

# TECHNICAL BRIEF

## LifeASSURE® PB GRADE INSTALLATION INTEGRITY TESTING

The installation integrity test was developed to allow customers to ensure proper installation and operation of LifeASSURE PB filter cartridges and capsules. The method, called a Pressure Hold Test (PHT), is based on gas flow through the water-wetted membrane and can be conducted with any number of LifeASSURE PB filters. The method can be conducted either manually, or with CUNO's CUNOCheck™ 2 automated integrity test instrument. The installation integrity test is intended to verify proper installation of filters and is not correlated to bacteria reduction.

### 1. Definition

The Pressure Hold Test uses a sensitive pressure gauge to measure the decay of pressure across the filter membrane. This pressure decay occurs on a closed volume of gas on the upstream side of the membrane as the gas flows from an area of higher pressure (the upstream side of the membrane) to one of lower pressure (the downstream side).

The Pressure Hold Test uses the following equation:

$$DP = \frac{Q}{V_{hsg}} \times K$$

Equation 1.

Where:

**Q** = Total maximum allowable gas flow rate for all cartridges installed (in cc/min)

**K** = 14.7 psi (1013 mbar)

**V<sub>hsg</sub>** = Upstream filter housing volume (cc) less the volume occupied by the cartridge(s)

**DP** = Allowable pressure loss (psi/min)

The allowable pressure loss for a given filter housing and LifeASSURE PB filter arrangement is calculated by determining 1. V<sub>hsg</sub>, the upstream filter housing volume (cc) less the volume occupied by the cartridge(s) and 2. Q, the total maximum allowable diffusion rate for all cartridges installed (in cc/min).

Table 1 provides the diffusion rates for LifeASSURE PB filter grades. To determine the cumulative maximum allowable diffusion rate, multiply the rate in the table below by the number of 10" equivalent cartridge lengths in the filter housing. For example, a housing employing four (4) 30" long LifeASSURE PB grade PLA020 filters, would have a cumulative maximum allowable diffusion rate of 720 cc/min ( 60 cc/min/10" length x three 10" lengths per cartridge x 4 cartridges = 720 cc/min).

Table 2 provides the upstream filter housing volume (cc), less the volume occupied by the cartridge(s), for standard CUNO filter housings. This measurement is from the inlet flange only. It is assumed that the upstream housing valve is installed at this flange. However, if additional piping is included beyond the flange and before the valve, its volume must be accounted for in the total upstream filter housing volume. Please consult CUNO Technical Sales or CUNO Scientific Applications Support Services (SASS) for assistance in calculating the housing volumes of non-CUNO filter housings.

Maximum allowable pressure decay values for standard CUNO filter housings are supplied in Table 3. The pressure decay values given in table 3 are based on a constant gas temperature in the housing during testing. If using a non-CUNO housing, or if the upstream volume of your CUNO housing is greater than that listed in Table 2 (refer to \* under Table 2.), you must calculate a new allowable pressure loss for your housing.

Table 1. - Diffusion Rates For Lifeassure PB Filters		
LifeASSURE™ PB Grade	Test Pressure (psi)	Maximum Gas Flow Rate (cc/min/10" eq.)
PLA020	12	60
PLA045	6	30
PLA065	3	15
PLA080	1.5	7.5

Table 2 - Filter Housing Upstream Volume		
CUNO Filter Housing	Number of Filters	Upstream Volume (cc)*
A-style, 70235-01	One (1) 2.5"	186
A-style, 70235-02	One (1) 5"	317
1ZVS1	one (1) 10" = 1	1987
1ZVS2	one (1) 20" = 2	3188
1ZVS3	one (1) 30" = 3	4373
1ZVS4	one (1) 40" = 4	5557
1ZMS1	one (1) 10" = 1	2119
1ZMS2	one (1) 20" = 2	3319
1ZMS3	one (1) 30" = 3	4504
1ZMS4	one (1) 40" = 4	5705
4ZWC1	four (4) 10" = 4	11,200
4ZWC2	four (4) 20" = 8	14,400
4ZWC3	four (4) 30" = 12	19,600
4ZWC4	four (4) 40" = 16	24,800
8ZWC1	eight (8) 10" = 8	20,400
8ZWC2	eight (8) 20" = 16	28,800
8ZWC3	eight (8) 30" = 24	37,200
8ZWC4	eight (8) 40" = 32	45,600
11ZWC1	eleven (11) 10" = 11	27,300
11ZWC2	eleven (11) 20" = 22	42,600
11ZWC3	eleven (11) 30" = 33	54,900
11ZWC4	eleven (11) 40" = 44	67,200
21ZWC1	twenty-one (21) 10" = 21	65,300
21ZWC2	twenty-one (21) 20" = 42	80,600
21ZWC3	twenty-one (21) 30" = 63	100,900
21ZWC4	twenty-one (21) 40" = 84	136,200

Note: Multi-cartridge CUNO housing series ZWB (with bolt closures) is identical in volume to the ZWC series (with clamp closures). Single cartridge CUNO housing model ZMS (t-line connections) is identical in volume to the ZVS (in-line) model.

\* Upstream volume is calculated from the inlet flange. If your filter assembly has additional piping beyond this flange, you must determine the its volume, add it to the upstream volume of your housing listed above, and recalculate the allowable pressure decay using equation 1.

Table 3. - Allowable Pressure Decay (psi/min)				
CUNO Housing Model	LifeASSURE PB Grade			
	PLA020	PLA045	PLA065	PLA080
<b>MINI CARTRIDGE HOUSINGS</b>				
A-style, 70235-01, 2.5"	0.79	0.40	0.20	0.10
A-style, 70235-02, 5"	0.93	0.46	0.23	0.12
<b>DISPOSABLE CAPSULES</b>				
Capsule Size = 2.5"	1.0	0.50	0.25	0.13
Capsule Size = 5"	0.98	0.46	0.25	0.12
<b>STANDARD CARTRIDGE HOUSINGS</b>				
1ZVS1	0.44	0.22	0.11	0.06
1ZVS2	0.55	0.28	0.14	0.07
1ZVS3	0.60	0.30	0.15	0.08
1ZVS4	0.62	0.32	0.16	0.08
1ZMS1	0.42	0.21	0.10	0.05
1ZMS2	0.53	0.27	0.13	0.07
1ZMS3	0.59	0.29	0.15	0.07
1ZMS4	0.63	0.31	0.15	0.08
4ZWC1	0.31	0.16	0.08	0.04
4ZWC2	0.49	0.24	0.12	0.06
4ZWC3	0.54	0.27	0.13	0.07
4ZWC4	0.57	0.28	0.14	0.07
8ZWC1	0.35	0.17	0.09	0.04
8ZWC2	0.49	0.24	0.12	0.06
8ZWC3	0.57	0.28	0.14	0.07
8ZWC4	0.62	0.31	0.15	0.08
11ZWC1	0.36	0.18	0.09	0.04
11ZWC2	0.46	0.23	0.11	0.06
11ZWC3	0.53	0.26	0.13	0.07
11ZWC4	0.58	0.29	0.14	0.07
21ZWC1	0.28	0.14	0.07	0.04
21ZWC2	0.46	0.23	0.11	0.06
21ZWC3	0.55	0.28	0.14	0.07
21ZWC4	0.54	0.27	0.14	0.07

Once you have calculated the maximum allowable pressure decay for your LifeASSURE PB filter grade and filter housing combination, you are ready to perform the Pressure Hold Test.

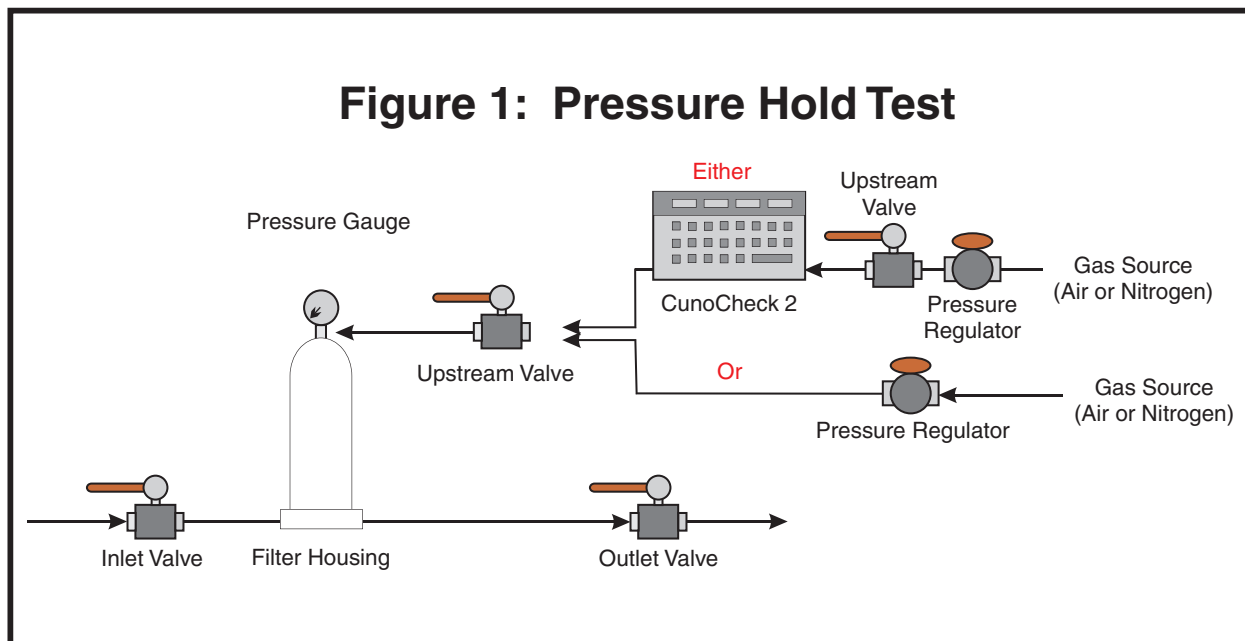
## 2. Procedure

1. Install the filter(s) in the housing and wet with clean, filtered water at ambient temperature at a flow rate of 3 GPM/10" cartridge length for 10 minutes.
2. Close inlet process valve and open outlet process valve to atmosphere.
3. Slowly pressurize the upstream side of the filter housing to the desired test pressure using a regulated supply of air or nitrogen (do not use CO<sub>2</sub>) and allow the system to equilibrate for 5 minutes.
4. When water flow from the outlet valve ceases, close the air source valve and measure the pressure decay for 1 minute. Compare the result versus the value from Table 3.

### 3. Troubleshooting

If the test value is greater than that listed in Table 3., consider the following:

- Verify that you have selected the proper value for the LifeASSURE PB grade filter(s) you are using and the housing employed.
- Ensure that there are no air leaks in the housing and assembly by pressurizing the housing, without filters, for 5 minutes with both inlet and outlet process valves closed.
- Examine the filters and O-rings for damage. Replace if needed.
- Seat the filters firmly in the housing using water or other fluid to lubricate the O-rings.
- Wet the filters again, increasing the water flow rate, or increasing the system pressure by slightly closing the downstream process valve.



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