

Mid-Scale Reagent and Culture Mixing with Mammoth 30mL Automation Tips on the Lynx Platform

Abstract

The Mammoth™ 30mL Automation Tip supports mixing of 1.5-20mL volumes in 6-well plates and reservoirs on the Dynamic Devices Lynx platform. This application note outlines recommended mixing parameters for cell resuspension and reagent homogenization to simplify mid-scale mixing workflows.

Introduction

Mixing larger liquid volumes in 6-well plates and reservoirs can be challenging on automated liquid handling systems. Standard 1mL and 5mL pipette tips often require multiple aspiration and dispense cycles to process working volumes in the 2-20mL range, increasing method complexity, run time, and the potential for inconsistent mixing.

The Mammoth™ 30mL Automation Tip extends the volume range of the Dynamic Devices Lynx platform, enabling high-volume aspirations, dispenses, and mixing operations in a single stroke. When coupled to four channels of a 24-channel ST or VVP pipetting arm, the Mammoth tip provides an efficient solution for resuspending cells, homogenizing media components, and mixing reagents directly in 6-well plate and reservoir formats.

This application note outlines recommended mixing parameters and workflow examples for mid-scale liquid handling applications, supporting consistent method development while reducing processing time and plastic consumption compared to workflows that rely on multiple smaller-volume tips.

Product Features

- Supports aspiration, dispensing, and mixing of 1.5-20mL volumes using a single Mammoth™ 30mL Automation Tip.
- Reduces the number of aspiration and dispense cycles required for mid-scale liquid handling workflows.
- Enables efficient cell resuspension and reagent homogenization in 6-well plates and reservoirs.
- Sterile, filtered design suitable for cell culture and reagent preparation applications.
- Helps decrease plastic consumption compared to workflows relying on multiple smaller-volume tips.
- Compatible with Dynamic Devices Lynx LM series liquid handlers equipped with 24-channel ST or VVP pipetting arms.
- Includes 5mL graduation marks for convenient visual volume verification.

Required Materials

- Dynamic Devices Lynx LM series liquid handler with 24-channel pipetting arm.
- Mammoth 30mL Automation Tips (PN 9453030).
- Thomson Deck Plate 30mL Tip Tray Adapter (PN 1212633-399).
- Thomson 6-well plates (PN 931170) or similar.
- Standard reagent reservoirs (high profile, approximately 300mL).
- Water, PBS, or 20% glycerol solution for setup and verification.

Workflow: Mid-Scale Reagent and Culture Mixing

Mammoth™ 30mL Automation Tips support high-volume mixing cycles for cell resuspension and solute mixing.

Mixing in 6-Well Plates

1. **Dispense liquid into 6-well plates.** Use the aliquoting workflow to deliver 10-20mL per well from reservoirs.
2. **Mixing protocol.** From each well, aspirate at least half of the total volume (e.g., $\geq 3\text{mL}$ from 6mL) at 3,000 $\mu\text{L/s}$ for three cycles with a 3 mm offset above the well bottom. Dispense back into the same well at mid-speed to minimize splashing and foaming.

Mixing in Reservoirs

1. Dispense liquid into reservoirs. Use the aliquoting workflow to deliver the required reagent volume into reservoirs.
2. Mixing protocol. From each reservoir, aspirate at least half of the total volume at 3,000 $\mu\text{L/s}$ for three cycles with a 3 mm offset above the reservoir bottom. Dispense back into the same reservoir at mid-speed to minimize splashing and foaming.

Applications:

- Resuspending cell pellets or aggregates after centrifugation or settling.
- Homogenizing buffer components or media supplements at mid-scale volumes.
- Premixing concentrated stocks prior to serial dilutions into plates.

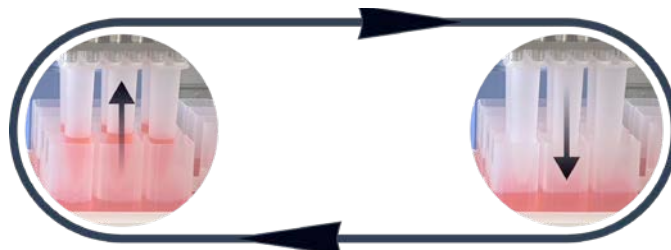


Figure 1. Mid-Scale Mixing Profile in a 6-Well Plate Using a 3 mm Bottom Offset and Three Mixing Cycles.

Vessel	Max Vol (mL)	Aspirated/cycle (mL)	Flow ($\mu\text{L/s}$)
6-well plate	82	$\geq$ half of working vol	3,000

Table 1. Recommended Parameters for Mid-Scale Mixing in 6-Well Plates.

Notes and Best Practices

- Use “Mid Speed Slow Enter/Exit” for aspiration and dispense to maintain precision at higher volumes.
- Include a post-airgap (25–50 μL) to prevent droplet formation during plate moves.
- Validate accuracy initially with colored water or PBS before introducing critical reagents.

Choosing the Right Volume Range

The Mammoth™ 30mL Automation Tip is designed for reliable aspiration and dispensing in the 1.5-20mL range (nominal 30mL tip volume).

Volume Selection Guidelines

- **Minimum transfer volume:** 1.5mL (5% of nominal volume).
- **Mixing volume:** at least 50% of total well volume for thorough homogeneity.

Mixing Height and Speed Parameters

For mixing operations, the Mammoth tip is positioned at a fixed height within the well — typically a defined offset above the well bottom — and then aspirates and dispenses at that height for a set number of cycles. Because the tip remains at a fixed, programmed height throughout the cycle, mixing does not rely on tracking the liquid level as it changes.

Mixing Parameters

- **Bottom offset:** 3 mm above the well or reservoir bottom.
- **Aspirate/dispense speed:** 3,000 µL/s.
- **Number of cycles:** at least 3 cycles per mixing step.
- **Aspirated volume per cycle:** at least half of the total working volume in the well.

Practical Application

When programming a mixing step, set the following parameters in order:

1. Set the fixed offset height above the well bottom.
2. Set the aspirate and dispense speed.
3. Set the number of mixing cycles.
4. Confirm the aspirated volume per cycle meets at least half of the working volume.

Troubleshooting and Tips

Issue	Likely cause	Recommended action
Tips cannot clear tip box after loading	Z height too low	Reteach labware Z; use 30mL Tip Tray Adapter
Tips leak when leaving liquid	Tips not loaded onto the pipetting arm properly	After tip loading, check motor current; it should read above 15%
Tips fall off after loading	Tip loading depth incorrect	See above for recommended steps

Table 2. Troubleshooting Guidelines for Mid-Scale Reagent and Culture Mixing.

Conclusion

The Mammoth™ 30mL Automation Tip provides an automated approach for mixing 1.5-20mL volumes in 6-well plates and reservoirs on the Dynamic Devices Lynx platform. By reducing the number of aspiration and dispense cycles required for large-volume mixing, it simplifies automated workflows while supporting consistent cell resuspension and reagent homogenization. The workflows described in this application note support mid-scale mixing for cell culture and reagent preparation applications.

Thomson Instrument Company is not affiliated with Dynamic Devices and their products.