

# Evotec's basic performance verification processes for DMSO based liquid handlers

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## Background

Evotec's Sample Management aims to deliver the highest quality service while maintaining efficiency. By striving for continuous quality improvement and minimizing equipment errors, we build trust with our partners through high-speed turnaround and a 'right first time' approach.

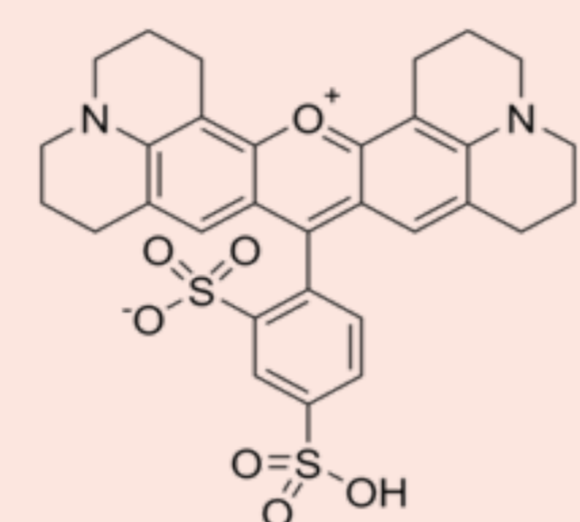
To achieve this, we ensure every instrument across all Evotec sites is properly qualified and standardized. Our Basic Performance Verification process, implemented globally, assesses the hardware performance of each instrument, enhancing the accuracy and consistency of liquid dispensing. This method also allows us to monitor equipment performance over time, ensuring timely responses to any drops in performance.

This poster outlines the DMSO-based method adopted across Evotec's Sample Management sites, covering: Gravimetry and fluorescence approaches based on volume tested; Specific protocols for instruments with different replication heads, needles, or Echo devices; Acceptance criteria for accuracy, precision, and outliers, tailored to local historical data; A universal template for consistent result analysis across sites

## Methodology

- Solvent: Dimethylsulfoxide (DMSO)
- Fluorescence dye: Sulforhodamine 101
- Reading Plates: Greiner Fluotrac 200
- Plate reader: Fluorescence reader
- Software: Software used in PROD
- Aspirate/Dispense mode: Single
- Measurements: Fluorimetric and Gravimetric
- Dispense type: Dry (except for machines running noncontact only)
- Volumes to test: Smallest and largest volume used in PROD

Sulforhodamine 101



## Acceptance criteria

Category	Volume	Criteria	Measurement	Acceptance Criteria (%)
1	≤ 5 µL	Accuracy	Fluorimetric	±10
		Precision	Fluorimetric	±10
2	> 5-250 µL	Accuracy	Gravimetric	±5
		Precision	Fluorimetric	±5
3	> 250 µL	Accuracy	Gravimetric	±5
		Precision	Gravimetric	±5

## Protocol

The protocol and frequency of verification depend on the instrument type and the volume dispensed. Three categories have been defined: Small volumes (Category 1), Middle volumes (Category 2) and High volumes (Category 3). The well layout can be adjusted based on the number of channels (8 or 16) and the header type (384 or 96)

### Category 1: Small volumes (<5 µL) accuracy and precision will be checked by fluorescence

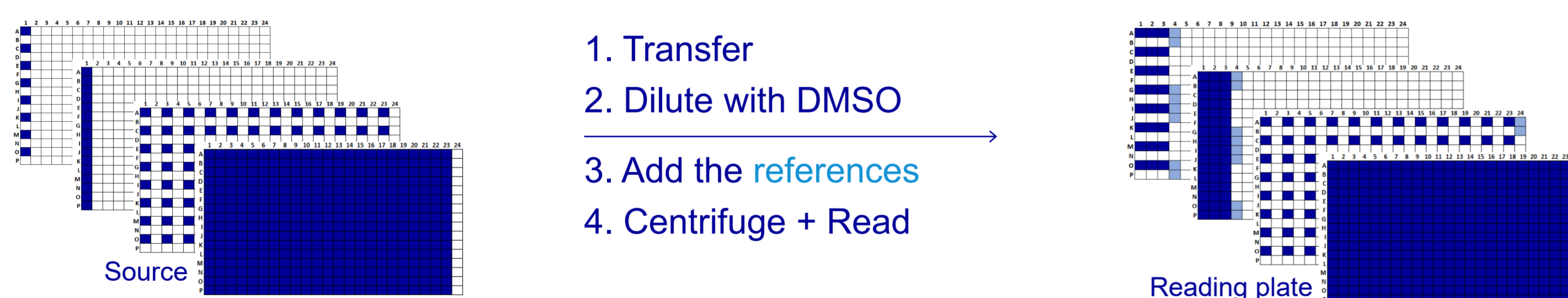


Figure 1: Small volume transfer protocol for 8/16-channel and full head devices

### Category 2: Middle volumes (5-250 µL) accuracy will be checked by gravimetry, precision by fluorescence

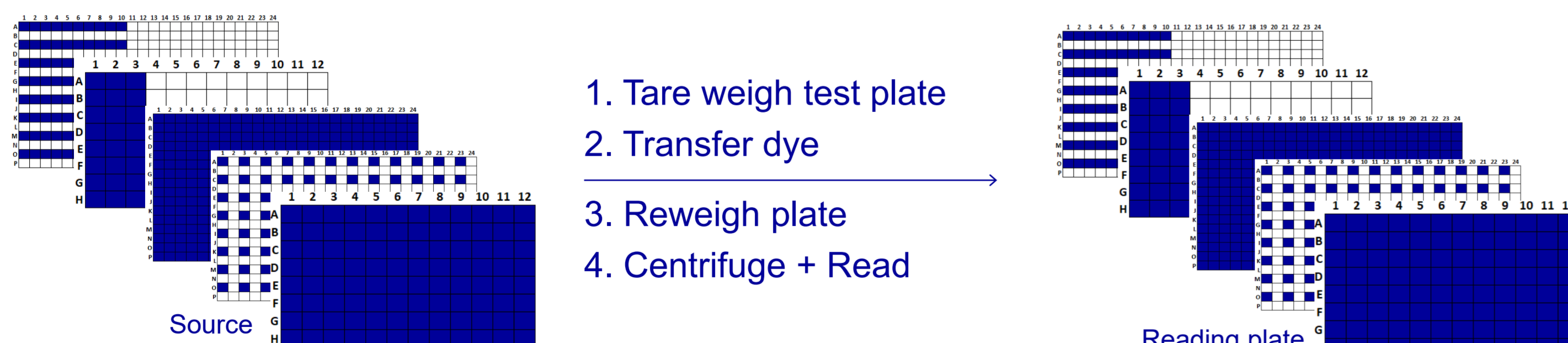


Figure 2: Middle volume transfer protocol for 8/16-channel and full head devices

### Category 3: High volumes (>250 µL) accuracy and precision will be checked by gravimetry

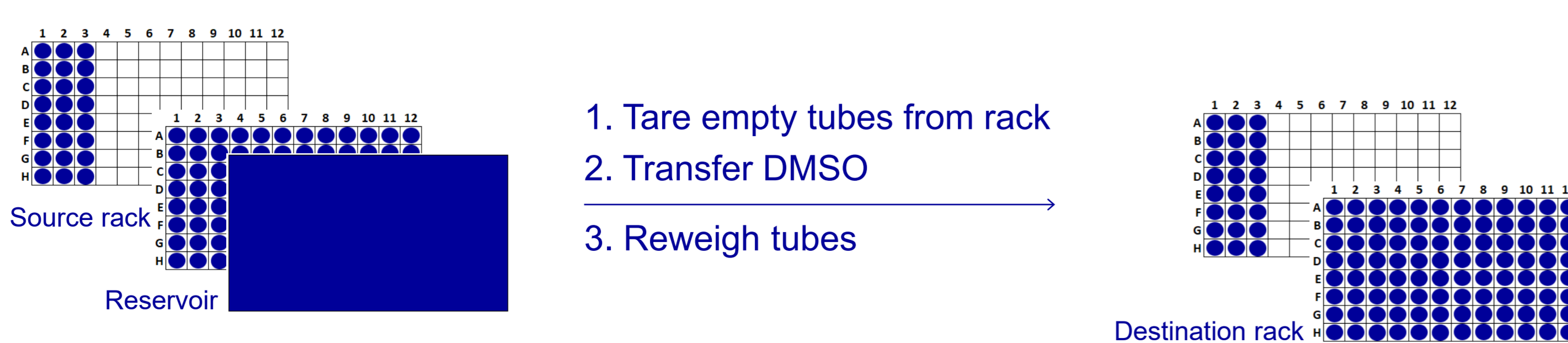


Figure 3: High volume transfer protocol for 8/16-channel and full head devices

## Outliers

Volume Range (µL)	Percentage Range (%)
≤1	20 to 50
>1 to 5	15 to 50
>5 to 200	7.5 to 50
>200	5 to 50

Outliers are single positions with high deviation in the accuracy of the transferred volume

The number of outliers tolerated is about 1% of the wells transferred: 1 outlier in 96 wells or 4 in 384 well

Note: If an outlier has a deviation higher than 50%, this is considered a failed transfer

## Frequency

- Machines preparing (near) assay ready plates: monthly verification
- Machines preparing intermediate solutions: at least quarterly
- Consumable-dependent machines: after each change of the spools/cassettes

Category	Consumable-Dependent	Higher Frequency	Regular Frequency
1	Mosquito LV & HV (spools)	Echo, Tecan, Beckman i7, Dragonfly	
2	Multidrop (cassettes)	Beckman i7, Cybiwell, Bravo	Multidrop (cassettes), Hamilton, Janus
3		Tecan	Hamilton, Janus, Tecan

## Performance check after Repair and Maintenance

- Liquid system: It will be tested in tubes using gravimetry (same as category3)
- Leak test: Aspirate the maximum volume, dispense 1 µL above the plates without blowout, and ensure the drop doesn't fall into the plate for 30-60s
- Volume ranges: Check one volume per range (the most used one)
- Deck position: Verify the deck with a challenging plate (usually 384LDV)

## Echo

- Category 1: 200nl transferred
- Stage motors check using picking list
- Source plate type: Beckman #001-6969 (1536LDV)
- Destination plates check: Spot test

- Precision ≤ 5%
- Accuracy ± 10%
- Frequency: Monthly

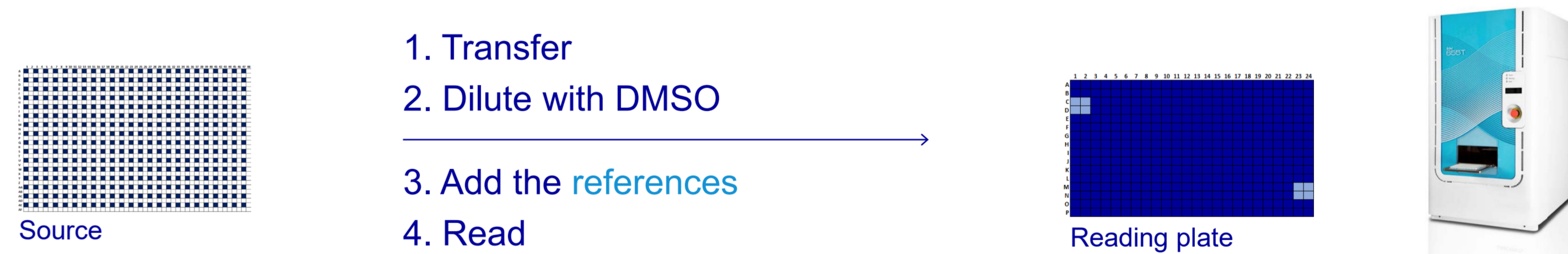
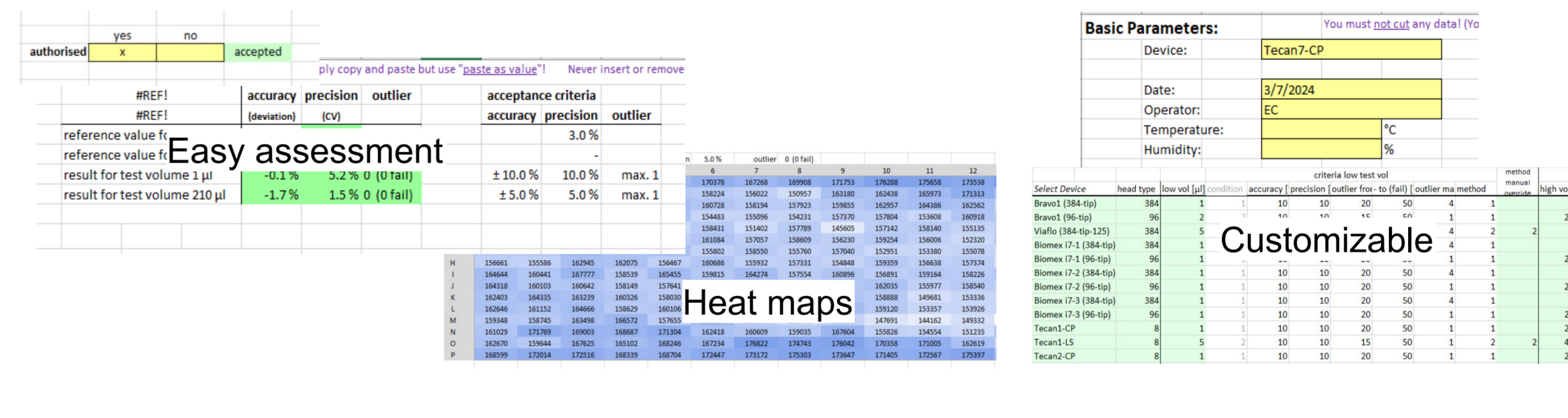


Figure 4: Low volume transfer protocol for Echo devices

## Data analysis template

By pasting the raw data into the template, users can quickly and clearly see the results, including metrics such as accuracy, precision, and the number of outliers. This immediate feedback helps determine whether the test was successful or not



## Performance over time

Plotting the results over time helps us identify performance losses and allows us to act if necessary

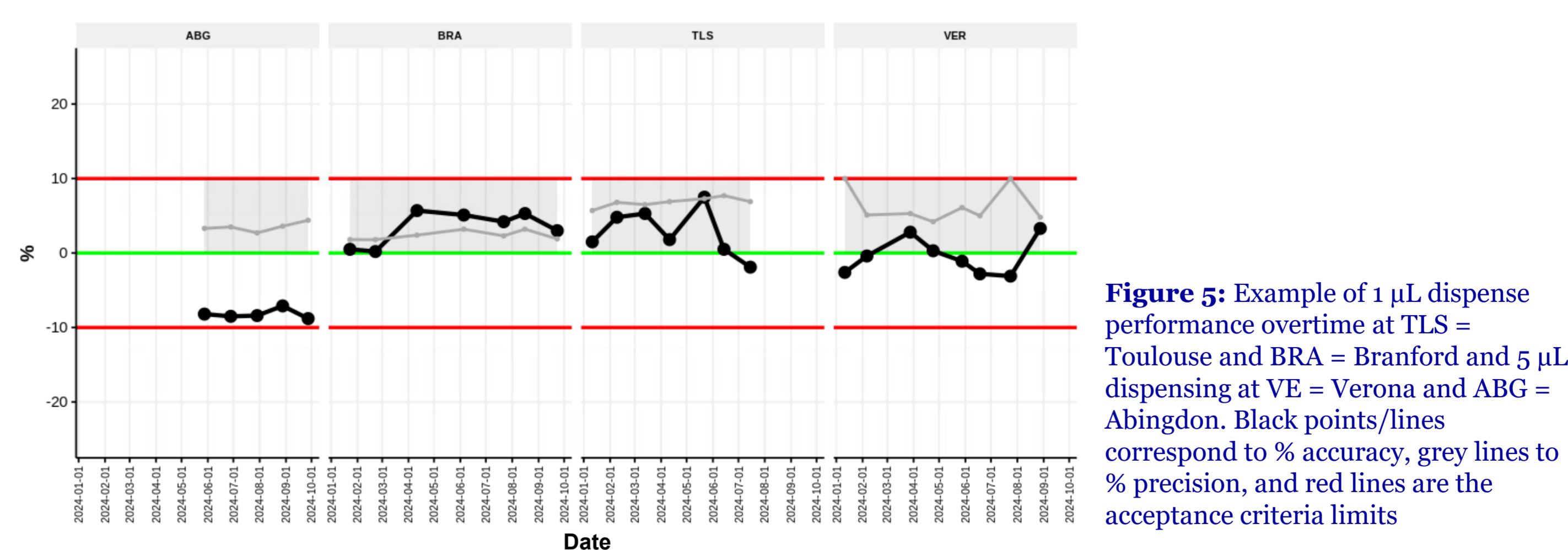


Figure 5: Example of 1 µL dispense performance overtime at TLS = Toulouse and BRA = Branford and 5 µL dispensing at VE = Verona and ABG = Abingdon. Black points/lines correspond to % accuracy, grey lines to % precision, and red lines are the acceptance criteria limits

## General Conclusions

- We have set up a verification protocol that minimizes business disruptions while keeping high quality dispensing. By grouping devices and setting specific checks, we have customized our approach to fit different needs. This global process lets us compare performance across sites, check the performance over time, and tap into expert knowledge when issues arise. Plus, it enhances our quality assurance and raises a collaborative environment where we share best practices and insights between sites.