

General

Flanders Dimple Pleat HEPA/ULPA Filters are available in efficiencies from 99.99% on 0.30 micrometer size particles to 99.99999% on 0.12 micrometer size particles. They are available in 2", 3", 4" and 6" depths with a complete range of sizes and standard frame styles to meet the needs of critical applications where HEPA/ULPA filtration is required. Individual testing under rigid quality control and modern assembly methods ensures conformance to specifications.

Dimple Pleat HEPA/ULPA filters are used in a variety of cleanroom applications including:

- Semiconductor Fabrication
- Disk Drive Manufacturing
- Pharmaceutical Production
- Biotechnology
- Aerospace
- Food Processing
- Compact Disc Manufacturing

Application

Dimple Pleat HEPA/ULPA filters are used in applications that require ultraclean air. They typically operate at a velocity of 100 fpm making them ideal for unidirectional (laminar flow) applications in pressurized plenum ceiling grids, downflow hoods, portable cleanrooms, clean benches, fan powered-modules and horizontal flow wall modules. Filters

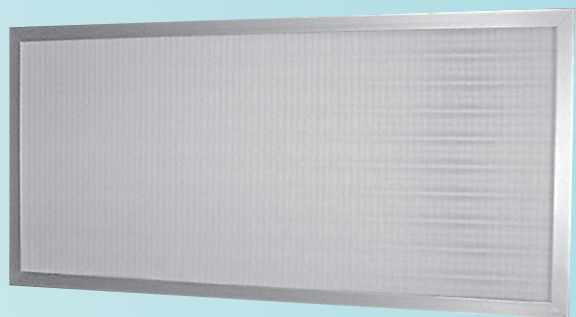
of standard construction may be operated at up to 150 fpm face velocity and to a final resistance of 2.0 inches w.g. As with all HEPA/ULPA Filters, high efficiency ASHRAE-rated prefilters are recommended.

Construction

The Dimple Pleat media pack is a completely separatorless media pack and requires no glue, strings, or strips of media to hold adjacent folds of media apart and gives the media pack its shape and strength. Such materials are potential sources of off gassing and particle generation, and may not meet the stringent smoke and flame requirements of UL 900 Class 1. They can also block up to 10% of the filter's effective media area. The Dimple Pleat media pack eliminates these materials as a contamination concern and fully utilizes the available media area, creating a cleaner and aesthetically pleasing appearance. The Dimple Pleat filter is available in a variety of depths depending on the performance requirements. The media pack is sealed to the anodized extruded aluminum filter frame with a fire retardant solid urethane sealant. The filter frame can be designed with either a gasket on one side, a knife-edge or a gel filled channel to seal in the respective grid or equipment. A painted expanded metal faceguard on the downstream side is available as an option to protect the media.

Important Features

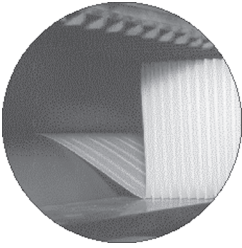
- Maximum utilization of media for long life
- No potential for off gassing or yellowing from glue lines
- No particle generation or fraying of strings or strips
- Lightweight, easy to handle
- Superior appearance
- State of the art testing
- UL 900 Class 1 and Factory Mutual Approved
- Low off gassing urethane to seal media pack to the frame



Media Manufacturing

The ability to conduct in-house R&D on the filter media (the most critical component of the filter) led Flanders to the exclusive development of the unique Dimple Pleat filter.

Filter media is formulated from all-glass microfibers, wet-laid on Flanders's dedicated papermaking process. Binding and waterproofing agents are drawn completely through the media while in the wet stage, ensuring maximum tensile strength and protection from humidity. The media is constantly monitored by statistical process controls to ensure correct physical properties.



Conventional mini-pleat media packs are produced by taking a roll of media and using either glue, strings or strips of media as a separator. The media pack is pleated and the separators give the media pack its shape and strength.

Dimple Pleat media packs are produced in the final step of the papermaking process by having dimples formed in the media. The dimples function as typical separators by aligning against each other at adjacent folds of the pleats and give the media pack its shape and strength. Each ULPA and VLSI II Dimple Pleat Filter is assembled and tested in a cleanroom environment. Each filter is sealed in a polybag before leaving the production area.

Filter Efficiencies

- HEPA: 99.99% minimum removal efficiency on 0.30 micrometer particle size.
- ULPA: 99.9995% minimum removal efficiency on 0.12 micrometer particle size.
- VLSI II: 99.99999% minimum removal efficiency on 0.12 micrometer particle size. These filters meet today's most rigorous requirements for Class 1 and better cleanroom applications.

Bar Code Documentation

Flanders uses a bar coding system that provides complete documentation of the media content and testing history of every filter. The system tracks the specific production run and original efficiency test results for every media pack. After the filter is assembled, the system tracks its test history, recording the date and location of each test and providing a pass/fail tally. If a filter fails any test, the reason is documented.



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The Flanders bar code system provides a customer with the highest level of confidence that every filter purchased meets or exceeds its performance specifications.

HEPA and ULPA Efficiency Testing

Each HEPA and ULPA filter is tested for efficiency and resistance by Dual Laser Spectrometer. The spectrometer samples simultaneously on the upstream and downstream sides of the filter to determine the percentage of penetration.

Flanders's standard test challenge is an aerosol of PSL (polystyrene latex) spheres. The laser instrument detects the size of each penetrating sphere in seven particle size classes from 0.07 μ m to 1.0 μ m.

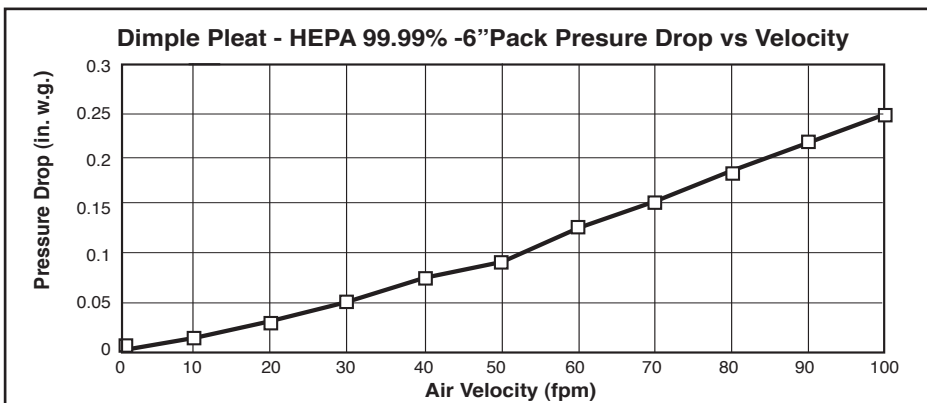
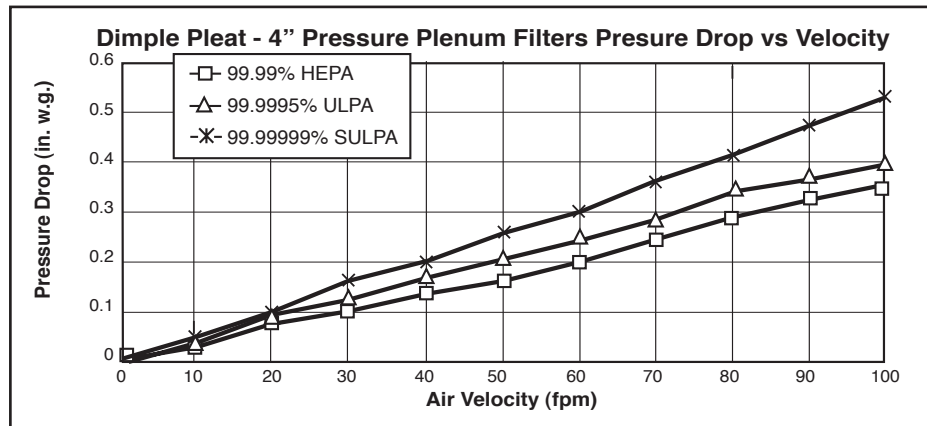
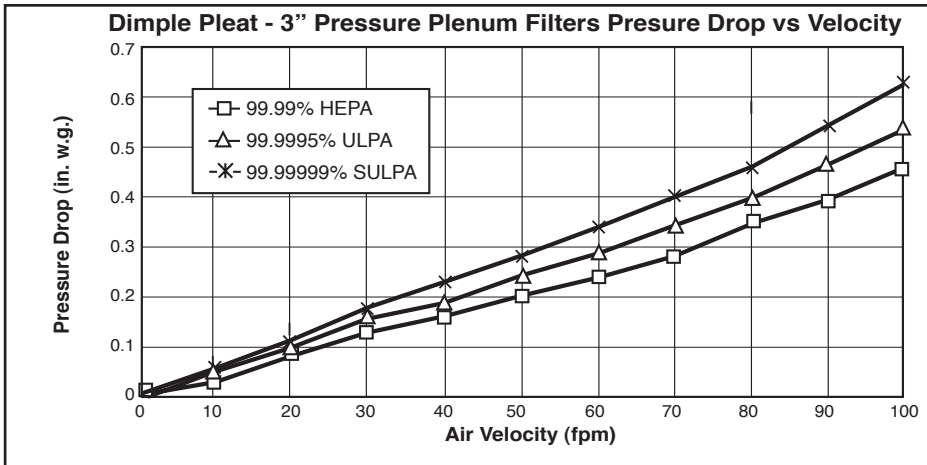
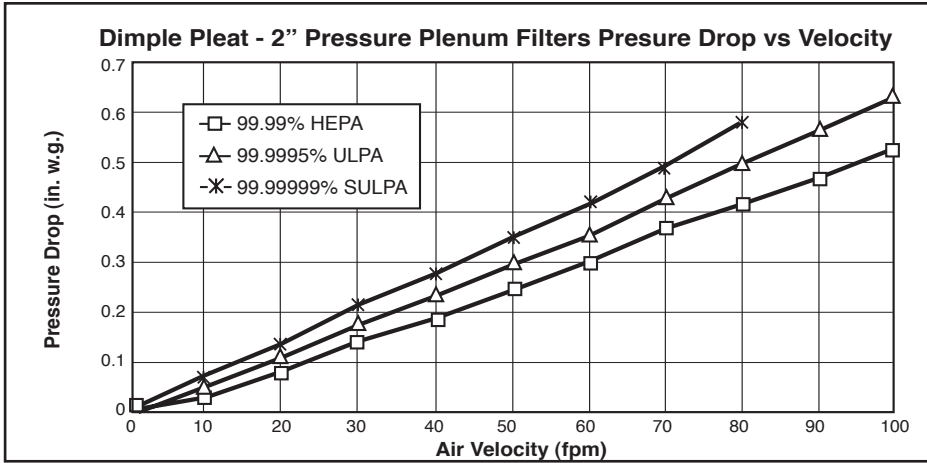
Resistance readings are taken according to volumetric parameters (i.e., 100 cfm per ft² of media face area) and are expressed in inches of water gauge.

VLSI II Efficiency Testing

The highest levels of filtration are achieved with Flanders' VLSI II filter. Because of the extremely high efficiency of this media, hours of laser testing would be required to obtain statistically valid results for individual filters. For this reason, the media itself is tested prior to being pleated into packs.

In this test, a sample is taken from each batch of media in the production run. (A batch is enough to produce 10 filters.) These samples must not exceed specified maximum values for penetration and resistance. Experience shows that patch test results are confidently correlated to the targeted VLSI II efficiency.





Filters for Gel Seal Cleanroom Ceiling Grids

Dimple Pleat filters are available with knife-edge frames designed for installation into Flanders Channel Ceil grid systems and other open-plenum cleanroom ceiling systems requiring gel-seal filters. In addition to the sizes listed below, many other standard and special sizes are available to accommodate the needs of the room design.

Resistance and CFM for 3/4 in. knife-edge filters

Size	Size Designator	cfm (1)	99.99% on 0.30 micrometers			99.9995% on 0.12 micrometers			99.99999% on 0.12 micrometers		
			2 in.	3 in.	4 in.	2 in.	3 in.	4 in.	2 in.	3 in.	4 in.
23 in. x 23 in.	K-GG	325	.52	.45	.35	.63	.52	.40	*	.62	.53
23 in. x 35 in.	K-GP	505	.52	.45	.35	.63	.52	.40	*	.62	.53
23 in. x 41 in.	K-GH	595	.52	.45	.35	.63	.52	.40	*	.62	.53
23 in. x 47 in.	K-GQ	685	.52	.45	.35	.63	.52	.40	*	.62	.53

(1) cfm based on 100 fpm velocity per sq. ft. net media face area

* 2 in. deep VLSI II filter can operate at velocities up to 80 fpm

Resistance and CFM for 2 in. knife-edge filters

Size	Size Designator	cfm (1)	99.99% on 0.30 micrometers			99.9995% on 0.12 micrometers			99.99999% on 0.12 micrometers		
			2 in.	3 in.	4 in.	2 in.	3 in.	4 in.	2 in.	3 in.	4 in.
23-3/8 in. x 23-3/8 in.	K-GG	325	.52	.45	.35	.63	.52	.40	*	.62	.53
23-3/8 in. x 35-3/8 in.	K-GP	505	.52	.45	.35	.63	.52	.40	*	.62	.53
23-3/8 in. x 41-3/8 in.	K-GH	595	.52	.45	.35	.63	.52	.40	*	.62	.53
23-3/8 in. x 47-3/8 in.	K-GQ	685	.52	.45	.35	.63	.52	.40	*	.62	.53

(1) cfm based on 100 fpm velocity per sq. ft. net media face area

* 2 in. deep VLSI II filter can operate at velocities up to 80 fpm

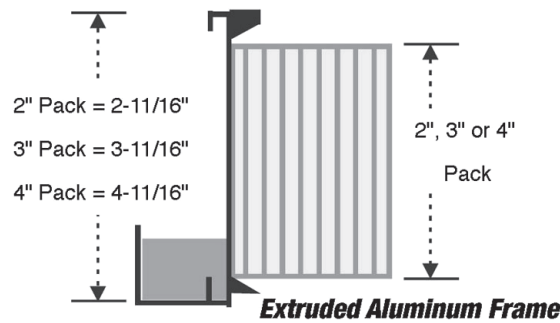
Values shown may be averages or estimates typical of product styles.

Contact factory for test data on specific models.

An earlier version of the gel seal frame is also available with Dimple Pleat packs as replacement filters

Gel Seal Dimple Pleat Filters

Gel Seal Dimple Pleat filters have a channel provided on the downstream perimeter of the filter frame and is factory-filled with Flanders Blu-Jel Sealant. A knife-edge flange located in the hood or module is sized to mate into the channel. When the filter is lifted into place, the knife-edge submerges into the gel to effect a leak tight interface between the filter and the equipment. The filter is held in place with simple retainers at each corner.



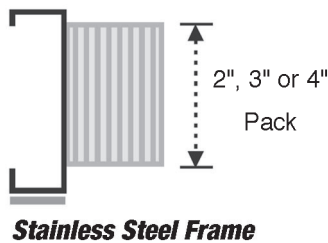
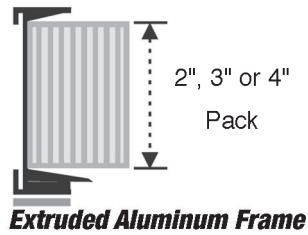
Airflow Resistance

Size	cfm(1)	99.99% on 0.30 micrometers			99.9995% on 0.12 micrometers		
		2 in.	3 in.	4 in.	2 in.	3 in.	4 in.
21-3/4 in. x 20 in.	235	.52	.43	.35	.63	.52	.40
21-3/4 in. x 44 in.	560	.52	.43	.35	.63	.52	.40
22-3/8 in. x 22-3/8 in.	275	.52	.43	.35	.63	.52	.40
22-3/8 in. x 46-3/8 in.	610	.52	.43	.35	.63	.52	.40

(1) CFM based on 100 fpm velocity per sq. ft. net media face area

Filters for Gasket Seal Applications

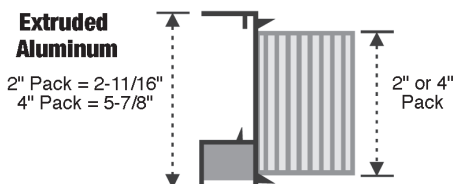
Gasket seal Dimple Pleat filters are typically installed in equipment such as clean benches. A closed cell neoprene gasket is attached to one or both faces of the filter where it mates to sealing surfaces in the equipment. Fasteners or clamping devices are provided in the equipment to hold the filter in place. Standard frame materials for gasketed Dimple Pleat filters are extruded anodized aluminum and stainless steel.



Size	cfm(1)	99.99% on 0.30 micrometers			99.9995% on 0.12 micrometers		
		2 in.	3 in.	4 in.	2 in.	3 in.	4 in.
12 in. x 12	75	.52	.43	.35	.63	.52	.40
24 in. x 12	165	.52	.43	.35	.63	.52	.40
24 in. x 24 in.	350	.52	.43	.35	.63	.52	.40
24 in. x 30	445	.52	.43	.35	.63	.52	.40
24 in. x 36	540	.52	.43	.35	.63	.52	.40
24 in. x 48	725	.52	.43	.35	.63	.52	.40
24 in. x 60	915	.52	.43	.35	.63	.52	.40
24 in. x 72	1100	.52	.43	.35	.63	.52	.40

(1) cfm based on 100 fpm velocity per sq. ft. net media face area

Other Gel Seal Frame Types



An earlier version of the gel seal frame is also available with Dimple Pleat packs as replacement filters.

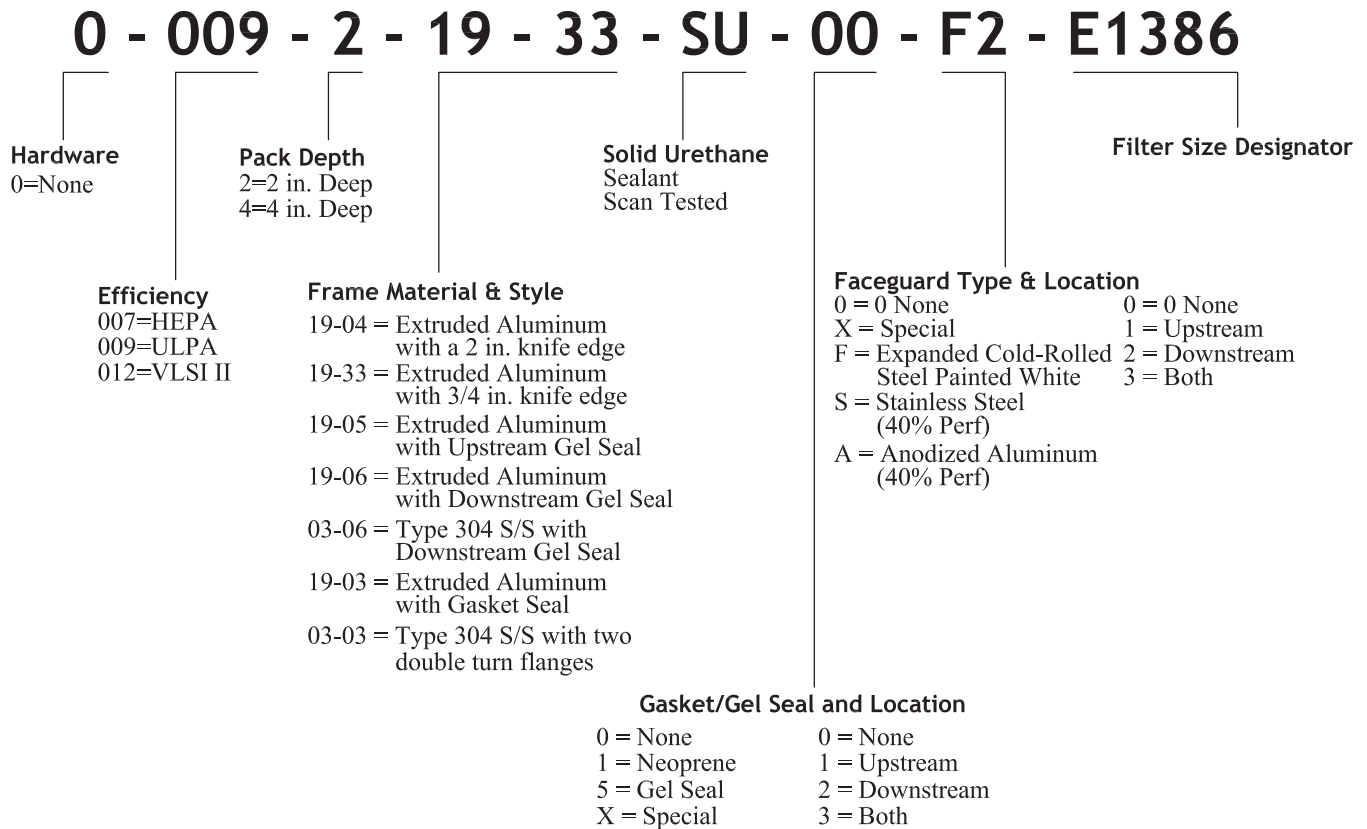
Dimple Pleat Component Chart

For odd size filters use the following alpha Numeric Designator. The first two numbers specify the Height Whole Number with an Alpha Designator specifying the Height Fraction. The second two numbers specify the Width Whole Number with an Alpha Designator specifying the Width Fraction. The depth is not specified and will be based on the pack depth and the frame style.

A "Z" Drawing will be developed and become the size designator for any filter which has special materials or testing which are not covered in the Style Code System.

Odd Size Designator Height and Width

A = 0"	J = 1/2"
B = 1/16"	K = 9/16"
C = 1/8"	L = 5/8"
D = 3/16"	M = 11/16"
E = 1/4"	N = 3/4"
F = 5/16"	P = 13/16"
G = 3/8"	Q = 7/8"
H = 7/16"	R = 15/16"



Guide Specifications

1.0 General

- 1.1 Minipleat HEPA/ULPA Filters shall be Dimple Pleat as manufactured by Flanders.
- 1.2 Module sizes, efficiencies, capacities and construction options shall be as scheduled or noted on the drawings.
- 1.3 Modules shall be UL 900 Class 1 listed and Factory Mutual Approved.

2.0 Module Construction

- 2.1 The filter pack shall be either a 2 in. or 4 in. deep Dimple Pleat Separatorless design constructed of a water-laid microfine glass media containing a water repellent binder. The filter pack shall have raised impressions on the media that shall align against each other when pleated to support adjacent folds without the use of dissimilar materials such as media strips, strings or glue filaments as separators.
- 2.2 The Filter pack shall be sealed to the filter frame with a fire retardant solid urethane.
- 2.3 The anodized extruded aluminum filter frame shall have either double turn flanges with a neoprene gasket to fit in a gasket seal application, an integral 3/4 in. or 1-3/4 in. knife-edge to fit in a Gel Grid or an integral gel track filled with Flanders Blu-Jel silicone gel.
- 2.4 The protective grille shall be painted expanded metal. Perforated stainless steel or anodized aluminum available as an option.

3.0 Performance

- 3.1 Initial and final resistances shall not exceed the scheduled values.
- 3.2 Each filter shall have a bar code label applied at the beginning of manufacture to document the media lot used and testing results.
- 3.3 Dimple Pleat HEPA filters shall have a minimum efficiency of 99.99% on 0.30 micrometer size

particles and shall be scan tested per Section 6.2 of IEST-RP-CC034.1. By challenging the filter with a high concentration of PSL Spheres using a particle counter, the media pack and the pack-to-frame seal shall be scanned to insure that there are no leaks greater than .01% of the upstream concentration at 100 fpm face velocity.

- 3.4 Dimple Pleat ULPA Filter shall have a minimum efficiency of 99.9995% on 0.12 micrometer size particles when tested with a laser test system using a PSL challenge. Each ULPA Filter shall be scan tested per Section 6.2 of IEST-RP-CC034.1. By challenging the filter with a high concentration of PSL Spheres using a particle counter, the media pack and the pack-to-frame seal shall be scanned to insure that there are no leaks greater than .01% of the upstream concentration at 100 fpm face velocity.
- 3.5 Dimple Pleat VLSI II Filters shall have a minimum efficiency of 99.999999% on 0.12 micrometer size particles. Penetration shall not exceed .0028% on 0.10 to 0.30 micrometer size particles for each batch of media subject to patch testing. Each VLSI Filter shall be scan tested per Section 6.2 of IEST-RP-CC034.1. By challenging the filter with a high concentration of PSL Spheres using a particle counter, the media pack and the pack-to-frame seal shall be scanned to insure that there are no leaks greater than .01% of the upstream concentration at 100 fpm face velocity.
- 3.6 When specified, each Dimple Pleat ULPA and VLSI II filter shall be autoscan tested with a high concentration (30x10⁶ ULPA and 100 x 10⁶ VLSI II) of PSL Spheres. Using a particle counter, the media pack and the pack-to-frame seal shall be scanned using a computer controlled probe to insure that there are no leaks greater than (.005% ULPA and .0001% VLSI II) of the upstream concentration at 100 fpm face velocity.



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