

Automating Mid-Scale Aliquoting from Bulk Sources with Mammoth™ 30mL Tips on the Lynx® Platform

Abstract

The Mammoth™ 30mL Automation Tip enables automated aliquoting of mid-scale liquid volumes on the Dynamic Devices Lynx® platform, moving reagents, buffers, media, and cell cultures from bulk source containers into destination vessels of varying formats. Coupled to a 24-channel ST or VVP pipetting arm, it closely mimics manual serological pipetting while reducing tip consumption.

This application note covers key volumetric considerations, operating parameters, and a vessel compatibility guide for aliquoting from bulk sources into 6-, 24-, and 96-well plates.

Introduction

Splitting a bulk reagent or culture stock into multiple aliquots is a routine but tedious step in many workflows. Standard 1-5mL tips require repeated aspirate/dispense cycles to empty a single source vessel, adding time and handling steps to what should be a simple task.

The Mammoth™ 30mL Automation Tip addresses this directly: a single tip can pull up to 20mL per stroke and distribute it across compatible destination vessels, supporting mid-scale automation applications without reconfiguring the deck for each new labware format.

Product Features

- **Designed for mid-scale volumes** on Dynamic Devices Lynx LM series automated liquid handling systems using a 24-channel ST or VVP pipetting arm.
- **Aspiration and dispensing operating range** of approximately 1.5-20mL.
- **5mL increment graduation marks** to visually confirm volumes.
- **Sterile, filtered tip** with high-volume mixing capability to disrupt cell pellets or resuspend/mix reagents.

Required Materials

1. Dynamic Devices Lynx LM series liquid handler with 24-channel pipetting arm.
2. Universal 4-Position Rack (PN 1212605-399).
3. Mammoth™ 30mL Automation Tips (PN 9453030).
4. Thomson Deck Plate 30mL Tip Tray Adapter (PN 1212633-399).
5. Thomson 6-well plates and 24-well plates (e.g., PN 931167, 931170, 931565-G-1X, 931568, 931569-G-1X, 931571) or similar.
6. Automation-friendly 50mL Conical Tube Rack.
7. Standard reagent reservoirs (high profile, approximately 300mL).
8. Water, PBS, or 20% glycerol solution for setup and verification.

Workflow: Aliquot Creation from Bulk Sources

This workflow describes how to split bulk reagent or culture volumes into multiple mid-scale aliquots in 6- or 24-well plates using Mammoth tips. The example uses a glycerol stock.



Figure 1. Mid-Scale Aliquoting Setup: 50mL Conical Tubes in the Universal 4-Position Rack and Dispensing into a 24-Well Plate.

Overview

- **Source:** 50mL conical tubes or reservoirs containing 10–50mL of reagent or culture.
- **Destination:** 6-, 24-, and 96-well plates for batch culture or reaction setup.

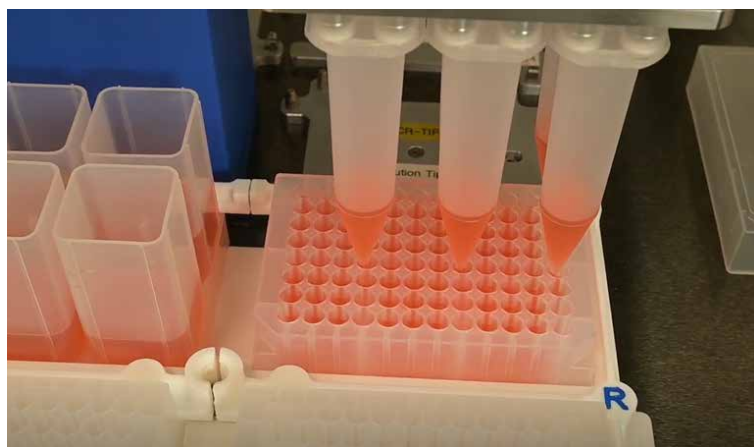


Figure 2. Mid-Scale Aliquoting from 50mL Conical Tubes into a Multiwell Plate.

Mammoth tips aspirate from a 50mL tube rack supported by the Universal 4-Position Rack and dispense into a 24-well plate, with each tip delivering multiple 2–7.5mL aliquots per aspirate cycle.

Method

1. **Load labware.** Add “Thomson30mL_Tip” to the MM4 worktable, along with the source and destination vessels at the defined deck positions.
2. **Aspirate bulk volume.** From a source vessel, aspirate the total volume needed for several aliquots (for example, 15,000 µL for five 3mL aliquots) using the appropriate per-channel volume.
3. **Dispense** into the destination vessels at the defined deck positions.
4. **Repeat** for additional tubes or reagents. If multiple bulk reagents are needed, assign additional positions and use separate aspirate/dispense steps to populate destinations with different materials.

Notes and Best Practices

- Ensure the total aspirated volume plus air gaps remains within the effective stroke range of the Mammoth tip (1.5–20mL).
- For viscous liquids such as 20% glycerol, optimize and validate flow rates for the liquid being transferred.
- Test aliquoting patterns with colored PBS to confirm well mapping before running critical reagents.
- 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.

Volume Selection Guidelines

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

- **Minimum transfer volume:** 1.5mL (5% of nominal volume).

Compatible Thomson Labware

The Mammoth™ 30mL Automation Tip supports compatible Thomson multiwell plates, 50mL conical tubes, and reagent reservoirs when appropriate labware definitions and volumes are used.

Mammoth™ 30mL Automation Tip Vessel Compatibility Matrix

Source Vessel	6-Well Plate	24-Well Plate	96-Well Plate	50mL Tube Rack	Reagent Reservoir
6-Well Plate	✓	✓	✓	✓	✓
24-Well Plate	✓	✓	✓	✓	✓
96-Well Plate	X	✓	✓	✓	✓
50mL Tube Rack	✓	✓	✓	✓	✓
Reagent Reservoir	✓	✓	✓	✓	✓

Table 1. Vessel Compatibility Matrix for Mammoth™ 30mL Automation Tips. Compatibility depends on labware definitions, liquid volumes, and deck layout.

Representative Source and Destination Vessel Combinations for Mammoth™ 30mL Automation Tips

Source Vessel	Typical Application
Reservoir → 6-Well Plate	Media, buffer, and reagent dispensing
Reservoir → 24-Well Plate	Batch aliquoting and assay setup
Reservoir → 96-Well Plate	High-throughput reagent filling
50mL Conical Tube → 6-Well Plate	Cell culture and media distribution
50mL Conical Tube → 24-Well Plate	Sample aliquoting
6-Well Plate → 50mL Conical Tube	Pooling cultures or harvested material
24-Well Plate → Reservoir	Reagent recovery or pooling
96-Well Plate → 50mL Conical Tube	Sample consolidation

Table 2. Common Aliquoting and Liquid Transfer Applications

Critical Height and Timing Parameters for Lynx Automation

Understanding liquid-level tracking and aspiration timing is essential for preventing air aspiration and ensuring consistent volume transfers.

Height Definitions

- **“Starting Height”** – height in millimeters up from the Z-zero position of the labware deck location.
- **“Final Height”** – also height in millimeters up from the Z-zero position of the labware deck location.

Volume-to-Height Relationships

- **6-well plate:** every 16,000µL (16mL) aspirated = 9mm height difference.
- **50mL tubes:** every 16,000µL (16mL) aspirated = 28mm height difference.

These ratios are approximate guidelines for standard labware geometry; verify against the specific 50mL tube model and fill volume in use, since tube geometry is not constant over the full height. The starting height of the operation can be estimated from how full the labware is, using the labware’s dimensional data from Method Manager 4 (MM4).

Recommended Aspiration Speed and Timing

- 6-well plate @ 1,000 µL/s: allow 8 s for 9 mm of downward travel (9 mm : 8 s).
- 6-well plate @ 2,000 µL/s: 9 mm : 5 s.
- 6-well plate @ 3,000 µL/s: 9 mm : 4 s.
- 50mL tubes @ 2,000 µL/s: 28 mm : 5 s.

Example: aspirating 16mL from a 6-well plate at 3,000 µL/s drops the liquid level 9 mm and should take approximately 4 s. Set tip travel to track from the starting height to (starting height – 9 mm).

Practical Application

When programming workflows, use these ratios to:

1. Calculate “Starting Height” based on initial fill volume.
2. Calculate “Final Height” based on the volume to be aspirated.
3. Set aspiration speed to match the distance:time ratio.
4. Prevent tips from aspirating air due to premature completion.

These parameters help prevent the following errors:

- Tips moving faster than liquid can enter (causes air gaps).
- Tips reaching final position before aspiration completes (causes air aspiration).
- Inconsistent volumes due to varying liquid-column heights.

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	Reteach the tip-loading height and confirm complete tip seating before rerunning

Table 3. Troubleshooting Guidelines for Mid-Scale Aliquoting Workflows.

Conclusion

Mammoth™ 30mL Automation Tips support single-stroke transfers of up to 20mL on Dynamic Devices Lynx® liquid handlers. The workflow and compatibility guidance presented here provide a practical starting point for automating mid-scale aliquoting from bulk sources into compatible tubes and multiwell plates.

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