

The PeriWave Microfluidic Pump

Fluid delivery for microfluidics demands special attention. The PeriWave is a high-precision, programmable, pulse-free pump that is ideal for 3D cell culture experiments.



A New Age of Fluid Delivery Pumps

The PeriWave offers superior flow control, response and performance. An on-board microprocessor rapidly adjusts the rpm of the peristaltic wheel, based on the flow sensor data, to provide pulse-free fluid delivery.

PeriWave Advantages

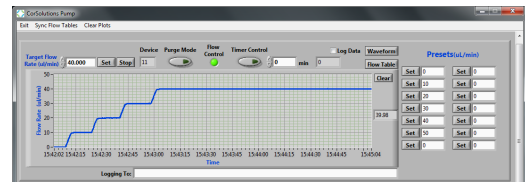
- Precise, accurate flow rate control
- Nanoliter resolution
- Pulse-free
- Superior performance to syringe pumps and traditional peristaltic pumps
- Forward and reverse flow modes
- Fast response
- Unlimited fluid reservoir volume
- Ability to recycle precious fluids
- Programmable fluid delivery controlled with user-friendly software
- Ability to multiplex two or more pumps
- No need to recalibrate even after exchanging tubes
- Ideal for stop-flow and 3D cell culture experiments

Models Offered

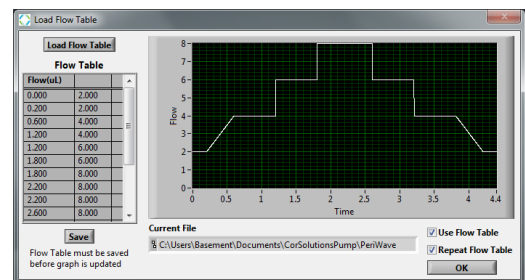
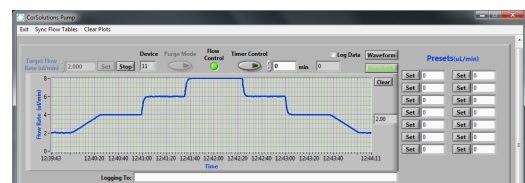
- PeriWave Nano ± 20-7000 nanoliters/min
- PeriWave Micro ± 0.1-50 microliters/min
- PeriWave Milli ± 30-1000 microliters/min
- PeriWave Milli +5 ± 0.2-5.0 milliliters/min

PeriWave Control

PeriWaves come with user-friendly stand-alone PC and LabVIEW VI software. The software allows for programmable fluid delivery. A flow rate of zero can also be programmed, resulting in an active control of zero flow.



Screen capture of PeriWave software. 10 microliters/min step increases were made every 16 seconds before holding the flow constant at 40 microliters/min.



An example programmed flow table is shown on the bottom. On the top the actual flow profile achieved is provided.

The PeriWave Microfluidic Pump

PeriWaves offer superior performance over pneumatic and syringe-based pumps. The PeriWave is a peristaltic-based pump with an integrated, in-line flow sensor. This flow sensor which measures the actual flow rate being delivered, allows for highly accurate flow control with nanoliter resolution. Additionally the pump offers programmable fluid delivery, and with its excellent precision, it can generate

custom flow profiles. Because of its precise control, this pump is ideal for 3D cell culture experiments used in body-on-a-chip and organ-on-a-chip applications.

Furthermore the pump is pulse-free and can operate in both positive and negative flow modes, permitting a user to reverse flow direction. It can also actively control a flow rate of zero, making it ideal for stop-flow ex-

periments. The PeriWave can recycle liquid, allowing users to conserve precious fluids. Two or more PeriWaves can be connected with a tee, and flows can be synchronized. This allows for multiple fluid streams to be accurately manipulated simultaneously. This pump has a maximum operating pressure of 30 psi, is calibrated for aqueous solutions, and comes in four models to accommodate various flow rates.

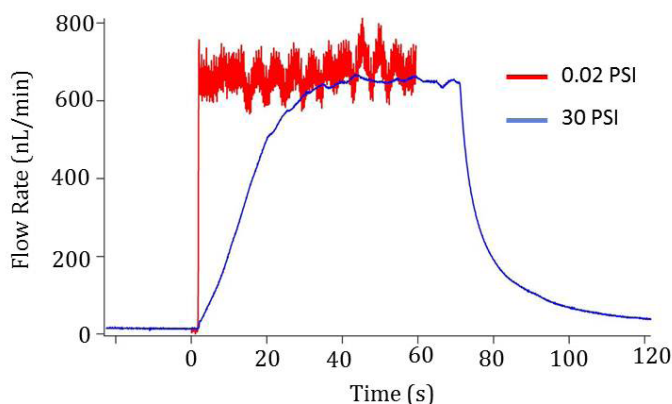
Flow Specifications

	Nano	Micro	Milli	Milli +5
Flow Rate Range	±0 - 7000 nL/min	±0 - 50 µL/min	±0 - 1100 µL/min	±0 - 5.0 mL/min
Standard Calibrated Flow Rate Range	±20 - 7000 nL/min	±0.1 - 50 µL/min	±10 - 1000 µL/min	±0.2 - 5.0 mL/min
Accuracy below full scale (% of full scale)	0.3%	0.15%	0.2%	0.2%
Repeatability below full scale (% of full scale)	0.05%	0.01%	0.02%	0.02%
Flow Detection Response Time	40 msec			
Flow Rate Stability	Down to 0.1% RSD*			
Operating Temperature	10 to 50°C			
Fluid Connector Type	UNF ¼-28 Flat Bottom			
Flow Sensor Inner Diameter	150 µm	430 µm	1.0 mm	1.8 mm
Flow Sensor Internal Volume	1.5 µL	5.1 µL	< 30 µL	< 90 µL

*Relative to fluid type, tubing and system set-up

Syringe Pumps Compromise Performance

Syringe pumps are the most widely used means of fluid delivery for microfluidics. However these pumps suffer from drawbacks that severely compromise performance and can negatively impact your microfluidic application. These drawbacks include: pulsation, slow response time, refilling of syringes is required, increased chance of air bubble introduction during syringe refill, and backpressure variations significantly effect performance.



Fluid delivery using a syringe pump is undesirable. If backpressure is increased, the pulsation is reduced, but then the response time increases.



Two PeriWave pumps connected via a tee fitting allow for accurate delivery of two fluid streams.