

Module Storage: How, Where, and In What?

Lenticular modules can be stored for a few days or several months between uses. This article will detail **where** they can be stored and **in what solutions**. Whatever storage method you choose, make sure that you regularly inspect media to ensure:

- The modules are properly submerged
- The gaskets have been removed
- The solution is still sanitary (of appropriate antimicrobial concentration).

WHERE TO STORE MODULES

Modules can be stored:

- Inside the housing (most common)
- A brew fermentation bucket that is not tapered (12" modules)
- Food-grade plastic trash cans or Rubbermaid totes with lids (16" modules)

QUICK GUIDE TO STORAGE SOLUTIONS:

SOLUTION TYPE	CONTACT TIME	NOTES
Inexpensive Ethanol (Vodka)	> Months	*Keep strength above 20%/40 proof. *Do not use denatured spirits. *Purge out water very well before submerging to avoid lowering proof < 40 degrees. <i>This is the preferred method of storing carbon modules.</i>
Nitric and Phosphoric Acid/Blends	Maximum 6 hours cumulative	Use at own risk. These acids damage the membrane structure at longer contact times.
Peracetic Acid at 0.05%	≤ 3days	After 3 days the peroxide in the formulation will have broken down, offering little protection against spoilage. Storage at a higher concentration can lead to premature breakdown and/or damage of the media.
Citric Acid 1-2% Solution	≤ 3days	After 3 days bacteria will target this solution. If bacteria is already present in the cartridge, then bacterial spoilage will begin within hours. <i>See below for use with SO₂.</i>
Citric Acid 1-2% in	≥ 3 months	Citric acid is commonly used in wineries with 50-200 ppm of added SO ₂ for long term

combination with 50-200 ppm SO ₂		storage. Periodically add more SO ₂ by dropping in an Inodose effervescent tablet.
SO ₂ Solution without Acidifying 50-200 ppm or ≤1000 ppm	≥ 3 months	<i>This is less effective than using SO₂ with Citric Acid</i> , however you can use up to 1000 ppm of SO ₂ which helps to bleach the media if your intention is to remove color. Periodically add more SO ₂ by dropping in an Inodose effervescent tablet.
Sulfuric Acid 2% Solution	6 weeks +	Recommended by the manufacturer for long term storage.
Caustic Soda (NaOH or KOH 1-2%)	≤ 12 hours	Difficult to neutralize, longer contact time weakens cellulose structure.
Ozone Water/Gas	Not recommended by the manufacturer	Instant destruction of media.
Iodophor or other Iodine-based Sanitizers	Not recommended by the manufacturer	Permanent staining and impossible to remove.

Storage Solutions Explained

For a more in-depth explanation of the suitability of each storage solution and contact time, please see below. Remember, whatever storage method you choose, make sure that you have removed O-rings and gaskets if storing for longer than 2 days and that you regularly inspect media to ensure:

- The modules are properly submerged
- The gaskets have been removed
- The solution is still sanitary (of appropriate antimicrobial concentration)

APPROPRIATE STORAGE SOLUTIONS

Inexpensive Ethanol* (Neutral vodka)

Modules can be stored in 40-135 proof ethanol solutions for months to years as long as the ABV doesn't drop below 20%. Do not store cartridges in solutions greater than 135 proof, or the module and storage container can prematurely age and crack.

We only recommend this method for 12" modules. We see a poor distribution of the alcohol, within the depth of a 16" module, unless the ethanol is circulated first which requires impractical amounts of ethanol.

Acids* (Citric and Tartaric Acids)

Acceptable acids to store media in include citric and tartaric acid but for the long term, it must be used in combination with potassium metabisulfite (KMBS) to keep spoilage organisms from metabolizing these bio-essential acids. This method is commonly used in the wine industry. Periodic additions of SO₂ must be maintained to keep the modules from spoiling.

**When storing modules in liquid, your module should be purged with gas to empty the module before storage. This avoids dilution of the storage solution to the point where it is no longer antimicrobial. To do this, bring the backpressure up to 3-5 psi when purging.*

Storage Under Pressure

Modules can be stored inside the lenticular housing under pressure for several months so long as the pressure does not drop below 1 bar. Pall (manufacturer) recommends performing a regeneration, steaming or hot water sanitizing them, then placing the drained housing under 1-1.5 bars (14.5-21.8 psi) with a food-grade gas like nitrogen. You may use CO₂ but it is soluble and will take longer to build up the proper pressure.

Please take proper safety precautions when storing under pressure as many lenticular housings are only pressure rated for liquid pressure, not gas pressure.

SOLUTIONS TO AVOID

Ozone, Iodophor, and Caustic Soda

- Ozone will destroy the media within minutes.
- Iodophor will permanently stain the media.

- Caustic soda should not be used for longer than 6 hours as it will be difficult to remove/neutralize and will break down the cellulose.

Acid Sanitizers (Nitric or Phosphoric Acid Blends)

The manufacturers of cellulose filter media advise against using phosphoric acid, nitric acid, or peracetic acid. They are acceptable to run through the media just prior to filtration, but extended contact time is detrimental to the media.

They will break down the cellulose which can cause inconsistent filtrate quality and degraded filter media may end up in your final product. Some of them will also change color and cause off-flavors in the media or break down into a non-antimicrobial concentration.