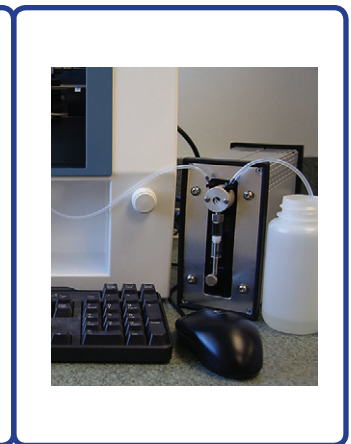




## FlowCAM®

### Syringe Pump Option for Ultra-High Precision and Efficient Sampling

The Syringe Pump option for the FlowCAM enables precise control of sample delivery for applications such as enumeration where absolute control over flow amount and speed are critical. Combined with specialized Field of View (FOV) flow cells and automated pump control through the VisualSpreadsheet® software, FlowCAM can achieve maximum volume efficiency with samples as small as 35µl.



*Benchtop FlowCAM with Syringe Pump installed (left), and external syringe pump option (right)*

In operation with the syringe pump, once the run parameters have been input, the instrument is completely controlled by the software, requiring no operator intervention during a run. The system automatically primes, runs the samples and rinses (if desired). The software takes into account tube diameters, tubing lengths (for priming) and all other factors affecting the actual volume imaged during a run when calculating concentrations. For production environments, this means that samples can truly be run in a “hands-off” mode, freeing up the operator for other tasks.

The VisualSpreadsheet software includes an interactive dialog box which allows the user to try out different pump speeds and camera frame rates, and instantly calculates both volume efficiency and the time the run will take given those parameters. This allows very rapid and simple set-up of experiment parameters, while keeping in mind the trade-off between volume efficiency and run time.

The software also permits three different priming methods: machine prime, manual prime with sample and manual prime with non-sample. In machine prime mode, the user dispenses the sample into the FlowCAM with the tubing and flow cell containing only air. VisualSpreadsheet calculates the amount of sample to pull through the tubing to reach the flow cell based upon tube length and then automatically starts the run. The system can also be 100% manually primed from the software.

#### Syringe Pump Specifications & Features:

- ◇ Variable flow rate (computer controlled) from .005ml/min to 20 ml/min
- ◇ Accuracy:
  - 0.005 ml (0.5 ml syringe)
  - 0.01 ml (1.0 ml syringe)
  - 0.05 ml (5.0 ml syringe)
  - 0.125ml (12.5 ml syringe)
- ◇ Volume Precision:
  - <0.1%CV for 50µl to 100µl
  - <0.05CV for 250µl +
- ◇ Fully automated operation
- ◇ Automatic or manual prime/rinse
- ◇ Built-in software calculator for balancing efficiency and run time
- ◇ “Continuous” mode allows for running sample volume up to ten times syringe size automatically (software automatically pauses run, evacuates syringe and restarts capture as soon as pump begins pumping sample again)

## VisualSpreadsheet Software Integration:

The VisualSpreadsheet software has been tightly integrated with the syringe pump to offer maximum flexibility and ease of use. Figure 1 shows the “Flow Cell” tab of the Context menu. The flow cell type is chosen from the drop-down list, which automatically fills in the flow cell depth and width. The user is responsible for filling in the tube parameters (since these can vary). However, once these parameters are set, they do not need to be changed unless the flow cell is changed. The tube diameter and length above the flow cell are used by the software to automatically calculate the proper amount of fluid for the pump to pull through in order to prime the system.

Figures 2 and 3 below show the “Fluidics” tab of the Context menu. It is here that the user inputs the sample volume, flow rate desired and camera frame rate. Once these parameters are entered, the software automatically fills in the estimated volume efficiency and run time. As shown in the example below, by varying the flow rate and frame rate, one can quickly optimize the trade-off between volume efficiency and run time.

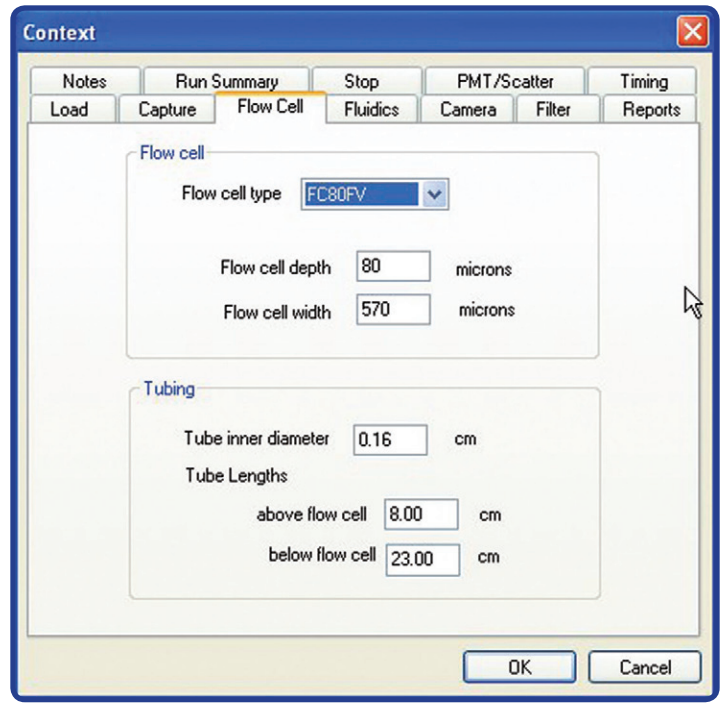


Figure 1: Flow Cell Dialog Box in Context Menu

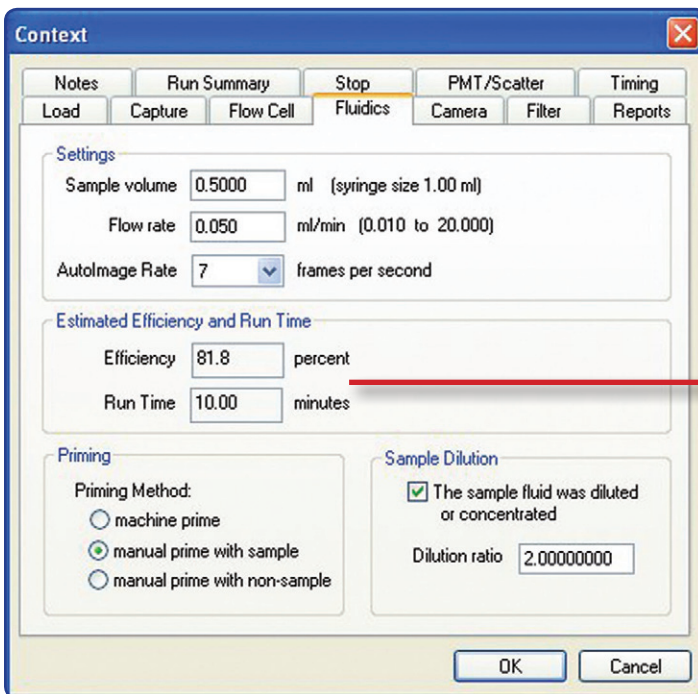


Figure 2: Slower Flow and Frame Rate

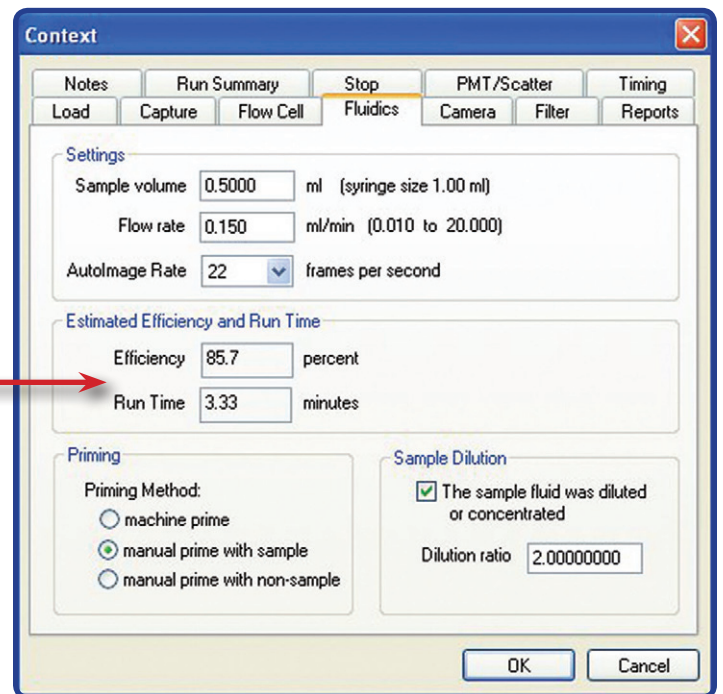


Figure 3: Faster Flow and Frame Rate

Demonstration of how the Fluidics Dialog in the Context Menu of VisualSpreadsheet is used: The left window shows that a 0.5ml sample run at a flow rate of 0.5ml/min using 7 frames/sec imaging rate would yield an 81.8% efficiency rate and the run would take 10 minutes. By increasing the flow rate to 0.150ml/min and the imaging rate to 22 frames/sec, the same sample can be run in 3.33 minutes with an 85.7% efficiency. The dialog boxes automatically update when any of the factors (volume, flow rate and Autolmage rate) are changed.