



## Integrity Testing of Membrane Filters

*Integrity testing ensures that membrane filters are removing their target microbial contaminants and that there is no bypass occurring due to the filters or housing components. It is a critical step that must be correctly performed to ensure product quality.*

### Why do we have to integrity test our filters?

Verifying the integrity of a membrane filter ensures that it is truly removing all contaminants at its rated pore size. It ensures that the membrane is integral, and that the cartridge is not damaged or installed incorrectly.

### When should we perform an integrity test?

Cartridges are most susceptible to failure during cleaning and sanitation. Many integrity failures also occur due to incorrect filter installation, such as rolled or damaged o-rings, or filters damaged during install or shipping. These are the main times when a filter should be integrity tested. Some plants will also integrity test after a run, but before cleaning, to ensure that the run was successful or during production, if production is running continuously for long periods, to ensure that the filters are performing correctly. It is extremely rare to have a filter fail during a production run, however.

### What integrity test should we use?

Housings 3-Rd 30" or smaller should be tested with bubble point. Housings greater than 3-Rd 30" should be tested with pressure hold.

## What is the basic procedure for a bubble point?

- (1) Wet the filters.
- (2) Drain water from both sides of the housing.
- (3) Close all housing upstream valves.
- (4) Attach air supply to the upstream of the filters.
- (5) Attach hose or tubing to a downstream housing valve and submerge the open end in a container of water. Make sure this valve is open.
- (6) Introduce regulated air pressure to about 10 psi. Allow pressure to stabilize.
- (7) Slowly increase pressure in 5 psi increments.
- (8) Note the pressure at which vigorous bubbling from the tube occurs. This is the bubble point. If it occurs below the specification, the filter has failed. If it occurs above the specification, the filter has passed.

## What is the basic procedure for a pressure hold?

- (1) Wet the filters.
- (2) Drain water from both sides of housing.
- (3) Close all housing upstream valves.
- (4) Attach air supply to the upstream of the filters.
- (5) Introduce regulated air pressure at 80% of the bubble point. Allow 5 minute stabilization time.
- (6) Ensure that a downstream valve is open.
- (7) Turn off the air supply.
- (8) Wait 10 minutes and measure the pressure drop. If the drop is less than the specification, the filters have passed. If the drop is greater than the specification, the filters have failed.

## Should we use an automatic integrity tester?

The use of an automatic integrity tester is not required, however, some plants prefer them. Typically, a well-trained operator is faster performing a manual test. Well-trained operators also tend to be able to troubleshoot better and reduce false failures due to issues such as not leaving the downstream valve open during pressure hold or forgetting to turn the gas supply off. These would both result in a false passing test without actually testing the filters. An automatic unit would not detect this on its own. Automatic units have printing or data-logging capabilities that many plants find useful for recording purposes. Both automatic and manual testing is equally effective and it is up to the plant to decide which method they prefer. Note that integrity testers should be programmed to reflect the filters they are testing and that all integrity testers work with all manufacturers' filters.

## Do all membranes integrity test the same?

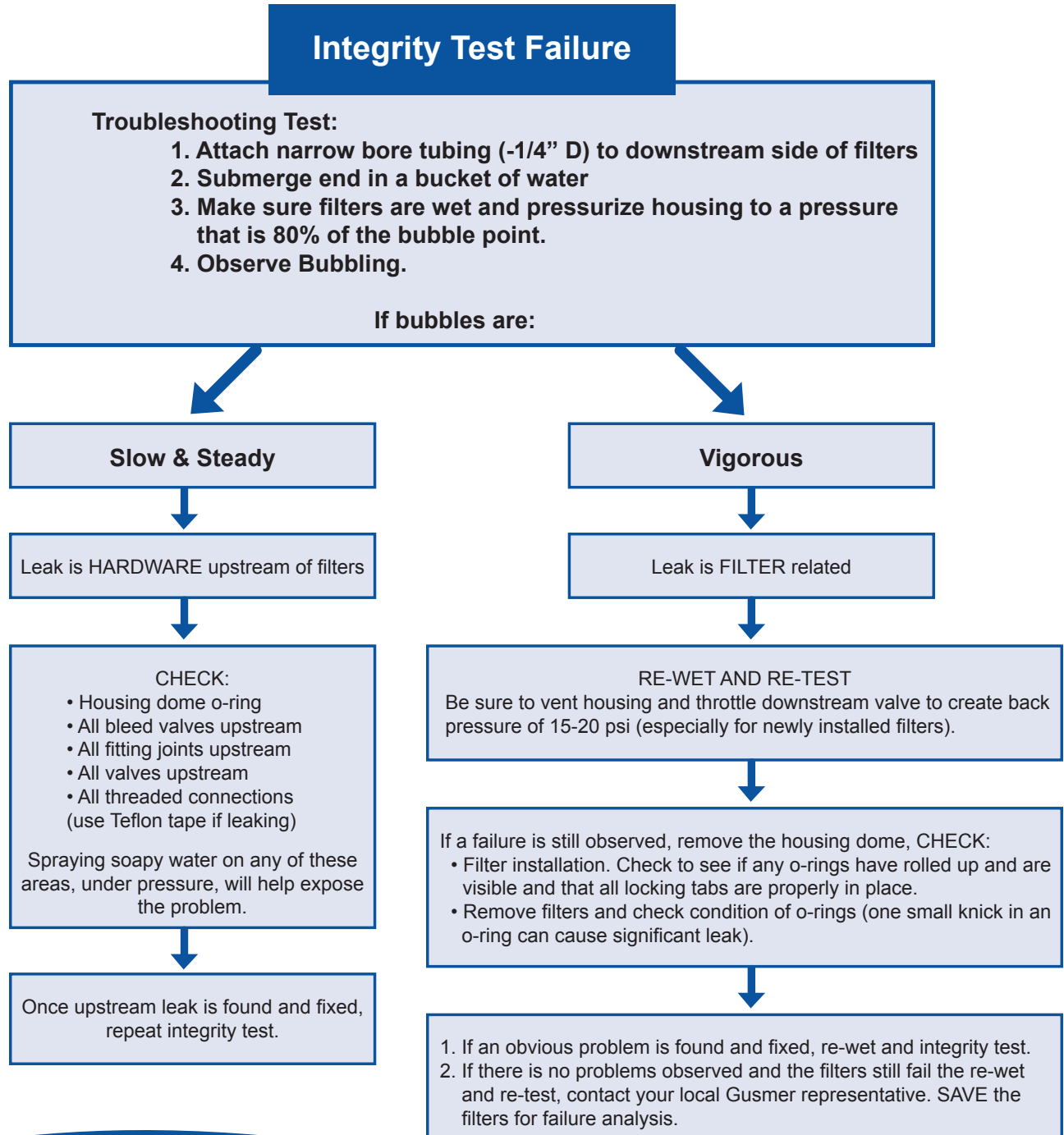
The test procedure is always the same. The diffusion and bubble point specifications of each membrane is different based on membrane type and pore size.

## Does temperature matter during an integrity test?

The temperature a test is run at does not matter as long as it is the same temperature throughout the test. Gas pressure is a function of temperature. If a housing significantly cools during the test the gas will contract. This causes a loss of pressure and may cause a false failing test. If a housing heats up during the test the gas will expand and it may cause a false passing integrity test.

## What should we do if we fail an integrity test?

The first step is to inspect, re-wet and re-test the filters. Most failing integrity tests occur due to incorrectly installed or un-wetted filters. If that fails, it should be determined if the failure is due to either an upstream leak or a downstream leak, and then to the specific cause. This flow chart should help. If uncertain or if it is believed that a filter failure is involved, please contact your Gusmer Enterprises representative for assistance.



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