Application note

Date: 05.03.2020
Version: 1.1

Droplet measurement

Pulsed flow sensor / B-drop mini

Introduction

This application note shows how the **Pulsed Flow Sensor (PFS)** can be used in combination with a micro valve (B-drop mini) to measure single droplet volumes from 0.2 to 16 µl.

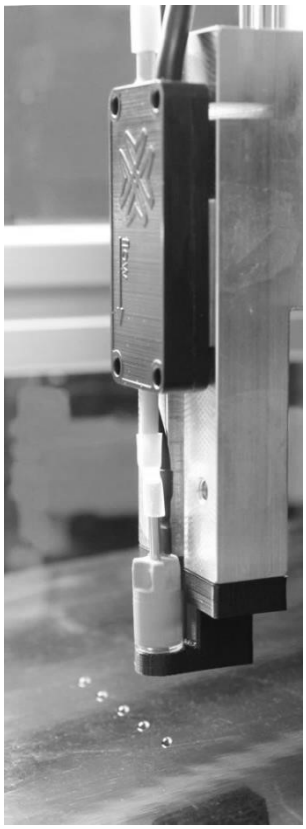

Image 1: PFS and valve setup

Used Material

- Pulsed Flow Sensor
- PFS controller with User Interface
- B-drop mini
- Pressure supply 0.5 bars
- Water container 300 ml
- Silicone Tubing

Experiment setup

The PFS was connected to a B-drop mini in a vertical setup. The tube between sensor and valve was kept as short as possible to prevent damping.

The system was then pressurized to 0.5 bars (without pressure control) and the measurement mode was set to "Droplet Mode". Then the valve was triggered with different opening times using the following waveform.

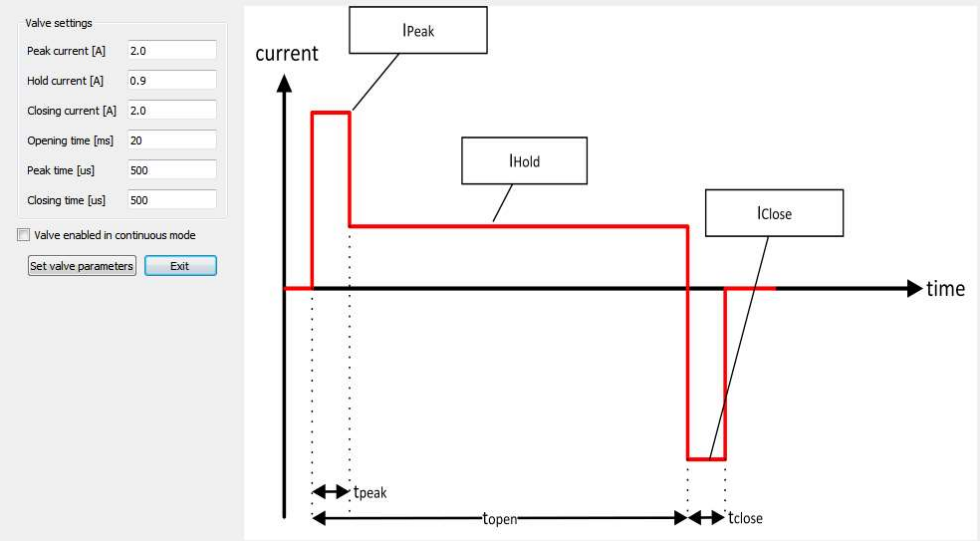

Figure 1: Waveform for the B-drop mini.

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Measurements

For 5 different opening times the droplet volumes were measured with the Pulsed Flow Sensor. The measured diagrams show that for the shortest opening time (2 ms) the valve already closes before a constant flow plateau can be reached. Still a good repeatability can be achieved. Longer opening times lead to smaller influence of the opening and closing process of the micro valve and therefore show better repeatability.

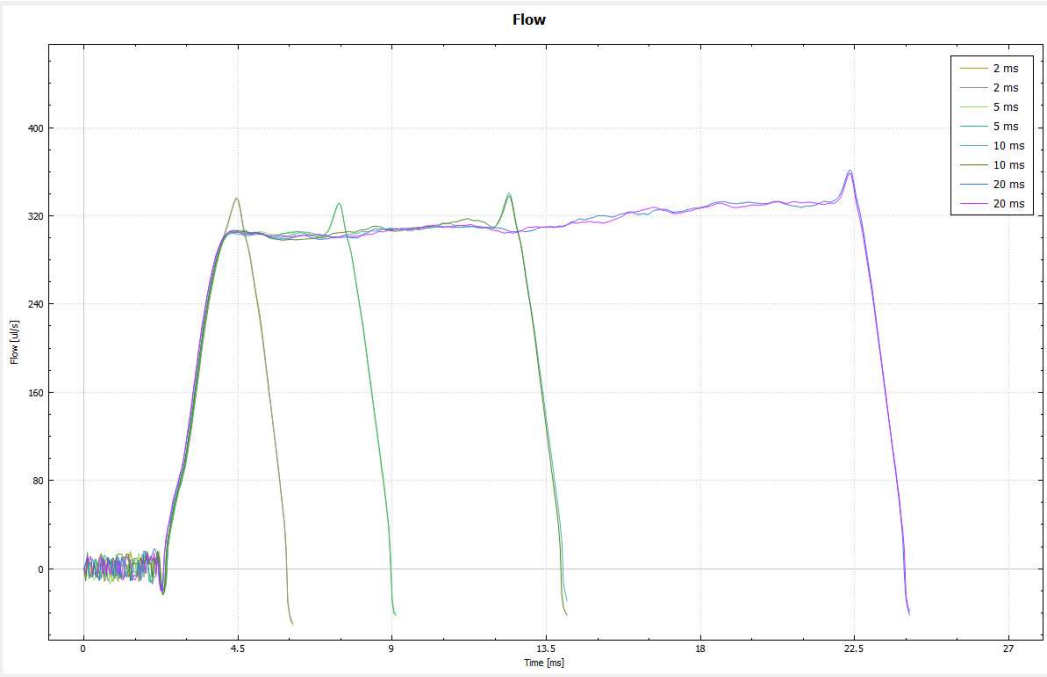

Figure 2: Volume flows produced by opening times of 2,5,10 and 20ms.

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Measured Data

	Opening time of the Valve				
Drop no.	2 ms	5 ms	10 ms	20 ms	50 ms
1	0.545	1.298	2.581	5.392	13.541
2	0.531	1.282	2.594	5.4	13.496
3	0.535	1.291	2.577	5.399	13.469
4	0.537	1.294	2.587	5.396	13.506
5	0.531	1.305	2.59	5.392	13.503
6	0.531	1.283	2.581	5.406	13.492
7	0.531	1.291	2.562	5.402	13.441
8	0.538	1.291	2.585	5.39	13.505
9	0.534	1.285	2.584	5.38	13.477
10	0.529	1.292	2.596	5.388	13.466
11	0.524	1.296	2.582	5.412	13.439
12	0.538	1.293	2.586	5.407	13.485
13	0.531	1.288	2.602	5.418	13.441
14	0.522	1.283	2.589	5.407	13.464
15	0.542	1.301	2.59	5.42	13.441
16	0.524	1.297	2.603	5.431	13.441
17	0.539	1.291	2.587	5.416	13.436
18	0.524	1.287	2.582	5.4	13.404
19	0.538	1.285	2.603	5.42	13.412
20	0.541	1.285	2.595	5.435	13.401
Mean vol. µl	0.53325	1.2909	2.5878	5.40555	13.463
St. dev. %	1.23%	0.49%	0.38%	0.27%	0.28%