Automated Medical Aliquoting Device

TERUMO BLOOD AND CELL TECHNOLOGIES

DESIGN CENTER COLORADO

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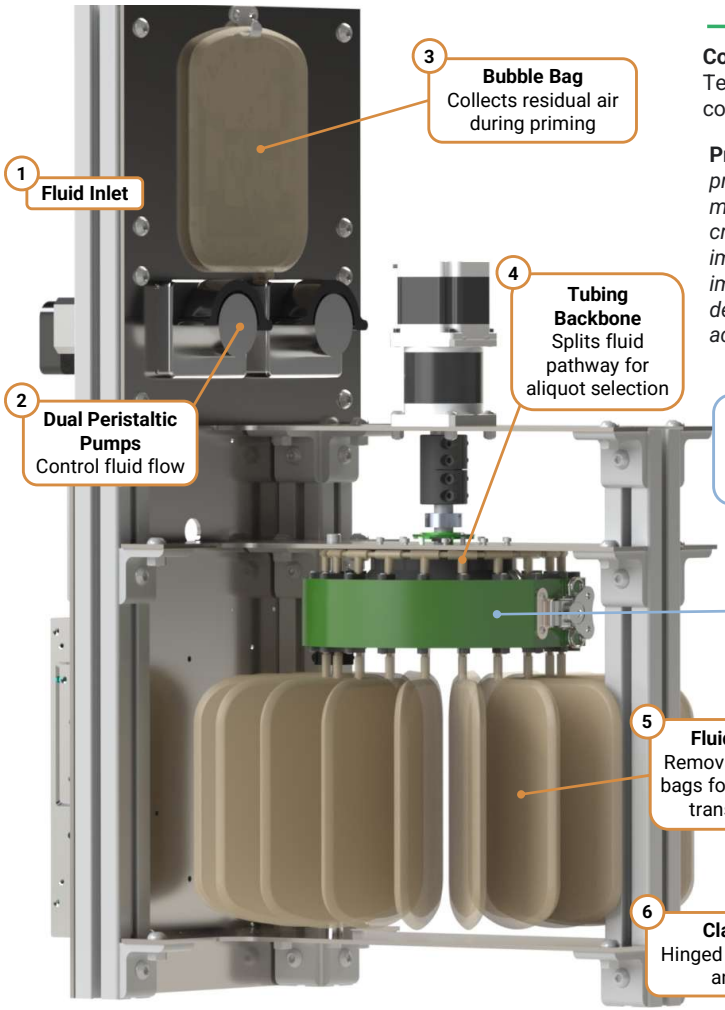


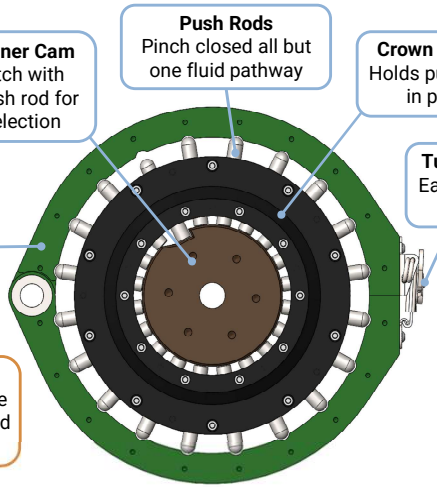
Background

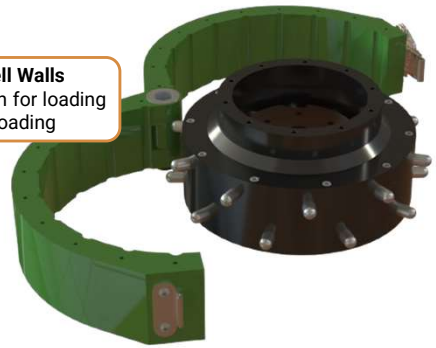
Company Introduction: Headquartered in Lakewood, Colorado, Terumo Blood and Cell Technologies is a global leader in blood component, therapeutic apheresis and cellular technologies.

Project Goal: *Develop a refined prototype for an automated medical fluid aliquoting device; create novel design whose improvements may be implemented in future development, increasing patients' access to life-saving therapies.*

Improvement Targets:

I. Increase capacity
II. Decrease operation time
III. Decrease waste costs
IV. Increase ease of use
V. Potential for modularity
VI. Minimize footprint





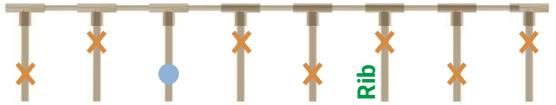
Specifications

1. Fluid Pathway	2. Aliquot Specifications	3. Residual Volumes
1a Disposable fluid path	**2a** 4 to 20 aliquot generation	**3a** Minimize residual air to ≤1mL per bag
1b Sterile barrier	**2b** Aliquot volumes from 5mL to 100 mL	**3b** Minimize residual liquid to ≤ 6mL per run
1c Receive fluid from an outside source	**2c** Aliquot volume accuracy of ≤ 3mL or 15% volume target	
1d No tools required for loading or unloading	**2d** Flow rate ≥ 40 mL/min	
1e Load time under two minutes		

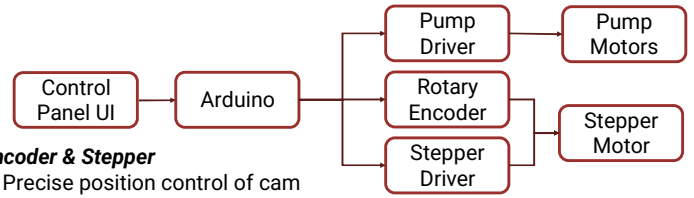
Disposables: Tubing & Bags

Final Disposable Structure:

- **20 ribs, 4-inch length, 0.77-inch apart**
  - Push rods pinch on ribs to stop fluid flow
  - Estimated 0.54 mL residual liquid per bag
  - **10.86 mL** of residual liquid in the fluid pathway



Electronics



- ***Encoder & Stepper***
  - Precise position control of cam
- ***UI with Real-time Update***
  - Easy and intuitive settings for different aliquots sizes and quantities
  - One-click emergency stop for safety

Operations & Ease of Use

A Clamshell: Two-minute Loading time

B Tubing Clips: Secures tubing for positional control

C Clamshell: Aligns tubing with push rods

D Aliquot Doses: Run automated cycle

E Seal Aliquots: Heat seal bags for storage

Testing & Results

- ✓ Receive fluid from outside source
- ✓ Disposable fluid path
- ✓ No tools required to install fluid path
- ✓ Sterile barrier
- ✓ 4 - 20 aliquots generated
- ✓ Aliquot volume range of 5 mL to 100 mL

(Pending Testing)

- ❑ Aliquot volume accuracy of 15% or 3 mL
- ❑ Flow rate ≥ 40 mL/min
- ❑ Residual liquid ≤ 6 mL
- ❑ Residual air ≤1 mL per aliquot

"This design represents a **truly innovative approach** to fluid distribution, which could have broad applications for Terumo **to serve more patients globally**. This novel thinking was the hard-earned result of a diverse team keeping an open mind and **challenging the status quo**."

–Nate Johnson, Terumo BCT Innovation Engineer

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