

# Freezing Kinetics of Plasma Bags

## Froilabo ULT Freezers



ULT



-70 °C



Fresh Frozen Plasma

Keywords: Fresh Frozen Plasma, FFP



### CORE FREEZING KINETICS OF 250 ML AND 500 ML BAGS.

The Froilabo CRP Blast Freezer is designed to rapidly freeze blood plasma in preparation for long term storage in ULT freezers. To preserve the quality and function of fresh frozen plasma (FFP) the freezing process must be rapid and homogeneous. During a Site Acceptance Test (SAT) the Froilabo CRP Blast Freezer was installed on a production line which processed plasma product. In this test, the aim was to verify the final temperature inside the plasma bags was -70°C.

Supported by:



### TEST CONDITIONS

The test was performed in a temperature-controlled room at 20°C (+/- 2°C) with a humidity level of 60%. The blast freezer used was the CRP100 EGD model.

Measurement chain:

- Central units and calibrated probes
- 20 PT100 temperature probes

Designation	Type	Manufacturer	Range	Type of calibration
Acquisition unit	34970A	Hewlett Packard	-	Internal
Probes	Pt100 Ohms 4 wires	Pyro-contrôle, Pyrocapt Atexis	-80°C to 215°C	CETIAT Acc. COFRAC

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### EXPECTED RESULTS

Core freezing kinetics must be achieved at a temperature below  $-70^{\circ}\text{C}$  in less than 2.5 hours for a fully loaded blast freezer (30 litres of initial product at ambient temperature).

	Final temperature	Expected value ( $^{\circ}\text{C}$ )
Cart probes	Between $-70^{\circ}\text{C}$ and $-80^{\circ}\text{C}$ .	$-75.0 \pm 5.0$
Bag probes		$-75.0 \pm 5.0$

For this test, 250 and 500 mL bags of saline solution were used.

### TEST PROTOCOL

The test used the following the protocol:

1. Start the blast freezer.
2. Select the preservation mode with a set point of  $-75^{\circ}\text{C}$  (1 hour)
3. Wait until the temperature inside the freezer has stabilized for 5 minutes.
4. Open the door of the freezer.
5. Connect the measurement probes to the control unit using the probe passage.
6. Begin the temperature recording. 1 measurement/30seconds
7. Insert the cart into the tank/chamber of the freezer.
8. Close the door.
9. Start the freezing cycle. Target temperature  $-75^{\circ}\text{C}$ , freezing cycle time 2h30.

### LOADING MAP

Over-wrapping is removed before freezing. The total load of the unit is 30 L of 0.9% NaCl solution, mixed between 250 ml and 500 ml bags, with the probes placed in the 250 ml bags.

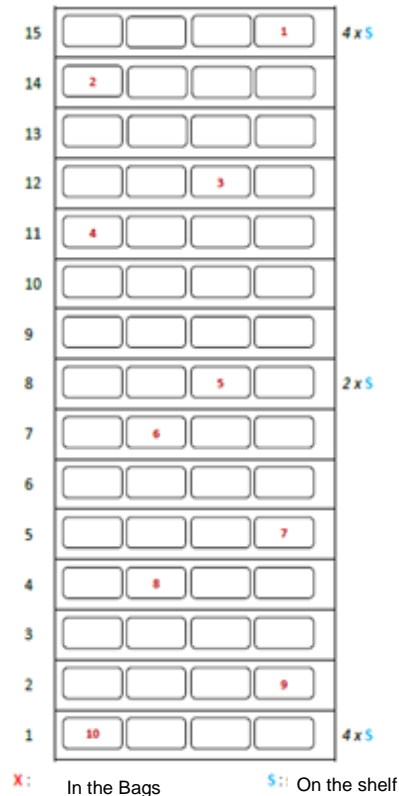


Figure 1: Front view of probe location

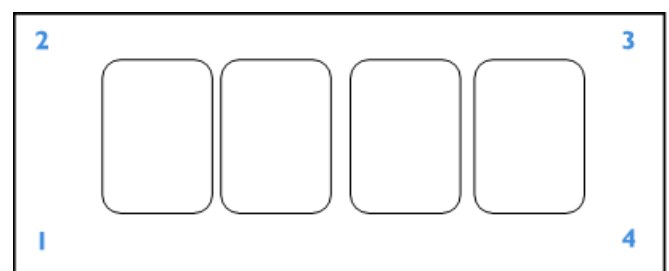


Figure 2: Top view of shelf 1

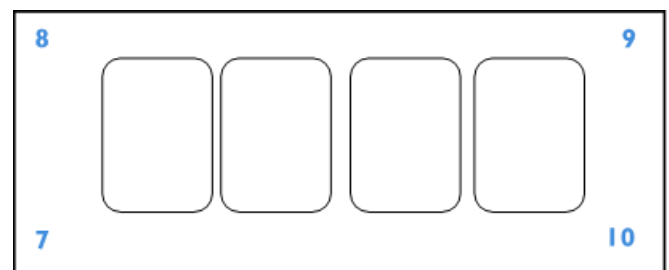


Figure 3: Top view of shelf 15

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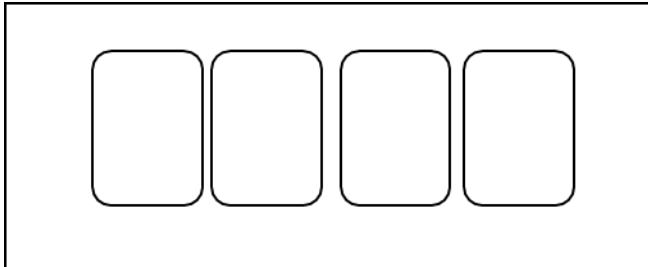


Figure 4: Top view of shelves 2 to 7 and 9 to 14

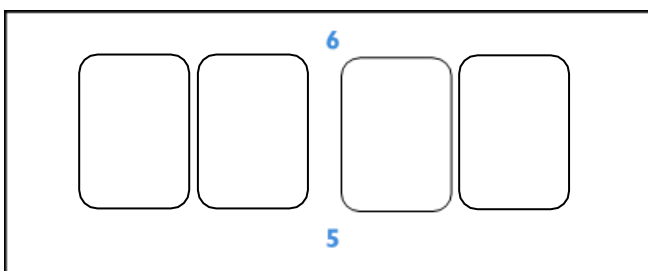


Figure 5: Top view of shelf 8

Froilabo blast freezer is a reliable and easy to use method for the freezing of plasma bags. The frozen product can then be placed in long term cold storage. Froilabo offer a complete range of ULT freezers and cryogenic storage.

### TEST RESULTS

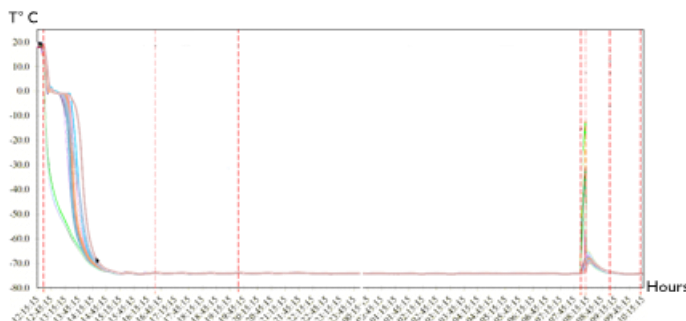


Figure 6: Test result with final temperature of -70°C

As expected, in freezing mode, all probes reached the temperature of -70°C in around 2 hours. Thereafter, the freezer maintained the temperature of -70°C in preservation mode with a great stability thanks to the air circulation inside the tank. After several hours in preservation mode, the freezer switches to a 12-minute defrost mode to prevent frost from forming. This mode is not harmful to the samples inside the tank.

The customer has a requirement to freeze plasma bags is less than 2.5 hours. The CRP achieves this in around 2 hours, giving margin to the user. The