



EXTENDED WATER ENTRY PRESSURE TEST GUIDELINE

The following guidelines are based on Gore's best practices in eWEP (extended Water Entry Pressure) testing for GORE® Portable Electronic Vents. Please follow the guidelines to conduct the eWEP testing to minimize water leakage failures caused by test issues.

GORE® Vent Waterproof Mechanism

Gore ePTFE membrane Structure

Gore ePTFE is created when PTFE is expanded, producing a microporous structure. For mobile electronics applications, ePTFE helps deliver optimized solutions that focus on acoustic quality, airflow, and waterproof protection.

How Do GORE® Vents Provide Water Protection?

The microporous structure of GORE® Vents allows bidirectional passage of gas and vapor molecules, while blocking ingress of particulates and liquids (Figure 1).

Vents are challenged by a broad range of fluids, most often complex formulations (soapy water, oils, sebum ...).

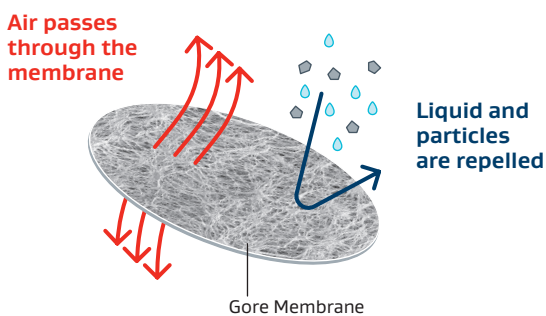
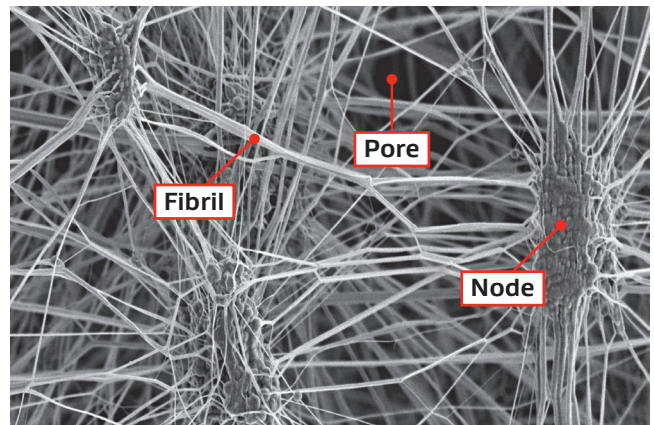


Figure 1: Functionalities of Gore membrane



- Low surface tension fluids can spontaneously wet ePTFE resulting in failure (Figure 2).
- Some may migrate into the vent over time, compromising the device's performance, durability, and lifetime.
- Others may just stick to the surface because of poor roll-off properties and prevent pressure equalization.

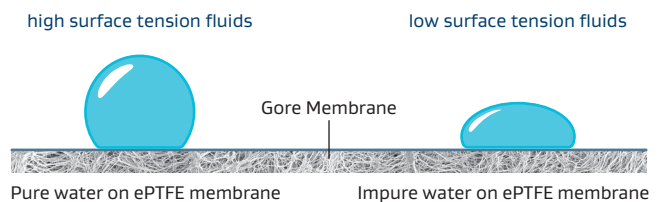


Figure 2: Wettability under different surface tension

eWEP Test (extended Water Entry Pressure Test) Introduction

Gore conducts an in-depth waterproof test twice at the membrane and part level, a step that supplements and solidifies the reliability testing done by customers. eWEP testing is conducted to simulate waterproof performance in an immersion environment. The vent is installed on a test plate, secured in a fixture, and tested under water pressure for a specified time.

Remarks

1. A compression plate as shown in Figure 3 is required for high pressure (≥ 5 bar) eWEP testing, but not required for IPx7/IPx8 (1 to 5 meters of water) as shown in Figure 4.
2. For additional questions about handling and installation, please contact a Gore representative.

Test procedure

1. Install the GORE® Vent on the test plate, apply defined pressure and then dwell to make sure the adhesive has good bonding with the test plate.
2. Place the sample in the text fixture, then set the water pressure ramp rate (normally 0.5 psi/sec) and holding time according to product spec.
3. Observe if any water leakage happens during the test.

Test Water recommendation

1. DI water (deionized water) is recommended to avoid unwanted contamination.
2. Change the test water regularly to ensure the water tank is clean.

eWEP Test typical failure mode

1. Adhesive/test plate interface failure: Water passes between the test plate and the membrane as shown in Figure 6. It does not compromise the adhesive to membrane bond or penetrate the membrane.
2. Active area leakage: water penetrates through the membrane structure, as shown in Figure 7.

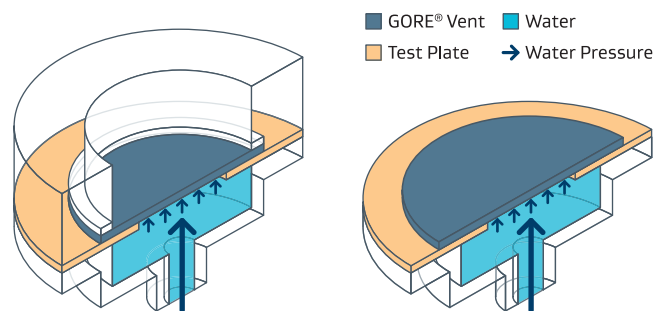


Figure 3:
Demo of eWEP test (≥ 5 bar)

Figure 4:
Demo of eWEP test (IPx7/IPx8)

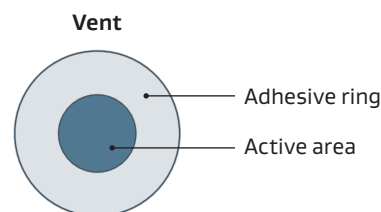


Figure 5: Active area of a GORE® Portable Electronic Vent

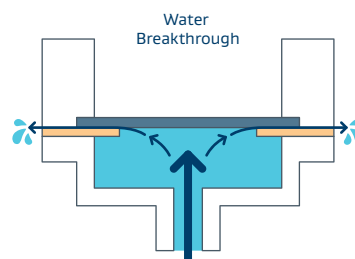


Figure 6:
Water leakage at adhesive/test plate interface

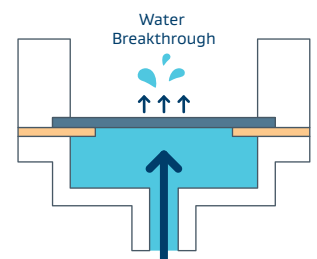
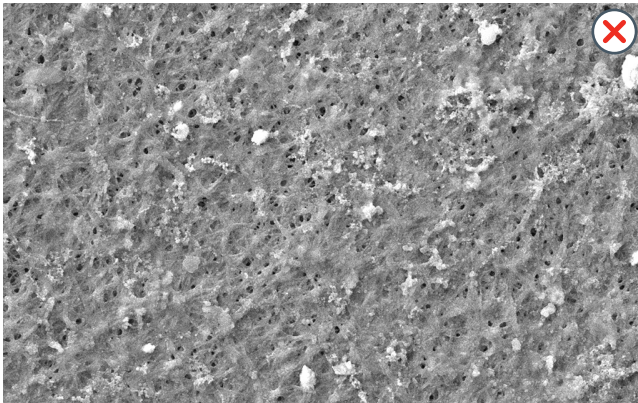


Figure 7:
Water penetration at active area

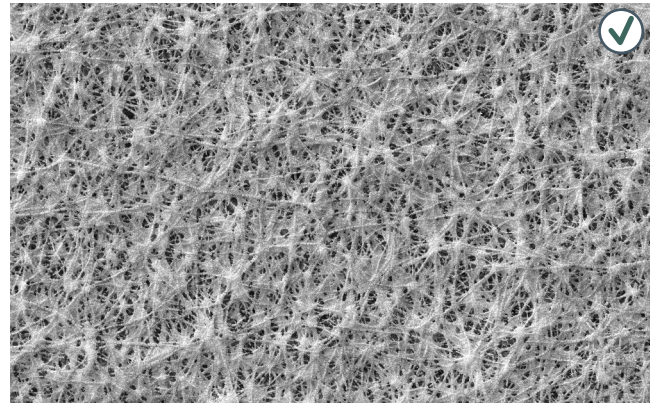
Typical eWEP Test Failure Caused by Contamination

NG (Not Good) sample vs. OK sample under SEM

The NG sample membrane returned by a customer is covered with significant contamination and the porous structure is not visible.

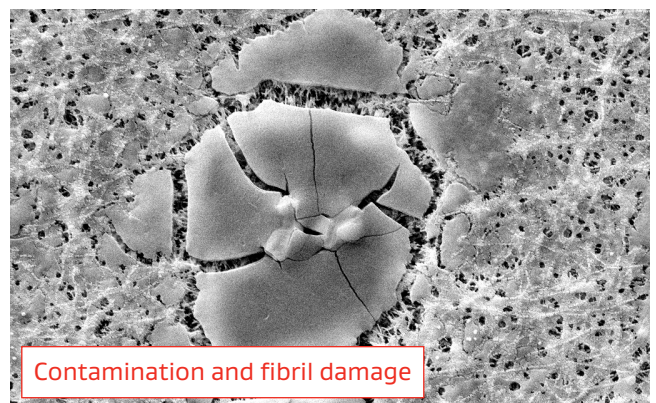
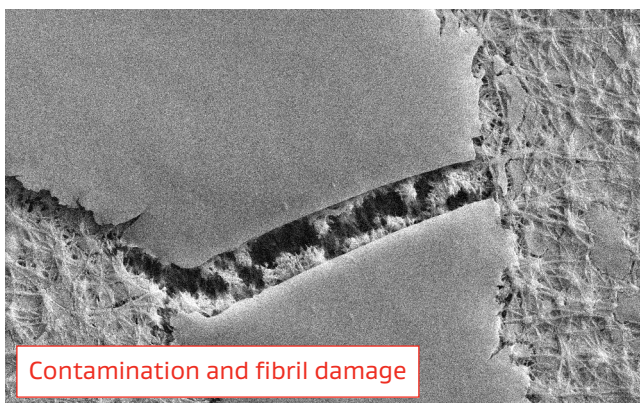
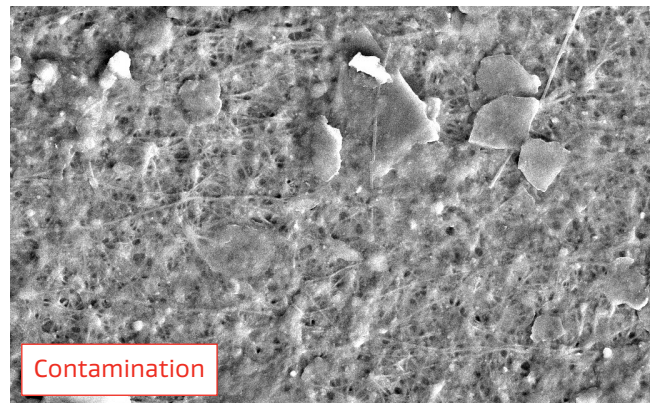
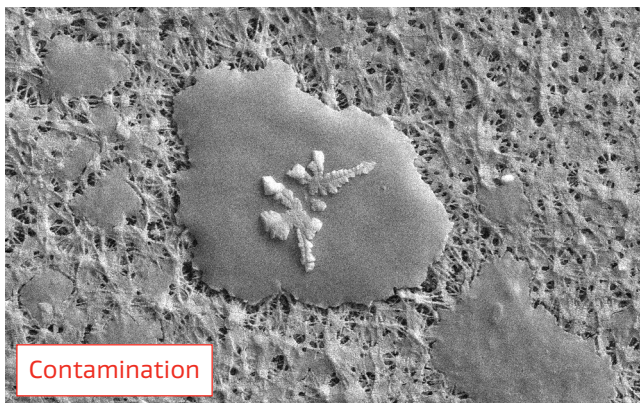


NG Sample (under 3000x magnification)



OK Sample (under 3000x magnification)

Typical defective samples caused by contamination



Typical defective samples caused by contamination (under 3000x magnification)

Water Leakage Failure Analysis Recommendation



1. If the leakage occurs at the adhesive ring area, we recommend to re-press the part with an acrylic plate and re-test to check the result. If the leakage occurs in the part's active area, we recommend to examine using SEM/EDS to further check the microporous membrane surface. Membrane damage or contamination will impact waterproof performance.

We recommend to use water-soluble dye (surface tension must be close to 72.8 mN/m) to check the leakage path for further analysis. For example, blue dye solution.

Blue dye recipe: Less than < 0.6% Concentration (i.e. mixed with > 99.4% deionized water) Clariant blue dye is recommended, higher concentration of dye may have risk of changing the surface tension of the mixture, causing the membrane to wet out.

2. If further analysis from Gore is required when water leakage happens, please do NOT disassemble the GORE® vent from the test plate. Installed vents are easily damaged during removal and this will confound the failure analysis results.
3. Clean nitrile rubber gloves are recommended while handling the vents. Put defective samples in a clean bag, protected on the outside with bubble wrap or foam to avoid damage (Avoid gloves containing powder or bags that have silicone coatings or anything else that can contaminate the vents).

Note: W. L. Gore & Associates Quality Assurance Procedure dictates removal of some vents from the liner prior to shipment. Sufficient extra length of liner and vents is provided to make a full product count. This procedure assures that all parts are handled minimally to avoid contamination and/or Damage.

For additional questions about handling and installation, please contact a Gore representative.

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