipGenie Slide Frame Glass 01 – Handling frame for chips in the format of a microscopy slide

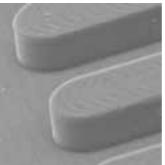
Product Code	Description	Heater Temperature Range	Chip format [mm]	Fluidic interfaces	Price [€/unit] 10+
22-4501-0000-00	ChipGenie Slide Frame Glass 01	No	Microscopy slide: 75.5 x 25.5 x 1.65	4.5 on-chip spacing     Fits for microfluidic     ChipShop's standard slide     format chips	980.00
22-4502-0000-00	ChipGenie Slide Frame Glass 01	Yes 20-60°C +/- 0.5°C	Microscopy slide: 75.5 x 25.5 x 1.65	4.5 on-chip spacing     Fits for microfluidic     ChipShop's standard slide     format chips	1,485.00

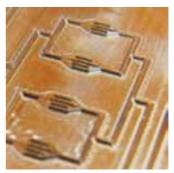












# 5 Silicone chips



## 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.

### 5.1 Silicone chips and mold inserts

Within the silicone chip services portfolio a standard kit for easy fabrication of first silicone microfluidic chips is offered together with our partner GeSim within the brand name MicCell. Exceeding this service, microfluidic ChipShop offers for casting of PDMS custom-design silicon stampers.

### 5.1.1 Silicone casting kit - 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.

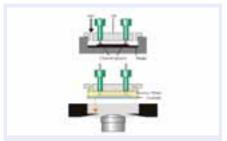


Fig. 223: Molding of the Channel Plate on a silicon master and subsequent mounting in an inverted microscope

### 5.1.1.1 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. 224: Channel Plate 22 mm x 22 mm with S-shaped single channel, precast, ready to use



Fig. 225: Channel Plate 22 mm x 22 mm with double-Y-branched channel, precast, ready to use



Fig. 226: MicCell support for 22x22 Channel Plates, to be placed in an inverted microscope via an adapter plate (not shown)



Fig. 227: Channel Plate 25x75 with crossed-shaped (T-junction) channel, different channel designs are available on request



Fig. 228: MicCell support for 25x75 Channel Plate



Fig. 229: Fully assembled MicCell with 25x75 Channel Plate, cross-shaped with 3 inlets and 1 outlet

Product Code	Description	Channel Design, Depth [µm]	Pri 1 +	ice [€/ch 5+	ip] 10+
07-0452-0000-06	PDMS-CP/22x22/S-100	S-shape, 100 $\mu$ m 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 $\mu$ m 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



### 5.1.1.2 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. 230: Polycarbonate (PC) body 22 mm x 22 mm

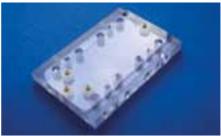


Fig. 231: Polycarbonate (PC) body 25 mm x 75 mm

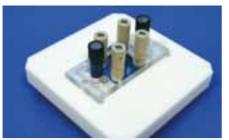


Fig. 232: Casting Station 22 mm x 22 mm. Top: assembled, including channel spacers (brown)  $\,$ 



Fig. 233: Casting Station 25 mm x 75 mm



Fig. 234: Casting Station box

Product Code	Description	Design	1+	Price [€] 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 $\mu$ m, width $>$ height	2,490.00		

<sup>\*</sup> Set of PDMS-CPs, channel spacers, mixing glasses, syringes, needles

### 5.2 Silicon stampers

For casting of silicone microfluidic ChipShop offers 4 inch (100 mm diameter) silicon wafer. The wafer can be ordered with 1-3 channel depth differing in pricing.

Following design rules need to be considered:

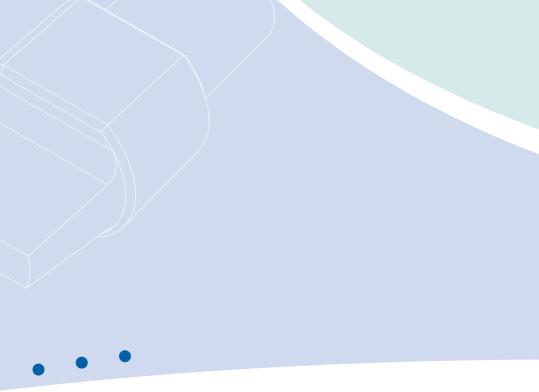
- Wafer size: 4 inch - Wafer thickness: 700  $\mu$ m

- Minimum feature size:  $10 \,\mu\text{m}$ , less upon request at extra cost

- Maximum structure depth: 50  $\mu$ m - Maximum aspect ratio: <1

CAD files need to be delivered in the following format: dwg, dxf

Product Code	Description	, Pi	rice [€/unit]	
		1+	3+	10+
30-8001-0000-21	One structure depth	2,490.00	2,290.00	1,980.00
30-8002-0000-21	Two structure depths	5,980.00	5,250.00	4,700.00
30-8003-0000-21	Three structure depths	10,450.00	9,550.00	8,750.00































## 6 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.



#### 6.1 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.

### 6.1.1 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  $\mu$ l.

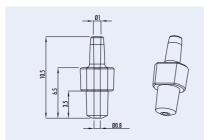


Fig. 235: Schematic drawing of a Mini Luer connector

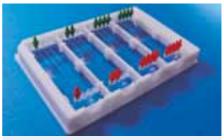


Fig. 236: Single, twin type Mini Luer connectors and row of four

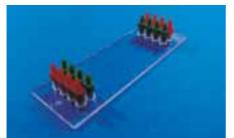


Fig. 237: Four times row of four Mini Luer connectors mounted on a Mini Luer platform



Fig. 238: Mini Luer connectors mounted on a Mini Luer fluidic platform

Product Code	Connector Type	Material	l 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

### 6.1.2 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).

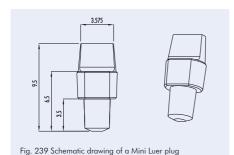




Fig. 240: Single, twin type Mini Luer plugs and row of four



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

### 6.1.3 Male Mini Luer plugs – Low volume displacement plugs

These special male Mini Luer plugs are designed to fit in the through hole integrated on the microfluidic chip and surrounded by the female Mini Luer interface. They seal in this connecting hole only and simply replace the volume in this hole and not the complete volume of the female Mini Luer. This avoids liquid movement due to air displacement of the Mini Luer volume.

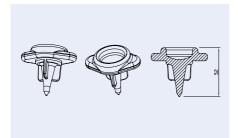


Fig. 241: Mini Luer plug – low volume displacement plug



Fig. 242: Mini Luer plug – low volume displacement plug

Product Code	Description	Plug Type	Material	Color	Pri	ce [€/1 5+	0 piece 10+	es] 20+
09-0567-0438	-09 Male Mini Luer plug Low volume displac ment		PP	Red	19.00	14.00	9.40	7.40

### 6.1.4 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.

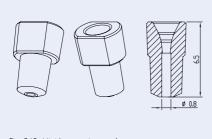


Fig. 243: Mini Luer to pipette adaptor



Fig. 244: Example of a Mini Luer to pipette adaptor in use with a Rhombic Chamber chip

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

### 6.1.5 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.

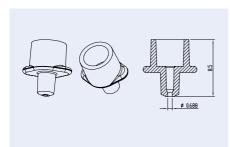


Fig. 245: Mini Luer to Luer adaptor



Fig. 246: Example of a Mini Luer to Luer adaptor in use with a Rhombic Chamber chip

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



### 6.1.6 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 straight walls (product code 09-0500-0302-01) or a wide base for easier glueing (product code 09-0512-0303-01, see chapter 6.1.7 and Figure 249 & 250).

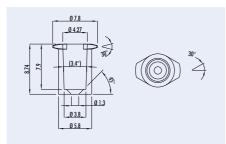


Fig 247: Schematic drawing of the Luer Lok compatible adapter  $\,$ 



Fig. 248: Female Luer Lok connector with straight walls

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

### 6.1.7 Female Luer Lok compatible connectors with wide base

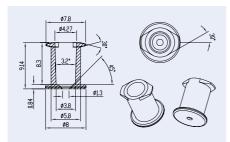


Fig. 249: Schematic drawing of female Luer Lok compatible connectors with wide base



Fig. 250: Female Luer Lok connector with wide base

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	

### 6.1.8 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. 251: Male Luer plug

Fig. 252: 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  $\mu$ l, the reduced height Luer plug only displaces 20  $\mu$ l.

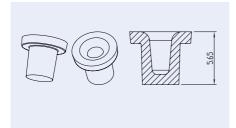


Fig. 253: Schematic drawing Luer plug 270



Fig. 254: Luer plugs 270



Fig. 255: Schematic drawing Luer plug with reduced displacement volume 262



Fig. 256: Luer plug with reduced displacement volume 262



Product Code	Description	Material	Price [€/10 pieces]
09-0503-0270-09	Male Luer plug, opaque	PP	19.00 9.40
09-0504-0270-09	Male Luer plug, black	PP	19.00 9.40
09-0505-0264-09	Male Luer plug with retaining strip, opaque	PP	25.00 14.40
09-0506-0264-09	Male Luer plug with retaining strip, black	PP	25.00 14.40
09-0507-0262-09	Male Luer plug with reduced displaced volume, opaque	PP	25.00 14.40

### 6.1.9 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.

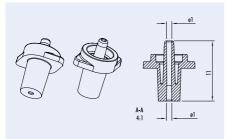


Fig. 257: Male Luer fluid connector

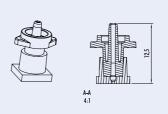


Fig. 258: Male Luer fluid connector coupled with the female counterpart on chip



Fig. 259: Male Luer fluid connector with olive interface



Fig. 260: Male Luer fluid connector with olive interface mounted on chip

Product Code	Description	Price [ŧ	€/10 pieces] 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

### 6.1.10 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. 261: Upchurch Nanoports assembly set



Fig. 262: 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

### 6.1.11 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 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. 263: Cross-shaped channel chip with three bonded port connectors and three chip reservoirs

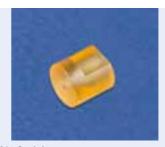


Fig. 264: Bonded port connector



Fig. 265: Female Luer Lok adapter



Fig. 266: One piece plug (left) and one piece fitting (right)



Fig. 267: Cross-shaped channel chips with embedded threads to connect with LabSmith's one piece fittings

Product Code	Description	Material	Price [€]	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 $\mu$ m 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

### 6.2 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. 268: Tanks mounted on a microfluidic chip



Fig. 269: Blister pouches integrated in a microfluidic chip

### 6.2.1 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.

### 6.2.1.1 Tank 500 $\mu$ I with piercing interface

This tank version, which exists in single, double, and triple tank versions, has a volume of  $500 \,\mu$ l 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. 458, 464 and 465.

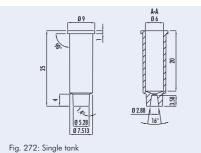


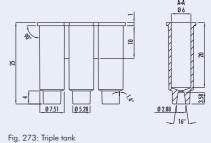
Fig. 270: Single, double, and triple tank



Fig. 271: Filled tanks sealed with alumina foil







Product Code	Description	Material	Price (+	€/10 pi	eces] 100+
16-0601-0229-09	Single tank piercing interface	PP	25.00	10.20	5.40
16-0602-0230-09	Double tank piercing interface	PP	26.00	11.80	5.80
16-0603-0231-09	Triple tank piercing interface	PP	27.00	12.40	6.10

### 6.2.1.2 Tank 500 $\mu$ l with Luer interface

This tank version with a tank volume of 500  $\mu$ l 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  $\mu$ l Luer tank is available in a single, double or triple tank version.

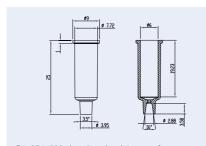


Fig. 274: 500  $\mu$ l single tank with Luer interface

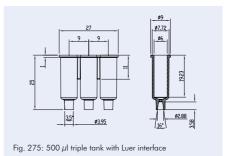


Fig. 276:  $500 \, \mu l$  triple tank – black



Fig. 277: 500  $\mu$ l single tank mounted on Luer interface

Product Code	Description	Material	Price (+	€/10 pi	eces] 100+
16-0604-0387-09	Single tank Luer interface	PP	25.00	10.20	5.40
16-0605-0388-09	Double tank Luer interface	PP	26.00	11.80	5.80
16-0606-0389-09	Triple tank Luer interface	PP	27.00	12.40	6.10
16-0607-0387-09.1	Single tank Luer interface – black	PP – black	25.50	10.70	5.90
16-0608-0388-09.1	Double tank Luer interface – black	PP – black	26.50	12.30	6.30
16-0609-0389-09.1	Triple tank Luer interface – black	PP – black	27.50	12.90	6.60

### 6.2.1.3 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.

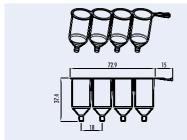


Fig. 278: Schematic tank layout – fluidic interface: male Luer



Fig. 279: Liquid reservoir: 4.5 ml tank

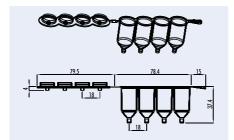


Fig. 280: Schematic tank layout with cap for pneumatic actuation  $% \left( 1\right) =\left( 1\right) \left( 1\right) \left($ 



Fig. 281: Tank with cap for pneumatic actuation

Product Code	Description	Material		10 pieces] 0+ 100	
16-0612-0232-09	Row of 4 tanks	PP	35.00 2	2.00 9.4	10
16-0613-0233-09	Row of 4 tanks with cap	PP	38.00 2	5.00 11.4	10



### 6.2.2 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  $1.000 \,\mu$ l.



Fig. 282: Blister pouch with 25  $\mu$ l liquid volume



Fig. 283: Blister pouch with 150 µl liquid volume



Fig. 284: DNA analysis chip with blister and integrated lateral flow strip



Fig. 285: Blister test chip with aluminum foil pouches

### 6.3 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.

### 6.3.1 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.

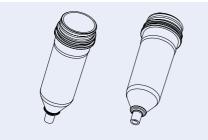


Fig. 286: Schematic drawing of sampling vessel

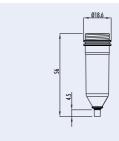


Fig. 287: Detail of sampling vessel



Fig. 288: Sampling vessel prefilled with liquid mounted on a chip



Fig. 289: Sampling vessel prefilled with buffer and inserted

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

#### 6.3.2 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.

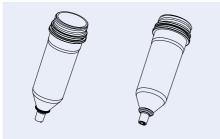


Fig. 290: Schematic drawing of sampling vessel with septum 0276

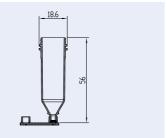


Fig. 291: Detail of sampling vessel with septum 0276 with counterpart on chip



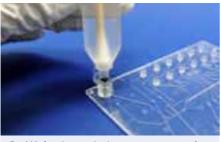


Fig. 292: Sampling vessel with septum on piercing interface on chip



Fig. 293: Sampling vessel prefilled with buffer and inserted

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

#### 6.4 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.

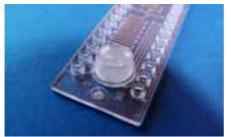


Fig. 294: Fluidic chip with embedded rotary valve



Fig. 295: Rotary valve with metering function

Product Code	Lid Thickness [µm]	Material	Description	Price [€	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

#### 6.5 Tubing

#### 6.5.1 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. 296: Capillary PEEK tubing



Fig. 297: Capillary PEEK tubing in use with nuts of the Upchurch Nanoport set in combination with a chip adapter frame

Product Code	Description	Material	Price [€/10 pieces]
29-0530-0000-12	Capillary PEEK tubing 1575-12x OD: 795 μm (0.0313"), ID: 200 μm (0.008")	PEEK	60.10

#### 6.5.2 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	Material	Quantity	Price [€]
29-0803-0000-16	Micro tubes, PTFE, ID: 560 μm, wall thickness: 0.25 mm	PTFE	5 m	42.50

#### 6.5.3 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. 298: Silicone sleeve mounted on a male Mini Luer fluid connector



Fig. 299: PTFE tube connected via silicone sleeves to Mini Luer fluid connector

Product Code	Description	Quantity	Price [€]
29-0610-0000-08	Silicone tube, ID: 0.76 mm, OD: 1.65 mm	2 m	16.20
29-0611-0000-08	Silicone tube, ID: 0.5 mm, OD: 2.5 mm	2 m	16.85

#### 6.6 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 10.1.



Fig. 300: Microfluidic support kit 1



Fig. 301: Chip-PCR support kit 1



Product Code	Kit Type	Product Description	Product Code	Price [€/kit]
11-0800-0000-00	Microfluidic support kit 1	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) - Forceps (3) - Single-use syringes (10 ml, 3) - Syringe adapter (3)	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 11-0804-0000-00 11-0805-0000-00	27.80
11-0850-0000-00	PCR support kit 1	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) - Forceps (1) - mcs-oil-04 - mcs-foil 007 (3 sheets)	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 20-5004-0000-00 10-0692-0000-00	32.90

#### 6.7 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.

#### 6.7.1 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. 302: Handling frame



Fig. 303: 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



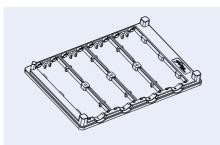


Fig. 304: Schematic drawing of handling frame with flat skirt



Fig. 305: 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

### 6.7.2 Handling frames for the spacing of a 384 microtiter plate

These handling frames place microfluidic devices in the format of a microscopy slide 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 microtiter plates.



Fig. 306: Handling frame for microscopy slide format chips to fit 384 well positions of a microtiterplate – fitting with 384 well plate readers

Product Code	Description	Price [€] 1+
15-4004-0000-00	Handling frame to comply with the spacing of 384 microtiter plates	128.50

## 6.7.3 Handling frames for the spacing of a 96 microtiter plate

These handling frames place microfluidic devices in the format of a microscopy slide 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 microtiter plates.

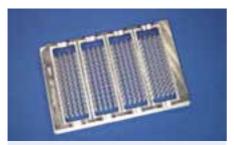


Fig. 307: Handling frame for microscopy slide format chips to fit 96 well positions of a microtiterplate – fitting with 96 well plate readers

Product Code	Description	Price [€] 1+
15-4005-0000-00	Handling frame to comply with the spacing of 96 microtiter plates	128.50



#### 6.8 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. 308: MFP - fluidic probe



Fig. 309: EBP – 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	





#### 6.9 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.

#### 6.9.1 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 gene- ration	22.40

#### 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.

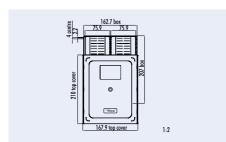


Fig. 311: Microfluidic chip storage box for devices with 1.0 – 2.0 mm thickness



Fig. 312: Microfluidic chip storage box for devices with 1.0 – 2.0 mm thickness



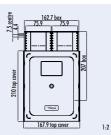
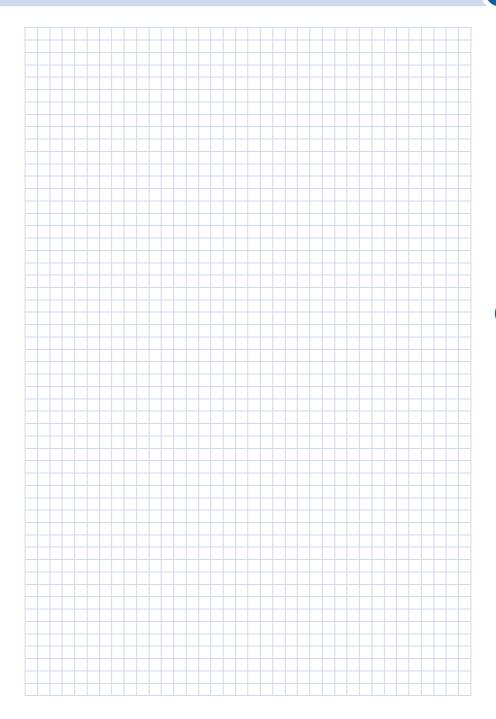


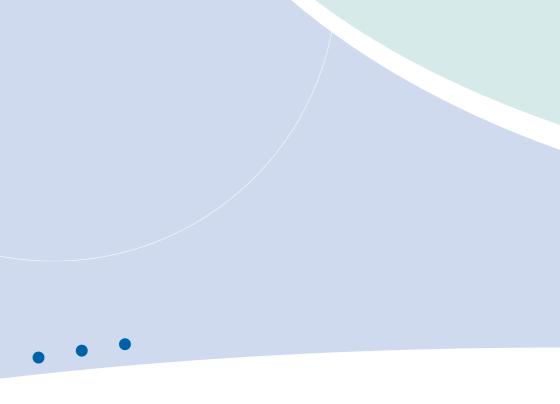
Fig. 313: Microfluidic chip storage box for devices with  $3.0-4.0\ \mbox{mm}$  thickness



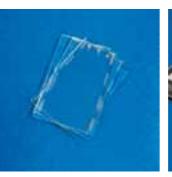
Fig. 314: Microfluidic chip storage box for devices with  $3.0-4.0\ \mbox{mm}$  thickness

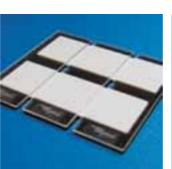
Product Code	Description	Price [€,	/Box] 10+
25-2000-0000-09	Microfluidic chip storage box  For chip formats: Microscopy slide format (25.5 mm x 75.5 mm)  For chip thicknesses: 1.0 –2.0 mm  Color: Orange	19.10	12.90
25-2001-0000-09	Microfluidic chip storage box  For chip formats: Microscopy slide format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

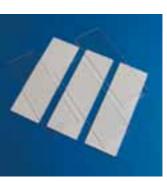












# 7 Polymer substrates and foils

# Polymer substrates and 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 ½-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



### 7.1 Wafer format – 115 mm diameter

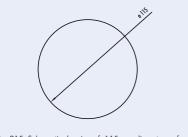


Fig. 315: Schematic drawing of 115 mm diameter wafer



Fig. 316: 115 mm diameter wafer

Product Code	Material	Thickness [mm]	Comment	Price	[€/per 10+	unit*] 50+
10-0646-0300-2.0-02	Topas	2.0		75.00	62.00	36.00
10-0647-0300-2.0-03	PC	2.0	individually wrapped	75.00	62.00	36.00
10-0648-0300-2.0-04	Zeonex	2.0	памавану жарреа	75.00	62.00	36.00
10-0649-0300-2.0-05	Zeonor	2.0		75.00	62.00	36.00
10-0656-0300-1.5-02	Topas	1.5		75.00	62.00	36.00
10-0657-0300-1.5-03	PC	1.5	individually wrapped	75.00	62.00	36.00
10-0658-0300-1.5-04	Zeonex	1.5	памавану жарреа	75.00	62.00	36.00
10-0659-0300-1.5-05	Zeonor	1.5		75.00	62.00	36.00

<sup>\* 1</sup> unit consists of 10 wafers

# 7.2 Microtiter plate format (127.76 x 85.48 mm)

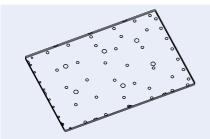


Fig. 317: Schematic drawing of substrate in microtiterplate

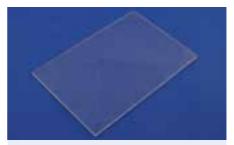


Fig. 318: Polymer substrate – microtiter plate format

Product Code	Material	Thickness [mm]	Comment	Price	[€/per 10+	unit*] 50+
10-0702-0269-1.5-02	Topas	1.5	individually wrapped	75.00	62.00	36.00
10-0703-0269-1.5-05	Zeonor	1.5	individually wrapped	75.00	62.00	36.00
10-0704-0269-2.0-02	Topas	2	individually wrapped	75.00	62.00	36.00
10-0705-0269-2.0-05	Zeonor	2	individually wrapped	75.00	62.00	36.00
10-0706-0269-2.5-02	Topas	2.5	individually wrapped	75.00	62.00	36.00
10-0707-0269-2.5-05	Zeonor	2.5	individually wrapped	75.00	62.00	36.00
10-0708-0269-3.0-02	Topas	3	individually wrapped	75.00	62.00	36.00
10-0709-0269-3.0-05	Zeonor	3	individually wrapped	75.00	62.00	36.00

<sup>\* 1</sup> unit consists of 10 substrates

## 7.3 Microscopy slide format (75.5 mm x 25.5 mm)



Fig. 319: Schematic drawing of the slide substrate



Fig. 320: Various polymeric substrates in the format of a microscopy slide

Product Code	Material	Thickness [mm]	Comment	Price 1+	[€/per 10+	unit*] 50+
10-0671-0349-1.0-01	PMMA	1.0	Individually wrapped	55.00	30.00	22.00
10-0665-0349-1.0-01.1	PMMA black	1.0	Individually wrapped	55.00	30.00	22.00
10-0662-0349-1.0-02	Topas	1.0	Individually wrapped	55.00	30.00	22.00
10-0663-0349-1.0-03	PC	1.0	Individually wrapped	55.00	30.00	22.00
10-0664-0349-1.0-04	Zeonex	1.0	Individually wrapped	55.00	30.00	22.00
10-0672-0349-1.0-05	Zeonor	1.0	Individually wrapped	55.00	30.00	22.00
10-0676-0349-1.0-05.1	Zeonor black	1.0	Individually wrapped	55.00	30.00	22.00
10-0673-0347-1.5-01	PMMA	1.5	Individually wrapped	55.00	30.00	22.00
10-0675-0347-1.5-02	Topas	1.5	Individually wrapped	55.00	30.00	22.00
10-0666-0347-1.5-03	PC	1.5	Individually wrapped	55.00	30.00	22.00
10-0667-0347-1.5-04	Zeonex	1.5	Individually wrapped	55.00	30.00	22.00
10-0674-0347-1.5-05	Zeonor	1.5	Individually wrapped	55.00	30.00	22.00



Product Code	Material	Thickness [mm]	Comment	Price	[€/per 10+	unit*] 50+
10-0677-0347-2.0-01	PMMA	2	Individually wrapped	55.00	30.00	22.00
10-0678-0347-2.0-02	Topas	2	Individually wrapped	55.00	30.00	22.00
10-0679-0347-2.0-03	PC	2	Individually wrapped	55.00	30.00	22.00
10-0700-0347-2.0-04	Zeonex	2	Individually wrapped	55.00	30.00	22.00
10-0701-0347-2.0-05	Zeonor	2	Individually wrapped	55.00	30.00	22.00
10-0668-0304-4.0-02	Topas	4	Individually wrapped	75.00	35.00	22.00
10-0669-0304-4.0-03	PC	4	Individually wrapped	75.00	35.00	22.00
10-0670-0304-4.0-04	Zeonex	4	Individually wrapped	75.00	35.00	22.00

<sup>\* 1</sup> unit consists of 10 slides

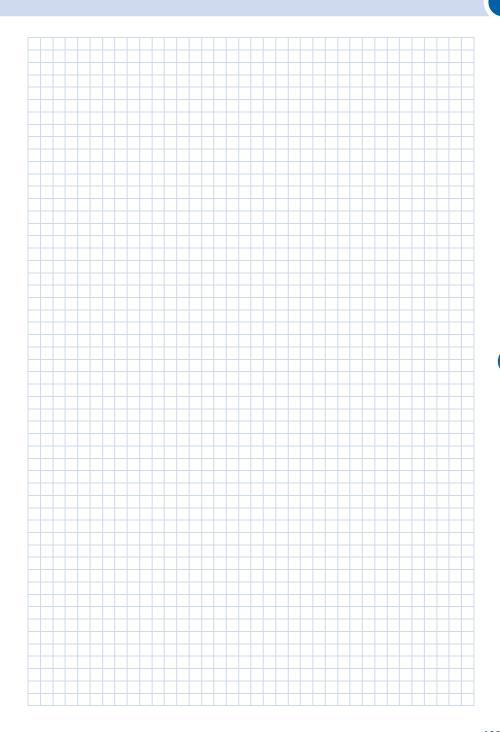
#### 7.4 Foils

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	Format	Thickness		rice [€/m²	•
				[µm]	1+	5+	10+
10-0680-0000-05	mcs foil 005	Zeonor	A4*	188	120.00	104.00	98.00
10-0681-0000-05	mcs foil 015	Zeonor	A4	100	120.00	104.00	98.00
10-0682-0000-05	mcs foil 051	Zeonor	Roll format, width = 24.5, 30, 100, 300	50	110.00	94.00	88.00
10-0683-0000-05	mcs foil 049	Zeonor	Roll format, width = 24.5, 30, 100	40	110.00	94.00	88.00
10-0684-0000-02	mcs foil 028	Topas	Roll format, width = 1130	300	78.00	52.50	38.50
10-0685-0000-02	mcs foil 029	Topas	A4	240	78.00	52.50	38.50
10-0691-0000-02	mcs-foil-081	Topas	A4	175	78.00	52.50	38.50
10-0686-0000-02	mcs foil 011	Topas	A4	140	78.00	52.50	38.50
10-0688-0000-02	mcs-foil-080	Topas	A4	125	78.00	52.50	38.50
10-0689-0000-02	mcs-foil-079	Topas	A4	100	78.00	52.50	38.50
10-0690-0000-02	mcs-foil-077	Topas	A4	50	78.00	52.50	38.50
10-0687-0000-00	mcs foil 008	Double sided pressure sen- sitive adhesive tape	Roll format, width = 114	140	78.00	52.50	38.50

<sup>\*</sup> A4 format: Width = 210 mm, height = 297 mm

<sup>\*\*</sup> For any deviation from standard format (A4 – size) or standard roll width extra costs for customized cutting need to be charged individually.



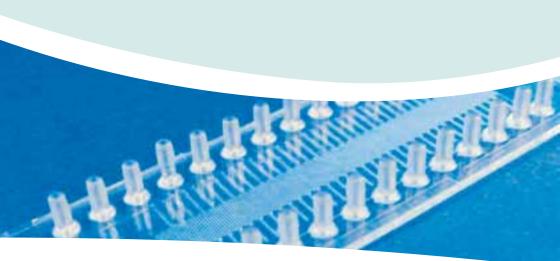








# 8 Instruments and applications



# 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.



### 8.1 ChipGenie® edition T – Heating and PCR systems

#### 8.1.1 ChipGenie® edition T – the instrument platform

With the ChipGenie® edition T2 and ChipGenie® edition T2O microfluidic ChipShop offers two unique thermocycling systems specially designed for the development for lab-on-a-chip applications. Both systems contain 14 individually controllable thermozone. This allows for several heat assisted reactions on chip, e.g. cell lysis, reverse transcription, PCR, hybridization assays and freely configurable chip designs that can be operated with these instruments. ChipGenie® edition T2O includes an optical unit for the read-out of the reaction e.g. for end-point or real time PCR. The systems are supposed to act as development platforms. Their 14 heating zones span over the size a microtiter plate.

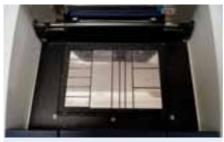


Fig. 321: Heating zones of ChipGenie® edition T2 and T2O



Fig. 322: Heating zones of ChipGenie® edition T2 and T2O with chips



Fig. 323: ChipGenie® edition T2



Fig. 324: ChipGenie® edition T2O

Product Code	Description	Price [€]
08-0494-0000-00	ChipGenie® edition T2 instrument with 14 independent heating zones	22,295.00
08-0495-0000-00	ChipGenie® edition T2O instrument with 14 independent heating zones and optical read- out for detection purposes	29,498.00



#### 8.1.2 Continuous-flow-chip-PCR

microfluidic ChipShop offers 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	Material	Comments Design		Price	[€/chip]	
	[µm]		Width / Depth / Length	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	Lid Thickness	Material	Comments Design Channel Dimensions	Prio	ce [€/cł	nip]
	[µm]			1+	10+	100+
08-0475-0501-03	200	PC	Integrated continuous flow chip, 35 cycles, PCR meander 200 $\mu$ m deep & 400 $\mu$ m wide, one 40 $\mu$ l, one 25 $\mu$ l cavity	132.98	64.60	39.76
08-0475-0501-02/05	100	Topas/Zeonor	Integrated continuous flow chip, 35 cycles, PCR meander 200 µm deep & 400 µm wide, one 40 µl, one 25 µl cavity	132.98	64.60	39.76





Fig. 325: Schematic drawing of 15-cycle continuous-flow PCR chip

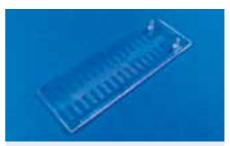


Fig. 326:15-cycle continuous-flow PCR-chip



Fig. 327: Schematic drawing of 36-cycle continuous-flow PCR chip

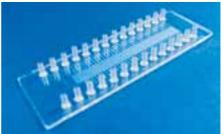


Fig. 328: 36-cycle continuous-flow PCR chip

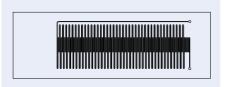


Fig. 329: Schematic drawing of 41-cycle continuous-flow PCR chip  $\,$ 



Fig. 330: 41-cycle continuous-flow PCR chip

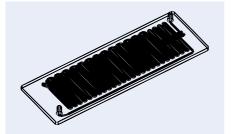


Fig. 331: Schematic drawing of 40 cycle continuous-flow PCR chip 0243



Fig. 332: 40 cycle continuous-flow PCR chip 0243

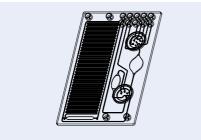


Fig. 333: Integrated continuous flow PCR chip with sample preparation



Fig. 334: Chip-PCR support kit

# 8.2 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. 335: Microfluidic chips for the ChipGenie® edition E series



Fig. 336: ChipGenie® edition E capillary electrophoresis unit

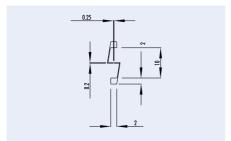


Fig. 337: Details of the electrodes



Fig. 338: Microscopy image of electrodes over microchannel







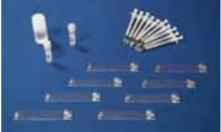


Fig. 340: ChipGenie® edition E – starter kit 2

Product Code	Channel Width Depth Le	ength A B C D	Lid Thick- ness [µm]	Mate- rial	Pric	te [€/chip]
03-0110-0082-01	50 50 87	7.0 6.0 5.0 5.0 0	60	PMMA	125.00	85.00 32.50
03-0111-0201-01	50 50 87	7.0 6.0 5.0 5.0 0.1	60	PMMA	125.00	85.00 32.50
03-0798-0166-01	100 100 87	7.0 6.0 5.0 5.0 0	60	PMMA	125.00	85.00 32.50
03-0799-0166-05	100 100 87	7.0 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

Product Code	Description	Detail	Product Code	Price [€]
11-0827-0000-00	ChipGenie® edition E starter kit 1	- ChipGenie® edition E instrument - Cross-shaped channel chips (50 μm width/50 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (50 μm width/50 μm depth), double T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: Zeonor (2) - Single-use syringes, 1 ml (10) - 10 ml mcs buffer 03 (separation buffer) - ChipGenie® edition E starter kit 3 – standards: Anion standard solution, Li+ , Na+ , K+ (1 ml) Cation standard solution, Li+ , Na3-, SO42- (1 ml) Organic acid standard solution, tartaric acid, succinic acid, citric acid (1 ml)	08-0486-0000-00 03-0110-0082-01 03-0111-0201-01 03-0798-0166-01 03-0799-0166-05 11-0809-0000-00 20-5061-0000-00 11-0829-0000-00	4,192.00
11-0828-0000-00	ChipGenie® edition E starter kit 2	- Cross-shaped channel chips (50 μm width/50 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (50 μm width/50 μm depth), double T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: Zeonor (2) - Single-use syringes, 1 ml (10) - 10 ml mcs buffer 03 (separation buffer) - ChipGenie® edition E starter kit 3 – standards: Anion standard solution, Li+, Na+, K+ (1 ml) Cation standard solution, Li+, Na5, SO42- (1 ml) Organic acid standard solution, tartaric acid, succinic acid, citric acid (1 ml)	03-0110-0082-01 03-0111-0201-01 03-0798-0166-01 03-0799-0166-05 11-0809-0000-00 20-5061-0000-00 11-0829-0000-00	790.00

Product Code	Description	Detail	Product Code	Price [€]
11-0829-0000-00	ChipGenie® edition E kit 3 – standards	- Cation standard solution (Li+, Na+, K+) - Anion standard solution (Cl-; NO3-, SO42-) - Organic acid standard solution (tartaric acid, succinic acid, citric acid)		78.20

#### 8.3 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. 341: Principle of a bead-based assay with the ChipGenie® edition P instrument



Fig. 342: ChipGenie® edition P instrument with bead-filled sample-prep chip

Product Code	Description	Price [€/instrument]
08-0487-0000-00	ChipGenie® edition P instrument	695.00

#### 8.3.1 Chips eP1 - chips for ChipGenie® edition P

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

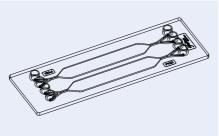


Fig. 343: Schematic drawing of the rhombic chamber chip

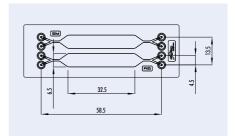


Fig. 344: Rhombic chamber chip – 120  $\mu$ l chamber volume



Product Code	Char   Volume	nber Depth	Lid   Thickness	Material	Surface Treatment	Pr	ice [€/cl	nip]
	[μl]	[μm]	[µm]		lieuilleill	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

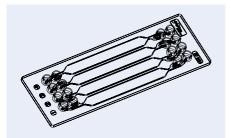


Fig. 345: Schematic drawing rhombic chamber chip

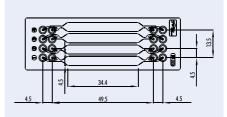


Fig. 346: Rhombic chamber chip – 100  $\mu$ l chamber volume

Product Code	Chamber Lid Material Surface		Chamber   Lid   Material   Surface   Pr			Pri	ice [€/cl	nip]
	[µI]	[µm]	[µm]		realmeni	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

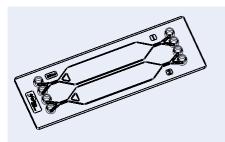


Fig. 347: Schematic drawing rhombic chamber chip

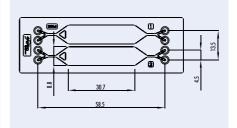


Fig. 348: Rhombic chamber chip – 250  $\mu$ l chamber volume

Product Code	Chamber   Lid   Material   Surface Volume Depth   Thickness   Treatment		Pri	ice [€/cl	hip]			
	[μl]	[µm]	[µm]		Ireatment	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

#### 8.4 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. 295), 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 w x d x h = 18 cm x 9 cm 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. 349: Dielectrophoresis system DEP consisting of high frequency signal generator DEP1, microfluidic chip DFC1 and connecting cable



Fig. 350: 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	2,843.75
11-0867-0000-00	DFC1 Dielectrophoresis chips. Set of 6 chips	1,875.00



#### 8.5 Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1

The Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 enables to carry out cell-based assays in microfluidic chips placed in this incubator to be easily mounted on a microscope stage. Microfluidic chips can be directly placed in the frame that allows for the desired temperature on the chip due to integrated heating elements. The fluidic interfaces are directly integrated in the Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 to achieve an easy liquid supply and removal without interfering with the optical detection zone.

Various kinds of applications can be facilitated on chip with the help of the **Lab-on-a-Chip Cell Culture Incubator** – LOC CCI 1:

- CO<sub>2</sub>-independent microfluidic cell culture assays
- Cell-based microscopy assays
- Live cell imaging

#### Features that the Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 offers:

- Standard microtiter plate format; fits with all inverted microscopes having a 96 well plate holder or frame.
- Integrated heating system for excellent cell culture conditions.
- For standard cell culture no additional gas incubation necessary.
- Cell culture is comparable to standard CO<sub>2</sub>-incubator.
- Compatible with all standard microscopy slides and microfluidic chips in the format of a microscopy slide.
- Microfluidic interface integrated allowing for liquid handling for long-time assays without additional handling steps.

The fluidic operation of the **Lab-on-a-Chip Cell Culture Incubator** – LOC CCI 1 can be done manually with a pipette or with connected pumps. Open cavities should be closed with Mini Luer plugs (09-0551-0334-09) to avoid e.g. evaporation.



Fig. 351: Insertion of a microfluidic chip in the Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1



Fig. 352: Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 placed on a microscopy stage

Product Code	Description	Detail	Product Code	Price [€]
22-4500-0000-00	Lab-on-a-Chip Cell Culture Incubator – LOC-CCI 1			1.485.00
11-0826-0000-00	LOC-CCI 1 starter kit 1	- Male Mini Luer plugs, red, material: PP (10) - Rhombic chamber chip, 120 μl chamber volume, 500 μm channel depth, hydrophilized, material: Topas (10)	09-0551-0334-09 12-0906-0172-02	638.32
		<ul> <li>Rhombic chamber chip, 100 μl chamber volume, 600 μm channel depth, hydrophilized, material: Topas (10)</li> </ul>	12-0913-0221-02	
		- Rhombic chamber chip, 250 μl chamber volume, 800 μm channel depth, hydrophilized,	12-0919-0194-02	



#### 8.6 ChipGenie® I instrument – Pipetting & Read-out system

ChipGenie® I instrument offers pipetting of chips in the format of a microtiterplate with 1536 spacing. Microfluidic chips having the size of a microscopy slide can be fitted in respective microtiter plate sized handling frames to be handled with the pipettor.

A colorimetric read-out system is integrated in the **ChipGenie® I instrument** to cope with the detection of special detection spots addressed by the IFSA 1 Immunoassay Chip. Various other kinds of chips can be operated by this system.

The **ChipGenie® I instrument** is a merger of lab-on-a-chip and labautomation, liquid supply is managed by the pipettor, the liquid control on chip is ensured through the fluidic design.

As an example chips being used with the **ChipGenie® I instrument** the IFSA 1 Immunoassay Chip is shown below allowing for a frit-based sample enrichment and colorimetric detection.

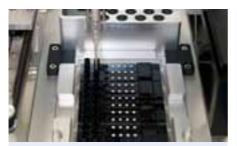


Fig. 353: Chips in microtiter sized handling frame placed in ChipGenie® edition I instrument

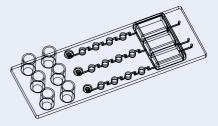


Fig. 354: Schematic drawing of IFSA 1 Immunoassay Chip – 249

Product Code	Short product description	Product Description	Price [€]
08-0496-0000-00	ChipGenie® edition I instrument	Pipetting system with optical read-out e.g. for IFSA 1 Immunoassay Chips	14,240.00

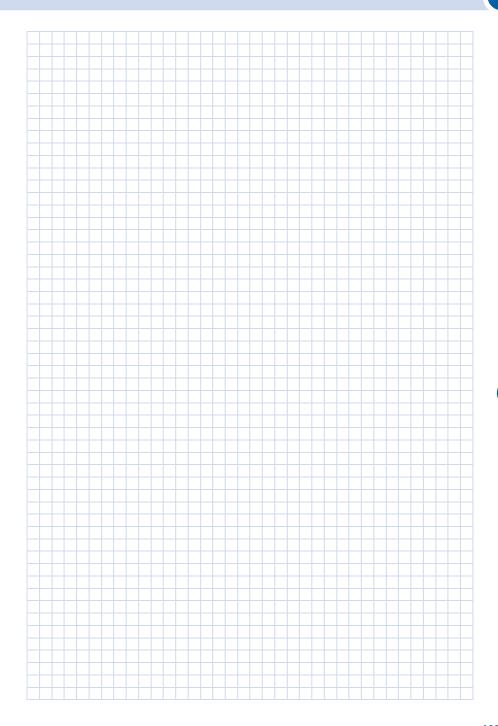


# 8 Instruments and applications

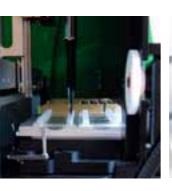
Product Code	Embedded Frits	Functional Description	Chip Material	Pric	e [€/ch 10+	ip]* 100+
21-6006-0249-02	- Negative control - Positive control (anti POD) - Anti hapten 1 - Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with two generic frits for custom immunoassay and positive and negative control	Topas	134.76	58.60	29.45
21-6007-0249-02	- Negative control - Streptavidin - Anti hapten 1 - Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with three generic frits for custom immunoassay and negative control	Topas	134.76	58.60	29.45
21-6008-0249-02	- Negative control - Biotin - Anti hapten 1 - Anti hapten 2	IFSA 1 Immunoassay Chip pre-equipped with three generic frits for custom immunoassay and negative control	Topas	134.76	58.60	29.45
21-6009-0249-02	Negative control     Positive control (anti hapten 1)     Streptavidin     Streptavidin	IFSA 1 Immunoassay Chip pre-equipped with two frits for the same analyte as du- plicate for <u>broard dynamic</u> <u>range</u> . Positive and negative control included.	Topas	134.76	58.60	29.45
21-6010-0249-02	Negative control     Positive control (anti POD)     Anti CRP     Anti Procalcitonin	IFSA 1 Immunoassay Chip pre-equipped with two target frits and positive and negative control as demonstration kit.	Topas	134.76	58.60	29.45

<sup>\*</sup>For production quantities, please ask for a quote.

Product Code	Description	Detail	Price [€]
20-5104-0000-00	IFSA 1 Immunoassay Chip Reagent Kit 1	IFSA 1 Immunoassay Chip Reagent Kit 1 – for 50 chips  - Washing buffer  - Substrate buffer  - Conjugate (Streptavidin-HRP)  - Trigger (TMB)  - Hapten 1 (optional)  - Sample Dilution Buffer  - Antibody Stabilization Buffer	167.00
20-5105-0000-00	Standards for Demonstration kit 21-6010-0249-02	Standards for Demonstration kit 21-6010-0249-02 - CRP - Procalcitonin	64.50











# 9 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.



#### 9.1 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. A dosing module for up to 3 bar, a module for medium pressure up to 398 bar and a high pressure module for up to 510 bar are available to be combined with a base unit.



Fig. 355: cetoni neMESYS starter unit



Fig. 356: cetoni neMESYS dosing module



Fig. 357: cetoni neMESYS medium pressure module



Fig. 358: Starter unit combined with different syringe pumps



Fig. 359: cetoni neMESYS high pressure module V2

Product Code	Description	Price [€/instrument]
11-0897-0000-00	BASE 120 - cetoni neMESYS base unit, power supply (120 W) for up to:  - 8 low pressure modules  - 5 medium pressure modules	1,400.00
	- 2 high pressure modules	
11-0894-0000-00	BASE 600 - cetoni neMESYS base unit, power supply (600 W) for: - more than 2 high pressure modules	2,345.00
11-0898-0000-00	cetoni neMESYS dosing module for pressure up to 3 bar	3,150.00
11-0899-0000-00	cetoni neMESYS medium pressure module for pressure up to 198 bar	5,250.00
11-0893-0000-00	cetoni neMESYS high pressure module V2 for pressure up 510 bar	7,886.00
11-0895-0000-00	Connector kit for low pressure module:	30.00
	- 4 fittings ¼ 28-UNF - O-rings - tubing	

Several high precision glass syringes with volumes between 10  $\mu$ l and 50 ml are available upon request.

#### 9.2 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.

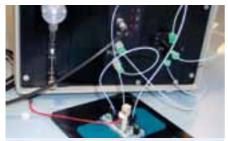


Fig. 360: MicCell FP-1-1-standard Fluid Processor. Foreground: MicCell with hydrogel valve in its blue support and black adapter plate

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

### 9 Pumps and pressure controllers

#### 9.3 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.

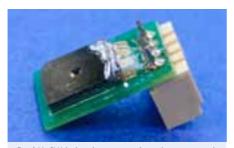


Fig. 361: PV6 hydrogel-containing silicon chip on a printed circuit board (top view)

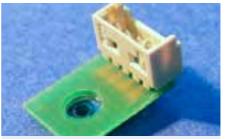


Fig. 362: PV6 hydrogel-containing silicon chip on a printed circuit board (bottom view)  $\,$ 



Fig. 363: PV6 injector, ready to use, in UNF 1/4-28 fitting

Product Code	Description	Features	Prid	ce [€/ch 5+	ip] 10+
07-461-0000-00	Hydrogel-Valve PV6, tube	Valve chip on PCB in PEEK fitting 1/4-28 UNF; inlet: Telfon 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 fit- ting 1/4-28 UNF; inlet: open funnel, electrical connector DC input 3.5 V/0.1 A	550.00	495.00	455.00



## 9.4 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.

# 9.4.1 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:  $50 \mu l 5 ml$
- 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. 364: ExiGo Pump, controlled by iPad mini



Fig. 365: iPad mini App for ExiGo pump showing sample volume to be dispensed from each pump



# 9 Pumps and pressure controllers

## 9.4.2 Kima Pump with iPod Touch control

#### Features:

- Fits inside standard CO<sub>2</sub> incubators maintaining temp., humidity etc.
- Recirculating long term perfusion pump.
- Wash mode or pump mode
- Flow rate: 15 35 ml/hr ±4%
- Dead volume:  $< 300 \,\mu$ l
- 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. 366: Kima pump, controlled by iPod Touch

# 9.4.3 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: 100 nl/min 10 ml/min  $\pm$  1% (syringes available: 50  $\mu$ l 5 ml).
- 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. 367: 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 CO <sub>2</sub> 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

#### 9.5 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 nl/min
- $1 50 \,\mu l/min$
- $30 1000 \,\mu$ l/min

Maximum delivery pressure is 1 bar calibrated for aqueous solutions.



## 9 Pumps and pressure controllers

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. 368: PeriWave peristaltic pump system



Fig. 369: Flow rate diagram for PeriWave pump

#### 9.6 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:

AOB1 - 4 CHANNELS MICROFLUIDIC FLOW CONTROLLER

 The new OB1 Mk3 uses patented piezoelectric regulators to generate a stable and pulseless flow while remaining extremely reactive. The microfluidic flow control system enables to control up to 4 channels independently, from -1000 mbar to 8 bar for a wide variety of advanced microfluidic applications.

#### MUX - MICROFLUIDIC FLOW SWITCH MATRICES

 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 is particularly dedicated to fast and clean sample injection and quake valves control. It is designed for instantaneous stop and low volume sample injection into microchannels and features a switching time of 25 ms.

#### MFS - FLOW SENSORS

• These sensors can either be used with our instruments or as a standalone unit.



Fig. 370: Elveflow OB1 pressure controller

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

#### 9.7 FLUIGENT – Ultraprecise fluid control systems

FLUIGENT develops, manufactures, and commercializes innovative fluid handling solutions for a variety of rapidly growing applications where fluid control matters. All our products can benefit from our ISO-9001 certified processes since 2010.

For more in depth information of FLUIGENT's flow-control technology, please review the following publications:

- Ryckelynck M, Baudrey S, Rick C, Marin A, Coldren F, Westhof E, Griffiths A; Using droplet-based microfluidics to improve the catalytic properties of RNA under multiple-turnover conditions, RNA, 2015, 21(3), 458-469.
- Hudson S, Sarangapani P, Pathak J, Migler K; A microfluidic capillary rheometer for characterization of protein solutions, J Pharm Sci, 2015, 104(2), 678-685.
- Kardash E, Reichman-Fried M, Maître JL, Boldajipour B, Papusheva E, Messerschmidt EM, Heisenberg CP, Raz E: A role for Rho GTPases and cell-cell adhesion in single-cell motility in vivo, Nat Cell Biol. 2010, 12(1), 47-53.

#### 9.7.1 MFCS™-EZ pressure-based flow controller

The benefit of FLUIGENT's patented FASTAB<sup>TM</sup> technology are fast equilibrium times, superior reproducibility and a pulsation-free liquid operation even in the nanoliter scale. These technical features are ensured through the pressure-driven approach including an advanced feedback loop with no mechanical parts involved.

Main characteristics of the MFCS™-EZ pressure-based flow controller:

- Easy to install and use
- Easy to automate
- Fast and stable
- Field proven technology
- Possibility to connect up to 4 MFCS™-EZ units (up to 16 independent channels) on the same set-up

The respective flow controller and the set-up of the overall system and connection to the microfluidic device are highlighted in the figures below.





Fig. 371: Fluigent's MFCS™-EZ pressure-based flow controller



Fig. 372: OEM version of Fluigent's MFCS<sup>TM</sup>-EZ pressurebased flow controller for pre-industrial or industrial applications



Fig. 373: Schematic set-up of Fluigent's MFCS™-EZ pressure-based flow controller with fluid reservoir and connection to the microfluidic device

Operation features Pressure ranges	of Fluigent's M 0 – 25 mbar	FCS™-EZ 0 – 69 mbar	0 – 345 mbar	0 – 800 mbar	0 – 1000 mbar	0 – 7000 mbar
Type of pressure available	Negative & positive	Negative & positive	Negative & positive	Negative	Positive	Positive
Pressure sensor resolution	0.03% F.S. 7.5 µbar	0.03% F.S. 20.7 μbar	0.03% F.S. 105 µbar	0.037% F.S. 300 µbar	0.03% F.S. 300 µbar	0.03% F.S. 2.1 mbar
Response time	Down to 40 ms	Down to 40 ms depending on user PC operating system and configuration				
Settling time	Down to 100 m	Down to 100 ms (output volume dependent)				
Pressurizing gas	Non corrosive	Non corrosive or explosive gas (pressurized air recommended, or $N_2$ , Ar, $CO_2$ )				
Size	16 x 23 x 6.5 c	:m³ (6.3 x 9 x 2.5	inch³)			
Weight	2.0 kg (4.4 lbs	2.0 kg (4.4 lbs)				
Output connectors	Female Luer Lo	k				4 mm OD tube connectors

Product Code	Description	Price [€]*
11-0868-0000-00	Fluigent MFCSTM-EZ 1 channel	2,340.00
11-0869-0000-00	Fluigent MFCSTM-EZ 2 channels	4,280.00
11-0870-0000-00	Fluigent MFCSTM-EZ 3 channels	6,220.00
11-0871-0000-00	Fluigent MFCSTM-EZ 4 channels	8,160.00

<sup>\*:</sup> including MAESFLO $^{\text{TM}}$  software

#### 9.7.2 ESS™ fluid handling Platform

The ESS<sup>TM</sup> is a unique fluid handling platform enabling automated selections and injections of fluids thanks to three powerful accessories:

- 2-Switch<sup>TM</sup> valve
- M-Switch™ 10-way bidirectional valve
- Switchboard<sup>TM</sup>

# The elements of the fluid handling platform



#### 2-SWITCHTM

# 2-way bidirectional valve

A bidirectional 3-port / 2-way valve, controlled by the MAESFLO  $^{\text{TM}}$  software or manually as a stand alone device

- Fast response time: 20 ms
- Chemical and biological compatibility (wetted materials: teflon)
- Low internal volume (12 μL)
- No heating
- Use as a stand alone and manual system or software controlled (full automation)
- Possibility to connect up to 8 2-SWITCH $^{\text{TM}}$  on the same SWITCHBOARD $^{\text{TM}}$
- No dead volume
- · Easy identification of the positions thanks to indicator lights

#### 2-Switch™ valve



#### M-SWITCHTM

## 10-way bidirectional valve

A bidirectional 11-port / 10-way valve injecting and selecting up to 10 different liquids controlled by the MAESFLO™ software

- · Chemical & biological compatibility (RPC-7)
- Low internal volume (11.6 μL)
- · Integrated fittings
- Software controlled Full automation
- ullet Possibility to connect up to 4 M-SWITCH TM on the same SWITCHBOARD  $^{ extstyle extst$
- No dead volume

M-Switch™ 10-way bidirectional valve

# 9 Pumps and pressure controllers





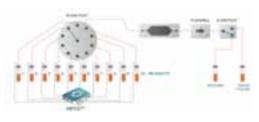
# SWITCHBOARD<sup>TM</sup> Communication platform

A platform managing the communication and the control of up to 4 M-SWITCH  $^{\text{TM}}$  and 8 2-SWITCH  $^{\text{TM}}$ 

- · Centralized communications to the computer
- · Computer connection with a single USB plug
- Provided power supply for M-SWITCH<sup>TM</sup> and 2-SWITCH<sup>TM</sup>

SWITCHBOARD™ Communication hub

## Operation options of the fluid handling platform



## SEQUENTIAL INJECTIONS

A Up to 10 liquids are selected and injected sequentially inside the 1-channel chip by the M-SWITCH $^{\text{TM}}$ . The samples at the outlet are then sorted by the 2-SWITCH $^{\text{TM}}$ . All steps can be automated by the MAESFLO $^{\text{TM}}$  software.

- Cell analysis
- Cell lysis and DNA extraction for PCR or NGS (Next Gen Sequencing) analysis
- Drug testing
- Calibration curve, etc.

#### Sequential injection



#### **SELECTIVE MIXING**

Several samples are injected simultaneously or separately within a Y-shape chip by applying the adequate position to the 2-SWITCH $^{\text{TM}}$ . The samples at the outlet are then sorted by the 2-SWITCH $^{\text{TM}}$  4. All steps can be automated by the MAESFLO $^{\text{TM}}$  software or controlled manually.

- · Chemical mixing reactions
- · Stoichiometry study, etc.

#### Selective mixing





# SAMPLES SEPARATOR AND COLLECTOR

Different proportions of the molecule of interest are injected in the chip, generating droplets of different concentrations. These droplets are then sorted at the outlet by the M-SWITCH<sup>TM</sup> depending on their concentrations. All steps can be automated by the MAESFLO<sup>TM</sup> software.

Molecules synthesis in droplets with sorting by concentration

Sample separation and collection

Product Code	Description	Price [€]
11-0872-0000-00	Fluigent 2-SWITCH™	970.00
11-0873-0000-00	Fluigent M-SWITCH™	3,010.00
11-0874-0000-00	Fluigent Switchboard™	510.00

#### 9.7.3 FRP Flow-Rate Platform

The FRP Flow-Rate Platform enables to easily monitor\* and control\*\* the flow-rates in most microfluidic systems with superior precision and stability.

\*: available in stand-alone version for flow monitoring (can be installed on set-ups having no MFCS™ pressure controller)

#### Examples of applications:

- Droplet generation and manipulation
- Organ on chip
- Beads manipulation
- Kinetic measurements
- Biological applications (blood / cells)
- Microfluidic flow control

#### The elements of the FRP flow-rate platform



#### FLOW UNIT:

high-precision bidirectional flow sensor

5 models with different ranges for water, among which 3 models (S, M and L) with a dual calibration: water and hydrocarbon based liquids (comparable with oil, solvents, fuel, alcohol)

FLOW UNIT: high-precision bidirectional flow sensor

<sup>\*\*:</sup> requires the Flow-Rate Control Module with a dongle in MAESFLO<sup>TM</sup> Software





# FLOWBOARD: communication hub

A hub managing the communication between MAESFLOTM software and up to 8 FLOW UNITS of any ranges and calibrations. Computer connection and power supply with a single USB plug

FLOWBOARD: communication hub

Performance char FLOW UNIT	racteristics of the dif	fferent flow units	M	L	XL
Calibrated media	Water	Water Isopropyl alcohol	Water Isopropyl alcohol	Water Isopropyl alcohol	Water
Range	0 -±1.5 μl/min	0-±7 μl/min 0-±70 μl/min	0-±80 μl/min 0-±500 μl/min	0-±1 ml/min 0-±10 ml/min	0-±5 ml/min
Accuracy	10% m.v. between -1500 to -75 and 75 to 1500 nl/min	5% m.v. between -7 to -0.35 and 0.35 to 7 μl/min 20% m.v. between -70 to -1 and 1 to 70 μl/min	5% m.v. between -80 to -2.4 and 2.4 to 80 $\mu$ l/min 20% m.v. between -500 to -25 and 25 to 500 $\mu$ l/min	5% m.v. between -1 to -0.03 and 0.03 to 1 ml/min 20% m.v. between -10 to -0.5 and 0.5 to 10 ml/min	5% m.v. between -5 to -0.2 and 0.2 to 5 ml/min
	7.5 nl/min between -75 to 75 nl/ min	17.5 nl/min between -0.35 to 0.35 µl/min	500 nl/min between -2.4 to 2.4 µl/min	1.5 µl/min between -30 to 30 ml/min	10 μl/min between -200 to 200 μl/min
Sensor inner diameter	25 μm	150 μm	480 μm	1.0 mm	1.8 mm
Wetted materials	PEEK and Quartz	PEEK and Quartz	PEEK and boro- silicate glass	PEEK and boro- silicate glass	PEEK and boro- silicate glass

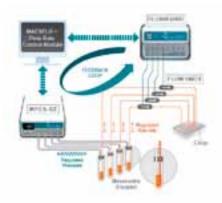


Fig. 374: Schematic set-up of flow-rate control or volume control using the FRP platform while keeping all the benefits of pressure actuation by MFCS $^{\text{TM}}$ .

Product Code	Description	Price [€]
11-0875-0000-00	Fluigent flow unit	1,530.00
11-0876-0000-00	Fluigent flowboard	510.00
11-0877-0000-00	Fluigent flow-rate control module (regulation algorithm)	970.00

#### 9.8 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.





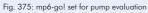
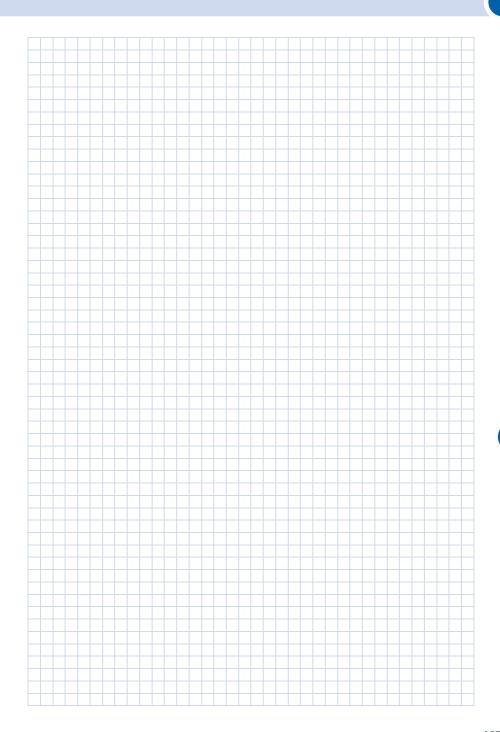




Fig. 376: mp6 basic set for pump evaluation

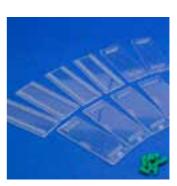
Product Code	Description	Price [€/instrument]
11-0880-0000-00	mp6-go! set, consisting of 3 mp6 pumps, controller and tubing	499.00
11-0881-0000-00	mp6-basic set, consisting of 3 mp6 pumps, controller board and tubing	199.00











# 10 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.



#### 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. 377: Microfluidic support kit 2

Fig. 378: Microfluidic support kit 3

Product Code	Kit Type	Product Description		Price [€/kit]
11-0800-0000-00	Microfluidic support kit 1	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1m) - Forceps (3) - Single-use syringes (10 ml, 3) - Syringe adapter (3)	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 11-0804-0000-00 11-0805-0000-00	27.80
11-0812-0000-00	Microfluidic support kit 2	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1m) - Silicon tube (ID: 0.76 mm, OD: 1.65 mm, 1m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1m) - Forceps (1) - Single-use syringes (10 ml, 3) - Syringe adapter (3) - Male Mini Luer fluid connectors, red, material: PP (10) - Male Mini Luer fluid connectors, blue, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, green, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10)	29-0611-0000-08 29-0610-0000-08 29-0803-0000-16 11-0801-0000-00 11-0804-0000-00 11-0805-0000-00 09-0540-0331-09 09-0542-0331-11 09-0552-0334-09 09-0559-0334-11	96.50
11-0813-0000-00	Microfluidic support kit 3	- Microfluidic support kit 2 plus: - Female Luer Lok compatible connectors with wide base, material: PMMA (10) - Male Luer plugs, opaque, material: PP (10)	11-0812-0000-00 09-0512-0303-01 09-0503-0270-09	46.20
11-0850-0000-00	PCR support kit 1	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1m) - Forceps (1) - mcs-oil-04 - mcs-foil 007 (3 sheets)	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 20-5004-0000-00 10-0692-0000-00	32.90

#### 10.2 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. 379: Microfluidic starter kit 1



Fig. 380: Microfluidic starter kit 2



Fig. 381: Microfluidic starter kit 3



Fig. 382: Microfluidic starter kit 4

Product Code	Kit Type	Product Description		Price [€/kit]
11-0811-0000-00	Microfluidic starter kit 1	- Microfluidic support kit 1 - Handling frame with high skirt, yellow (1) - Male Mini Luer fluid connectors, red, material: PP (10) - Straight channel chip, 4 channels (200 μm width/ 200 μm depth), material: Topas (2) - Straight channel chip, 4 channels (100 μm width/ 100 μm depth), material: PMA (2) - Straight channel chip, 16 channels (1000 μm width/200 μm depth), material: Topas (1) - H-shaped channel chip, material: Topas (2) - Droplet generator chip, material: PC (1) - Meander PCR-chip, 36 cycles, material: PC (1) - Meander PCR-Chip, 15 cycles, material: PC (1) - Rhombic chamber chip, 120 μl chamber volume, material: Zeonor (1)	11-0800-0000-00 15-4000-0000-12 09-0540-0331-09 01-0173-0156-02 01-0179-0152-02 04-0130-0164-02 13-1004-0163-03 08-0471-0065-03 08-0470-0047-03 12-0904-0172-05	369.00
11-0814-0000-00	Microfluidic starter kit 2	- Microfluidic support kit 2 plus - Straight channel chip, 4 channels (200 μm width/200 μm depth), material: PMMA (2) - Straight channel chip, 4 channels (200 μm width/200 μm depth), material: Topas (2) - Straight channel chip, 16 channels (200 μm width/100 μm depth), material: PMMA (2) - Straight channel chip, 16 channels (200 μm width/100 μm depth), material: Topas (2) - Rhombic chamber chip, 120 μl chamber volume, material: Zeonor (2)	11-0812-0000-00 01-0172-0156-01 01-0173-0156-02 01-0176-0142-01 01-0177-0142-02 12-0904-0172-05	432.00



Product Code	Kit Type	Product Description	Price [€/kit]
11-0824-0000-00	Microfluidic starter kit 3	- Microfluidic starter kit 1 11-0811-0000-00 - Bartels Micropump mp6-gol set 11-0880-0000-00	818.40
11-0825-0000-00	Microfluidic starter kit 4	- Microfluidic starter kit 2 11-0814-0000-00 - Bartels Micropump mp6-go! set 11-0880-0000-00	881.45

#### 10.3 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. 383: Microfluidic interface kit 1 - Mini Luer plugs and connectors  $\,$ 



Fig. 384: Microfluidic interface kit  $2-\mbox{Luer}$  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) - Male Mini Luer fluid connectors, blue, material: PP (20) - Male Mini Luer fluid connectors, opaque, material: TPE (20) - Male Mini Luer plugs, red, material: PP (20) - Male Mini Luer plugs, opaque, material: TPE (20)	09-0541-0331-09 09-0542-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11	110.50
11-0820-0000-00	Microfluidic interface kit 2	Microfluidic interface kit 2:  - Male Luer fluid connectors, opaque, material: PP (20)  - Male Luer fluid connectors, green, material: PP (20)  - Male Luer plugs, opaque, material: PP (20)  - Male Luer plugs, black, material: PP (20)	09-0508-0263-09 09-0509-0263-09 09-0503-0270-09 09-0504-0270-09	82.60

#### 10.4 Integrated chip support kits

In order to operate the different integrated chips various fluidic interfaces are necessary or make the handling of the chip more convenient, e.g. Mini Luer or Luer fluid connectors or plugs. Further handling aids like manipulators for turning valves or handling frames are the respective accessories being of use for these devices.





Fig. 385: Integrated chip support kit 1

Fig. 386: Integrated chip support kit 2

Product Code	Kit Type	Product Description		Price [€/kit]
11-0821-0000-00	Integrated chip support 1	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: PP (10) - Male Luer fluid connectors, green, material: PP (10) - Male Luer plugs, opaque, material: PP (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1) - Handling frame with high skirt, yellow (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0509-0263-09 09-0504-0270-09 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 19-1852-0000-00 15-4000-0000-12	197.14
11-0822-0000-00	Integrated chip support 2	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TFE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: PFE (10) - Male Luer fluid connectors, green, material: PP (10) - Male Luer plugs, opaque, material: PP (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Handling frame with high skirt, yellow (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0509-0263-09 09-0504-0270-09 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 15-4000-0000-12	169.76
11-0823-0000-00	Integrated chip support 3	- Male Mini Luer fluid connectors, green, material: PP ( 10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1) - Handling frame with high skirt, yellow (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0565-0391-09 29-0611-0000-06 19-1852-0000-00 15-4000-0000-12	159.64



Product Code	Kit Type	Product Description		Price [€/kit]
11-0830-0000-00	Integrated chip support 4	- Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: TPE (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: PP (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Manual turning valve actuator (1)	09-0541-0331-09 09-0562-0331-11 09-0552-0334-09 09-0559-0334-11 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 19-1852-0000-00	144.64

## 10.5 Sample preparation starter kits

Sample preparation starter kit 1 – plasma generation comprise plasma generation chips with either 2 or 4 membranes, accessories and a user guide for a quick start in on-chip plasma generation out of whole blood. Depending on the blood sample, the included chips allow generation of plasma/serum in the range of  $12 - 15 \,\mu$ l (Chip with 4 membranes) and  $20 - 35 \,\mu$ l (Chip with 2 membranes).

Sample preparation starter kit 2 – enrichment comprise a cross-flow membrane chip with 4 membranes, accessories and a user guide for a quick start in on-chip enrichment of bacterial suspensions. Cell suspensions can be filled in tanks. For bigger volumes, accessories for the connection to pumps are included. Cells are filtered by a membrane with determined pore size. The membrane divides the chip in one upper and one lower compartment, which can be opened and closed separately. Once cells are enriched in the upper compartment, they can be exhausted by closing the outlet of the lower compartment and opening the outlet of the upper compartment.



Fig. 387: Sample preparation starter kit 1 – plasma generation



Fig. 388: Sample preparation starter kit 2 - enrichment

Product Code	Kit Type	Product Description		Price [€/kit]
11-0838-0000-00	Sample preparation starter kit 1 - Plasma generation	- Male Mini Luer plugs - Low volume displacement, red, material: PP (40) - Mini Luer to pipette adapter, material: PP (40) - Handling frame with high skirt, yellow (1) - Plasma generation chips with 4 membranes, material: Topas (5) - Plasma generation chips with 2 membranes, material: Topas (5)	09-0567-0438-09 09-0565-0391-09 15-4000-0000-12 15-1504-0200-02 15-1507-0535-02	678.30

Product Code	Kit Type	Product Description		Price [€/kit]
11-0839-0000-00	Sample preparation starter kit 2 - Enrichment	Row of 4 tanks with cap, material: PP (10)  Male Mini Luer plugs, green, material: PP (40)  Mini Luer to pipette adapter, material PP (40)  Handling frame with high skirt, yellow (1)  Cross-flow membrane chip with 4 membranes, material: Topas (10)  Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (1)  Male Mini Luer fluid connector, green, material: PP (20)  Male Luer fluid connector, green, material: PP (10)	16-0605-0233-09 09-0552-0334-09 09-0565-0391-09 15-4000-0000-12 15-1505-0398-02 29-0611-0000-08 09-0541-0331-09 09-0509-0263-09	631.70

# 10.6 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. 389: ChipGenie® edition P starter kit 1



Fig. 390: ChipGenie® edition P starter kit 2



Fig. 391:  $ChipGenie^*$  edition P starter kit 3 – DNA extraction from whole blood

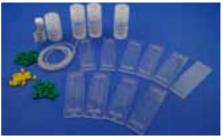


Fig. 392: ChipGenie® edition P starter kit 5 – DNA extraction from bacterial suspension

Product Code	Kit Type	Product Description		Price [€/kit]
11-0810-0000-00	ChipGenie edition® P starter kit 1	- ChipGenie edition® edition P instrument - Microfluidic support kit 1 - Male Mini Luer fluid connectors, red, material: PP (10) - Male Mini Luer plugs, green, material: PP (10) - Rhombic chamber chip, 120 μl chamber volume, material: Zeonor (3) - Straight channel chip, 4 channels (1000 μm width/200 μm depth), material: Topas (3)	08-0487-0000-00 11-0800-0000-00 09-0540-0331-09 09-0552-0334-09 12-0904-0172-05 01-0175-0138-02	759.00
11-0815-0000-00	ChipGenie edition® P starter kit 2	- Microfluidic support kit 1 - Male Mini Luer fluid connectors, red, material: PP (10) - Male Mini Luer plugs, green, material: PP (10) - Male Mini Luer plugs, green, material: PP (10) - Rhombic chamber chip, 120 $\mu$ l chamber volume, material: Zeonor (3) - Rhombic chamber chip, 100 $\mu$ l chamber volume, material: Zeonor (3) - Rhombic chamber chip, 250 $\mu$ l chamber volume, material: Zeonor (3)	11-0800-0000-00 09-0540-0331-09 09-0552-0334-09 12-0904-0172-05 12-0911-0221-05	384.00
11-0816-0000-00	ChipGenie edition® star- ter kit 3 – DNA extraction from whole blood	=  9-, 9, (,	09-0541-0331-09 09-0552-0334-09 09-0565-0391-09 29-0611-0000-08 12-0904-0172-05 20-5050-0000-00	561.43
11-0818-0000-00	ChipGenie edition® P starter kit 5 - DNA extraction from bacterial suspension	- Male Mini Luer fluid connectors, green, material: PP (20)  - Male Mini Luer plugs, green, material: PP (40)  - Mini Luer to pipette adapter, material: PP (20)  - Rhombic chamber chip, 120 µl chamber volume, material: Zeonor (10)  - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (1)  - ChipGenie® edition P starter kit 7 - buffer set for bacterial suspension	09-0541-0331-09 09-0552-0334-09 09-0565-0391-09 12-0904-0172-05 29-0611-0000-08 20-5051-0000-00	561.43

#### 10.7 Molecular biological starter kits

microfluidic ChipShop's microfluidic toolbox offers the complete set of chip modules and accessories to start directly with molecular biological experiments. Tubes, accessories for the interconnection and liquid handling are included. The molecular biological starter kits and the microfluidic accessories are designed for the combination with handling frames and chips of the molecular biological product families.

**PCR** starter kit – continuous flow **PCR** comprise chips with different number of PCR cycles and materials including accessories and application notes for a quick start in continuous flow PCR.

**PCR starter kit** – **oscillating PCR** comprise Boyle-Mariotte PCR chips and materials including accessories and application notes for a quick start in oscillation PCR.

**PCR** starter kit – stationary tempered **PCR** comprise PCR reaction chamber chips of 10, 20 and 24  $\mu$ l volume including PCR master mix and accessories for a quick start in on-chip stationary tempered PCR.

**PCR** starter kit – stationary tempered qPCR comprise qPCR reaction chamber chips of 10 and 20  $\mu$ l volume including qPCR master mix and accessories for a quick start on stationary tempered qPCR. Air bubble traps inside the chips enabling a clear imaging area for optical readout.

**DNA hybridization / microarray starter kit – custom specific printing** comprise 10 chips of two catalogue designs, which can be spotted with up to 10 custom specific molecules, including washing- and blocking solutions and accessories for a quick start on DNA hybridization or microarray analysis. Customer can chose between biotin labeled substrates for colorimetric or fluorescence readout.

**DNA hybridization / microarray starter kit –printing by customer** comprise 10 chips of different unsealed chip designs, already glued with structured adhesive tape, which leaves the structures open, in order to enable spotting by customer. The kit includes accessories for the interconnection and optical clear sealing foils for the chip devices.

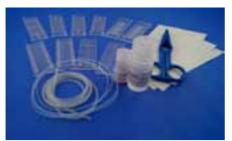


Fig. 393: PCR starter kit 1 - continuous flow PCR



Fig. 394: PCR starter kit 2 - oscillation PCR



Fig. 395: PCR starter kit 3 - stationary tempered PCR

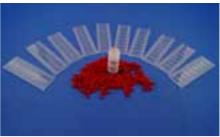


Fig. 396: PCR starter kit 4 - stationary tempered qPCR



Fig. 397: DNA hybridization / microarray starter kit - custom specific printing



Fig. 398: DNA hybridization / microarray starter kit - printing by customer

Product Code	Kit Type	Product Description		Price [€/kit]
11-0843-0000-00	PCR starter kit - continuous flow PCR	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) - Forceps (1) - mcs-oil 04 - mcs-foil 007 - mcs-on-chip PCR Master Mix 01, 10 reactions (0.25 ml) - continuous-flow PCR-chip, 15 cycles, material: PC (2) - continuous-flow PCR-chip, 36 cycles, material: PC (2) - continuous-flow PCR-chip, 41 cycles, material: PC (2) - continuous-flow PCR-chip, 40 cycles, material: PC (2) - continuous-flow PCR-chip, 40 cycles, material: Zeonor (2) - Manual	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 20-5004-0000-00 10-0692-0000-00 20-5052-0000-00 08-0470-0047-03 08-0471-0065-03 08-0472-0061-03 08-0473-0243-03 08-0474-0243-05	343.28
11-0831-0000-00	PCR starter kit - oscillation PCR	- Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) - Forceps (1) - mcs-on-chip PCR Master Mix 01, 10 reactions (0.25 ml) - Boyle-Mariotte PCR chip, material: PC (10) - Male Luer fluid connector, green, material: PP (10)	29-0611-0000-08 29-0803-0000-16 11-0801-0000-00 20-5052-0000-01 08-0469-0147-03 09-0509-0263-09	345.40
11-0832-0000-00	PCR starter kit - stationary tempered PCR	- Male Mini Luer plugs - Low volume displacement, red, material: PP (260) - Rhombic chamber chip, 10 μl chamber volume, material: Zeonor (2) - Rhombic chamber chip, 10 μl chamber volume, material: Zeonor (2) - Rhombic chamber chip, 24 μl chamber volume, material: Zeonor (2) - Rhombic chamber chip, 20 μl chamber volume, material: Zeonor (2) - Rhombic chamber chip, 20 μl chamber volume, material: Zeonor (2) - Rhombic zeonor (2) - Rosenor zeonor ze	09-0567-0438-09 12-0974-0561-05 12-0986-0558-05 12-0935-0133-05 12-0992-0559-05 12-1403-0556-05 20-5055-0000-00	299.18
11-0833-0000-00	PCR starter kit - stationary tempered qPCR	- Male Mini Luer plugs - Low volume displacement, material: PP (240) - Rhombic chamber chip with bubble traps, 10 µl chamber volume, material: Zeonor (5) - Rhombic chamber chip with bubble traps, chamber volume: 20 µl, material: Zeonor (5) - mcs-on-chip qPCR Master Mix 02, 120 reactions (1.6 ml)	09-0567-0438-09 12-0980-0585-05 12-0998-0584-05 20-5058-0000-00	427.84
11-0834-0000-00	DNA hybridization / microarray starter kit - custom speci- fic printing	- Mini Luer to pipette adapter, material: PP (20) - Male Luer plugs, opaque, material: PP (20) - Male Mini Luer plugs - Low volume displacement, red, material: PP (40) - Handling frame with high skirt, yellow (1) - Up to 10 molecules custom specific printing on 10 catalogue chips - Straight channel chip, 1 channel, material: Zeonor (5) - Straight channel chip with waste chamber, 2 channels, material: Topas (5) - Buffer set with washing and blocking solutions for 15 reactions of:  a. Biotin-labeled colorimetric readout, TMB () b. biotin labeled fluorescence readout, Cy5/Fam	09-0565-0391-09 09-0503-0270-09 09-0567-0438-09 15-4000-0000-12 01-0183-0268-05 01-0235-0272-02 20-5102-0000-00 20-5103-0000-00	502.95

Product Code	Kit Type	Product Description		Price [€/kit]
11-0835-0000-00	DNA hybridization / mic- roarray starter kit - printing by customer	- Mini Luer to pipette adapter, material: PP (20) - Handling frame with high skirt, yellow (1) - Optical foil, microscopy slide size, 10 piece - 4 channel chip with double-sided adhesive tape, material: Topas (4) - 1 channel chip with double-sided adhesive tape, material: Topas (3) - 2 channel chip with waste reservoir and double-sided adhesive tape, material: Topas (3) - Male Mini Luer plugs - Low volume displacement, red, material: PP (50) - Male Luer plugs, opaque, material: PP, opaque (20) - Manual	09-0565-0391-09 15-4000-0000-12 17-1601-0138-02 17-1606-0268-02 17-1608-0272-02 09-0567-0438-09 09-0503-0270-09	451,50

# 10.8 ChipGenie® edition E kits

The ChipGenie® edition E starter kits comprise instrument and standard chips as well as standards to carry out capillary electrophoresis with contactless conductivity detection on chip.



Fig. 399: ChipGenie® edition E – starter kit 1

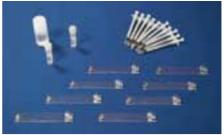


Fig. 400: ChipGenie® edition E – starter kit 2

Product Code	Kit Type	Product Description		Price [€/kit]
11-0827-0000-00	ChipGenie® edition E, starter kit 1	- ChipGenie® edition E instrument - Cross-shaped channel chips (50 μm width/50 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (50 μm width/50 μm depth), double T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: Zeonor (2) - Single-use syringes, 1 ml (10) - 10 ml mcs buffer 03 (separation buffer) - ChipGenie® edition E starter kit 3 – standards: Anion standard solution, Li+, Na+, K+ (1 ml) Cation standard solution, Cl-; NO3-, SO42- (1 ml) Organic acid standard solution, tartaric acid, succinic acid, citric acid (1 ml)	08-0486-0000-00 03-0110-0082-01 03-0111-0201-01 03-0798-0166-01 03-0799-0166-05 11-0809-0000-00 20-5061-0000-00 11-0829-0000-00	4,192.00



Product Code	Kit Type	Product Description		Price [€/kit]
11-0828-0000-00	ChipGenie® edition E, starter kit 2	- Cross-shaped channel chips (50 μm width/50 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (50 μm width/50 μm depth), double T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: PMMA (2) - Cross-shaped channel chips (100 μm width/100 μm depth), T-junction, material: Zeonor (2) - Single-use syringes, 1 ml (10) - 10 ml mcs buffer 03 (separation buffer) - ChipGenie® edition E starter kit 3 – standards: Anion standard solution, Li+, Na+, K+ (1 ml) Cation standard solution, Cl-; NO3-, SO42- (1 ml) Organic acid standard solution, tartaric acid, succinic acid, citric acid (1 ml)	03-0110-0082-01 03-0111-0201-01 03-0798-0166-01 03-0799-0166-05 11-0809-0000-00 20-5061-0000-00 11-0829-0000-00	790.00
11-0829-0000-00	ChipGenie® edition E starter kit 3 - standards	- Cation standard solution (Li+ , Na+, K+ ) - Anion standard solution (Cl-; NO3-, SO42-) - Organic acid standard solution (tartaric acid, succinic acid, citric acid)		78.20

#### 10.9 Cell culture basic kits

microfluidic ChipShop's microfluidic toolbox offers the complete set of chip modules and accessories to start directly with cell-based microfluidic experiments. Tubes, accessories for the interconnection and liquid handling are included. The cell culture basic kits and the microfluidic accessories are designed for the combination with handling frames and chips of the cell culture product families.

**Cell culture basic kit 1:** Chips with hydrophilized surfaces, accessories and application notes for a quick start in adhesive cell culture. The chips are suitable for applications like immunofluorescence microscopy, screening, apoptosis- and proliferation assays.

**Cell culture basic kit 2**: Chips with hydrophobic surfaces and microfluidic structures for retaining cells in the chip as well as accessories and application notes for a quick start in suspension cell culture. **Cell culture basic 3**: Accessories, application notes and chips for various applications like sorting, mixing, filtration, chemotaxis and many more. The chips are usable for adhesive cell culture as well as suspension cell culture.



Fig. 401: Cell culture basic kit 1



Fig. 402: Cell culture basic kit 2



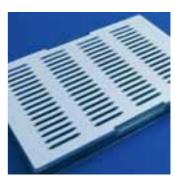
Fig. 403: Cell culture basic kit 3

Product Code	Kit Type	Product Description		Price [€/kit]
11-0840-0000-00	Cell culture basic kit 1 – adhesive cell culture	- Male Mini Luer fluid connector, green, material: PP (10)  - Male Mini Luer fluid connector, opaque, material: TPE (10)  - Male Mini Luer plugs, red, material: PP (10)  - Male Mini Luer plugs, opaque, material: TPE (10)  - Mini Luer to pipette adapter, material PP (10)  - Mini Luer to pipette adapter, material PP (10)  - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2)  - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5)  - Handling frame with high skirt, yellow (1)  - Rhombic chamber chip, 100 μl chamber volume, material: Zeonor, hydrophilized (2)  - Rhombic chamber chip, 250 μl chamber volume, material: Zeonor, hydrophilized (2)  - Rhombic chamber chip, 20 μl chamber volume 20 μl, material: Zeonor, hydrophilized (2)  - Straight channel chips in microtiter-plate format, 64 Channels, material: Zeonor, hydrophilized (1)  - Rhombic chamber chip, 20 μl chamber volume 20 μl, material: Zeonor, hydrophilized (1)  - Rhombic chamber chip, 20 μl chamber volume 20 μl, material: Zeonor, hydrophilized (1)	09-0541-0331-09 09-0562-0331-11 09-0551-0334-09 09-0559-0334-11 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 15-4000-0000-12 12-0914-0221-05 12-0920-0194-05 12-0926-0132-05 12-0932-0131-05 01-0245-0102-05 12-0971-0478-05	501.72
11-0841-0000-00	Cell culture basic kit 2 – suspension cell culture	- Male Mini Luer fluid connector, green, material: PP (10)  - Male Mini Luer fluid connector, opaque, material: TPE (10)  - Male Mini Luer plugs, red, material: PP (10)  - Male Mini Luer plugs, opaque, material: PP (10)  - Mini Luer to pipette adapter, material: PP (10)  - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2)  - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5)  - Handling frame with high skirt, yellow (1)  - Weir-filter chip, material: Zeonor (3)  - Cross-flow membrane chip, material: Topas (333)  - Rhombic chamber chip, 250 µl chamber volume, material: Zeonor (3)	09-0541-0331-09 09-0562-0331-11 09-0551-0334-09 09-0559-0334-11 09-0565-0391-11 29-0611-0000-08 29-0803-0000-16 15-4000-0000-12 14-1031-0220-05 15-1506-0480-02 12-0917-0194-05	449.24
11-0842-0000-00	Cell Culture basic kit 3 - Sorting, Filtration, Mixing	- Male Luer fluid connectors, green, material: PP (10) - Male Luer plugs, opaque, material: PP (10) - Male Mini Luer fluid connectors, green, material: PP (10) - Male Mini Luer fluid connectors, opaque, material: PP (10) - Male Mini Luer plugs, red, material: PP (10) - Male Mini Luer plugs, opaque, material: TPE (10) - Mini Luer to pipette adapter, material: PP (10) - Mini Luer to pipette adapter, material: PP (10) - Silicon tube (ID: 0.5 mm, OD: 2.5 mm, 1 m) (2) - PTFE tube (ID: 0.5 mm, OD: 1 mm, 1 m) (5) - Handling frame with high skirt, yellow (1) - Cross-flow membrane chip, material: Topas (1) - Cross-flow membrane chip, material: Topas (1) - Weir-filter chip, material: Zeonor (1) - Diffusion mixer, material: Zeonor (1) - Herringbone mixer, material: Zeonor (1) - Micro mixer with stir bar, material: Zeonor (1) - Micro mixer with stir bar, material: Zeonor (1) - Pillar chip, material: Zeonor (1)	09-0509-0263-09 09-0504-0270-09 09-0541-0331-09 09-0562-0331-11 09-0551-0334-09 09-0565-0391-09 29-0611-0000-08 29-0803-0000-16 15-1506-0480-02 15-1505-0398-02 14-1031-0220-05 18-1709-0382-05 14-1038-0187-05 14-1038-0187-05 14-1040-0286-05 19-1801-0261-05	514.68









# 11 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.



#### 11.1 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  $\mu$ m 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 or a glass slide can be mounted on top.



Fig. 404: M2-Automation instrumentTWO-200 in action



Fig. 405: instrument TWO-200spotting in microfluidic devices DNA-Arrey embedded in a microfluidic channel

M2-Automation offers an easy to use and robust micro-dispensing (spotting) solution. The spotter instrumentTWO-200 is recommended in order to start right away with your own spotting tasks.

Product Code	Description	Starting at Price per instrument [€]
11-0896-0000-00	instrumentTWO-200 spotter	40,000.00

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



Fig. 406: Titer-plate sized microfluidic device for customization

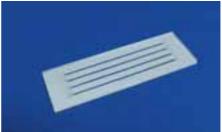


Fig. 407: Straight channel chip Fl. 0138 with double-sided adhesive tape

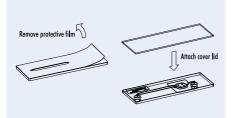


Fig. 408: Principle set-up of chip and double-sided adhesive tape



Fig. 409: Straight channel chip Fl. 95 with double-sided adhesive tape and waste reservoir

Product Code	Description	Width [µm]	Channe Depth [µm]	Length [mm]	Material	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

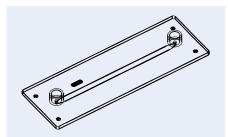


Fig. 410: Schematic drawing of the one channel chip with Luer interface 0268 to be equipped with double-sided adhesive tape



Fig. 411: Straight channel chip 0268 with double-sided adhesive tape

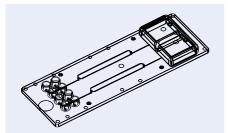


Fig. 412: Schematic drawing of a straight channel chip with waste chamber 0272 to be equipped with double-sided adhesive tape

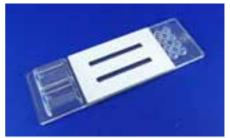
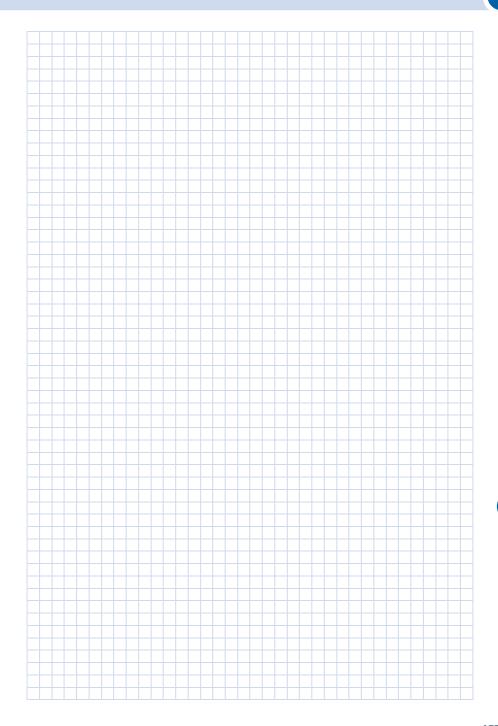


Fig. 413: Straight channel chip 0272 with double-sided adhesive tape



# 11 Customize standard chips

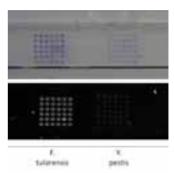
Product Code	Description	Width D	annel epth Length (m) [mm]	Material	Price [€	€/chip] 10+
17-1605-0268-01	1 channel chip Fl. 0268	2,500 2	90 26	PMMA	48.50	36.50
17-1606-0268-02	1 channel chip Fl. 0268	2,500 2	90 26	Topas	48.50	36.50
17-1607-0272-01	2 channel chip with waste reservoir Fl. 0272	2,500 3	340 58.5	PMMA	52.50	36.60
17-1608-0272-02	2 channel chip with waste reservoir Fl. 0272	2,500 3	340 58.5	Topas	52.50	36.60











# 12 Application development: Assay & reagent implementation



# Application development: Assay & reagent implementation

The transfer of biological and chemical assays on chip as well as reagent implementation and surface modification are central elements for the development of lab-on-a-chip systems. We offer our customers these application related services in order to facilitate the overall product development. Our equipped laboratories can be commonly used for development and quality control purposes.



#### 12 Application development: Assay & reagent implementation

Lab-on-a-chip systems target to make biological and diagnostic assays simpler, more sensitive, less error prone and to combine several assay steps conventionally done in different systems in one device.

To cope with the complex task to develop such systems, standard assay steps need to be adapted to the special requirements of the microfluidic surrounding as well as topics like surface functionalization or dry and liquid reagent storage have to be addressed.

Independent how different the custom specific assays themselves are, the underlying principle and general steps to transfer the assay on chip have similar requirements and are part of *microfluidic ChipShop*'s daily business.

Facilitating assay and product development for our customers, *microfluidic ChipShop* offers the following special services including the validation of the respective processes together with the customer:

- Reagent implementation
  - Dry reagent storage
    - Examples
      - PCR master mixes
      - PCR primers and probes
      - Cell lysis reagents
      - Beads for DNA extraction
      - Buffer
  - Liquid reagent storage
    - o Storage in blister packs
    - o Storage in tanks or syringes
- Spotting
  - DNA arrays
    - RNA arrays
  - Protein arrays
- Assay transfer on chip
- Transfer of instrument platforms to custom products together with the microfluidic device and the respective application.

To cope with these tasks, equipped biological and chemical laboratories and experienced application teams are at hand.



Fig. 414: Implementation of low-volume real-time PCR on chip – Chip on breadboard instrument

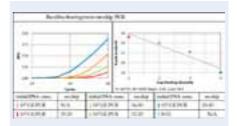


Fig. 415: Implementation of low-volume real-time PCR on chip – Real-time PCR curve of Bacillus thuringensis PCR

# 12 Application development: Assay & reagent implementation



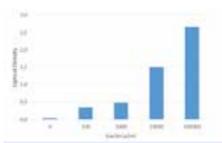


Fig. 416: Immunoassay on chip: results from colorimetric detection of *Francisella tularensis* 

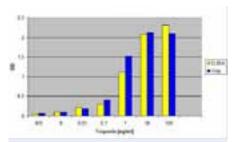


Fig. 417: Implementation of frit-based immunoassay on chip – Target: Troponin, comparison of standard ELISA plate versus assay on chip, colorimetric detection: poly HRP (pHRP)/TMB (blue dye)



Fig. 418: Implementation of frit-based immunoassay on chip – Target: Troponin, colorimetric detection: poly HRP (pHRP)/TMB (blue dye)

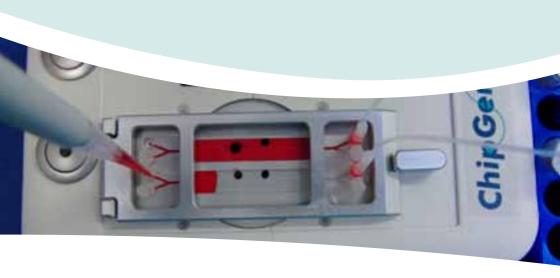








# 13 Application notes



# **Application notes**

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



# 13.1 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. 419: Chip with female Luer fluidic interfaces

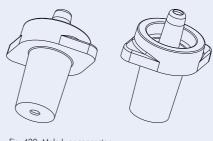


Fig. 420: Male Luer connector

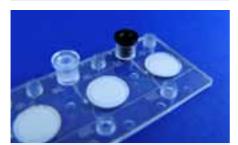


Fig. 421: Cap to close female Luer interfaces



Fig. 422: Mini Luer connectors and plugs mounted on a Mini Luer fluidic platform

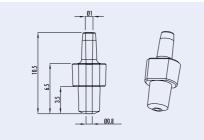


Fig. 423: Schematic drawing of a Mini Luer connector

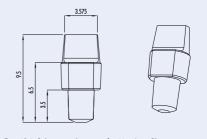


Fig. 424: Schematic drawing of a Mini Luer Plug

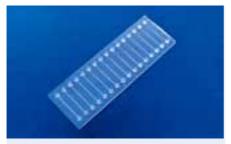


Fig. 425: Microfluidic platform with olives as fluidic interface

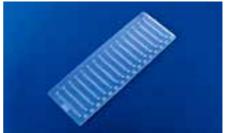


Fig. 426: Microfluidic platform with through holes as fluidic interface

# 13.1.1 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

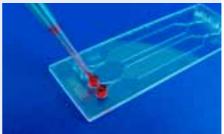


Fig. 427: Microfluidic chip with Mini Luer interfaces filled with a pipette and interfaces used as reservoir



# 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. Šilicone tube, e.g. IĎ: 0.5 mm (09-0802-0000-00) 6. PTFE tube, e.g. IĎ: 0.5 mm (09-0803-0000-00)
- 7. Peristaltic pump
- 8. Tube for peristaltic pump 9. Eppendorf vessel



Fig. 428: 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

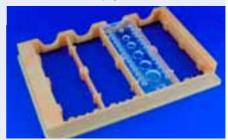


Fig. 429: Micromixer inserted in handling frame

#### Step 2: Mini Luer connector & silicone sleeve

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



Fig. 430: 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. 431: Connection of Mini Luer fluid connector with mounted silicone sleeve with a PTFE tube

#### Step 4: Insert connector on chip

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



Fig. 432: 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 PTEE tubing with a twist on the female interface on chip and place the end of the PTEE tube in an Eppendorf vessel for sample or waste collection

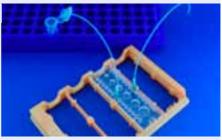


Fig. 433: Insertion of the Mini Luer with tubings in fluid exit of the chip and connection of tube with sampling vessel  $\,$ 

#### 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. 434: 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. 435: Connection of the chip via the PTFE tube with the



#### Step 8: Connect pump with reservoir and start pumping

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



Fig. 436: Connection of pump via a PTFE tube with a liquid reservoir

#### 13.1.2 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:

- Microfluidic chip with Luer interface
- 2. Standard syringe

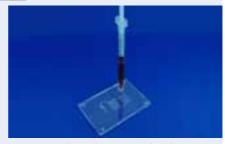


Fig. 437: Microfluidic chip with Luer interfaces filled with a standard syringe

# 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

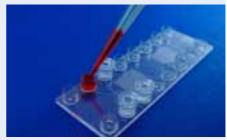


Fig. 438: Microfluidic chip with Luer interfaces filled with a pipette and interfaces used as reservoir



# 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. Šilicone tube, e.g. IĎ: 0.5 mm (09-0802-0000-00) 6. PTFE tube, e.g. IĎ: 0.5 mm (09-0803-0000-00)
- 7. Peristaltic pump
- 8. Tube for peristaltic pump 9. Eppendorf vessel



Fig. 439: 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

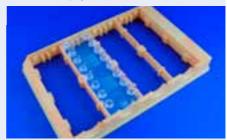


Fig. 440: Micromixer inserted in handling frame

#### Step 2: Luer connector & silicone sleeve

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



Fig. 441: 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. 442: Connection of Luer fluid connector with mounted silicone sleeve with a PTFE tube



#### Step 4: Insert connector on chip

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

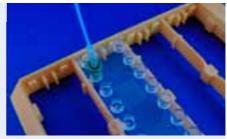


Fig. 443: Insertion of the Luer with tubings in fluid entrance of the chip

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

 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

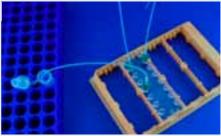


Fig. 444: Insertion of the Luer with tubings in fluid exit of the chip and connection of tube with sampling vessel

#### 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.

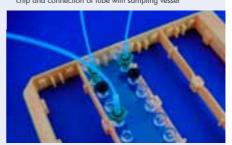


Fig. 445: Close unused fluid ports on chip with red Luer plugs

# Step 7: Connect chip with pump

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



Fig. 446: 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 pumpina.

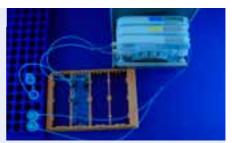


Fig. 447: Connection of pump via a PTFE tube with a liquid

#### 13.1.3 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. 448: Microfluidic chip with olive connected to different chip types

# Step 1: Chip & handling frame

1. Insert the chip in a handling frame

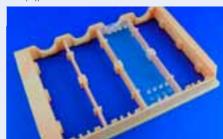


Fig. 449: Microfluidic chip with olive interfaces inserted in a microfluidic chip handling frame



# Step 2: Connect PTFE tubes with silicone sleeves

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



Fig. 450: 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

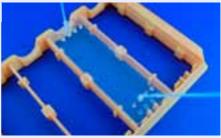


Fig. 451: Chip with olive interfaces connected with tubes

#### Step 4: Insert tube in pump tube

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



Fig. 452 Chip with olives connected via tubes to a peristaltic

# Step 5: Tube, pump & reservoir vessel

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



Fig. 453: 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

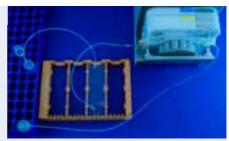


Fig. 454: Chip with olives connected via tubes to pump addressing a reservoir vessel and the exit port tube is inserted in a collection vessel

# 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 (09-0541-0331-09)
- 4. Male Mini Luer fluid connectors, e.g. the opaque version (09-0538-0331-09)
- 5. Male Mini Luer plugs, e.g. the red version (09-0551-0334-09
- 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

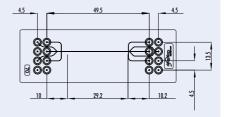


Fig. 455: Droplet generator chip 0162



#### Step 1: Chip & handling frame

1. Insert the chip in a handling frame

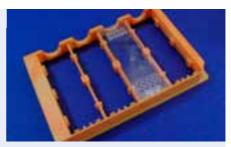


Fig. 456: Droplet generator 0162 placed in handling frame

# Step 2: Interface chip & pump for aqueous phase

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).

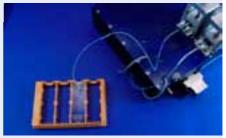


Fig. 457: Central entrance of the droplet generator chip conneted to the pump

#### Step 3: Interface chip & pump for oil phase

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



Fig. 458: 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.

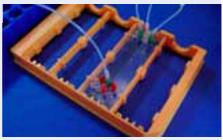


Fig. 459: Droplet generator with all redundant exit ports closed

# 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. 460: 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



Fig. 461: Complete experimental set-up

#### Step 8: Visualisation of the experiments

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



Fig. 462: Droplets generated on chip



# 13.3 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.

13.3.1 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:

 Close one inlet and one outlet port of the chamber with a Mini Luer plug.

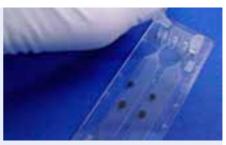


Fig. 463: Chip for 120  $\mu$ l sample volume with ready-made beads

#### Preparation steps 2:

- 2. Place chip into the ChipGenie® P instrument.
- 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 464: 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  $\mu$ l mcs wash buffer 1.
- 10. Start magnet for 30 sec.
- 11. Stop magnet.
- 12. Repeat steps 9-11 two more times.



Fig 465: Chip and ChipGenie® edition P during sample loading



Fig. 466: Beads on chip during clean-up and elution

#### 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.
- Disconnect the Mini Luer-connector from the outlet port and aspirate the eluate with the help of a pipette.

#### 13.4 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.

# 13.4.1 On-chip plasma generation out of whole blood

The membrane chip enables you to generate blood plasma from  $20-40\,\mu l$  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

# 13 Application notes



#### 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.

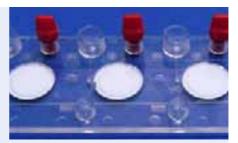


Fig 467: Membrane chip Fl. 200 with Mini Luer plugs

#### Sample loading:

Pipette the designated volume (between 20 and 40  $\mu$ l) of whole blood into Luer-inlet-port of the membrane chip.

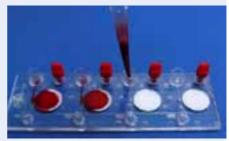


Fig 468: Insertion of blood in membrane chip

# Filtration:

Use a pipette (for yellow tips) with a set volume of  $100~\mu l$ . Press the pipette tip tightly into the sample outlet port and suck slowly for  $\sim 30$  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 469: Plasma take up

# Results:

Based on your starting volume, between 10 and 20  $\mu$ l of blood plasma will be generated. It should be clear, light yellow and free of blood cells.



Fig 470: On-chip generated plasma

# 13. 5 Cell culture with Lab-on-a-Chip Cell Culture Incubator LOC-CCI 1

An easy handling of cell cultures can be achieved with the help of the **Lab-on-a-Chip Cell Culture Incubator** LOC-CCI 1 allowing for a short and long term CO<sub>3</sub>-independent cell culture.

The Lab-on-a-Chip Cell Culture Incubator LOC-CCI 1 has to be equipped with a consumable microfluidic device, the cell culture itself has to be inserted with the help of a pipette, tubing has to be connected and everything is placed on the stage of a microscope. Heater and pumps have to be accommodated to the respective cell culture conditions. Either static media supply or continuous flow can be used for medium exchange or cell treatment. Cell based assays can be performed over a few hours up to several weeks according to the experimental needs.

#### Preparation step:

Insert cell culture on chip with pipettelnsert chip in Lab-on-a-Chip Cell Culture Incubator LOC-CCI 1



Fig 471: Rhombic chamber chip placed in Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1

#### Preparation step:

Connect chip and Lab-on-a-Chip Cell Culture Incubator LOC-CCI 1 with external pumps

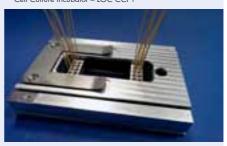


Fig 472: Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 with embedded chip and capillaries for the connection of pumps

#### Preparation step:

Place chip and Lab-on-a-Chip Cell Culture Incubator LOC-CCI 1 and define pump rate and heating conditions: Run experiments



Fig 473: Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 during use on microscope stage



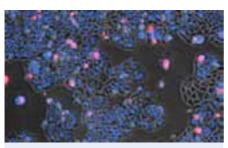


Fig 474: Cell culture carried out in  ${\rm CO_2}$ -incubator

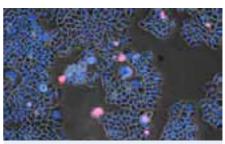


Fig 475: Cell culture done in Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1

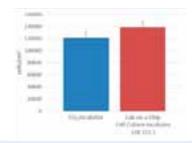
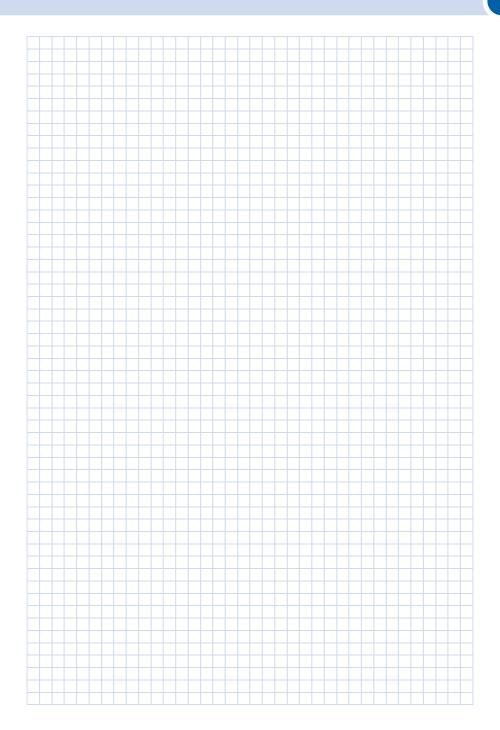
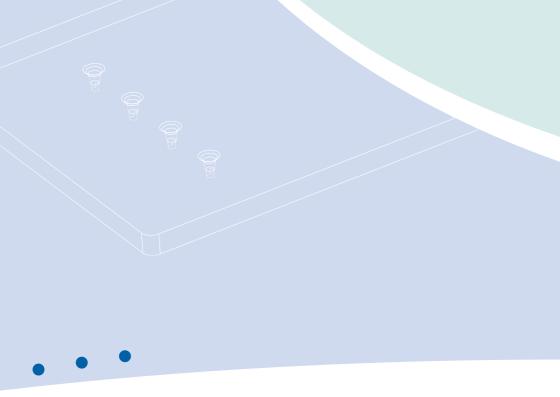


Fig 476: Comparison of cell culture done in CO<sub>2</sub>-incubator and Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1

That  $\mathrm{CO}_2$ -independent cultivation of cells in the Lab-on-a-Chip Cell Culture Incubator – LOC CCI 1 leads to slightly increased proliferation in comparison to common  $\mathrm{CO}_2$ -incubator-based cell culture.

Product Code	Description	Detail		Price [€]
22-4500-0000-00	Lab-on-a-Chip Cell Culture Incubator – LOC-CCI 1			1,485.00
11-0826-0000-00	LOC-CCI 1 starter kit 1	- Male Mini Luer plugs, red, material: PP (10) - Rhombic chamber chip, 120 µl chamber volume, 500 µm channel depth, hydrophilized, material: Topas (10)	09-0551-0334-09 12-0906-0172-02	638.32
		chamber chip, 100 µl chamber volume, 600 µm channel depth, hydrophilized, material: Topas (10)	12-0913-0221-02	
		- Rhombic chamber chip, 250 μl chamber volume, 800 μm channel depth, hydrophilized, material: Topas (10)	12-0919-0194-02	





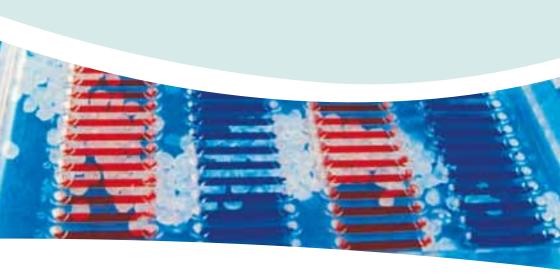








# 14 Fabrication services



# **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 14.1 General design guidelines for polymer-based microfluidic devices helps you to judge the feasibility of design features of microfluidic chips.

Chapter 14.2 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.



# 14.1 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  $\mu$ m. 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  $\mu$ m for features < 100  $\mu$ m. For features between 100 and 1000  $\mu$ m, the minimum depth is 15  $\mu$ m.

# d) Minimum residual thickness of the device

The minimum residual thickness of the device in structured areas (see Fig. 477) is  $500 \, \mu m$  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  $500 \, \mu \text{m}$ . Smaller holes can be realized with additional means upon request.

#### h) Open areas

Open areas (see Fig. 477) are possible.



Fig. 477: Through-holes, open and structured areas



# 14.1.1 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. 478) is 50  $\mu$ m. For features in the range between 50 and 100  $\mu$ m, 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  $\mu$ m occurs as standard. Smaller radii down to 10  $\mu$ m 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  $45^{\circ}$ -90° (depending on absolute feature size) are possible.

# d) Surface roughness

Mechanical machining results in a surface roughness of the order of  $0.5-1 \mu m$  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. 478), to create an optical finish (roughness < 50 nm RMS).

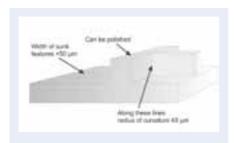


Fig. 478: Features of a milled mold insert



Fig. 479: Mold insert realised using ultraprecision mechanical machining

# 14.1.2 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  $10 \, \mu m$ . For features in the range between 10 and  $100 \, \mu m$ , the aspect ratio is limited to 1.5.

#### b) Maximum height

For lithography-based mold inserts, the maximum feature height is 100  $\mu$ m.



# 14.2 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.

# 14.2.1 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.

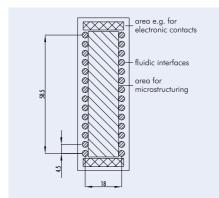


Fig. 480: Principle drawing of a microscopy slide with fluidic interfaces – in this version, fluidic interfaces are grouped along the long sides of the chip.

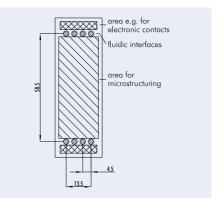


Fig. 481: Principle drawing of a microscopy slide with fluidic interfaces – in this version,fluidic interfaces are grouped along the short sides of the chip

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  $4.5~\mathrm{mm}$  spacing, corresponding to the spacing of a  $384\mathrm{-well}$  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.

# 14.2.1.1 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.

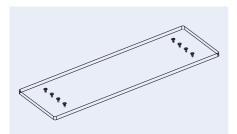


Fig. 483: Microscopy slide through-hole platform – version with eight fluidic interfaces

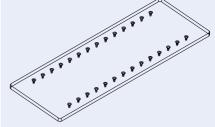


Fig. 484: Microscopy slide through-hole platform – version with 28 fluidic interfaces

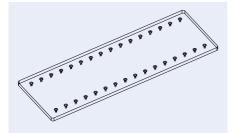


Fig. 485: Microscopy slide through-hole platform – version with 32 fluidic interfaces



Fig. 486: Example of microscopy slide through-hole platform with 32 through-holes



Product Code	Description	Material	Price [ŧ	€] 10+
10-1100-0339-01	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	PMMA	55.00	30.00
10-1101-0339-03	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	PC	55.00	30.00
10-1102-0339-02	Microscopy slide platform 2 x 4 through-holes, pack of 10 slides	Topas	55.00	30.00
10-1103-0339-05	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

# 14.2.1.2 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  $\mu$ l due to the internal volume of the olives which is added to the dead volume of the tubing.

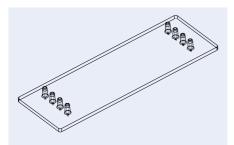


Fig. 487: Microscopy slide olive platform – version with eight fluidic interfaces  $\,$ 

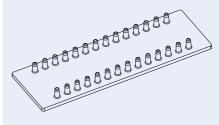


Fig. 488: Microscopy slide olive platform – version with 28 fluidic interfaces

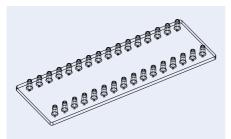


Fig. 489: Microscopy slide olive platform – version with 32 fluidic interfaces



Fig. 490: 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

# 14.2.1.3 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.



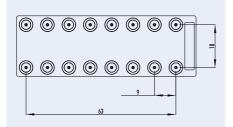


Fig. 491: Microscopy slide Luer platform – version 16 fluidic interfaces

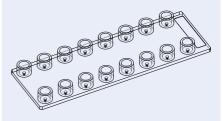


Fig. 492: Microscopy slide Luer platform – version 16 fluidic interfaces

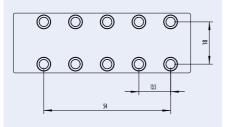


Fig. 493: Detail of the microscopy slide Luer platform with ten fluidic interfaces



Fig. 494: Example of microscopy slide Luer platform with ten Luer interfaces

Product Code	Description	Material	Price [€	€] 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

# 14.2.1.4 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.

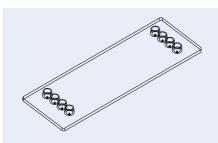


Fig. 495: Microscopy slide Mini Luer platform – version with eight fluidic interfaces



Fig. 496: Microscopy slide Mini Luer platform – version with eight fluidic interfaces

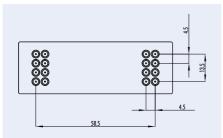


Fig. 497: Microscopy slide Mini Luer platform – version with 16 fluidic interfaces on the short edges



Fig. 498: Microscopy slide Mini Luer platform – version with 16 fluidic interfaces on the short edges

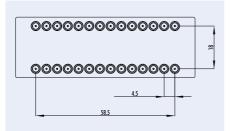


Fig. 499: Microscopy slide Mini Luer platform – version with 28 fluidic interfaces on the long edges



Fig. 500: Microscopy slide Mini Luer platform – version with 28 fluidic interfaces on the long edges

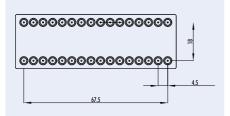


Fig. 501: Microscopy slide Mini Luer platform – version with 32 fluidic interfaces on the short edges



Fig. 502: Microscopy slide Mini Luer platform – version with 32 fluidic interfaces on the short edges



Product Code	Description	Material	Price [€	€] 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

# 14.2.2 Double slide format (75.5 mm x 50 mm x 2 mm)

The double slide format is an in-between solution of small microscopy slide and the microtiter plate. The platform is equipped with two double rows of 10 Mini Luer interfaces allowing for a large variety of fluidic interconnects in the development phase.

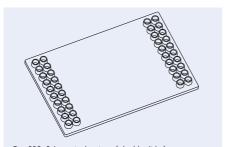


Fig. 503: Schematic drawing of double slide format -Fluidic 508

Product Code	Description	Material	Price [€	€] 10+
10-1148-0508-01	Double slide platform 40 Mini Luer interfaces, pack of 10 substrates	PMMA	76.00	44.50
10-1149-0508-02	Double slide platform 40 Mini Luer interfaces, pack of 10 substrates	Topas	76.00	44.50
10-1150-0508-03	Double slide platform 40 Mini Luer interfaces, pack of 10 substrates	PC	76.00	44.50
10-1151-0508-05	Double slide platform 40 Mini Luer interfaces, pack of 10 substrates	Zeonor	76.00	44.50



# 14.2.3 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 microfiter 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 microfiter 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 microfiter plates, allows the use of, for example, pipetting robots or conventional plate readers for optical detection.



Fig. 504: Schematic drawing of one microfluidic microtiter plate

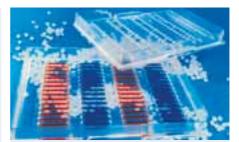


Fig. 505: Example of one of microfluidic ChipShop's microfluidic microtiter plates

# 14.2.4 1/4 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.

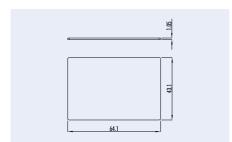


Fig. 506: Schematic drawing of 1/4 microtiter-plate

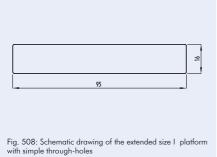


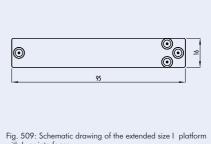
Fig. 507: Example for 1/4 microtiter-plate, realized within EU-FP7 project "CD-Medics", No. 216031. Design: IMM

#### 14.2.5 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.



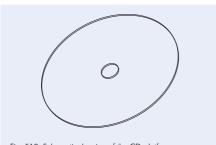




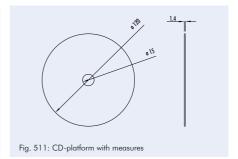
with Luer interfaces

#### 14.2.6 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.







# 14.2.7 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.

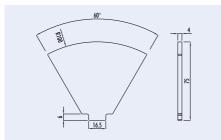
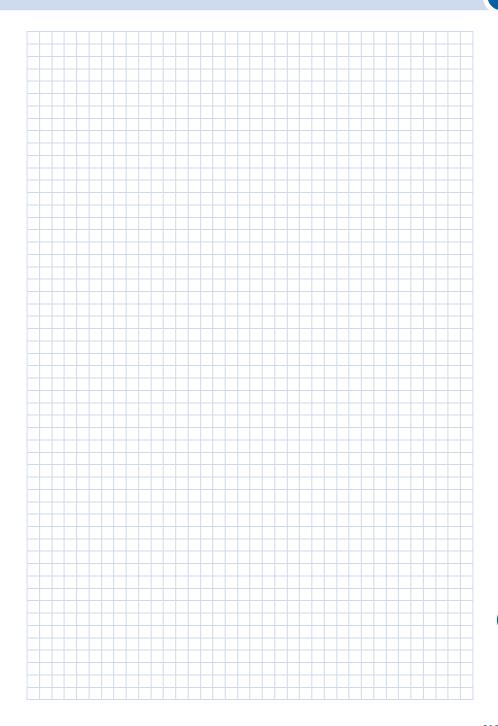
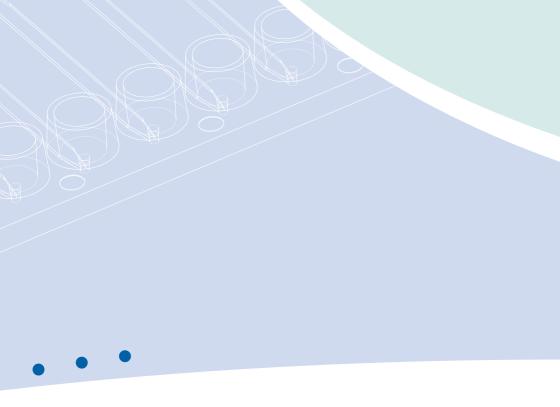


Fig. 512: Geometrical layout of the pie slice plate



Fig. 513: Examples of pie slice plate chips. The chips were developed within the BMBF-Project "ZentriLab", FKZ 16SV2350.













### 15 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. 514: Diagnostic platform with Luer connectors



Fig. 515: Cell sorting chip



Fig. 516: PCR chip with integrated freez-dried master mix



Fig. 517: Channel-array chip



Fig. 518: Hybrid chip consisting of polymer and filters for plasma generation



Fig. 519: Continuous-flow PCR chip, chip, realized within the BMBF-Project "ChipFlussPCR", FKZ 13N9556



Fig. 520: Hybrid chip for immunoassays with electrochemical detection, realized within the EU-FP6 project "SmartHEALTH", No. 016817



Fig. 521: Cell culture chips with integrated thin film electrodes, realized within the BMBF-Project "HepaChip", FKZ 01GG0728



Fig. 522: Hybrid chip for immunoassays with plasma generation unit for electrochemical detection, realized within EU-FP6 project "SmartHEALTH", No. 016817



Fig. 523: Two component microinjection molding – Device for agglutionation based assays, realized within the BMBF project FASAMOS, FKZ 02PC2001



Fig. 524: Sample-in-result-out DNA-analysis chip, realized within the BMBF project ChipFlussPCR, FKZ 13N9556



Fig. 525: Microfluidic chip for a complete SELEX-cycle, realized within the ETB project Artamis, FKZ 03139428

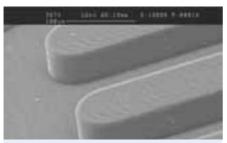


Fig. 526: Microchannel with nanostructured channel floor. The nanostructures have a 1.2  $\mu$ m period and 200 nm height



Fig. 527: Microfluidic chip for immunoassay applications with reagent reservoirs and antibody-coated frits for three assays, realized within the BMBF project IFSA, FKZ 16SV5417



Fig. 528: Sample-in-result-out DNA-analysis chip with hybridisation zone for optoelectronic read-out, realized within the project PatholD Chip, A-102-RT-GC



Fig. 529: Microfluidic chip coupled to conventional (top) and flex (bottom) PCBs, realized within the BMBF-project "SafelS", FKZ 0315574C





Fig. 530: Filtration chip with liquid reservoir



Fig. 531: Fluidic chip with rotary valve



Fig. 532: Extended size electrophoresis chip for sequencing



Fig. 533: Immunoassay chip with plasma generation unit and blister pouches  $\,$ 



Fig. 534: HLA typing chip for the detection of coeliac disease, realized within the FP 7 project "CD-Medics", No. 216031



Fig. 535: Serology test chip for the detection of coeliac disease, realized within the FP 7 project "CD-Medics", No.216031

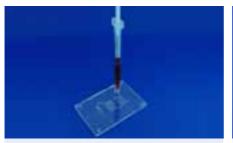


Fig. 536: Boyle-Mariotte PCR chip for ultrafast PCR, design: IMM, realized within the FP 7 project "CD-Medics", No. 216031



Fig. 537: Enyzme-assay development chip, realized within the FP 7 project Multisense Chip, No. 261810



Fig. 538: Enzyme-assay development chip in bread board instrument, realized within FP 7 project Multisense Chip, No. 261810



Fig. 539: Microfluidic chip with lateral flow strip based detection and implemented blister for liquid storage

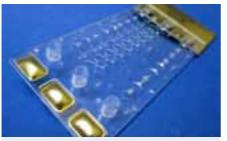


Fig. 540: PCR cartridge with TMR-sensor-based read-out , BMBF projekct MiniLab, No. 16SV4029



Fig. 541: Particle counting chip with integrated turning valve and staining solution, TAB project No. 2009 FE 0134



Fig. 542: Cell culture chip with integrated membrane, TAB project No. 2011 FE 9014

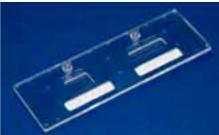


Fig. 543: Parallel PCR chip, FP 7 project Multisense Chip, No. 261810

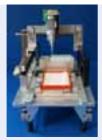


Fig. 544: Merger of standard liquid handling and lab-on-achip technology – LOC pipettor & xy-stage for optical read out, TAB project No. 2011 FE 9023



Fig. 545: Chip cuvette for frit-based immunoassays, realized within the BMBF project IFSA, FKZ 16SV5417



Fig. 546: One sample – 10 reactions: 0.5  $\mu$ l volume PCR chip, FP 7 project Multisense Chip, No. 261810



Fig. 547: Integrated microfluidic chip for continuous-flow PCR and parallel immunoassay, FP7 project Multisense Chip, No. 261810



Fig. 548: Breadboard system: Electrochemical immunoassay system for air sample analysis, FP7 project Multisense Chip, No. 261810



Fig. 549: Breadboard system: Lab-on-a-Chip instrument for optical read-out of immunoassays, TAB project LabChipIO



Fig. 550: Microfluidic chip realized for CARE-MAN - Health-CARE by biosensor Measurement and Networking, FP 6, NMP4-CT-2006-017333



Fig. 551: Integrated microfluidic chip for the detection of bacterial pathogen on molecular and immunological level, FP7 project Multisense Chip, No. 261810



Fig. 552: Integrated microfluidic chip for the detection of bacterial pathogen on molecular and immunological level with integrated electrodes, FP7 project Multisense Chip, No. 261810



Fig. 553: Integrated microfluidic chip with complete sample preparation for miRNA analysis, BMBF project IMRA, FKZ 0316078A



Fig. 554 Selective cell counting chip for hematology, BMBF project MrCyte, FKZ 13N12018

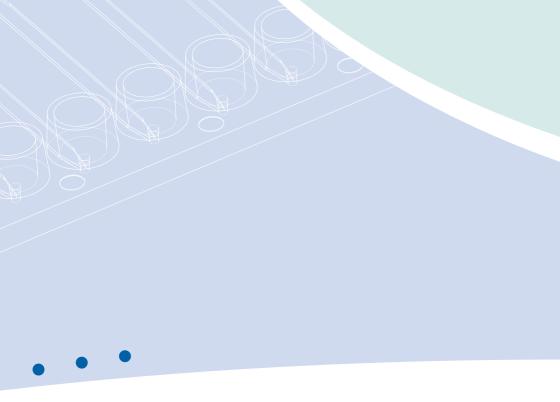


Fig. 555: Miniaturized spectrometer module, ChipGenie Optics, TAB project 2013 FE 9021

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# 16 One for all – A universal diagnostic platform



## One for all – A partnership with Stratos Product Development for the Bill & Melinda Gates foundation

"One for all" summarizes the question Bill Gates posed in a recent blog: "Can you create a new device that quickly diagnoses HIV, TB, malaria, and other diseases... accepts different samples, like blood, saliva, and sputum... is affordable... and reliable... and will work in a small clinic that has only a few hours of electricity a day?"



#### 16 One for all – A partnership with Stratos Product Development for the Bill & Melinda Gates foundation

### Lab-on-a-Chip solutions – Enabling elements for a complete diagnostics platform for health centers in the developing world

Delivering a universal point-of-care diagnostic platform allowing for molecular-based, immunological and clinical chemistry assays in combination with coping with different sample matrices like sputum, blood, plasma, urine etc. is the overall goal of the PanDx project.

Within the Grand Challenges in the Global Health initiative of the Bill & Melinda Gates Foundation, Stratos Product Development took care of the development of the instrument platform and partnered with microfluidic ChipShop for the lab-on-a-chip and assay development.

Within an 18-month time frame making massive use of *microfluidic ChipShop*'s microfluidic toolbox concept to speed up assay development, a fully working breadboard instrument capable of all three assay types was realized by Stratos, complemented by *microfluidic ChipShop*'s work delivering three fully integrated cartridges combined with the development and implementation of three different assay types on chip, namely:

- 1. A tuberculosis assay working on the molecular level.
- 2. An HIV p24 antigen immunoassay for the early detection of an infection.
- A clinical chemistry assay for analyzing the liver function through a colorimetric read-out of the ALT level.



Fig. 556: Stratos breadboard unit – operating molecular, immunological and clinical chemistry assays



Fig. 557: microfluidic ChipShop's tuberculosis cartridge placed in the chip loader



Fig. 558: Cartridges for the detection of tuberculosis, early HIV infection, and liver function (from left to right)



microfluidic ChipShop's cartridges are fully equipped with all reagents. The only remaining task for the user is the sample input followed by placement of the cartridge in the Stratos instrument, which takes over the complete assay handling and read-out.

The pictures highlight the three fully working cartridges as well as the breadboard instrument.

Besides the microfluidic chip design and fabrication, microfluidic ChipShop covered also the complete assay development making use of its wide service portfolio beyond the microfabrication. The related fabrication tasks include injection molding and assembly, dry and liquid reagent storage and lyophilization, biological reagent formulation, surface tuning, membrane and frit integration, and valve implementation, leading to a fully integrated cartridge as a complete lab-on-a-chip device, demonstrating the potential of the system.

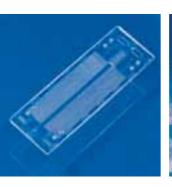
To be continued...



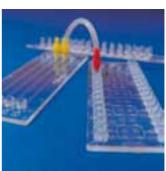












### 17 Order form



#### 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	*				
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:					

<sup>\*</sup> Minimum order volume:  $\in$  250 (below this amount we charge a  $\in$  15 minimum quantity surcharge) \*\*Estimated shipping charges: Germany:  $\in$  15-30 / EU:  $\in$  20-60 / RoW:  $\in$  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 Paymen	t:
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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

