# AUTOMATIC SWITCH BETWEEN MULTIPLE SOLUTIONS MAINTAINING A CONSTANT FLOW-RATE
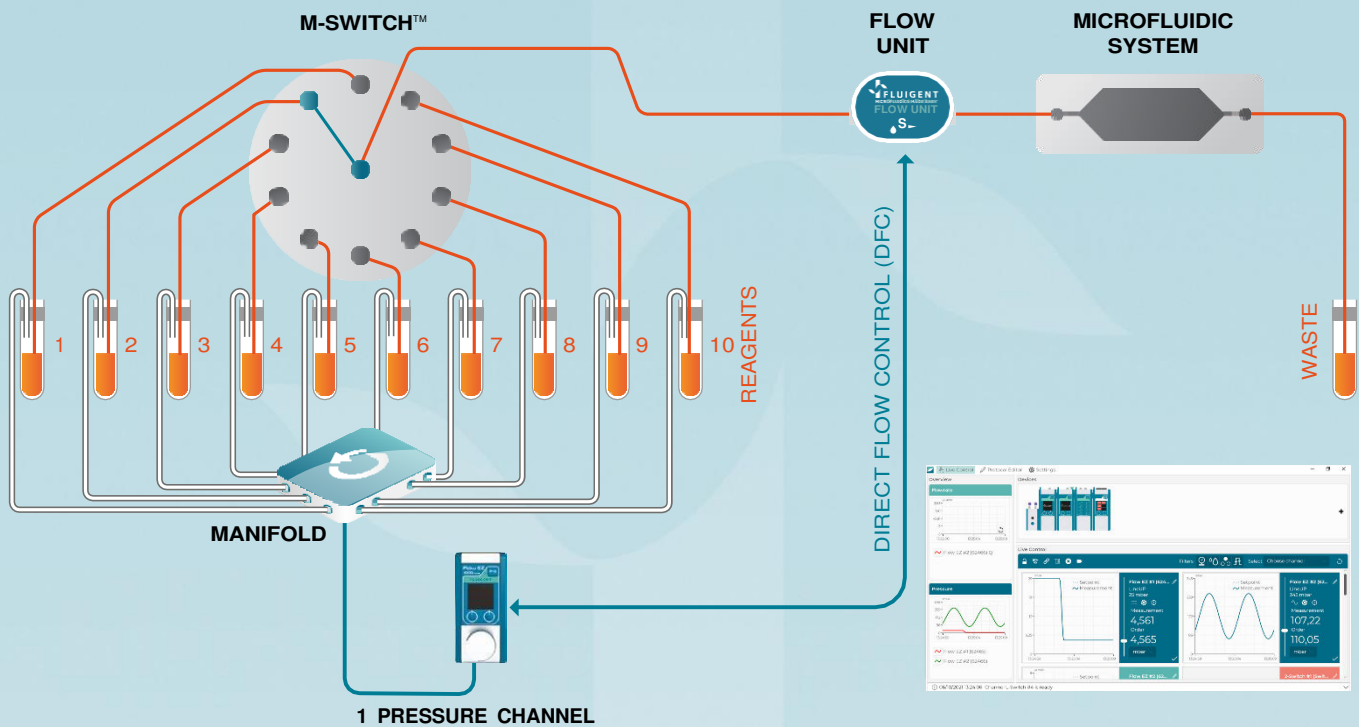


Figure 1: Schematic diagram of the setup

## BENEFITS

- High repeatability
- Stability and responsiveness
- Pressure and flow-rate multiplexing
- Set-up optimization
- Bench space saving

## APPLICATIONS

- Cell analysis
- Drug Screening
- Sample Preparation
- Cell lysis
- Calibration curve

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# INTRODUCTION

Many microfluidic applications require switching between multiple solutions (such as samples or buffers) while maintaining a constant flow-rate during the course of their experiment.

In this application, one Flow EZ™ pressure channel is connected via a manifold to ten separate vials containing different aqueous solutions. Use of the M-Switch™ and OxyGEN allows the selection of a specific solution directed to a microfluidic device.

This presents an economical way to change between fluids as it requires a single pressure channel and one flow sensor.

# MATERIALS

- Flow EZ™ at 345 mbar full scale
- A manifold to split the pressure (up to 10 outlets) from the Flow EZ™ identical pressure channels
- Fluiwell filled in with aqueous solutions
- M-Switch™, Switchboard
- FEP tubing with an ID of 200 microns to create some resistance in the system (OD 1/16'')
- FLOW UNIT M, calibrated for water over the range of 60 nL/min to 80 µL/min
- A reservoir for the waste
- Computer with the OxyGEN software

# METHODS

The experiment was run with the OxyGEN to automaticaly:

- Set the M-Switch™ on position #1
- Set the flow-rate to 10µL/min
- Switch from one port to the next one in line at desired time points
- Measure and save the flow-rate, then analyze in Excel.

The goal of this note was to set a simple and complete protocol for a multiple injection of several solutions within a fluidic system. We also checked if any material variation of the flow-rate was observed. It is important in this type of experiment to be able to switch from a vial to another without changing the flow-rate for too long. For example, one can compare the effect of different concentrations of drugs in a media on cells.

The settling time chosen is based on a 5% error band.

# RESULTS

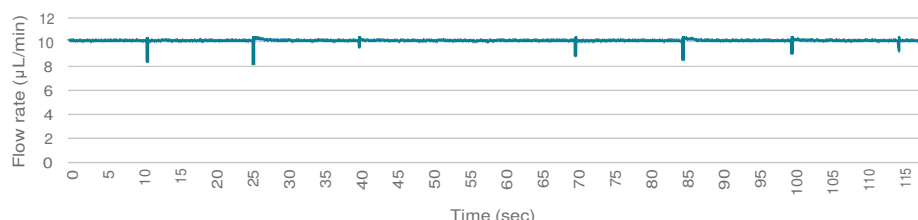A graph of flow-rate over time shows the flow profile throughout the study.



*Figure 2: M-Switch™ - Effect of valve position change on flow-rate*

Settling time:
≤100ms

The data for each switching interval was analyzed to determine the settling time for each change of position. Although it is visually possible to find the switching step when reading the raw data of the OxyGEN, in all cases normal flow was re-established in 100 ms or less.

It is important to note that the flow rate is always positive during the switching steps. This eliminates the possibility for cross contamination between the various solutions.

# CONCLUSION

**The Fluigent ESS™ Platform, when combined with flow control, allows for the simple switching between multiple reagents with minimum disruption to flow-rate from the M-Switch™.**