MEMSEP FILTRATION Ltd.

Laboratory Technical Procedure

Diffusion Test of MEMFLO Filter Cartridges

Introduction

The Diffusive Flow Test at a pressure approximately 80% of the minimum bubble point, the gas molecules migrate through the water-filled pores of a wetted membrane through Diffusion which is measured to determine a filter's integrity. It is also known as Forward Flow Test a standard test for ensuring the integrity of membrane filters, generally recognized as a non-destructive integrity test for membrane filters.

Diffusion Test as stated in this LTP applies to MEMFLO filter cartridges with end connections such as **Code-7, 222, Double Open end** [i.e. Hydrophobic filters are wetted with IPA-water solution prepared using 60% isopropyl alcohol (IPA) and 40% water while hydrophilic filters are wetted with water alone].

- Only non soluble gases can be used, normally air or nitrogen.
- A measurement is made of the Flow Rate of the gas through the Filter and compared with the manufacturer provided parameters.
- Rate of measurement of diffusion shows the total volume of the flow from the pores.
- When the Trans membrane pressure increased the diffusive gas flow through the wetted membrane pores will also increase proportionally that is diffusion range.
- Filter element is intact if the test results are in the limit.

Working Procedure

✓ **Determination of Upstream Volume**

- The volume between the Inlet of the Filter Housing till the Top end of the Filter cartridge installed inside the housing is termed as Upstream Volume of that specific Filter.
- This volume is measured using a Reference vessel of known volume which is used by the tester as a Reference Volume to calculate the upstream volume of Filter.
- Upstream volume determination is necessary to correlate the volume and element area for which the Diffusion Flow is to be determined.
- This may vary with respect to the Filter cartridge to be tested, Test Filter Housing and the Surface Tension of the Test Fluid used, So it has to be measured every time for precise results. This is due to the deformations which occur while manufacturing in the shape and design of Filters as well as Filter Housings.

✓ **Measurement of Diffusion Flow**

a) Prepare wetting solution i.e. for hydrophobic filters use 60% IPA [Isopropyl alcohol] and 40% water while for hydrophilic filters use water alone. Pre-wet the filter cartridge as per wetting procedure.

b) After wetting of filter cartridge fix the filter cartridge inside the filter housing and tight the housing Clamp.

c) Close the Inlet of the filter housing.

d) Connect the pressure sensor on the top of the filter housing interconnect it to Pressure sensor connector on Filter integrity tester.

e) Also connect the filling valve on the top of filter housing and interconnect it to filling valve connector on Filter integrity tester.

f) Ensure that the outlet of the filter housing is open in a beaker so as to store the excess fluid expelled out by the test pressure applied on the filter.

g) Interconnect the compressed air line to pressure regulator and then to pressure inlet on Filter integrity tester through PU tube.

h) Connect the power supply charger to the back side of Filter integrity tester.

i) Start the tester with **"ON"** button.

j) Select the Block No. in which the specified Test program is pre-created.

k) Then select the Program No. in which program is stored and press "ENTER".

l) Enter filter details using IR- keyboard in programme and press "ENTER".

m) Start the compressed air and take pressure between 6 to 8 bars [Max. operational pressure required by the Tester].

n) As **"Ready to start"** appears on the display of Tester Press **"START"** button.

o) The tester will automatically do the test and printed result will come out.

p) On completion of Test disconnect the air line and dismantle the assembly, put the pressure sensor and filling valve back to the tester.

q) Perform oven drying of Filter Cartridge at ambient Temperature for about 15-30 minutes to remove the excess wetting fluid from the surface of filter.

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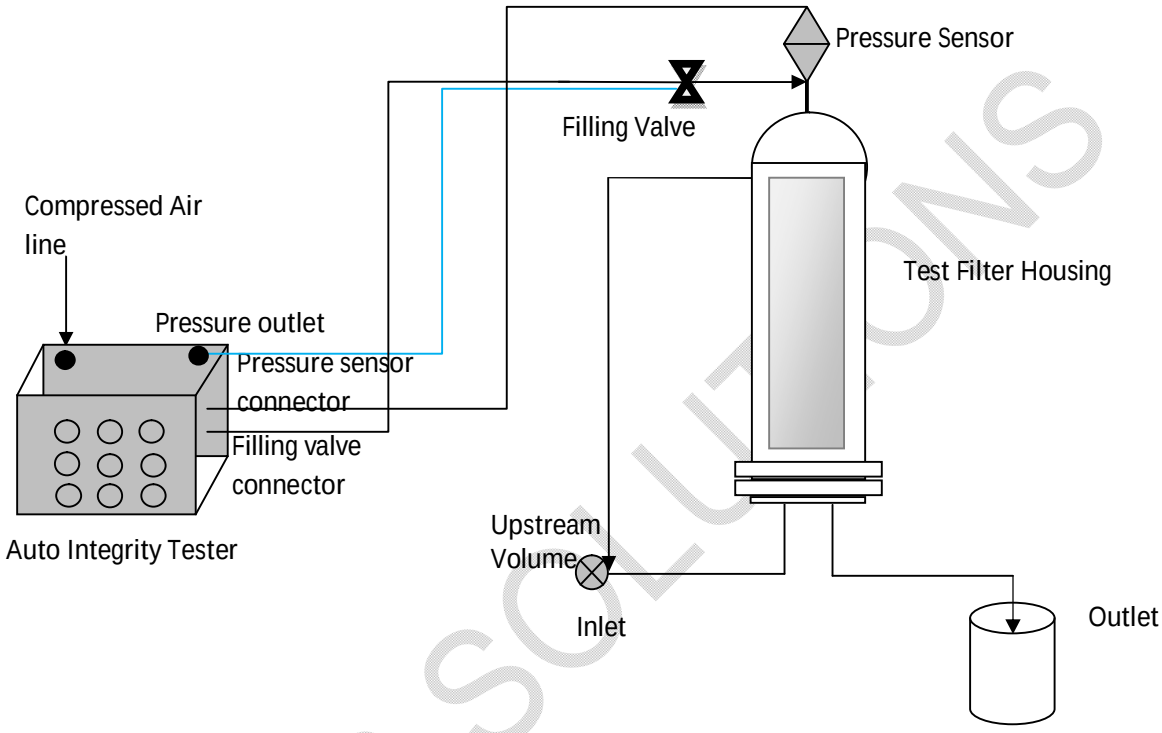
Diffusion Flow Test Assembly



Key points to remember

- Ensure that the filter is thoroughly and uniformly wet. Any dry pores in the membrane will result in test failure.
- Failure to wet the filter may result in premature air flow resulting in false failure. Rewet the filter and run the test again.
- Contamination of the filter should be avoided as it can adversely affect the wetting of the membrane thus resulting in a false failure.
- Variation in temperature and leakage from seal material may result in test failure.
- Test parameters may vary by change in wetting fluid due to change in surface tension of the liquids and inadequate stabilization time.

- Increased Test Time and pressure drop will result in decreased Diffusion Flow value.
- Increased Upstream volume will result in increased Diffusion Flow value.
- Temperature variations will result in test failures.

Failure Investigation Procedure for Filter Cartridge

- *Improper installation of "O" ring*- Do the physical verification of "O" ring to check the size for proper fitting and for any cuts and then Re-install it.
- *Leakage in Filter System*- Check the leakage in filter system, Staubli connectors, filter housing and PU tubes through Hydro Test or use soap solution at the connection sites.
- *Improper wetting of Filter Cartridge*- Refer Standard Wetting procedure either manual or using "it-Flush" wetting assembly to attain proper wetting of filter cartridge and retest the filter.
- *Puncture in membrane*- Check for integrity of cartridge filter through Reverse Bubble Test. If Filter cartridge is found ok in test and no physical leakage or damage observed means that cartridge is integral and if not found ok in test the Filter is damage.