

Controlled-Rate Cell Freezing System

Introduction

CoolCell FTS30 is a high-capacity 1ml or 2ml cryovial freezing system. Freezing clustered vials without the aid of an expensive computer controlled stand-alone freezing unit presents a unique challenge as the freezing rate of the vials toward the middle of the cluster will be influenced by the thermal barrier created by the surrounding vials. CoolCell FTS30 solves this problem by introducing a regulated micro-convection ventilation system into the freezing module. The warmer and less dense air inside the CoolCell FTS30 chamber rises and exits through the top vent choke while drawing cold environmental air in through the lower vent. The cold air is mixed in the lower chamber and then rises, taking up thermal energy as it passes over the vials. As the air takes up thermal energy, it decreases in density and continues to rise and to exit the top vent choke. The top vent choke restriction regulates the rate of air passage and controls the freezing rate. The continuous flow of cold air in combination with conductive heat loss through the surrounding chamber insulation duplicates the same ideal temperature reduction profile of -1°C per minute provided by the widely accepted BioCision CoolCell 12-vial 2ml cryovial freezing container. (Fig. 1)

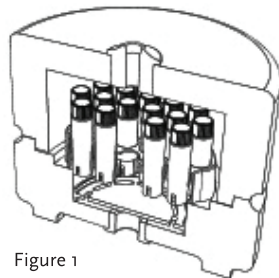


Figure 1

Instructions for use

- Locate and reserve a clear space in a -70°C to -80°C freezer that is at least 9 inches in diameter. Make sure that there is not an accumulation of frost on the shelf space as this may interfere with the proper airflow during the freezing process. The freezer will need to remain closed for at least 3 hours during the freezing process. Check with associates to ensure that temporarily restricted access will not conflict with their requirements.
- If the CoolCell FTS30 has been recently used, it is recommended that the parts be disassembled to check for accumulated moisture. The bottom vent can easily be removed from the base. Inserting a finger through the base vent hole, push out the alloy diffuser plate and thoroughly dry the plate and inner base chamber. Make sure the base vent is dry.
- Insert the base vent into the foam base from the underside (**IMPORTANT: the vent flange should be on the outside of the CoolCell FTS30**) (Fig. 2 and 3)

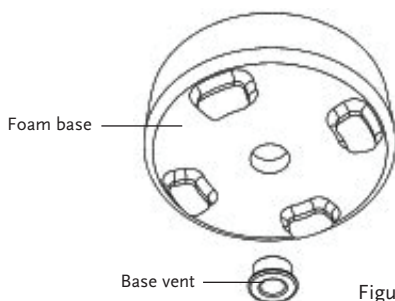


Figure 2

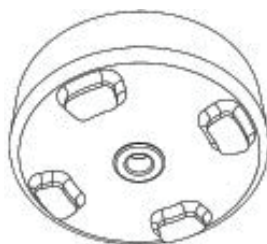


Figure 3

- Insert the top vent choke into the foam lid from the top side of the lid. (**IMPORTANT: The tapered flange should be on the outside of the CoolCell FTS30**) (Fig. 4 and 5)

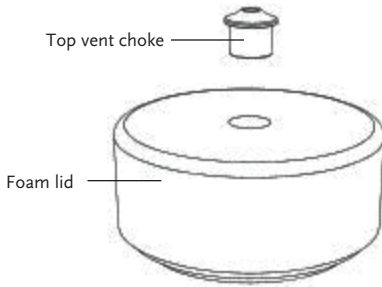


Figure 4

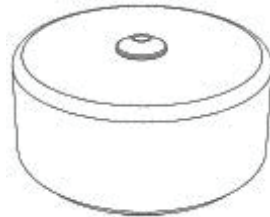


Figure 5

- Insert the alloy diffuser plate into the base cavity. The diffuser plate is reversible and cannot be inserted incorrectly. Ensure that the plate is all the way at the base of the chamber. (Fig. 6 and 7)

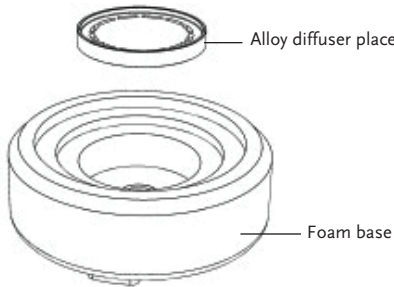


Figure 6



Figure 7

- Insert the plastic FTS Vial Module into the base and make sure that the skirt of the module is evenly seated on the foam shelf. Place 30 cryovials containing 1 ml of freezing medium into the module. Alternatively, the FTS Vial Module may be filled with vials remotely and then placed into the CoolCell FTS30 base. (**IMPORTANT: Do not place a vial in the center hole of the vial module. The center hole is part of the ventilation pathway and must not be blocked.**) (Fig. 8 and 9)

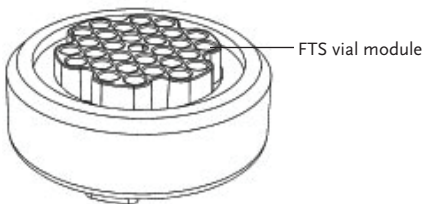


Figure 8

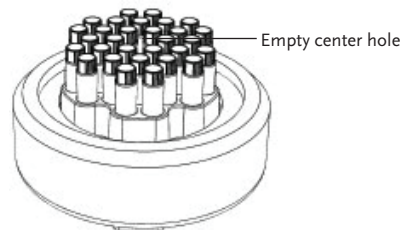


Figure 9

Additional Notes

- CoolCell FTS30 is designed to achieve the ideal freezing rate when loaded with 30 cryovials, each containing 1 ml of freezing media. If less than 30 vials of cells are to be frozen, fill the remaining positions with a BioCision CoolCell Filler Vial (2ml vial, item # BCS-3105) or similar vial containing 1 ml of freezing medium.
- Some freezing protocols require that the cells be chilled prior to freezing. CoolCell FTS30 may be used with cells beginning at any temperature between 0° and 4°C, however it is recommended that the entire CoolCell FTS30 module be pre-equilibrated to the vial temperature to prevent a rise in vial temperature.
- Place the lid onto the CoolCell FTS30 base making sure that the mating surfaces form a complete closure.
- While supporting the CoolCell FTS30 base, transfer the unit to the freezer space previously selected for the freezing process. Make sure that nothing is sitting on top of or can fall onto the top of the CoolCell FTS30 module. Close and latch the freezer door. **(IMPORTANT: Do not stack CoolCell FTS30 units on top of each other. Each unit needs to be free of any overhead obstructions to ensure proper ventilation.)**
- It is recommended that a notice be placed on the freezer door requesting that the door not be opened during the freezing process as opening the door during the freezing process may cause a deviation in the highly repeatable freezing profile. Allow a minimum of 3 hours for the freezing process. CoolCell FTS30 will approach the final equilibrium temperature within 4 hours.

Transferring Frozen Samples to Archive Storage

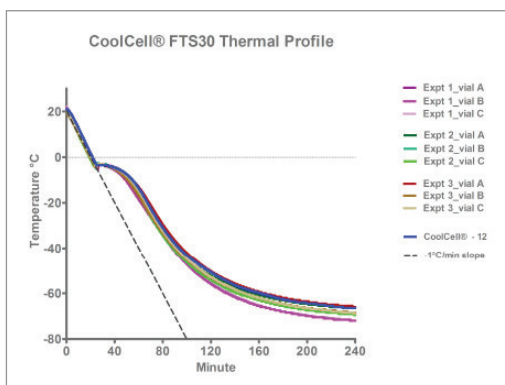
- Remove CoolCell FTS30 from the freezer being sure to support the base. Transport the closed CoolCell FTS30 to the cryogenic storage area and select the storage box intended for the vials. Carefully open the CoolCell FTS30 unit and transfer the FTS Vial Module with frozen vials to a storage box. Place the lid on the cryo storage box and return it to cryogenic storage.

Alternate method

- Prepare an insulated pan or container with a 1-inch (2.5 cm) layer of pulverized or pellet dry ice.
- Remove CoolCell FTS30 from the freezer being careful to support the base. Carefully open the CoolCell FTS30 and transfer the FTS Vial Module with the frozen vials to the dry ice. Individually transfer the vials to cryogenic storage.

Special Notes

- Cryovial contents can rise from -80°C to over -50°C in less than one minute when exposed to room temperature air. Use dry ice for individual vial transfer.
- It is strongly recommended that all frozen cell cultures be checked for viability before the stock culture is terminated.



CoolCell FTS30 Freezing Performance

CoolCell FTS30 will freeze 30 tubes each containing 1 ml of cell suspension at -1°C per minute when placed in a -80°C environment (mechanical freezer or dry ice locker). The graph (left) shows the consistency of freezing profiles of three cryovials over three consecutive freeze runs.

Recycling CoolCell FTS30 to room temperature

CoolCell FTS30 with lid removed will quickly readjust to room temperature - typically, in 15 to 20 minutes. Follow disassembly instructions above and make sure all components are dry before reassembly. Be sure to use gloves when touching the cold alloy diffuser plate to prevent freezing injury.

About the CoolCell FTS30

CoolCell FTS30 in combination with a -70°C to -80°C freezer will provide a freezing rate of -1°C/minute that is ideal for cryopreservation of most cell lines. The regulated micro-convection ventilation features of CoolCell FTS30 provide a previously unachievable degree of clustered vial freezing profile consistency. The vial-to-vial and cycle-to-cycle thermal profiles are highly repeatable when the same vial load and freezer temperature is applied. Due to the low thermal mass of CoolCell FTS30, freezing can be conducted without a rise in local freezer temperature, thereby protecting nearby samples.

Troubleshooting

Problem: The lid appears to be stuck.

Solution: Most likely the CoolCell FTS30 base and/or lid was not fully dry when assembled. Plug the top vent to prevent back flow of warm air through the CoolCell FTS30. Wait a few moments to allow the foam to warm up while applying gentle finger pressure to separate the base and lid. The seal should release within 1-2 minutes.

Care and cleaning

CoolCell FTS30 is constructed from closed-cell cross-linked high density polyethylene foam. It is compatible with prolonged cryogenic temperature exposure. The foam may be cleaned by water and mild soap. Rinse and dry thoroughly. CoolCell FTS30 is resistant to alcohols and 10% bleach solutions. Do not autoclave. Maximum temperature exposure: 60°C. Avoid prolonged exposure to UV light sources.

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