

## Application note resealable flowcells

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### Description of resealable flowcells

Resealable flowcells are made by an elastomeric gasket, which is on a carrier borosilicate glass substrate. The gasket forms an open cell, available designs are either two standard layouts or custom made designs. By covering the gasket with a second glass slide a closed flowcell is formed, which, if compressed in an appropriate holder, can withstand a certain pressure. Thus, fluids can be flushed through the flowcell. We can provide various materials that are *inter alia* stable to several (organic) solvents, are of medical grade, and stable to temperatures up to 150 °C.

Currently, the resealable flowcells are made onto the standard glass slides (15 mm x 45 mm). Two different standard designs are available, straight flowcell and straight flowcell with extended region see Figure 1. The dimensions of the straight flowcell are 3 mm x 40 mm. The extended flowcell has a wide region of 10 mm x 30 mm and two narrow regions of 9 mm x 4 mm. The flowcell height is 300 µm with tolerances of +/- 30 µm.



*Figure 1: Designs of the two standard layouts, straight flowcell and extended flowcell. The dimensions of the glass slides are 15 mm x 45 mm.*

The maximum operating pressure depends on the gasket, i.e. thinner structures could resist less pressure. For the standard designs the advised maximum operating pressure is about 0.3 bar. Regarding flowrates, the standard flowcells were successfully tested at flow rates of 8 ml/min.

## Applications

Versatile applications of resealable flowcells are especially in cell culturing, bio-sensing, and chemical- and bio-chemical enzymatic production lines.

Example applications for cell culturing are to cultivate adhering cells in the resealable flowcell by flushing nutrients at specific velocities and concentrations. After cultivation, the cells could be easily harvested by just reopen the flowcell. The flowcell could be reused and, if necessary, sterilized with ethanol. Another application for cell cultivation is to use a membrane for which Micronit offers an Organ-On-A chip solution (OOC). This resealable flowcell device contains a porous membrane attached to a supporting layer, with the membrane interconnecting two separate flowcells.

The resealable flowcells yield advantages for bio-sensing applications for academic use as well as commercial use, as the surface of the flowcell could be modified with specific sensors, DNA- or protein-arrays that are incompatible with harsh chemicals or high temperatures since neither are used to close the flowcell. Also possible for commercial applications is the integration of sensor layers into the flowcell.

Besides cell culturing and (bio)sensing resealable chemical and biochemical enzymatic reactions could benefit from the advantages of the resealable flowcells. For some enzymatic reactions it is necessary to immobilize the enzymes to the device surfaces. The resealable flowcell offers an easy access to surface modification, chemically and physically global or locally when opened. After the modification the flowcell can be closed and the reaction could be performed.