

Freeze-Drying Product Containers and Accessories

Quik-Dry™ Flasks

U.S. Pat. No 4,084,330

When product is frozen in a thin layer on the inner wall surface of a large-diameter flask using a shell freezer, the overall sublimation rate significantly increases as compared to product frozen as a plug in the bottom of a similar flask. Quik-Dry flasks feature a special shape to achieve a thin layer of product when shell-freezing a horizontally-placed flask.

For example, the FTS 1200 ml flask shell freezes a 125 ml sample to a thickness of approximately 0.25 cm. This creates a product surface area of more than 450 cm². The same sample frozen in the bottom of a flask exhibits a product surface area of only 63 cm² and a thickness of nearly 3 cm.

Flasks with 600 ml and 1200 ml capacity are equipped with a compression O-ring seal for reliable vacuum sealing and easy opening. A half turn applied to the large, hand-tightened top nut compresses the ring to create a grease-free, positive mechanical seal which prevents accidental opening. The wide flask opening permits easy and complete removal of the dried product.

Smaller-diameter flasks include one-piece polycarbonate tops with standard O-ring seals. Flask tops feature oversize filters that have a greater mean free area than the entrance diameter of the connecting port eliminating any restrictions which might retard drying, or create a vapor lock.



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- ▶ **Selection of accessories to provide a complete freeze-drying solution**
- ▶ **Demonstrated durability and performance through extensive field testing**



- 1. QD-1200
- 2. QD-300
- 3. QD-600
- 4. QD-40
- 5. QD-75
- 6. QD-150

Quik-Dry™ Flasks

Catalog no.	Max. volume	Max. sample volume
QD-40	40 ml	20 ml
QD-75	75 ml	37 ml
QD-150	150 ml	75 ml
QD-300	300 ml	150 ml
QD-600	600 ml	300 ml
QD-1200	1200 ml	600 ml

The filters prevent light, flyaway dried materials from being swept into the freeze-dryer by the vapor stream during the drying cycle. Flask tops are machined with a 20 mm O.D. lip (similar to a standard serum vial neck) which fits vacuum-tight into a Quik-Vac valve without an adapter.

The self-standing flasks require no preassembly. Amber flasks are available for light-sensitive products.

Multi-Tainers™

Rugged, stainless steel Multi-Tainers are used for freeze-drying bulky materials or products which have already been frozen in Petri dishes, serum vials, or similar containers.

Unless additional heat is supplied by a hot plate or heated bath, drying rate is generally lower than is possible with products shell-frozen in glass flasks. Therefore, the Multi-Tainer is good for processing heat viable materials with low eutectic points—materials which might “melt back” on a manifold if not insulated from ambient heat.

Non-toxic Multi-Tainers are fitted with clear acrylic tops which seal vacuum tight. The 1.27 cm (0.50") O.D. hose nipple in the top connects directly to a Quik-Vac™ valve, or the containers can be connected by using a short piece of 1.27 cm(0.50") I.D. rubber tubing and a stainless steel adapter supplied with the Multi-Tainer.



1. MT-2
2. MT-8
3. MT-1
4. MT-4

Multi-Tainers™

Catalog no.	Volume (liters)	Dimensions (centimeters)	Diameter x depth (inches)
MT-1	1	10.3 x 14	4.06 x 5.50
MT-2	2	12 x 15.5	4.75 x 6.12
MT-4	4	16.8 x 19.7	6.62 x 7.75
MT-8	8	20 x 24	7.87 x 9.50

SC-1 Stoppering-Tainer™

U.S. Pat. No. 4,161,857

The FTS Stoppering-Tainer lets you conveniently freeze-dry and stopper multiple samples under original process vacuum for use as reference samples or for storage without flame sealing. Simply attach the Stoppering-Tainer to the manifold system.

Ready-to-use Stoppering-Tainer is easy to operate. Place serum vials containing pre-frozen samples in the stainless steel container with their split-rubber stoppers partially inserted. The clear plastic top plate seals to the top of the Stoppering-Tainer with an O-ring. Turn the handle to position the clear plastic stoppering plate so that it almost touches the stoppers. After drying, but while under vacuum, turn the handle again to press the stoppers firmly into the bottles.

Vacuum retention can be enhanced by using Model TOS-20 aluminum seals (see chart under serum vials). Drying can be hastened by adding controlled heat to the bottom of the container.

The transparent top plate and stoppering plate make it easy to view the product during stoppering and drying. The top plate is fitted with a 1.5 cm (0.625") O.D. hose nipple that fits directly into a Quik-Vac valve. You can also connect it to an existing auxiliary port by using a short piece of 1.27 cm (0.50") I.D. rubber tubing and an adapter supplied with Stoppering-Tainer.



Stoppering-Tainer Capacities

Serum vial size (ml)	5	10	20	30	50	100
QD-40	14*	10*	7	4	3	1

Maximum height of vial with extended stopper: 109 mm.

* 2 layers

Freeze-drying Trays & Containers

GORE™ LYOGUARD® Freeze-Drying Products

Improved Lyophilization Operations through Effective Product Isolation.

- o Improve product sterility assurance
- o Reduce the risk of product contamination
- o Enhance worker safety
- o Increase yields by reducing product loss due to fly-out
- o Decrease cleaning and cleaning validation costs
- o Optimize operations throughput by enabling shorter cycles

GORE™ LYOGUARD® Freeze-Drying Trays for Bulk Applications

These completely enclosed, single-use, autoclavable, disposable trays are constructed of polypropylene and ePTFE. The tray's surface that contacts the product is chemically inert and biocompatible, and its flexible, thin-film bottom closely conforms to dryer shelves for efficient and uniform heat transfer.

Outside dimensions are approximately: 400mm x 270mm x 50mm.

The tray can be filled with 200ml to 1800ml of solution.

GORE™ LYOGUARD® Freeze-Drying R&D Containers

The microporous Gore ePTFE membrane is incorporated in a removable screw-top, and it protects the product from cross contamination in laboratory-scale freeze dryers. This smaller sized container is a perfect solution for freeze-drying smaller quantities for research studies, lyophilization cycle development and scale-up studies.

Outside dimensions are approximately: 65 mm diameter by 50 mm height. The R&D Container can be filled with 5 to 60 ml of solution.



GORE™ LYOGUARD® Freeze-Drying Tray
GORE™ LYOGUARD® Freeze-Drying R&D Container

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Serum Vials, Stoppers & Seals

FTS serum vials minimize the effects of storing biological products in glass containers. All serum vials are borosilicate glass. Vial necks are available in 13 mm or 20 mm O.D. and are designed to fit snugly into Quik-Vac valves for convenient manifold drying.

To vacuum seal samples under original process vacuum, fill vials to approximately one-half of rated volume and load in trays with split-rubber stoppers partially inserted.

After freeze-drying, the stoppers are mechanically inserted into the vials to vacuum seal the sample. For maximum protection against accidental removal or long-term vacuum retention, clamp the stoppers to the lip of the serum vials using aluminum seals.



1. SV-10 2. TOS-20 3. SV-5 4. ST-20 5. SV-20
6. TOS-13 7. SV-2 8. SV-3 9. ST-13

Serum Vials

Catalog No.	Vol. (ml)	Max. sample volume	Neck dia. (mm)	Body dia. (mm)	Ht. (mm)	No. in case
V-2	2	1.0	13	15.0	32	144
SV-3	3	1.5	13	17.0	38	144
SV-5	5	2.5	20	22.0	40	144
SV-10	10	5.0	20	24.0	50	144
SV-20	20	10.0	20	30.5	58	120

Stoppers and Seals

- ST-13** Split stoppers for freeze-drying with SV vials. Butyl runner. 13 mm O.D.
- ST-20** Split stoppers for freeze-drying with SV vials. Butyl rubber. 20 mm O.D.
- TOS-13** Tear-off aluminum seals for securing stopper to 13 mm neck serum vial after vacuum stoppering for long-term storage. Secured with crimper. Easily removed by tearing aluminum by hand.
- TOS-20** Tear-off aluminum seals for securing stopper to 20 mm neck serum vial after vacuum stoppering for long-term storage. Secured with crimper. Easily removed by tearing aluminum by hand.

Ampules

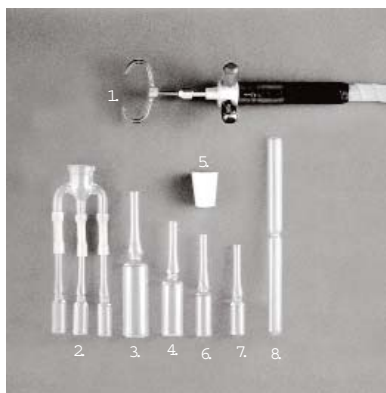
Ampules—useful for long-term storage of numerous small samples—are heat-sealed by evenly applying a hot flame from an oxygen-gas torch (see SOF-1) to the circumference of the ampule neck. As the glass melts, the ampule section is pulled away to leave both ends sealed. All FTS ampules are fabricated from borosilicate glass.

SOF-1 OXY-Gas Sealing-off Torch

The SOF-1 is equipped with a modified double tip to seal off ampules with neck diameters up to 14 mm. Its small size, lightweight (2 oz.) and easily-controlled metering valves help prevent fatigue when large numbers of samples need to be sealed under process vacuum.

►**SOF-1:** Complete torch with 1.82 meters (72") long, color-coded service lines in protective sheath. Connections to 0.535 cm (0.25") regular fitting. Torch length—17 cm (6.75").

►**SOF-T-5:** Torch head only.



1. SQF-1
2. TA-3
3. AP-10
4. AP-5
5. VA-4
6. AP-2
7. AP-1
8. AC-3

Ampule Adapters (dimension in mm)

Catalog no. Description

VA-4 White silicone rubber with 4 mm hole to adapt 7 mm neck ampules to 12 mm Quik-Vac valve. Large end indexes vacuum tight in 20 mm recess in valve.

VA-8 Same as VA-4 only 8 mm diameter hole to adapt 10 mm neck ampules

TA3 The FTS triple adapter is a convenient method of multiplying the drying capacity of a manifold port by a factor of three; useful when processing a large number of 1/2 ml samples in small-necked (4.4 mm) pre-scored 1 ml capacity ampules. Fabricated from borosilicate glass with a 20 mm neck that indexes directly into the inlet of the Quik-Vac valve. In operation, the pre-frozen samples are connected with small sections of 1/8" ID silicone rubber tubing supplied with the adapter. There is ample room in the neck of the adapter to accommodate a cotton plug if required for sterility during transfer. Use with 1 ml (AP-1) or 2 ml (AP-2) pre-scored ampules or equal.

Ampules

Catalog no.	Size (ml)	Max. fill (ml)	Adapter no.	Description
AC-3	3	1.5	VA-8 (10 mm neck)	Constricted Ampules 10 mm OD neck and body with constriction at midpoint. Overall length 13 cm.
AP-1	1	0.5	4.75 x 6.12	Pre-scored (gold band) thin-wall ampules w/flat bottoms.
AP-2	2	1.0	6.62 x 7.75	
AP-5	5	2.5	7.87 x 9.50	Neck "snaps" apart for reentry without preparation.
AP-10	10	2.5	7.87 x 9.50	

Acid Filters

►**AF-1:** Acid filter for Dura-Dry™ with polyethylene condenser shell only. Hydrated lime, sodium hydroxide and potassium hydroxide packaged in plastic, rechargeable assembly. Easily hand-inserted into vapor stream at condenser entrance. Internal placement of filter requires no new vacuum connections to maintain integrity of system vacuum. Filter changes color from white to violet as it absorbs acid.

►**AF-2:** Acid filter for Dura-Dry with stainless steel condenser shell only.

►**SL-6:** Soda-lime replacement for AF-1.

►**AFI-10:** In-line acid filter. Hydrated lime, sodium hydroxide, and potassium hydroxide packaged in a disposable cartridge. The cartridge is housed in a clear plastic enclosure with connections to accept 1.5 cm (0.625") I.D. vacuum tubing. Includes support for free-standing, table-top use.

►**SLC-1:** Replacement cartridges for AFI-1.



1. AFI-10
2. AF-1



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