Telos® High Throughput Droplet System

Description

The Telos® System is a breakthrough product for parallel microfluidic processes, including emulsion generation, micro-particle production, high throughput mixing and microreactions. This modular, scalable, and highly flexible system removes the low throughput limitation of individual microfluidic chips, enabling litres of droplets or particles to be produced in a day.

Up to 10 Telos® modules can be assembled in parallel. Each module holds a microfluidic chip typically with 7 junctions, enabling a total of 70 parallel junctions to be run at once. All junctions are visible from above and below for illumination and optical access. The modules also have integrated valves providing excellent flow control during priming and operation and optional integrated filters on all input streams. The Telos® system can be configured to allow collection of the output streams into a bulk fluid reservoir or into parallel tubing to allow downstream process steps.

Telos® operates from 0-10bar (150psi) and 4-80°C. Fast set-up time is achieved with tool-free assembly of modules, chips, valve blocks and connectors.

A 10 module Telos® System made from Telos® Support Frame (Part No. 3200375) and 10 x Telos® Clamp Module – Tube Collection (Part No. 3200399)

Benefits

- Enables high throughput microfluidics
- Tool - free system set up
- Wide temperature and pressure range
- Excellent chemical compatibility
- Optical access above and below chip
- Excellent flow control during priming and operation
- Scalable with up to 10 chips in parallel
- Various configurations possible to suit many applications

System Specifications

Specification	
Footprint	Depth: 100mm, Width: 60 – 300mm, Height: 105mm
Number of Ports	3
Output configuration options	Surface Connector, Edge Connector, bulk fluid reservoir
Number of chips in Parallel	1 – 10
Chip compatibility – Linear Connector*	Width: 15mm, Thickness: 4mm, Length: 45mm
Chip compatibility – Edge/Manifold*	Width: 15mm, Thickness: 4mm, Length: 22+mm
Operating pressure	0 – 10bar
Operating temperature	4 – 80°C
Chip materials	Glass, Quartz, other options available on request
Wetted materials	FFKM, PEEK, PCTFE, PTFE
Internal volume per Telos® Clamp Module	207µl
Emulsion Flow rate per Telos® Clamp Module	~ 10ml/min**

**Note: Surface connection required, for hole positions see Telos® 2 Reagent Chip*

***Example fluids: water in decane*

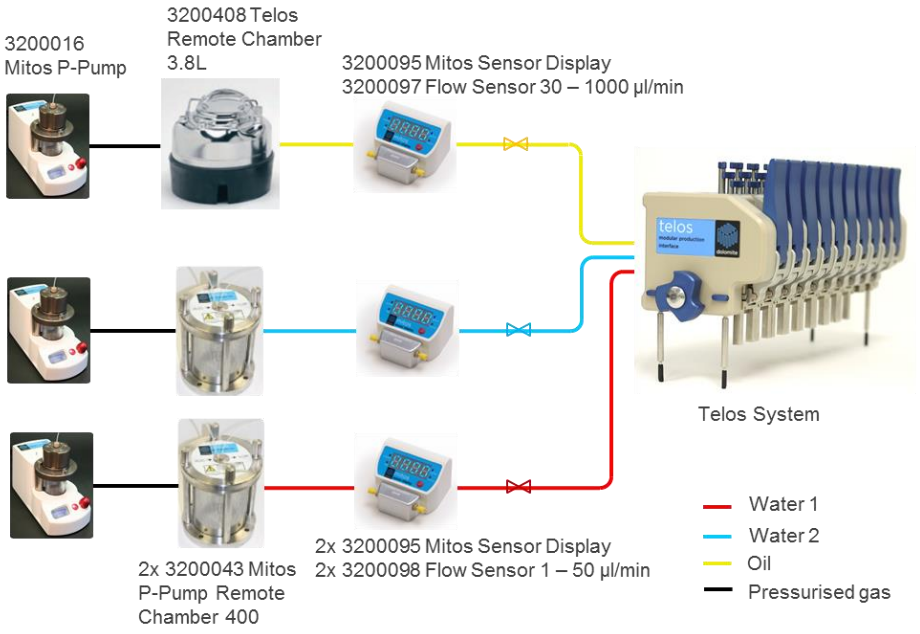
Applications

Telos® benefits a wide range of industries including pharmaceutical, food, agrochemical, cosmetics and research and can be used for the following applications:

- High throughput emulsion and foam generation
- Microparticle and nanoparticle synthesis
- Novel product formulation
- DNA, cell and bead encapsulation
- Parallel Micromixing and micro-reactions

Typical Telos® System setup

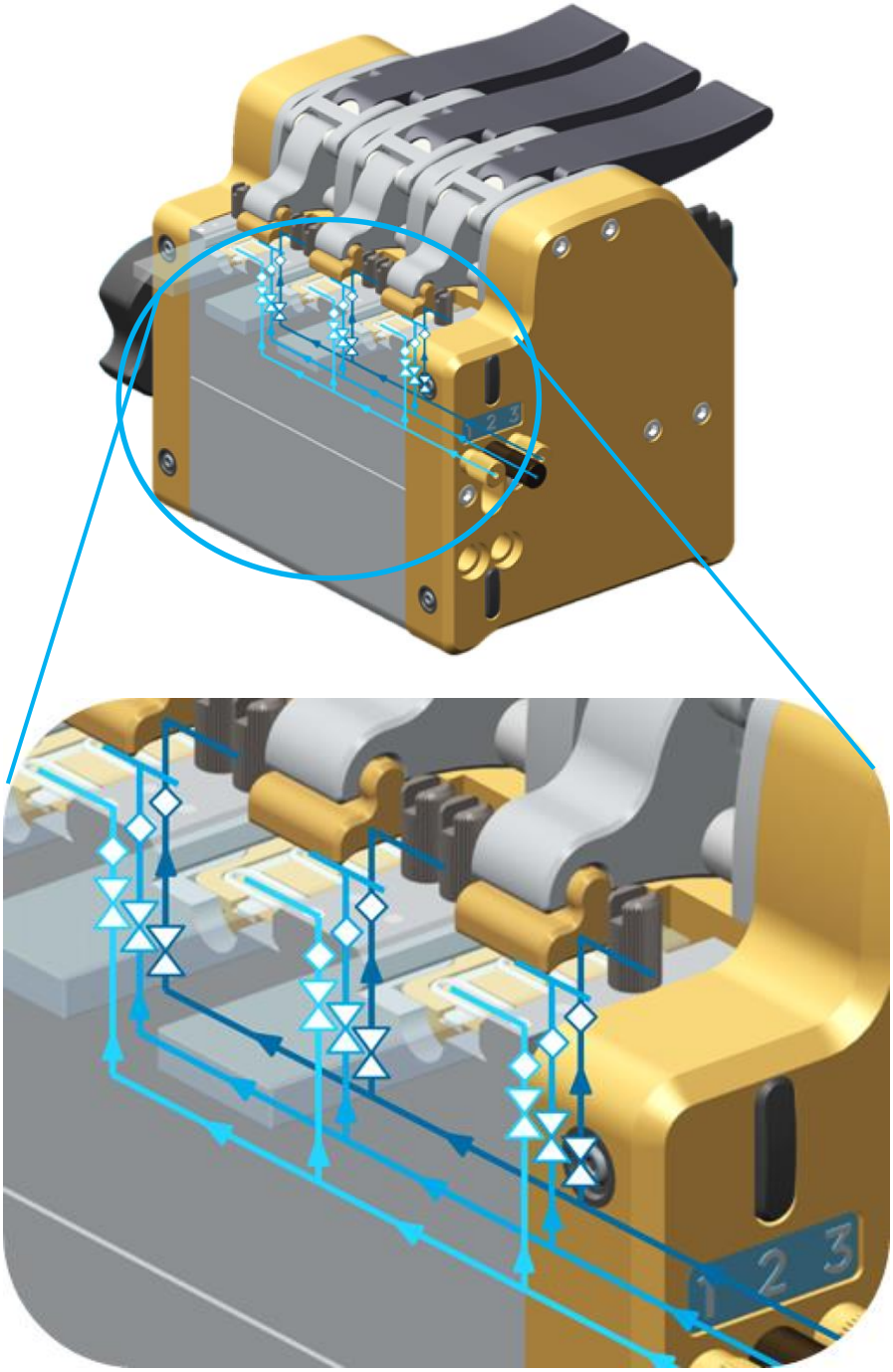
The diagram below shows a typical Telos® system setup with Dolomite P-Pumps, remote chambers and flow sensors controlling the flow of three input streams:



For more information on system setup please refer to the Telos® application notes.

Fluid Pathway

Below is a schematic that shows the fluid pathway for the Telos® system. Input tubes connected via the Telos® Support Frame to supply input fluids to all of the Telos® Clamp Modules. Each Telos® Clamp Module has three on/off valves which control the flow of the input fluid streams to each chip. Each Telos® Clamp Module also has three in-line filters which are replaceable and are situated just before the flow reaches the chip.



Key:

- Valve

- Filters

Vertical Orientation

In this orientation a fluid reservoir can be placed under the chips and filled so that the ends of the chips are submerged. This allows the droplets to be collected in a bulk solution.

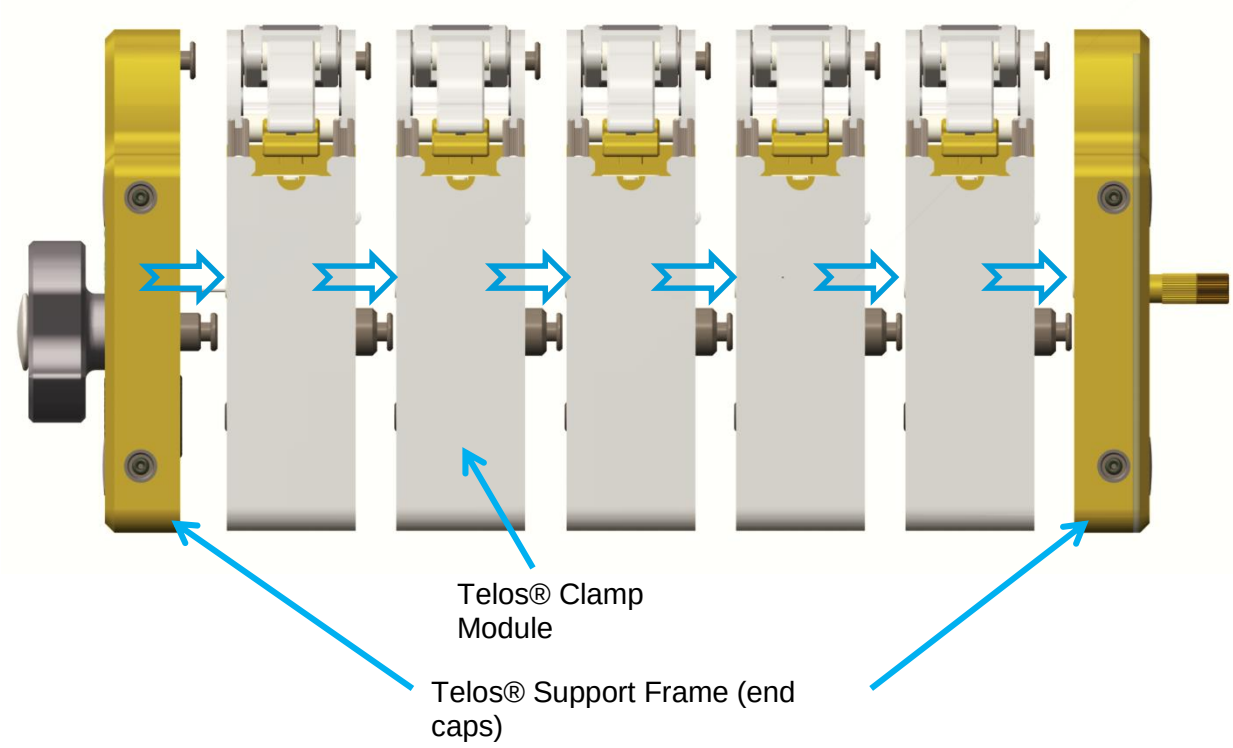
In the image below four legs hold the Telos® in the vertical orientation. The legs are normally retracted into the Telos® support frame and are extended using the release buttons.

Horizontal Orientation

In horizontal orientation the output streams are typically collected into tubing using the Telos® Clamp Module - Tube Collection (Part No. 3200399). For system with two input streams it is possible to use the fluid input channel on the Telos® to collect the output stream from the chip.

Assembly

Multiple Telos® clamp modules can be stacked together to build up a system as shown below



After the system is assembled chips can be inserted and clamped down using a force limited lever mechanism which avoids overcompression of the chips and seals. Input tubing is connected using the nut and ferrule connection which is supplied with the Telos® Support Frame.

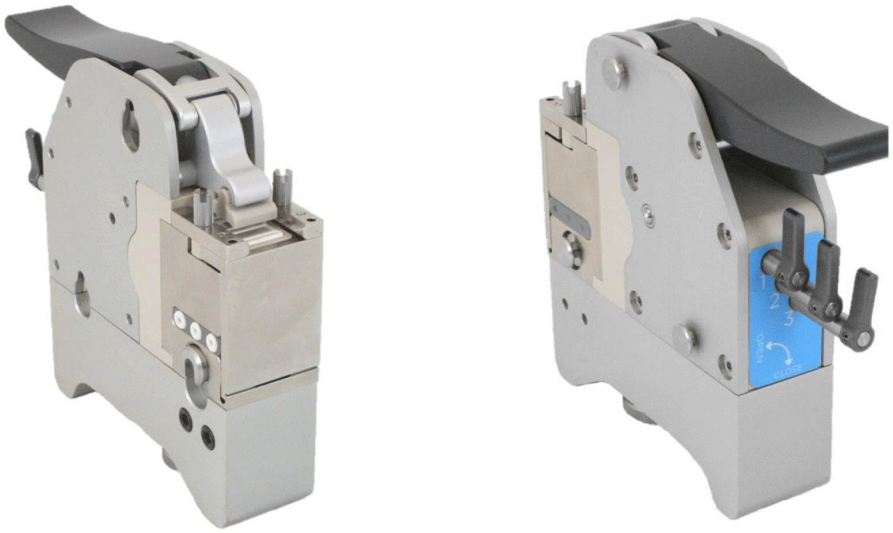
Telos® Clamp Module (Part No. 3200400)

The Telos® Clamp Module holds a microfluidic chip with up to 7 channels. Each junction is visible from above and below for illumination and optical access. Fast set-up time is achieved with an easy to use tool-free clamp mechanism that locates and seals the chip in place, making or breaking connections instantly.

The Telos® Clamp Module incorporates the 3 in-line on/off valves for excellent flow control during priming and operation. Additionally, the Telos® Clamp Module includes optional integrated filters.

Multiple Telos® Clamp Modules can be stacked side by side to scale up production allowing on/off control of fluid throughput streams for each chip. Up to 10 of these modules can be added, giving a total of 70 parallel channels. The Telos® Clamp Module is configured to allow vertical product collection into bulk fluid. Telos® operates from 0-10bar (150psi) and 4-80°C.

The Telos® Clamp Module works in conjunction with the Telos® Support Frame (Part No. 3200375).



Telos® Clamp Module (Part No. 3200400)

Specification	
Number of ports	3
Internal volume	207µl
Operating pressure	10bar*
Operating temperature of connector	4 to 80ºC
Wetted materials	PCTFE (body), PTFE (rotor), PEEK (seal block), FFKM (seals)

**Tested at 21ºC*

Included Parts	
Telos® Standard Interface	1
Telos® Valve Block	1

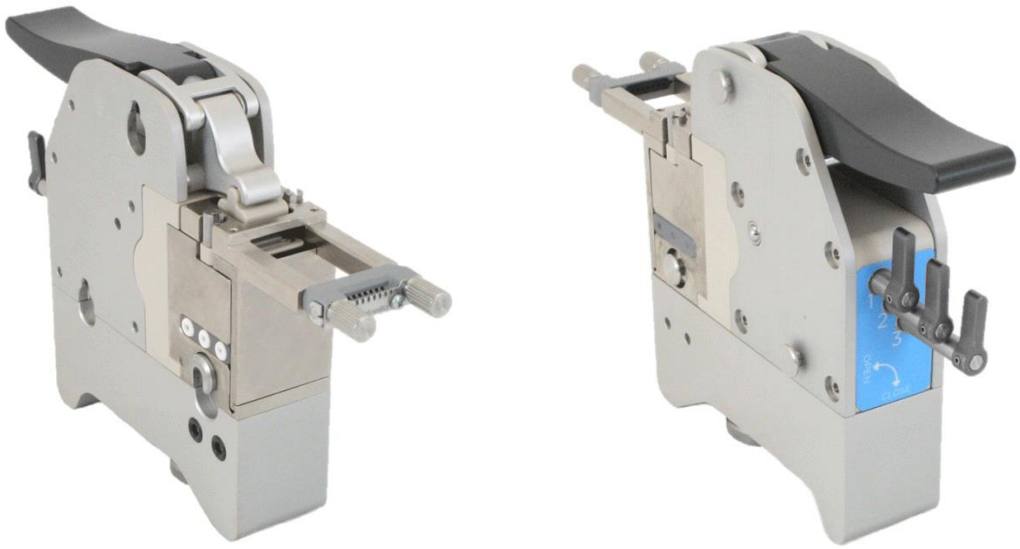
Telos® Clamp Module – Tube Collection (Part No. 3200399)

The Telos® Clamp Module - Tube Collection holds a microfluidic chip with up to 7 channels. Each junction is visible from above and below for illumination and optical access. Fast set-up time is achieved with an easy to use tool-free clamp mechanism that locates and seals the chip in place, making or breaking connections instantly.

The Telos® Clamp Module – Tube Collection incorporates the 3 in-line on/off valves for excellent flow control during priming and operation. Additionally, the Telos® Clamp Module includes optional integrated filters.

Multiple Telos® Clamp Modules can be stacked side by side to scale up production allowing on/off control of fluid throughput streams for each chip. Up to 10 of these modules can be added, giving a total of 70 parallel channels. The Telos® Clamp Module - Tube Collection is configured to allow droplets to be collected directly into FEP or similar tubing. Telos® operates from 0- 10bar (150psi) and 4- 50°C.

The Telos® Clamp Module - Tube Collection works in conjunction with the Telos® Support Frame (Part No. 3200375).



Telos® Clamp Module – Tube Collection (Part No. 3200399)

Specification	
Number of ports	3
Internal volume	207µl
Operating pressure	10bar*
Operating temperature of connector	4 to 50ºC
Wetted materials	PCTFE (body), PTFE (rotor), PEEK (seal block), FFKM (seals)

**Tested at 21ºC*

Included Parts	
Telos® Tube Collection Interface	1
Telos® Valve Block	1

Telos® Support Frame (Part No. 3200375)

The Telos® Support Frame slots onto the ends of a series of Telos® Clamp Modules (Part Nos. 3200399 and 3200400) creating a system with up to 10 Telos® Clamp Modules.

One end of the Telos® Support Frame has fluid input ports which are fed by Mitos P-Pumps (Part No. 3200016).

The Telos® Support Frame has adjustable legs to set the height for vertical orientation of the chip output over a liquid collection reservoir (see Telos® Clamp Module Part No. 3200400).

Telos® operates from 0-10bar (150psi) and 4-50°C. Fast set-up time is achieved with tool-free module assembly.

Telos® Support Frame (Part No. 3200375)

Specification	
Number of ports	3
Operating pressure	10bar*
Operating temperature of connector	4 to 50ºC
Wetted materials	FFKM (seals), FEP (tubing)

**Tested at 21ºC*

Included Parts	
FFKM O-ring	1
Flangeless Ferrule, ETFE	3
FFKM O-Ring	3
Short Headless Nut	2
Long Headless Nut	1
PTFE Tube Cutter	1
FEP Tubing, 1/16" x 0.8mm, 10 metres	1

Telos® Starter Kit (Part No. 3200363)

The Telos® Starter Kit allows evaluation of the Telos® chip range, prior to the purchase of a full Telos® system. This starter kit is perfect for initial experimentation, for example testing a single Telos® 2 Reagent Chip (Part No. 3200357), before scaling up to multiple chips.

Telos® Starter Kit (Part No. 3200363)

Specification	
Inputs	3 surface
Output	1 edge
Operating pressure	0 – 10bar
Operating temperature of connector	-15 – 50°C *
Operating temperature of fluid in connector	-15 – 150°C **
Chip materials	Glass, Quartz, other options available on request
Wetted materials	FEP or PEEK (tubing), FKM (seal), FFKM (seal), PEEK, ECTFE, Glass (chip)
Chip thickness options	4mm (+ 0.2 mm / - 0.05mm)
Chip width options	15mm (+ 0.02mm / - 0.2mm)
Chip length options	45mm (+ 0.2 mm / -0.05mm)

**Upper temperature limit applies to PEEK tubing. FEP tubing is limited to 40ºC*
***Assumes external surfaces of connector are at room temperature and tube I.D. <0.3mm.*

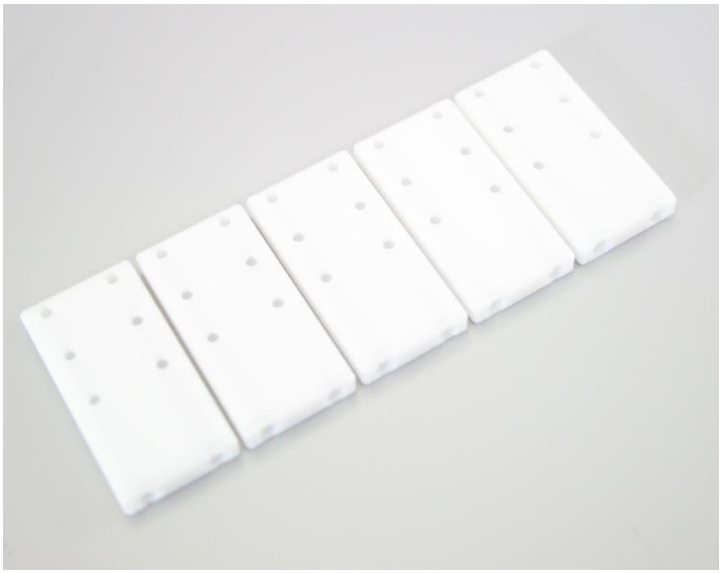
Included Parts	
Linear Connector 7-way	1
Linear Connector Funnel	3
Triple Top H Interface (45mm)	1
PTFE Tube Cutter	1
FEP Tubing, 1/16" x 0.8mm, 10 metres	1

FEP Tubing, 0.8 x 0.1mm, 10 metres	1

Telos® Purging Chip (Pack of 5) (Part No. 3200370)

The Telos® Purging Chip is an accessory for the Telos® Clamp Modules (Part Nos. 3200399 and 3200400).The purging chip can be loaded into the position of a droplet chip and allows the Telos® feed lines to be purged, primed or cleaned. This low cost chip is unlikely to become blocked as it has very large channels. Used before starting an experiment this chip will prolong the life of the Telos® chips.

The primed fluids drip off the end of the chip and can be collected in a suitable container.



Telos® Purging Chip (Pack of 5) (Part No. 3200370)

Benefits

- Enables the Telos® system to be rapidly purged before use
- Allows chips to be disconnected during Telos® cleaning
- Excellent chemical compatibility (PTFE)
- Reduces set up time when using viscous fluids

Telos® Remote Chamber 3.8L (Part No. 3200408)

The Telos® Remote Chamber 3.8L is a 10bar stainless steel pressure chamber accessory for use with the Telos® system. Using a Mitos P-Pump (Part No. 3200016) it enables large sample volumes up to 3.8L to be used, so that continuous pumping for long periods is possible. With the precise pressure-driven pumping mechanism of the Mitos P-Pump, the flow from the chamber is highly stable and pulse-free. The Telos® Remote Chamber 3.8L is simple to connect and comes pre-fitted with a 10µm PEEK B-o-B Filter (Part No. 3200409).

Telos® Remote Chamber 3.8L (Part No. 3200408)

Benefits

- Sample volumes up to 3.8 litres
- In-tank filter supplied
- Continuous pumping for extended periods of time
- Simple to connect to the Telos® system
- Suitable for use with 1/8” or 1/16” tubing
- Can be pressurised up to 10bar*
- Excellent chemical compatibility
- Robust stable design fitted with stainless steel base
- Marine grade stainless steel
- Temperature range 4 - 80ºC

**note tested at 21˚C*

10µm PEEK B-o-B Filter, 1/16” (Pack of 5) (Part No. 3200409)

The 10µm PEEK B-o-B Filter, 1/16” (Pack of 5) is designed to fit onto the end of 1/16” tubing enabling inlet fluids to be filtered at the bottom of the bottle or reservoir.

The large surface area allows operation at high flow rates and is recommended for use in Telos® Remote Chamber 3.8L (Part No. 3200408) and Mitos P-Pump Remote Chamber 400 (Part No. 3200043).

These filters are required to prevent debris/particulates entering microfluidic chips.

The filter has an extra port providing the option to bubble an inert gas, such as Helium, through the filter to de-gas the sample.

10µm PEEK B-o-B Filter, 1/16” (Pack of 5) (Part No. 3200409)

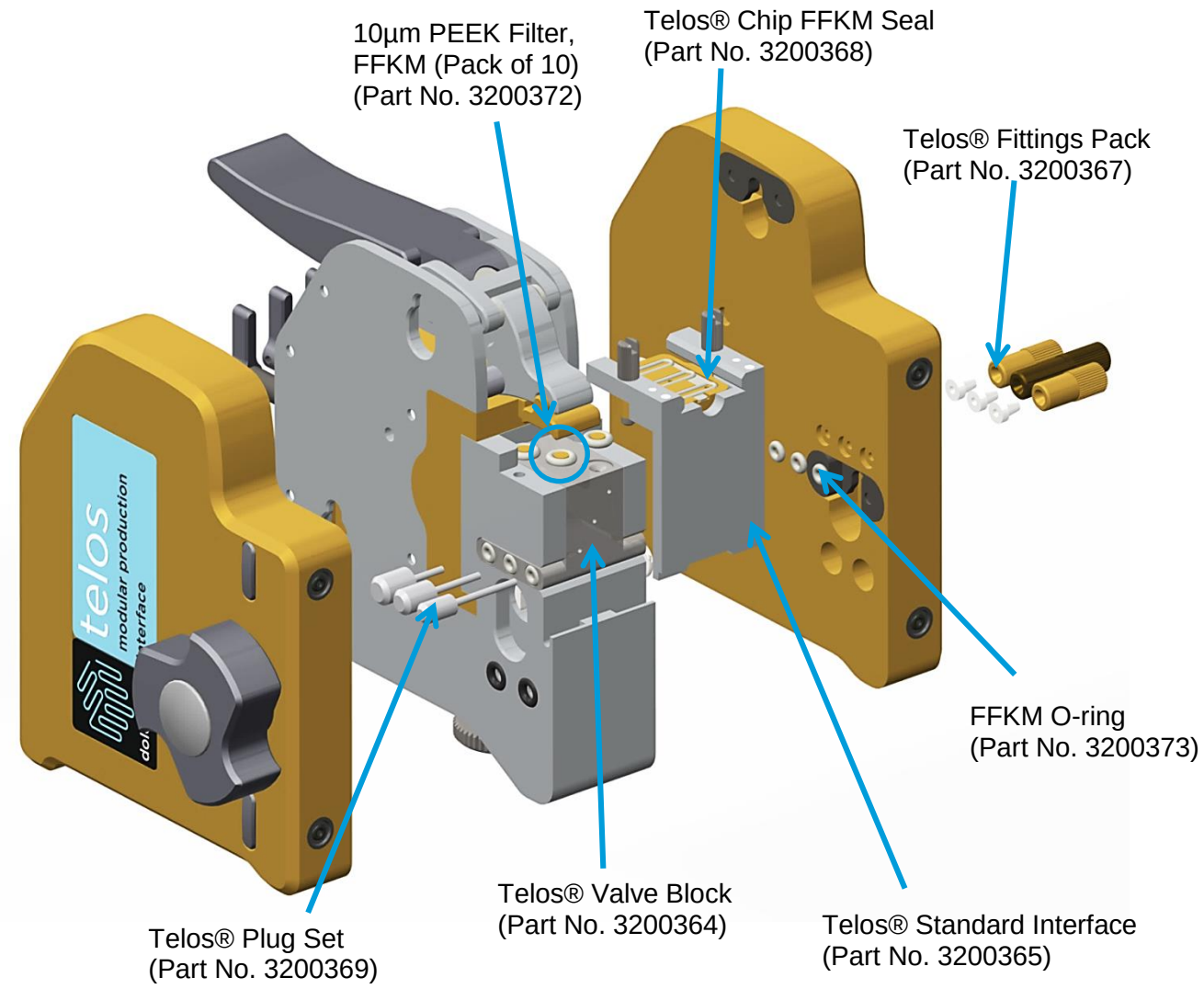
Benefits

- Bottom of Bottle design enabling full sample usage
- Large surface area
- Excellent chemical compatibility (PEEK)
- Prolongs the life of microfluidic chips
- De-gassing port for optional use
- 10µm filter

Telos® spares

Telos® Valve Block	3200364
Telos® Standard Interface	3200365
Telos® Tube Collection Interface	3200366
Telos® Fittings Pack	3200367
Telos® Chip FFKM Seal	3200368
Telos® Plug Set	3200369
10µm PEEK Filter, FFKM (Pack of 10)	3200372
FFKM O-ring (Pack of 10)	3200373

Telos® Spares Exploded View



Telos® Valve Block (Part No. 3200364)

The Telos® Valve Block is a spare for the Telos® Clamp Modules (Part Nos. 3200399 and 3200400). Each Telos® Valve Block includes 3 on-off valves which allow excellent flow control during priming and operation.

Note that the seals provided as standard in this valve are made from perfluoro-elastomer (FFKM), which is not compatible with fluorinated oils. To have Telos® Valve Block supplied with seals that are compatible with fluorinated oils please contact Dolomite.

Telos® Valve Block (Part No. 3200364)

Benefits

- Pre-chip replaceable filters
- Fast valve response
- High pressure capability
- Excellent chemical compatibility
- Robust design
- Small space envelope

Specification	
Number of ports	3
Internal volume	178µl
Operating pressure	10bar*
Operating temperature	4 to 80ºC
Wetted materials	PCTFE (body), PTFE (rotor)
10µm PEEK Filter, FFKM	3
FFKM O-ring	3

**Tested at 21ºC*

Telos® Standard Interface (Part No. 3200365)

The Telos® Standard Interface is an accessory for the Telos® Clamp Module (Part No 3200400). The Telos® Standard Interface is also interchangeable with the Telos® Tube Collection Interface (Part No 3200366) allowing for different output collection configurations.

Note that the seals in this interface are made from perfluoro-elastomer (FFKM), which is not compatible with fluorinated oils. To have Telos® Standard Interface supplied with seals that are compatible with fluorinated oils please contact Dolomite.

Telos® Standard Interface (Part No. 3200365)

Specification	
Number of ports	3
Internal volume	29µl
Chip thickness options	4mm (+ 0.2 mm / - 0.05mm)
Chip width options	15mm (+ 0.02mm / - 0.2mm)
Chip length options	22 – 90mm
Operating pressure	10bar*
Operating temperature	4 to 80ºC
Wetted materials	PCTFE (body), PTFE (rotor), PEEK (seal block), FFKM (seals)
Telos® Chip FFKM Seal	1

**Tested at 21ºC*

Telos® Tube Collection Interface (Part No. 3200366)

The Telos® Tube Collection Interface is an accessory for the Telos® Clamp Module – Tube Collection (Part No. 3200399). The Telos® Tube Collection Interface is also interchangeable with the Telos® Standard Interface (Part No. 3200365) allowing different output configurations.

Note that the seals in this interface are made from perfluoro-elastomer (FFKM), which is not compatible with fluorinated oils. To have Telos® Tube Collection Interface supplied with seals that are compatible with fluorinated oils please contact Dolomite.

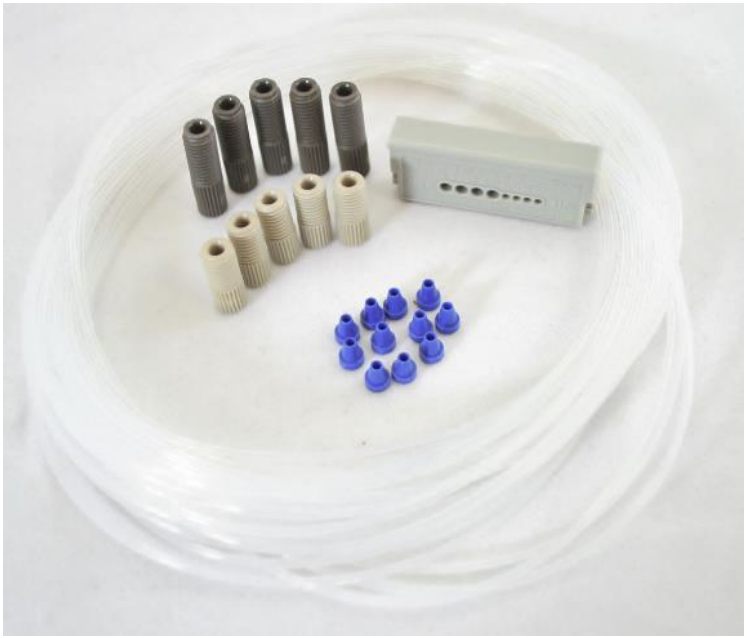
Telos® Tube Collection Interface (Part No. 3200366)

Specification	
Number of ports	3
Internal volume	29µl
Chip thickness options	4mm (+ 0.2 mm / - 0.05mm)
Chip width options	15mm (+ 0.02mm / - 0.2mm)
Chip length options	45mm (+ 0.2 mm / -0.05mm)
Operating pressure	10bar*
Operating temperature	4 to 50ºC
Wetted materials	PCTFE (body), PTFE (rotor), PEEK (seal block), FFKM/FKM (seals)
Telos® Chip FFKM Seal included	1

**Tested at 21ºC*

Telos® Fittings Pack (Part No. 3200367)

This pack of fittings and tubes are required to connect the Mitos P-Pumps to the Telos® system. Included in this pack is a tube cutter to enable successful tube termination. All parts have excellent chemical resistance.



Telos® Fittings Pack (Part No. 3200367)

Contents	Quantity
Flangless Ferrule, ETFE	15
Short Headless Nut	10
Long Headless Nut	5
PTFE Tube Cutter	1
FEP Tubing, 1/16" x 0.8mm, 10 metres	2

Telos® Plug Set (Part No. 3200369)

This is a spare for the Telos® Support Frame (Part No. 3200375). The Telos® Plug Set's functionality is to eliminate trapped air and seal the fluid input channels at one end of a series of Telos® Clamp Modules (Part Nos. 3200399 and 3200400).

The Telos® Plug Set contains 3 sets of 3 plugs.

Telos® Plug Set (Part No. 3200369)

Telos® Chip FFKM Seal (Part No. 3200368)

The Telos® Chip FFKM Seal is an accessory for the Telos® Clamp Modules (Part Nos. 3200399 and 3200400). The Telos® FFKM Seal provides excellent chemical resistance and reliable sealing to Telos® chips.

Note that this seal is made from perfluoro-elastomer (FFKM), which is not compatible with fluorinated oils. For seals that are compatible with fluorinated oils please contact Dolomite.

Telos® Chip FFKM Seal (Part No. 3200368)

10µm PEEK Filter, FFKM (Pack of 10) (Part No. 3200372)

The 10µm PEEK Filter, FFKM is an accessory for the Telos® Clamp Modules (Part Nos. 3200399 and 3200400). Each Telos® Clamp Module contains three of these filters allowing filtration for up to 3 input streams. These filters are required to prevent debris / particulates entering Telos® chips.

Note FFKM is not compatible with Fluorinated oils. For seals that are compatible with fluorinated oils please contact Dolomite.

10µm PEEK Filter, FFKM (Pack of 10) (Part No. 3200372)

FFKM O-ring (Pack of 10) (Part No. 3200373)

The FFKM O-Ring is a spare for the Telos® Clamp Modules and Support Frame (Part Nos. 3200375, 3200399 and 3200400). These FFKM O-Rings make a liquid seal between modules on the input liquid flow paths.

Note that these seals are made from perfluoro-elastomer (FFKM), which is not compatible with fluorinated oils. For seals that are compatible with fluorinated oils please contact Dolomite.

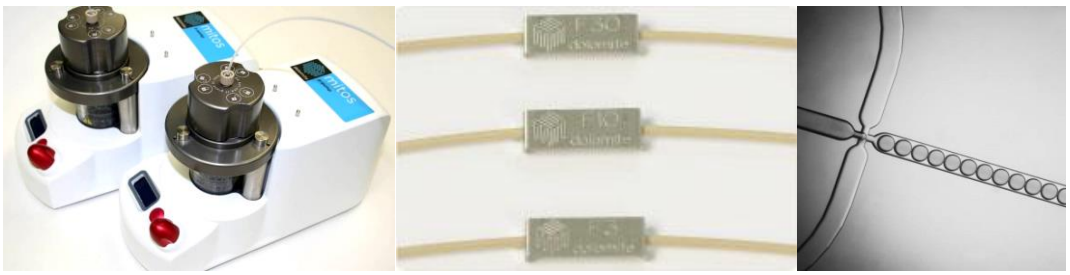
FFKM O-ring (Pack of 10) (Part No. 3200373)

Droplet Formation

The size, consistency, and production rate of droplet formation is a function of several physical parameters, including:

- Channel size
- Viscosity and surface tension of the various fluids
- Presence of surfactants
- Miscibility of the fluids
- Use of hydrophobic or hydrophilic coating on the channel walls
- Total flow rate and relative flow rate of each fluid
- Flow stability

To accelerate development work in droplet microfluidics, Dolomite offers a range of modular micro droplet systems featuring Dolomite's industry leading microfluidic pumps, connectors and chips. This features the Mitos P-Pump, which provides stable, pulse-free flow for generation of droplets with extremely consistent diameters (monodisperse). Please contact Dolomite to configure a droplet system that fits your requirements.



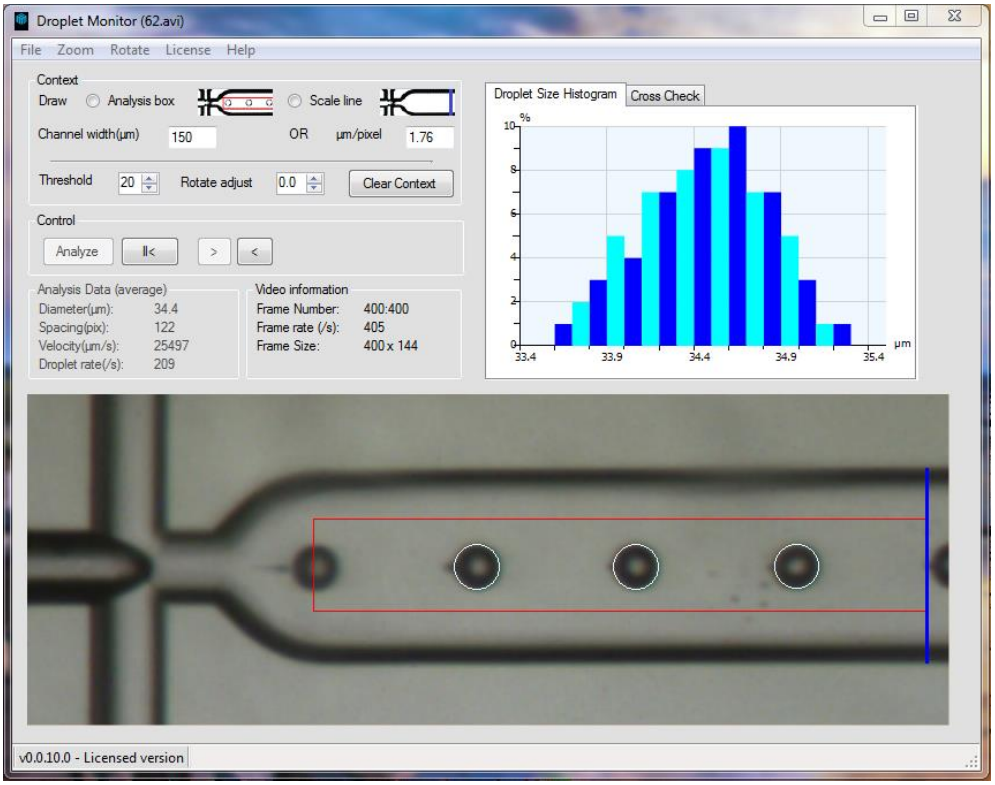
Mitos P-Pump, Flow Resistors and Droplet Chips featured in the Droplet Advanced System

IP license

Dolomite is a licensee of Japan Science and Technology Agency ("JST") under JST's microdroplet generation technology. Please see our website for further details.

Droplet monitoring software

The Droplet monitoring software has been developed to take a media file generated from a high speed camera and analyse the size range of droplets produced.



Customisation

Custom chips can be designed for this system to take full advantage of scale up potential. If you would like to generate droplets of a different size, operate with challenging fluids or perform complex droplet functions, Dolomite can design the junction geometry required.

The system lends itself well for customisation due to the modular nature of the design.

Some reasons for customisation:

- Real time product Quality Control
- Temperature and atmospheric control
- Production of core/shell particles
- Disposable fluidic pathways
- Chemical compatibility
- Automation
- More chips in parallel

The range of Dolomite services available covers all aspects of the development process from characterization of liquids for droplet generation to the design of commercial instruments in the field of droplet microfluidics. Please contact Dolomite to discuss your application.

ДИА•М
современная лаборатория

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