

# Technical Catalog:

# **EONflow Microfluidic Liquid Handling Platform**

---



3 september 2024



## Index

1. About Us
2. Introduction to EONflow
3. Key Features
4. Technical Specifications
5. System Architecture and Components
6. Performance and Validation
7. Applications
8. Consumables and Accessories
9. Comparison with Market Alternatives
10. Startup Vision and Business Plan
11. Ordering Information
12. Support and Warranty
13. Contact Information



## 1. About Us

EONflow is a pioneering startup in the field of healthcare diagnostics, founded by a team of experts in biomedical engineering, immunology, and clinical research. Our mission is to revolutionize Point-of-Care (POC) testing with innovative, compact, and automated solutions that bridge the gap between lab-based assays and real-world applications. We are committed to making diagnostics faster, more accessible, and affordable for healthcare providers and patients alike.

### Leadership Team:

- Amine Harbi, CEO & Founder
- Mehdi Dib, Chief Technology Officer
- Anissa Harbi, MD, Immunologist
- Amani Ikram Djemil, MD, Clinical Advisor

Together, we leverage our collective experience to deliver cutting-edge diagnostic tools designed for today's healthcare challenges.



## 2. Introduction to EONflow

EONflow is a groundbreaking handheld, plug-and-play microfluidic liquid handling platform designed to automate complex immunoassays with precision and ease. Built with a focus on portability and user-friendliness, EONflow integrates advanced electro-pneumatic control and a modular design, making it suitable for a wide range of diagnostic applications, from infectious disease testing to molecular diagnostics.

### The Problem We Address:

Current microfluidic and immunoassay systems are often bulky, require extensive manual setup, and are restricted to lab environments. This limits their utility in POC settings where rapid, reliable, and portable testing is needed.

### Our Solution:

EONflow offers a fully automated, compact platform that eliminates the need for complex manual operations, enabling efficient and accurate testing anywhere, anytime.

---

### 3. Key Features

- **Handheld Design:** Compact and lightweight (801 grams), ideal for on-the-go diagnostics.
- **Plug-and-Play Operation:** Clamshell-style cartridge socket allows quick and easy cartridge insertion without manual tubing.
- **Advanced Electro-Pneumatic Control:** Achieves precise reagent switching and flow control without the need for valves, using a regulated air pressure system.
- **Battery-Powered:** A robust 12V 3000 mAh rechargeable battery supports up to 42 hours of continuous operation.
- **High Sensitivity:** Detection limit of 31.1 ng/mL for SARS-CoV-2 spike antibodies, comparable to traditional lab-based ELISA assays.



## 4. Technical Specifications

Specification	Details
<b>Device Type</b>	Handheld Microfluidic Liquid Handling Platform
<b>Weight</b>	801 grams (including battery)
<b>Dimensions</b>	16.5 x 11.5 x 7 cm
<b>Power Supply</b>	12V 3000 mAh Rechargeable Battery
<b>Operating Time</b>	Up to 42 hours per charge
<b>Pressure Control</b>	Programmable, regulated air (0 to $\pm 5.8$ psi)
<b>Cartridge Type</b>	Single-use, injection-moldable, valveless
<b>Microcontroller</b>	Teensy 4.1 with ARM Cortex-M7
<b>Display</b>	2-inch LCD screen



---

## 5. System Architecture and Components

### **Pneumatic Subsystem**

- Utilizes a diaphragm pump and three acrylic air tanks for regulated pressure control.
- Features solenoid valves for precise control of reagent flow.
- Capable of achieving pressures from 0 to  $\pm 5.8$  psi (39.98 kPa), sufficient for driving liquids in microfluidic channels.

### **Microfluidic Subsystem**

- Incorporates a clamshell-style cartridge socket for seamless integration with disposable cartridges.
- The cartridge manifold ensures airtight sealing, preventing leakage and contamination.
- Supports multi-reagent switching and precise timing control for assays with up to six reagents.

### **Electronic Subsystem**

- Powered by a Teensy 4.1 microcontroller, featuring an ARM Cortex-M7 processor.
- Equipped with barometric sensors for real-time pressure adjustments.
- Includes an H-bridge driver for controlling solenoid valves and the diaphragm pump.
- Offers connectivity via USB for real-time control and data logging.

---

## 6. Performance and Validation

EONflow has demonstrated its capabilities in a series of rigorous tests, including:

- **Pressure Stabilization:** Achieves stable pressure outputs with minimal leakage, ensuring consistent reagent flow.
- **Immunoassay Testing:** Successfully detected SARS-CoV-2 spike antibodies with a sensitivity comparable to standard ELISA tests.
- **Power Efficiency:** Operates continuously for up to 42 hours on a single battery charge, making it suitable for field applications.

## 7. Applications

EONflow's versatility makes it ideal for a variety of applications:

- **Point-of-Care Diagnostics:** Rapid testing for infectious diseases (e.g., COVID-19, influenza).
- **Molecular Diagnostics:** Supports qPCR, sequencing, and other assays requiring precise liquid handling.
- **Cell Analysis:** Automated liquid handling for flow cytometry and cell sorting.
- **Biomanufacturing:** On-demand reagent mixing and small-scale production of diagnostic kits.

## 8. Consumables and Accessories

- **Disposable Cartridges:** Injection-moldable, single-layer design compatible with various assay types.
- **Adapter Cartridge:** Converts EONflow into a general-purpose pressure source for external microfluidic chips.
- **Replacement Battery:** 12V 3000 mAh rechargeable battery.

## 9. Comparison with Market Alternatives



Feature	EONflow	Elveflow OB1 MK3+	Correlia PIXI
<b>Size/Weight</b>	16.5 x 11.5 x 7 cm / 801 g	Larger / Heavier	Compact / Lightweight
<b>Plug-and-Play</b>	Yes	No	Yes
<b>Battery-Powered</b>	Yes (42 hours)	No	Yes (duration not specified)
<b>Pressure Control</b>	Regulated Air	Manual Setup	Integrated Pneumatic System
<b>Cost per Test</b>	Lower	Higher	Higher
<b>Setup Time</b>	Minimal	Extensive	Moderate
<b>User Interface</b>	Intuitive Touchscreen	Software-Based	Software-Based
<b>Maintenance Requirements</b>	Low	High	Moderate
<b>Portability</b>	High (Handheld)	Low	High
<b>Integration Capability</b>	High (Supports multiple assay types)	High (Customizable but requires setup)	Moderate (Specific to PIXI assays)
<b>Automation Level</b>	Full (No human intervention needed)	Partial (Manual adjustments required)	Full (Pre-configured assays only)
<b>Cartridge Design</b>	Injection Molded (Mass Production Ready)	Custom Fabrication (Expensive)	Custom Cartridges (Moderate cost)

<b>Reagent Capacity</b>	High (Supports up to 6 reagents)	Medium	Medium
<b>Real-Time Control</b>	Yes (via USB and Touchscreen)	Limited (Software-based control only)	No
<b>Software Compatibility</b>	Open-Source Firmware (Customizable)	Proprietary Software	Proprietary Software
<b>Manufacturing Cost</b>	Low (Scalable with injection molding)	High (Custom parts and fabrication)	Moderate
<b>Assay Sensitivity</b>	High (LOD: 31.1 ng/mL for SARS-CoV-2)	Variable (Depends on external configuration)	High (Specific to PIXI assays)
<b>Data Logging</b>	Yes (MicroSD and USB Interface)	Limited	No


## 10. Startup Vision and Business Plan

### Our Vision

EONflow aims to become a leader in Point-of-Care diagnostics by providing a reliable, efficient, and portable platform for automated liquid handling. We envision a future where healthcare providers can perform complex diagnostic tests anytime, anywhere, without relying on traditional laboratory setups.

### Business Model

- **Revenue Streams:**
  - Sales of the EONflow device.
  - Recurring revenue from single-use cartridges.
  - Subscription services for device maintenance and user training.
- **Go-to-Market Strategy:**
  - Initial pilot programs followed by full-scale distribution.

- 
- Partnerships with medical distributors and direct sales to healthcare providers.
  - Marketing through industry events, digital channels, and professional networks.

### **Why Choose EONflow?**

EONflow stands out for its unique combination of portability, precision, and ease of use. It reduces the need for complex lab equipment, offering a cost-effective, efficient solution for both routine and specialized assays. With EONflow, healthcare providers can perform high-quality diagnostics on-site, ensuring timely results and better patient outcomes.

For more information or to request a demo, please contact us at [amine.harbi@fulbrightmail.org](mailto:amine.harbi@fulbrightmail.org).