

Wednesday 10<sup>th</sup> February 2016

**Re: HIGH FLOW BIO-X filtration products particulate retention**

To whom it may concern,

Validation testing performed on Parker domnick hunter HIGH FLOW BIO-X gas filtration products demonstrates that they provide sterilizing-grade performance when challenged with either an aerosolized suspension of *Brevundimonas diminuta* bacterial cells, or an aerosolized suspension of MS-2 coliphage virus particles. Challenge performance data for each of these tests is summarised in figures 1 & 2 below.

Serial No.	Total Challenge Level (x 10 <sup>10</sup> )	Silt Samples		LRV
		Initial	Final	
143309	3.53	0	0	10.55
132777	3.64	0	0	10.56
143253	7.33	0	0	10.87
143061	2.51	0	0	10.40
143037	1.76	0	0	10.24
143243	0.80	0	0	9.90
143286	0.0963	0	0	8.98
143337	0.00168	0	0	7.23
132784	0.00222	0	0	7.35
143182	5.34	0	0	10.72

Figure 1. Retention of aerosolized *Brevundimonas diminuta* suspension by HIGH FLOW BIO-X cartridges

Day	Volume MS-2 nebulized (ml)	Total MS-2 challenge (pfu)	MS-2 (pfu) in effluent	
			Filter 1	Filter 2
1	7.0	2.38 x 10 <sup>11</sup>	None Detected	None Detected
2	7.1	2.41 x 10 <sup>11</sup>	None Detected	None Detected
3	7.0	2.38 x 10 <sup>11</sup>	None Detected	None Detected
4	6.1	2.07 x 10 <sup>11</sup>	None Detected	None Detected
5	5.8	1.97 x 10 <sup>11</sup>	None Detected	None Detected
6	7.1	2.41 x 10 <sup>11</sup>	None Detected	None Detected
7	8.3	2.82 x 10 <sup>11</sup>	None Detected	None Detected
8	7.0	2.38 x 10 <sup>11</sup>	None Detected	None Detected

Figure 2. Retention of aerosolized MS-2 coliphage suspension over 8-day challenge period by HIGH FLOW BIO-X cartridges

Both of these tests are highly searching; the bacterial cells typically measuring 0.3 x 0.8µm and the virus particles typically 0.026µm in diameter.

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In addition, HIGH FLOW BIO-X filters are 100% lot released tested using a Parker domnick hunter VALAIRDATA aerosol challenge. This method utilizes aerosolized droplets of mineral oil in the size range of 0.2 to 0.3 $\mu$ m to challenge the filter with any penetration detected using a laser particle counter. The test pass criteria requires each filter to retain at least 99.9996% of the particles in the challenge.

The filter performance determined via these test methods validates the sterilizing-grade gas retention provided by HIGH FLOW BIO-X products, and demonstrates their ability to exceed the requirements of High Efficiency Particulate Air Filter (HEPA) standards up to and including the H14 classification, which requires a minimum retention level of 99.995% when challenged with particulate of 0.3 $\mu$ m in diameter.

Yours faithfully,

A handwritten signature in black ink, appearing to read "D. Vecsey".

Daniel Vecsey  
Market Development Manager