

Single Tecan® Cold Deck controlled with Julabo *F25-MD*

Prepared by staff engineers at Julabo USA, Inc.



The Objective:

Achieving & maintaining a constant temperature in an Aluminum “Cold Deck” (or Thermal Block) for Micro Plate applications dominant in the Life Sciences.



Tecan's miniature assay for High Throughput Screening (HTS) applications



The Motivation:

The temperatures +4°C and +37°C are common requirements in biotechnology applications given that the former is a usable point above freezing H₂O, while the latter body temperature. In the effort to increase the throughput of assays, more Micro Plates are necessary giving rise to larger “Cold Decks” in order to accommodate them. In this

case, “Cold Decks” with larger surface areas are needed, and at the same time demands superior temperature control and higher cooling capacities due to greater heat losses involved.



The Solution:

Using Julabo Heating & Refrigerated Circulator *F25-MD* (#9130625) as a cost-effective solution for temperature control, and Julabo *EZTemp*™ software (*free*) for Data Acquisition of both the internal (*F25-MD*) & external (Cold Deck) temperatures.



Julabo F25-MD Heating & Refrigerated Circulator

for maintaining one Tecan Cold Deck at the following temperatures:

- a) $T_{ext} = +4^{\circ}\text{C}$,
- b) $T_{ext} = +37^{\circ}\text{C}$,

measured in the plastic vials containing Ethylene Glycol-Water (50-50%) mixture.

A Cold Deck seats sixteen Aluminum Blocks, which in turn holds up to twenty- four plastic Vials.

Test Summary:

Tests conducted at Julabo USA, Inc. with an *F25-MD* Refrigerated & Heating Circulator were able to meet the above requirements within a reasonable time frame (< 2 Hrs. from +20°C initial temperature). Internal bath temperatures of -2°C and +42°C were necessary to obtain T_{ext} of +4°C and +37°C, respectively. A maximum deviation of ±1.0°C was observed for T_{ext} across the Cold Deck. About 5 liters of Ethylene Glycol-Water (50-50%) mixture were utilized as the circulating medium or bath fluid. Additionally, 10mm ID Viton® tubing & Foam Insulation were used to transport & insulate the circulating medium.

Test Goal:

Tecan USA, Inc. requires a liquid temperature control instrument

Figure 1 illustrates the measuring points of T_{ext} at five Vial locations (at four corners and in the middle). A separate RTD

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temperature sensor was used to record these five temperature points over time. This sensor was immersed in ~1" of Glycol-Water mix contacting the Vials' internal surface. Figure 2 shows the results of a 6-hour cooling & heating test using an F25-MD.

Test Results & Conclusion:

In this test, the F25-MD was set to "Internal Control", which results in a slower temperature response for T_{ext} . Moreover, the internal bath setpoints of -2°C and $+42^{\circ}\text{C}$ were obtained through trial and error. Therefore, Julabo recommends a High Tech Circulator (i.e. F25-HE or F25-HP) with external PT100 capability, which enables "External Control" of the process. The advantages of "External Control" are as follows:

- 1) Faster External Temperature Response.
- 2) Improved External Temperature Stability over Time.

The additional accessory required for this function is a Pt100 external temperature sensor (#8981006).

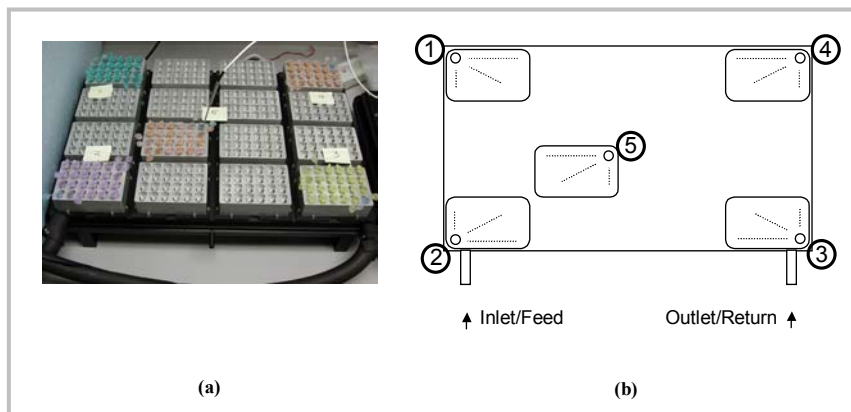


Figure 1:(a) Photograph of actual Cold Deck Set-up with sensor at position "5"; (b) Diagram of sensor positions "1" through "5" representing the Vials at four furthest corners and nearest middle.

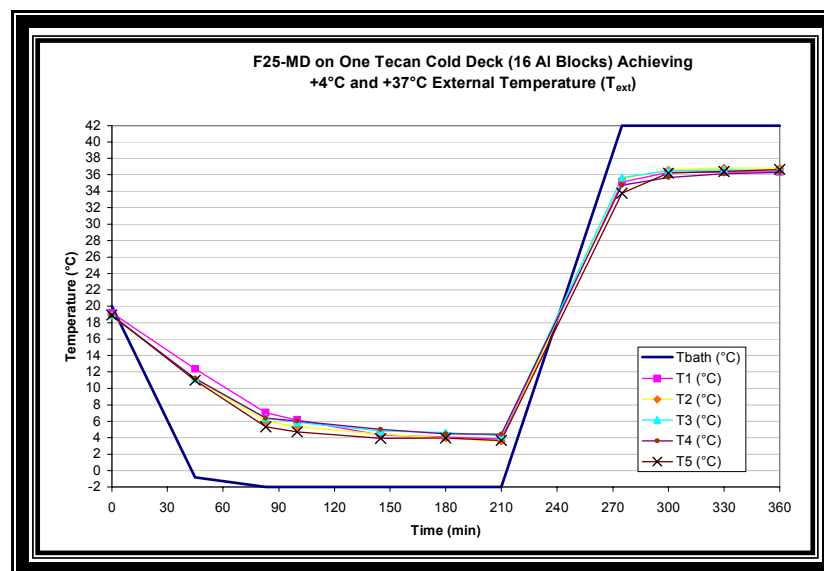


Figure 2: Temperature Distribution of T_{ext} at All Five Positions (denoted as T1-T5) vs. Time. $T_{room} = +20^{\circ}\text{C}$, Rel. Humidity=50%, Bath Fluid=Ethylene Glycol-Water 50-50 mix.