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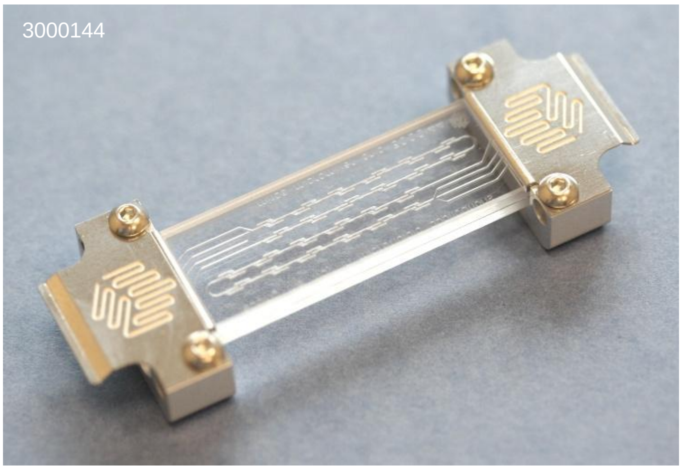
INFORMATION SHEET

Part name	Mitos micromixer chip	Part number	3000144

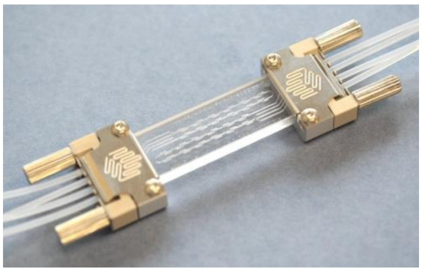
Description

The Mitos micromixer chip is a glass microfluidic device designed for rapid mixing of two or three fluid streams. Fast mixing times are required for the study of reaction kinetics, sample dilution, improving reaction selectivity, rapid crystallisation and nanoparticle synthesis. There are two independent micromixer channels on the chip and two headers allowing connection with the Mitos 4-way edge connector (3000024).



Left: Mitos micromixer chip (3000144)

Below: Micromixer chip with Edge Connectors



Benefits

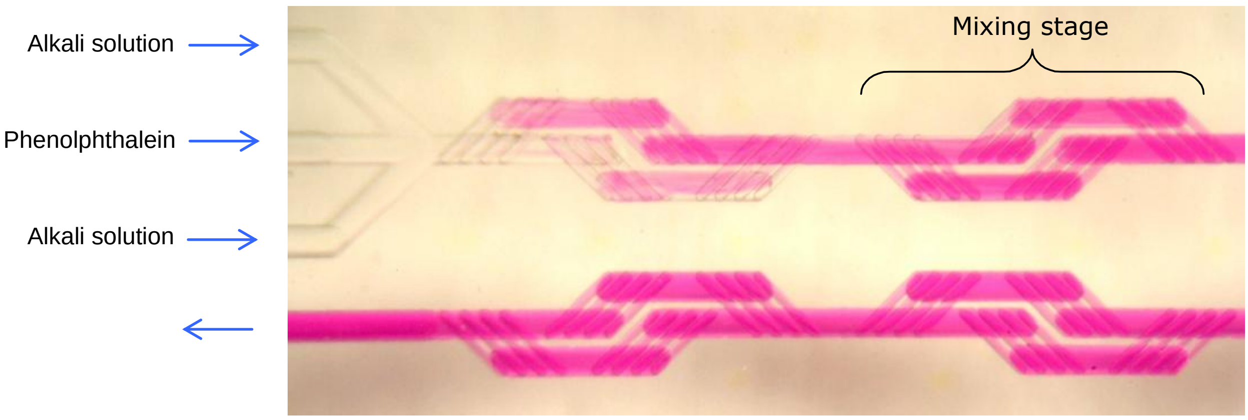
- Extremely rapid mixing across a range of flow rates
- Low dead volume
- High visibility (excellent access for optics)
- Quick connect / disconnect
- Wide temperature and pressure range
- Excellent chemical compatibility

	Specification	**Value**
1	Number of inputs	3
2	Number of outputs	1
3	Internal channel cross section	125 x 350 μm and 50 x 125μm (depth x width)
4	Internal volume of micromixer	8 μl
5	Internal volume of a mixing stage	0.35 μl
6	Back pressure with 100μl/min flow (water)	0.1 bar
7	Outside diameter of connection tubing	1.6 mm (1/16 inch)
8	Inside diameter of connection tubing	0.25 mm provided as standard
9	Connection tubing material	PTFE, FEP
10	Surface roughness of channels (R_a)	5 nm
11	Chip size	45 mm x 15 mm
12	Chip top layer thickness	2 mm
13	Chip base layer thickness	2 mm
14	Operating pressure	30 Bar with edge connector

15	Operating temperature	250 °C with edge connector (the glass can be locally heated to higher temperatures)
16	Material	Glass
17	Fabrication process	HF etching and thermal bonding

Micromixer performance

To measure mixing performance a transparent phenolphthalein pH marker was mixed with an alkali solution to produce a bright pink colour. This is shown in the image below.

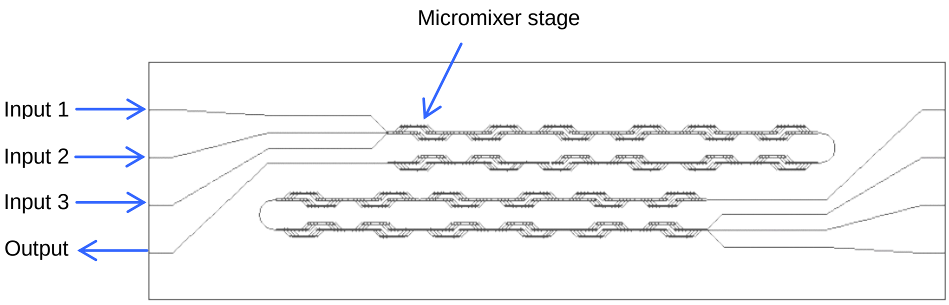


The mixing time was measured at various total flow rates, as shown in the table below. The volumetric flow rate ratio between the two input streams was 1:1.

Flow rate (microliters/min)	**5**	**10**	**20**	**40**	**80**	**160**	**320**	**640**	**1200**	**2000**	**3000**	**4000**	**5000**
Number of stages for mixing	**1**	**1**	**2**	**4**	**6**	**7**	**7**	**4**	**4**	**3**	**3**	**2**	**2**
Mixing time (milliseconds)	**4200**	**2100**	**2100**	**2100**	**1575**	**919**	**459**	**131**	**70**	**32**	**21**	**11**	**8**

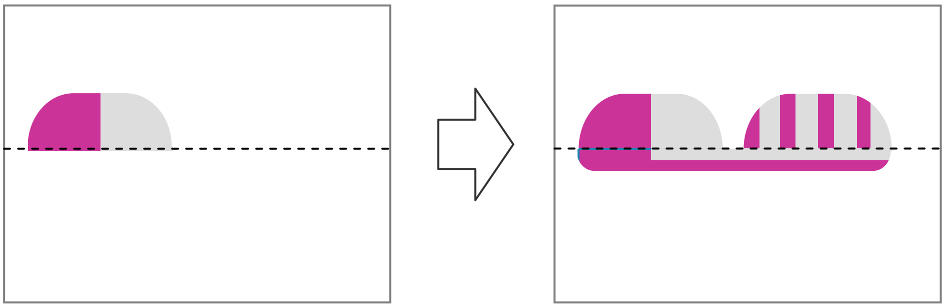
Micromixer chip channel layout

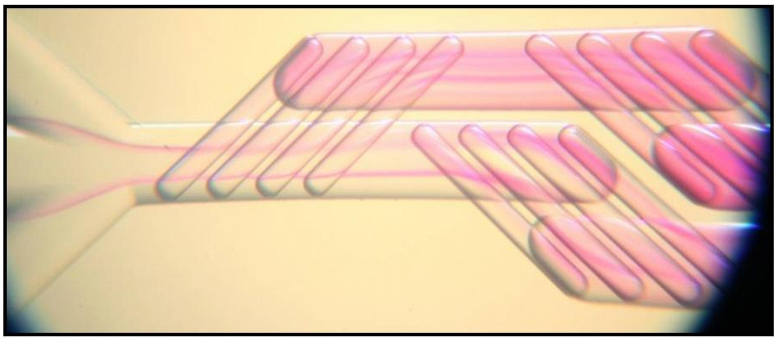
The channel geometry of the Micromixer chip is shown below:



Mixing mechanism

The Mitos micromixer is a static mixer (no moving parts), which at low flow rates creates lamination of the flow streams as shown in the diagram below:





The lamination of the streams reduces diffusion distances and hence improves mixing time. At high flow rates swirling occurs in the flow streams, reducing mixing time further.