

## ePump® PRODUCT COMPARISON

SFC Fluidics is proud to introduce the ePump® Model 190, a microfluidic delivery system which provides accurate, pulse-free flow in the nL/min to  $\mu\text{L}/\text{min}$  flow rate range while minimizing space, weight, and power requirements. These attributes make the ePump ideal for point-of-care and portable applications. Many solvent delivery applications currently use syringe pumps. The following table shows how the ePump model 190 compares to some of the best and most popular syringe pumps on the market.

	SFC Fluidics® ePump® Model 190	Competitor No. 1 Syringe Pump	Competitor No. 2 Syringe Pump	ePump® Advantage
<b>Size</b>	1" x 1.5" x 1.25"	9" x 6" x 3.5"	9" x 4.5" x 5"	36 ePump Model 190's will fit in the footprint of Competitor No. 1's pump!
<b>Flow Range</b>	0.250 - 10 $\mu\text{L}/\text{min}$	1.0-1274 $\mu\text{L}/\text{h}$ with 100 $\mu\text{L}$ syringe	0.0014 $\mu\text{L}/\text{h}$ - 26.56 mL/min; requiring different syringes	ePump flow rate is comparable to syringe pump using a syringe with a comparable stroke volume.
<b>Pressure</b>	> 30 psi	Depends on syringe	8-100 psi, Depends on syringe	ePump technology has been shown to pump up to 300 psi.
<b>Power Requirements</b>	Scales with flow rate: 2V, 125 mA, 0.25 W max	115 VAC, 0.1 A, 11.5 W	12 VDC, 1.5 A, 18 W	Fractional power requirements, compatible with battery operation.
<b>Min volume per step</b>	No mechanical parts	92 nL w/ 60 mL syringe	Depends on syringe	No minimum volume, no step, purely pulse-free flow at any rate.
<b>Weight</b>	Pump: 45 g (0.1 lb) Controller: 220 g (0.5 lb)	2.0 kg (4.5 lbs)	2.1 kg (4.6 lbs)	Weighs 87% less than a conventional syringe pump.
<b>Accuracy</b>	$\pm 5\%$ w/o feedback, $\pm 1\%$ w/feedback	$\pm < 1\%$	$\pm 0.5\%$	Accuracy can be improved using feedback.

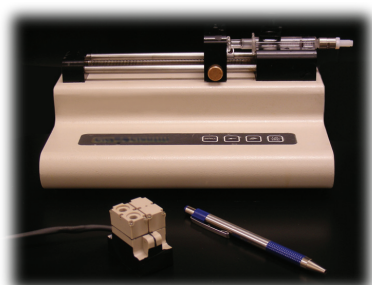


Figure 1: The ePump® Model 190 next to a common syringe pump.

The advantages of the ePump over the syringe pump include

- Smooth flow
- No pulsation
- Much smaller size and weight
- Compatible with battery operation
- Can be custom scaled for any application

Additionally, the Model 190 also has an option to be self-priming and self-refilling with little internal dead volume.

To demonstrate ePump’s® ability to deliver solvents, a side-by-side comparison was made between an ePump® and a popular commercially-available syringe pump. The syringe pump was fitted with a 50 µL syringe to mimic the stroke volume of the ePump® and obtain optimal flow values from the syringe pump. The flow rate was set at 1 µL/min. The pumps were attached to a commercially-available flow sensor (Sensirion, SLG1430-150) and filled with deionized water. Both the syringe and the ePump® reservoir were carefully purged of all gas to minimize the noise due to compression in the fluidic lines. Both pumps were run for 10 minutes, although they could have been run longer (the ePump® Model 190 can run at 1 µL/min for 90 minutes without stopping, whereas the syringe pump can run for only 50 minutes). SFC’s ePump® matched the syringe pump’s performance, while the using only 3% of the space occupied by the syringe pump and consuming only 1 mW of power (about 0.01% of what the syringe pump needed). Additionally, unlike the syringe pump, the ePump is capable of refilling itself from an external reservoir. The controller is programmed to execute this function automatically.

The following graph shows the ePump® run by the SFC Fluidics’ ePump® Controller, which is capable of operating with and without feedback from an external flow sensor. A Sensirion LG16-150 was used in this experiment to provide feedback to the controller. In both cases, the ePump® provided more precise flow than the syringe pump, due to the absence of mechanical parts in the ePump.

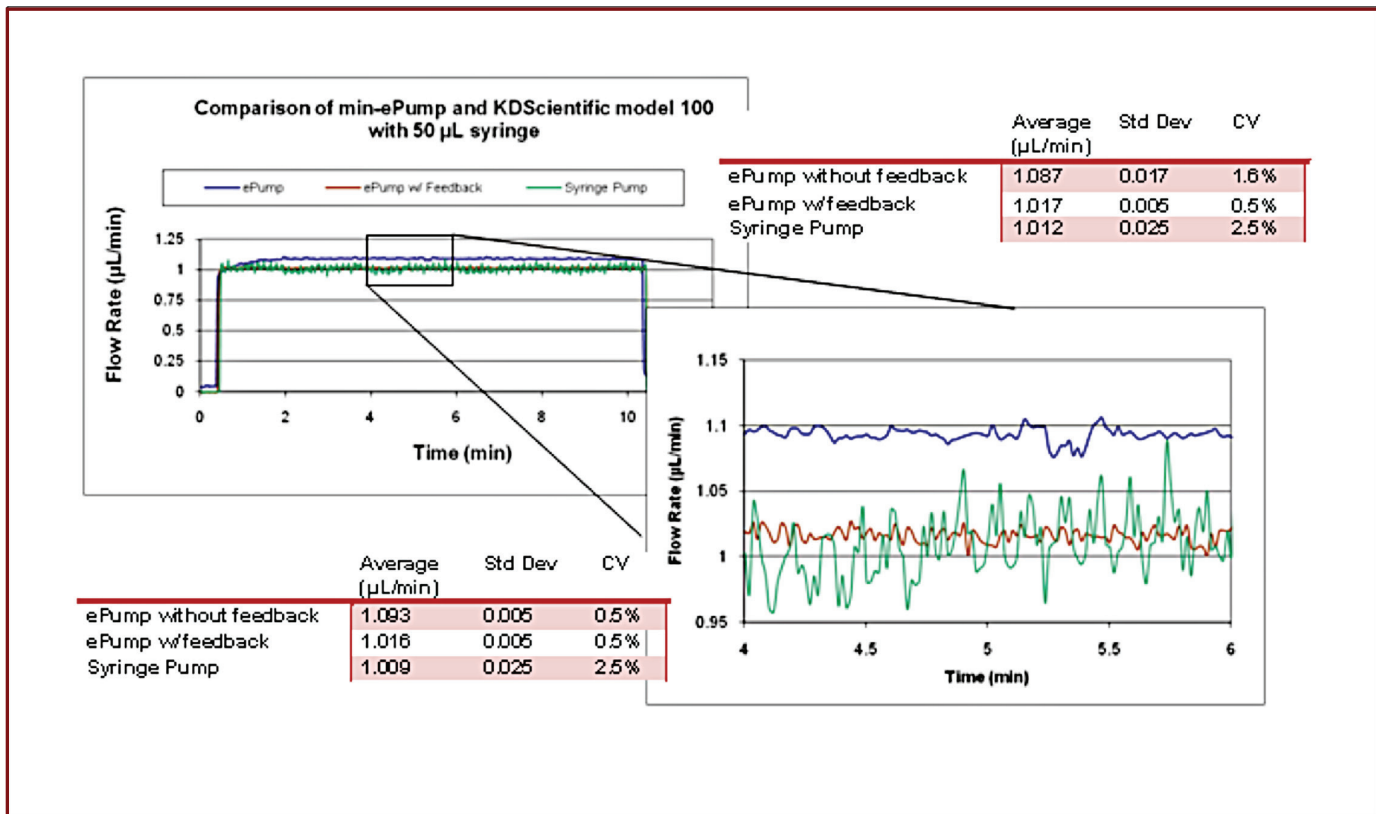
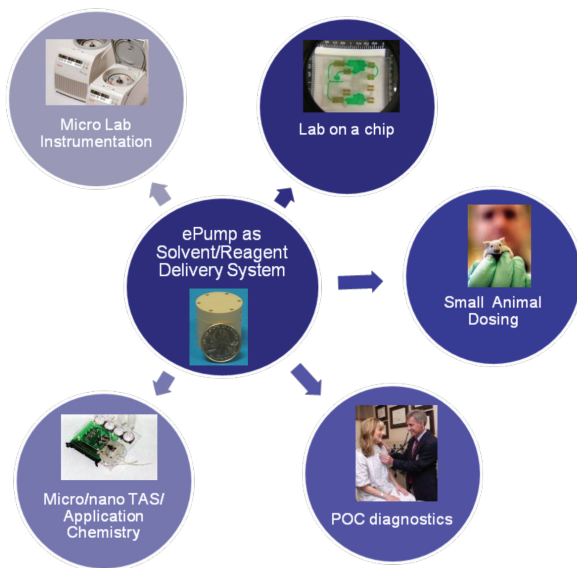


Figure 2: Compares the quality of flow generate by an ePump to the flow from a syringe pump. The syringe pump has the footprint of thirty six ePumps, and uses 1000 times as much power. The ePump® used in this test was initially calibrated using a different flow sensor, which contributed to the accuracy offset in the uncorrected flow.

The ePump compares favorably with other types of pumps as well. The following table lists some of the benefits that the ePump technology enjoys over other types of commercially available pumping technologies.

ePump® Advantage Compared To		
Electro-osmotic Pumps	Osmotic Pumps	Peristaltic Pumps
<ul style="list-style-type: none"> <li>Lower power requirements than most EO pumps</li> <li>Working fluid and user's fluid kept separated</li> <li>No need for sample introduction loops, pump directly with ePump®</li> <li>Higher pressure rating</li> <li>Reversible flow</li> </ul>	<ul style="list-style-type: none"> <li>Control and programmability: ePump® allows the user to change the flow rate and dispense volume on the fly</li> <li>Higher pumping pressure</li> <li>Pumps are reusable</li> <li>Better suited for research and OEM applications.</li> </ul>	<ul style="list-style-type: none"> <li>Smooth flow</li> <li>No pulsation</li> <li>Much smaller size</li> <li>Can be made self-priming</li> <li>Lower power</li> <li>Much stronger at lower flow rates</li> <li>No moving parts</li> </ul>

In addition, the non-mechanical nature of the ePump allows it to be designed and built in virtually any shape and size, perfect for OEM opportunities. The overall competitive advantage of the ePump is its truly pulse-free flow, high precision and customizable footprint that is compatible with the scale of a wide variety of growing and highly profitable applications, as illustrated in the diagram below. The Model 190 is only the first of many ePumps that will be introduced to meet new and exciting market demands.



For further technical assistance and purchasing information, contact

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