

HEPA Filters

For High Efficiency Applications

- *IEST-RP-CC001.3*
- *MIL-STD-282*

A Wholly Owned Subsidiary of Flanders Corporation

Quality Assurance

Any industry that has dangerous process or exhaust gases and/or particulates has a vital concern for the health and safety of personnel. In addition to corporate concern, the United States Government has dictated that safety equipment meet minimum safety standards. Any equipment sold to meet these minimum standards has to be manufactured using accepted Quality Control procedures.

Flanders has developed a Quality Assurance program to assure that the product or service provided meets these standards. This program addresses the entire range of Flanders' involvement, including the purchase of raw materials, the shortage of these raw materials, incorporation of these materials into a product or service, testing this product or service, and then shipping it to its destination.

The program at Flanders has been audited many times, and each time the program has been acceptable. An uncontrolled copy of the program manual is available with each request for Quality Assurance information. Like any dynamic document, the program is continually being revised to include recent issues of standards and specifications in order that Flanders may use the latest state-of-the-art methods in providing its products and services.

Notes:

1. As part of our continuing program to improve the design and quality of all our products, we reserve the right to make such changes without notice or obligation.
2. Flanders, through its limited warranty, guarantees that the products described herein will meet all specifications agreed to by the buyer and the seller.

Quality Assurance	Inside Front Cover
Table of Contents	1
Important Message	3
Introduction	4
General	
Efficiency Testing	
HEPA Filters	
Scan-Tested HEPA Filters	
Design and Construction	5
Separator or Separatorless Filter Pack Designs	
Filter Media	
<i>Diagram: Alpha 2000 with PUREFORM® Media Pack</i>	
<i>Diagram: Alpha 2000 with Separator--style Media Pack</i>	
Gasket Seal Design Filters, Gasket Seal Frame Styles	
Faceguards, Sealant Materials	
Fluid Seal Design Filters, Fluid Seal Frame Styles	
Underwriters Laboratories Qualification	
Performance Data	8
<i>Chart: Industrial Grade HEPA Pressure Drop vs. Velocity</i>	
<i>Illustration: Sample Filter Label</i>	
<i>Chart: Separator-type Standard Capacity HEPA Filter Size Designators</i>	
<i>Chart: PUREFORM® Standard Capacity HEPA Filter Size Designators</i>	
High Capacity	11
High Capacity HEPA Filters	
<i>Chart: Standard Capacity HEPA Filters</i>	
<i>Chart: High Capacity HEPA Filters</i>	
High Capacity Performance Data	12
<i>Chart: PUREFORM® High Capacity HEPA Filters — Metal Frame Box Style</i>	
<i>Chart: PUREFORM® High Capacity HEPA Filters — Metal Frame, Double Turn Flanges, Metal Frame "05" Fluid Seal, Wood Frame Box Style, Wood Frame "05" Fluid Seal</i>	
<i>Chart: Separator-style High Capacity HEPA Filters</i>	
Design Specifications and Model Number Development	13
Standard and High Capacity HEPA Filters	
Model Number Development	
<i>Chart: Standard Size Designators</i>	
E-Number Sizes	
Odd Size Designators	
<i>Chart: Odd Size Designators</i>	
Z-Drawing	

HEPA Filters

Table of Contents

Model Number Example	14
Model Number Designating Code	16
High Temperature Filters	17
Model Number Designating Code — High Temperature	18
Specialty Filters and Suggested Specifications	19
Round Filters, Nipple-Connected Filters Suggested Specifications for HEPA Filters	
Suggested Specifications and Environmental Conditions	20
Heat Resistance, Humidity and Water Resistance, Chemical Resistance	
Packaging, Palletizing, Storage and Shelf Life	21
Packaging and Palletizing, Receipt and Storage Requirements, Shelf Life Information	
Guide Specifications	22
Blu-Jel® Seal Data	23
Blu-Jel® Seal Data Sheet	

Important Message

NOTICE . . . Compliance with installation and operation standards must be met to ensure quality performance.

HEPA filters are factory tested to meet the requirements of IEST RP-CC001.3 for Type A, B, C, D, E or F filters:

- Industrial Grade
- Nuclear Grade
- Laminar Flow Grade
- Bio/Hazard Grade HEPA
- VLSI
- ULPA
- Pharmaceutical Grade

Test results appear on both the filter label and upon the filter carton label. An additional quality assurance test report is kept on file and is available upon request.

Flanders recommends that all HEPA filters be tested in place by qualified personnel to ensure that the filters have been correctly installed.

Flanders service personnel are available for installations, supervision of installation, testing and certification of compliance to industry and government standards and instruction of the owner's personnel in testing and maintenance procedures.

Flanders does not guarantee that its equipment will operate at the performance levels given on the identification labels or in the catalog specifications under all conditions of installation and use, nor does Flanders/CSC guarantee the suitability of its product for the particular end use which may be contemplated by the buyer.

For best results, it is recommended that the buyer supply complete information about the operating conditions of the ventilation system to Flanders/CSC for evaluation.

When the system components are supplied to the buyer or his agent for final installation and assembly in the field, it should be under the supervision of factory trained personnel.

Failure to adhere to this recommendation or failure of the buyer to have filters timely retested and serviced will nullify or limit any warranties which might otherwise apply and may result in a compromised installation.

HEPA Filters: *Introduction*

General

Flanders has been the leading manufacturer of HEPA Filters for half a century. In 1950, Flanders was one of three manufacturers who began producing HEPA Filters, primarily for the Atomic Energy Commission. Today, Flanders is the only remaining original manufacturer of HEPA Filters; and, unlike other manufacturers, our primary product is still HEPA Filters. Through the years, Flanders has maintained a reputation for supplying the highest quality HEPA Filters to the most demanding customers throughout the world.

We offer a complete line of HEPA filters in two efficiencies to meet the needs of critical applications where HEPA filtration is required. Every Flanders HEPA Filter is tested in accordance with IEST-RP-CC001.3, HEPA and ULPA Filters. Typical applications for HEPA Filters include:

- Hospitals
- Biomedical
- Biotechnology
- Genetic Research
- Universities
- Laboratories
- Food Processing
- Photo Processing
- Semiconductor Fabrication
- Industrial Processing Systems
- Pharmaceutical

Flanders Filters offers the most complete line of HEPA Filters available with many choices in frame materials, size, efficiency, testing criteria, temperature rating, and flow capacity.

Efficiency and Testing

Flanders individually tests and certifies each HEPA Filter to meet the customer's requirements for resistance and efficiency (penetration) at the filter's nominal rated capacity. This information appears on a test label affixed to the filter. When used with correctly selected and installed mounting frames or housings, Flanders HEPA Filters

will easily pass an in-place validation test to determine the overall system efficiency.

HEPA Filters

IEST describes the performance level of Type A filters as: A filter that has been tested at rated flow in accordance with Section 9.1.1 (Mil-Std-282). The minimum filter efficiency of the encapsulated filter for this type of filter is 99.97% on 0.3 μm particles. Each Flanders Type A HEPA filter shall have a minimum efficiency of 99.97% on 0.30 micrometer size particles when tested at rated capacity on a Q-107 Penetrometer. Filters rated for 1000 cfm or less are challenged with an approved nearly monodispersed oil aerosol of 0.30 micrometer size. Filters rated for flows greater than 1000 cfm are tested using a polydispersed oil aerosol. By measuring the upstream and downstream concentration of these particles with a light scattering photometer, the penetration can be determined and the efficiency can be calculated.

Scan Tested HEPA Filters

IEST describes the performance level of Type C filters as: A filter that has been tested for overall penetration in accordance with Section 9.1.1 (Mil-Std-282), and, in addition, has been leak tested in accordance with Section 9.2.1, scan tested at an average air velocity 90 ± 10 linear ft./min through the filter. Each Scan-Tested HEPA filter has a minimum efficiency of 99.99% on 0.3 micrometer particles. Scan testing is in accordance with Section 6.2 of IEST-RP-CC034.1, HEPA and ULPA Filter Leak Tests. In the scan test, the filter is challenged with a high concentration of an approved oil aerosol or PSL (Polystyrene Latex Spheres). The media pack and pack-to-frame seal is scanned using a photometer or particle counter to insure that there are not any leaks greater than .01% of the upstream concentration at 100 fpm face velocity.

Higher Efficiency ULPA Filters

Flanders can provide PUREFORM® and Separator-Style ULPA Filters with efficiencies up to 99.9995% on 0.12 micrometer size particles. Please contact the factory for more information.

Separator or Separatorless Filter Pack Designs

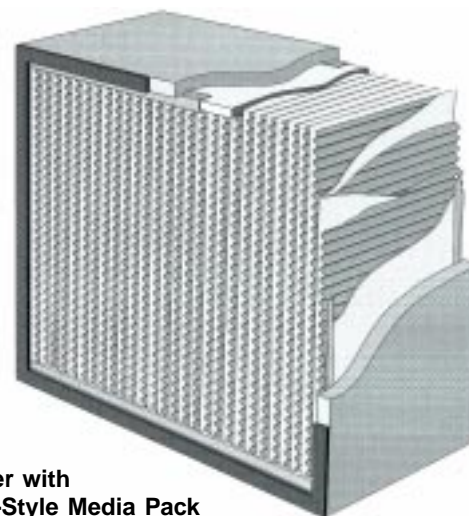
Flanders manufactures both conventional Separator-Style and PUREFORM® Separatorless HEPA Filters. To make a separator-style filter, the media is folded over corrugated aluminum separators with hemmed edges to separate the pleats in the filter pack. Flanders manufactures its own filter media, enabling it to develop a unique manufacturing process for the production of PUREFORM® Separatorless HEPA Filters. In one manufacturing operation, Flanders produces a self-supporting and self-separating PUREFORM® Media Pack.

The PUREFORM® Filter offers many advantages over conventional Separator-Style HEPA Filters:

- More usable media area for longer service life because of higher dust-holding capacity.
- Reduced cost of ownership because of longer service life.
- Maximum utilization of the media.
- Can handle some harsh environments which may attack aluminum separators.
- Media pack can be incinerated.
- Media is 28 mils thick, which is significantly thicker than conventional 15 mil media used in Separator-Style HEPA Filters.



**HEPA Filter with
PUREFORM® Media Pack**



**HEPA Filter with
Separator-Style Media Pack**

Filter Media

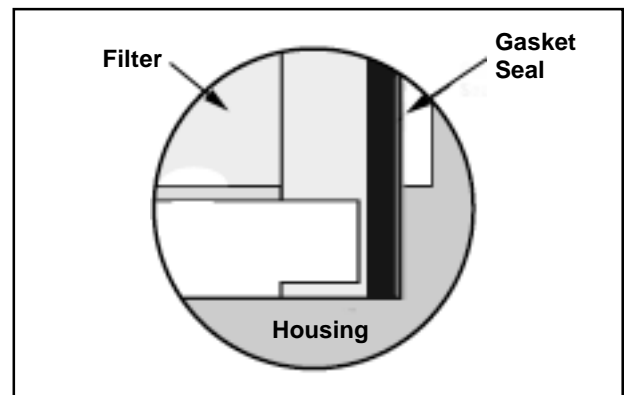
This filter media is boron silicate microfiber and contains a waterproofing binder which adds strength under both wet and dry conditions. Samples of the media are tested for physical and performance properties before filter construction.

HEPA Filters: *Design and Construction*

Gasket Seal Design Filters

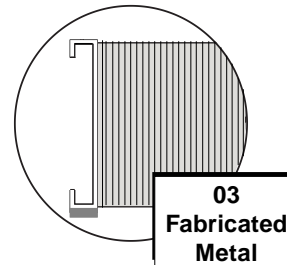
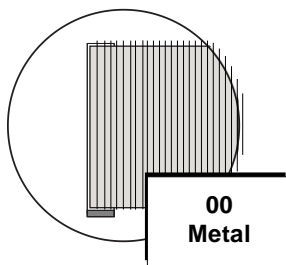
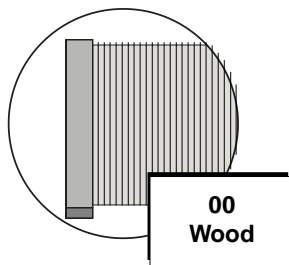
Flanders HEPA Filters are available in a variety of frame materials and frame styles to fit Flanders' and competitive framing systems and Side-Access Housings.

The standard gasket is a $\frac{3}{4}$ " x $\frac{1}{4}$ " neoprene which can be installed on either the upstream, downstream or both sides of the filter. As an option, a Silicone Sponge rated for 500° F is available. A filter clamping mechanism is typically used to maintain sealing pressure on gasketed filters. Gasket seals have a tendency to develop bypass leaks, primarily because of compression set.



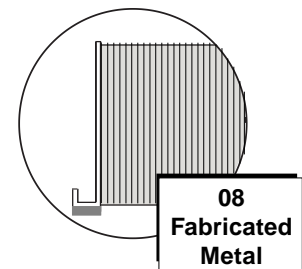
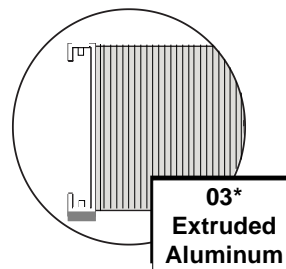
Frame Styles

- 00** Box-Type Construction
- 03** Double-Turn Flanges, Both Sides
- 08** Double-Turn Flange, One Side



Faceguards

Faceguards are available and are used primarily to protect the filter media from damage. The standard faceguard material is 4 x 4 mesh galvanized steel and a 4 x 4 mesh Type 304 Stainless Steel is also available.



Sealant Materials

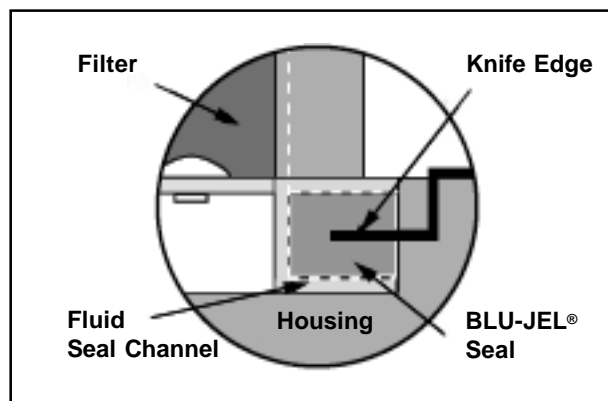
The entire media pack must be sealed to the filter frame to prevent by-pass leakage so that the filter will meet the minimum efficiency requirements. The filter pack is sealed with a variety of adhesives, depending upon the style of filter pack and the efficiency and testing requirements.

- IL** — Fire-retardant polyurethane foam for Separator-Style Filter Pack
- IU** — Fire-retardant solid urethane for PUREFORM® Filter Pack
- SU** — Fire-retardant solid urethane for Scan-tested PUREFORM® and Separator-Style Filter.

HEPA Filters: *Design and Construction*

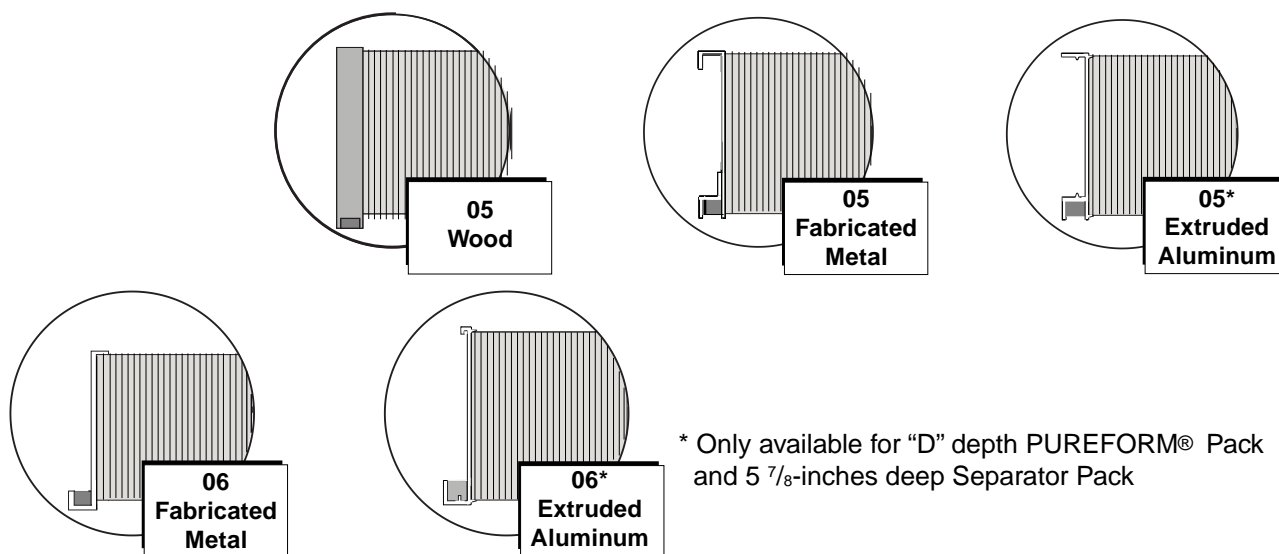
Fluid Seal Design Filters

The standard Fluid Seal is Flanders BLU-JEL® Seal which was developed by Flanders and is a two-part silicone material that is rated up to 390° F. A knife edge in the filter housing mates into a fluid-filled channel provided on the filter. Flanders invented the fluid seal in response to requirements for an absolute seal in the most critical applications. In most cases, fluid seal filters are also easier and quicker to change out than gasketed filters.



Frame Styles

- 05 Channel for Fluid Seal, One Face
- 06 Single Header with Channel for Fluid Seal



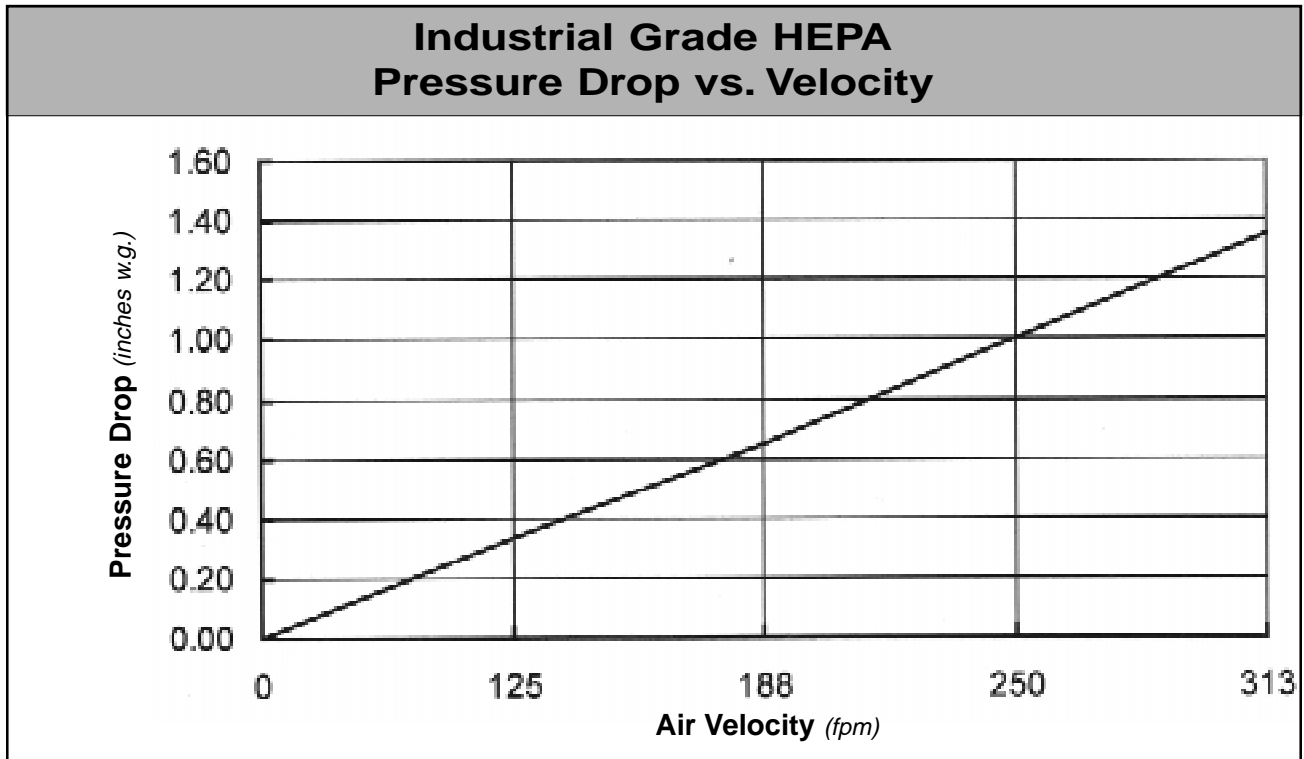
Underwriters Laboratories Qualification

UL 900 Class 1 — Flanders HEPA Filters are UL 900 Class 1 rated except those filters manufactured with non-fire-retardant wood frames. Upon request, the filter will have a stamp indicating compliance with UL 900 Class 1.

UL 586 — UL 586 is typically required for Nuclear Grade HEPA Filters. Many of the Flanders non-Nuclear HEPA Filters meet the requirements of

UL 586. To be listed under UL 586, filters must be submitted to Underwriters Laboratories for extensive testing including spot flame and environmental exposure to heated air. Upon request, a numbered UL 586 label certifying that the filter meets Standard 586 can be applied to the filter (maximum size is 24" x 30").

HEPA Filters: Performance Data



TEST FLOW DIRECTION ONLY <small>AIRFLOW MAY BE EITHER DIRECTION</small> 	Flanders		<small>FLANDERS FILTERS, INC. 531 FLANDERS FILTERS RD. WASHINGTON, NC 27889 (919) 946-8081</small>		PUREFORM® HEPA FILTER	
	.95 w.g.	Test Flow 1000 cfm	Penetration .012		<small>Tested per IES-RP-CC001.3 Type A Filter</small>	
	MODEL# 0-007-F-08-05-TU-51-00-GGF					
	ACTUAL SIZE 24" X 24" 11 1/2"					
	FFI ORDER NO. 979503	CUSTOMER PO NUMBER 816358	MEDIA LOT NUMBER 12504111997			
SERIAL NUMBER 154253						

Sample Filter Label

Separator-Type Standard Capacity HEPA Filter Size Designators					
Pack Style C Depth <i>(inches)</i>	Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity <i>(CFM)</i>
		H	W <i>(inches)</i>	D	Max. Initial Resistance 1.0 inches w.g.
10 ⁵ / ₈	CC-F	12	12	11 ¹ / ₂	205
	CG-F	12	24		425
	GC-F	24	12		455
	GE-F	24	18		725
	YY-F	23 ³ / ₈	23 ³ / ₈		945
	GG-F	24	24		1000
	GN-F	24	30		1275
	GQ-F	24	48		2095
5 ¹ / ₂	BB-D	8	8	5 ⁷ / ₈	35
	CC-D	12	12		105
	CG-D	12	24		190
	GC-D	24	12		225
	GE-D	24	18		365
	YY-D	23 ³ / ₈	23 ³ / ₈		470
	GG-D	24	24		500
	GN-D	24	30		635
	GP-D	24	36		775
	GQ-D	24	48		1045
	GR-D	24	60		1320
	GS-D	24	72		1590
	NG-D	30	24		635
	NN-D	30	30		810
	NP-D	30	36		985
	NQ-D	30	48		1330
NR-D	30	60	1680		
NS-D	30	72	2025		

Note: "06" Fluid Seal Design Filters will have a lower nominal rated capacity (or higher resistance) due to reduced media area.

HEPA Filters: Performance Data

PUREFORM® Standard Capacity HEPA Filter Size Designators					
Pack Style F & D Depth (inches)	Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity (CFM)
		H	W (inches)	D	Max. Initial Resistance 1.0 inches w.g.
8	CC-F	12	12	11 1/2	205
	CG-F	12	24		425
	GC-F	24	12		455
	GE-F	24	18		725
	YY-F	23 3/8	23 3/8		945
	GG-F	24	24		1000
	GN-F	24	30		1275
4	BB-D	8	8	5 7/8	35
	CC-D	12	12		105
	CG-D	12	24		190
	GC-D	24	12		225
	GE-D	24	18		365
	YY-D	23 3/8	23 3/8		470
	GG-D	24	24		500
	GN-D	24	30		635
	GP-D	24	36		775
	GQ-D	24	48		1045
	GR-D	24	60		1320
	GS-D	24	72		1590

Note: "06" Fluid Seal Design Filters will have a lower nominal rated capacity (or higher resistance) due to reduced media area.

High Capacity HEPA Filters

Flanders High Capacity HEPA Filters are designed for applications where either higher air flows are required or a lower resistance than Standard Capacity HEPA Filters. Flanders offers both a Separator-Style, utilizing specially designed aluminum separators, and an 11-inch deep Separatorless PUREFORM® High Capacity HEPA Filter. Both designs contain more media than the respective Standard Capacity version and allows the filters to operate at a higher airflow.

For new systems, High Capacity Filters allow the design of the system to be smaller and less expensive: fewer filters and less space are required. In addition, there is potential saving on the filter housing. HEPA Filters operating at 2000 CFM will match the flow rating of the lower efficiency prefilters.

For replacement applications, converting a system from Standard Capacity to High Capacity HEPA Filters will result in a lower initial resistance, reduced energy usage, longer life, lower operating costs, and reduced disposal cost; therefore, lower cost of ownership.

High Capacity HEPA Filters offer many advantages including:

- Air flow higher at the same resistance
- Operation at velocities up to 500 FPM with a small increase in resistance
- Up to 2000 CFM in a 24" x 24" x 11½" size, which matches the capacity of lower efficiency prefilters
- Longer life, lower energy cost, lower cost of ownership than Standard Capacity filters when operated at the same flow rate

Standard Capacity HEPA Filters		
Size and Style <i>(inches)</i>	Media Area (24" x 24" x 11 ½")	Rated Flow <i>(CFM)</i>
11-inch Separator-Style	180	1000
8-inch PUREFORM®	195	1000
High Capacity HEPA Filters		
Size and Style <i>(inches)</i>	Media Area (24" x 24" x 11 ½")	Rated Flow <i>(CFM)</i>
11-inch Separator-Style	260	2000
11-inch PUREFORM®	290	2000

HEPA Filters: *Performance Data*

PUREFORM® High Capacity HEPA Filters <i>(99.97% & 99.99% Scan Tested)</i> Metal Frame Box Style				
Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity (CFM)
	H	W (inches)	D	Max. Initial Resistance 1.45 inches w.g.
CG-F	12	24	11 1/2	850
GC-F	24	12		900
GG-F	24	24		2000
YU-F	23 3/8	11 3/8		830
YY-F	23 3/8	23 3/8		900

PUREFORM® High Capacity HEPA Filters <i>(99.97% & 99.99% Scan Tested)</i> Metal Frame ~ Double Turn Flanges ~ Metal Frame "05" Fluid Seal Wood Frame Box Style ~ Wood Frame "05" Fluid Seal				
Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity (CFM)
	H	W (inches)	D	Max. Initial Resistance 1.65 inches w.g.
CG-F	12	24	11 1/2	850
GC-F	24	12		900
GG-F	24	24		2000
YU-F	23 3/8	11 3/8		830
YY-F	23 3/8	23 3/8		1890

Separator-Style High Capacity HEPA Filters <i>(99.97% & 99.99% Scan Tested)</i> Gasket Seal and "05" Fluid Seal				
Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity (CFM)
	H	W (inches)	D	Max. Initial Resistance 1.45 inches w.g.
CG-F	12	24	11 1/2	850
GC-F	24	12		900
GG-F	24	24		2000
YU-F	23 3/8	11 3/8		830
YY-F	23 3/8	23 3/8		1890

HEPA Filters: Design Specifications and Model Number Development

Standard and High Capacity HEPA Filters

Flanders' Standard Capacity and High Capacity HEPA Filters are available in a variety of sizes, frame materials, frame styles, filter pack designs, efficiencies and test levels. Flanders' Model Number provides design and construction information.

Model Number Development

Specify the desired filter by referring to the model number charts in this bulletin and/or to the Model Number Designating Codes on this and the following pages.

Standard Size Designators		
Code	Height and Width (alpha fraction - inches)	Depth (inches)
A		3 1/16
B	8	
C	12	
D		5 7/8
D2		7 7/8
E	18	
F		11 1/2
F2		13 1/2
G	24	
N	30	
P	36	
H	42	
Q	48	
R	60	
S	72	
U	11 3/8	
Y	23 3/8	

Example: GG-F = 24" H x 24" W x 11 1/2" D

E-Number Sizes

The sizes of filters designed for use in Flanders hoods, modules, housings, and other standard equipment are often assigned numbers having an "E" prefix. This "E" number (including prefix) should be referenced as the size designator.

Example:
0-007-C-19-06-SU-52-00-E0781

Odd Size Designators

Odd Size Designator is an Alpha Numeric description. The first two digits specify the Height Whole Number with an Alpha Designator specifying the Height Fraction. The second two digits specify the Width Whole Number with an Alpha Designator specifying the Width Fraction, and the last Alpha Designator specifies the depth. If the height or width is less than 10 inches, use a 0 in front of the dimension.

Odd Size Designators		
Code	Height and Width (alpha fraction - inches)	Depth (inches)
A	0	3 1/16
B	1/16	
C	1/8	
D	3/16	5 7/8
D2		7 7/8
E	1/4	
F	5/16	11 1/2
F2		13 1/2
G	3/8	
H	7/16	
J	1/2	
K	9/16	
L	5/8	
M	11/16	
N	3/4	
P	13/16	
Q	7/8	
R	15/16	

Example:
23G23GF = 23 3/8"H x 23 3/8" W x 11 1/2" D

Z-Drawing

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

Example:
0-007-W-08-03-IU-12-00-Z97001

HEPA Filters: *Model Number - Example*

Model Number - Example

Number **0-007-F-07-02-05-IU-51-13-GG-FU9** represents a HEPA Filter with no hardware, Standard, 8-inch PUREFORM®, made of Type 409 Stainless Steel, Box Style, with Urethane Sealant (PUREFORM®), BLU-JEL® Seal in the Upstream Face Location, Galvanized Steel Faceguards on both faces, 24" x 24" x 11 1/2" with UL Code 9.

0 - 007 - F - 02 -

Hardware: 0 = None

P = 2" extended frame w/roughing prefilter pad (DUAL-PAC)

H = Bearing plates on filters for A-2/A-4/B-1 frames ordered before 6/1/1975

S = Bearing plates on filters for C-Series housings ordered before 6/1/1975

T = Extractor clips on filters for fluid seal housings

U = Handles for wood-frame filters for G-Series housings

Filter Media: 011 = High capacity Separator-Style Filter only

007 = PUREFORM® and Standard Capacity Separator-Style Filter

Pack Style: D = 4" deep PUREFORM® filter pack (Separatorless)

F = 8" deep PUREFORM® filter pack (Separatorless)

C = Pleated flat sheet with corrugated aluminum separators (Standard Capacity)

W = 11" deep PUREFORM® filter pack (Separatorless High Capacity)

H = Pleated flat sheet with corrugated aluminum spacers (High Capacity)

Frame Material: 01 = 3/4" non-fire-retardant exterior plywood

02 = Type 409 stainless steel

03 = Type 304 stainless steel

04 = 3/4" fire-retardant plywood

05 = aluminum

07 = 3/4" fire-retardant particleboard

08 = Galvaneal steel

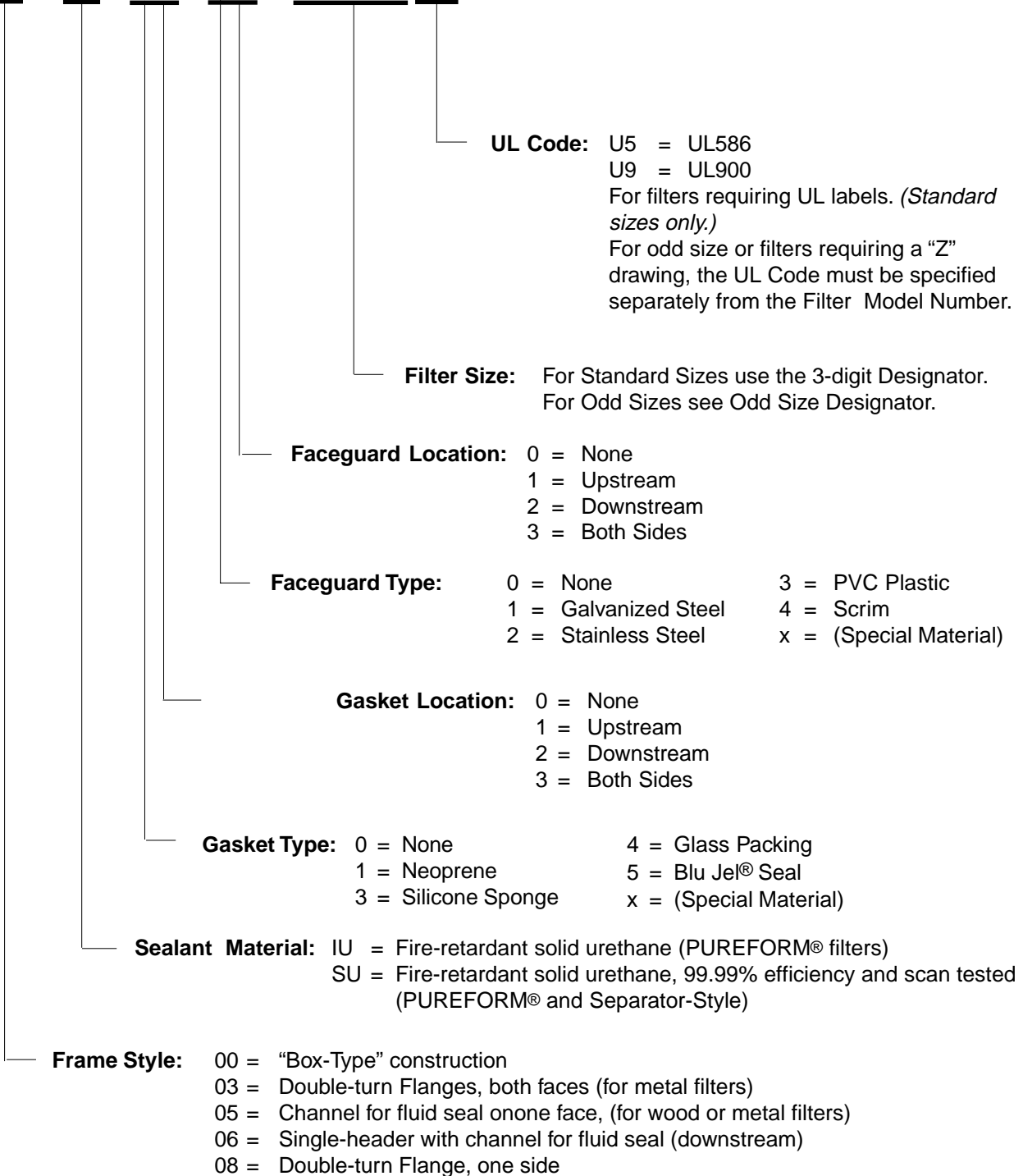
11 = 3/4" non-fire-retardant particleboard

19 = extruded anodized aluminum (*only available for "D" depth PUREFORM® and 5 7/8" depth SeparatorPack*)

Note: Not all model number combinations are available. Consult the factor for information.

HEPA Filters: *Model Number - Example*

00 - IU - 51 - 13 - GG - FU9



HEPA Filters: *Model Number Designating Code*

Hardware	None	0	EXAMPLE: <input type="checkbox"/> <input type="checkbox"/> -
	2" extended frame with roughing prefilter pad (DUAL-PAC)	P	
	Bearing plates on filters for A-2/A-4/B-1 frames ordered before 6/1/75	H	
	Bearing plates on filters for C-Series housings ordered before 6/1/75	S	
	Extractor Clips on filters for fluid seal housings	T	
	U-Handles on wood-frame filters for Flanders G-Series housings	U	
Filter Medium	HEPA Media (High Capacity Separator-Style Filter Only)	011	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> -
	HEPA Media (PUREFORM® and Standard Capacity Separator-Style)	007	
Pack Style	4" deep PUREFORM® filter pack (Separatorless)	D	<input type="checkbox"/> <input type="checkbox"/> -
	8" deep PUREFORM® filter pack (Separatorless)	F	
	Pleated flat sheet with corrugated aluminum separators (Std. Capacity)	C	
	11" deep PUREFORM® filter pack (Separatorless High Capacity)	W	
	Pleated flat sheet with corrugated aluminum spacers (High Capacity)	H	
Frame Material	3/4" non-fire-retardant exterior plywood	01	<input type="checkbox"/> <input type="checkbox"/> -
	Type 409 stainless steel	02	
	Type 304 stainless steel	03	
	3/4" fire-retardant plywood	04	
	Aluminum	05	
	3/4" fire-retardant particle board	07	
	Galvaneal steel	08	
	3/4" non-fire-retardant particle board	11	
	Extruded anodized aluminum (only for "D" depth PUREFORM and 5 7/8" depth SeparatorPack)	19	
Frame Style	'Box-Type" construction	00	<input type="checkbox"/> <input type="checkbox"/> -
	Double-turn flanges both faces (for metal filters)	03	
	Channel for fluid seal on one face (for wood or metal filters)	05	
	Single headers with channel for fluid seal (downstream)	06	
	Double-turn flange, one side	08	
Sealant Material	Fire-retardant solid urethane (PUREFORM filters)	IU	<input type="checkbox"/> <input type="checkbox"/> -
	Fire-retardant solid urethane, 99.99% efficiency and scan tested (PUREFORM® and Separator-Style)	SU	
Gasket Type/ Location	TYPE (1st Box) 0. None 1. Neoprene 3. Silicone sponge	LOCATION (2nd Box) 4. Glass packing 5. BLU-JEL® Seal X. (Special Material)	<input type="checkbox"/> <input type="checkbox"/> -
		0. None 2. Downstream face 1. Upstream face 3. Both faces	
Faceguard Material/ Location	TYPE (1st Box) 0. None 1. Galvanized Steel 2. Stainless Steel	LOCATION (2nd Box) 3. PVC Plastic 4. Scrim x. (Special Material)	<input type="checkbox"/> <input type="checkbox"/> -
		0. None 2. Downstream face 1. Upstream face 3. Both faces	
Filter Size	Seven spaces are allotted for filter size codes, although all spaces may not be required. Standard size designators (GG-F, etc.) are entered flush left, including dashes. Special sizes (Alpha Numeric Designators and Z-drawings) are entered flush left with the prefixes (no dashes)		
UL Code	NOTE: UL Code is entered flush left in the remaining boxes. USE these UL Codes when applicable: U5 for UL586; U9 for UL 900.		

HEPA Filters: *High -Temperature Filters*

High Temperature Filters

Flanders manufactures steel-frame separator-style HEPA filters for applications with high-temperature requirements up to 1,000°F (540°C) for exhaust air only and 500°F (260°C) for supply air. High-temperature filters are available with gasket or fluid seal, the latter for supply air applications only. (Filters with BLU-JEL® Fluid Seal have a maximum service temperature of 390°F.)

Two types of high-temperature HEPA filters are offered. The choice should be carefully made in accordance with the proposed filter service requirements for the specific application.

Note: Labels are not attached to high-temperature filters.

Silicone Sealant

This is a high-temperature room-temperature-vulcanizing (RTV) silastic-sealant silicone compound rated for continuous service up to 500°F (260°C)—supply air.

Glass Pack Sealant

The glass pack sealant is rated for continuous service up to 1,000°F (540°C) in exhaust air applications only. It is a mat of submicron glass fibers that creates a seal when compressed between the filter pack and filter frame. The glass packing is not an adhesive seal but a mechanical seal that functions much as the glass fiber medium of the filter itself.

Note: Due to the possibility that the glass pack may shed glass fibers, the glass pack sealant should be used for exhaust systems only.

Available Filter Sizes and Capacities*						
Filter Size & Frame Depth Designator	Frame Dimensions			Rated Capacity (CFM)		Max. Initial Resistance (inches w.g.)
	H	W (inches)	D	11-inch Separator	5 1/2-inch Separator	
CC-F	12	12	11 1/2	200		1.0
CG-F	12	24		425		1.0
GC-F	24	12		455		1.0
GG-F	24	24		1000		1.0
GN-F	24	30		1275		1.0
CC-D	12	12	5 7/8		125	1.3
CG-D	12	24			190	1.0
GC-D	24	12			250	1.0
GG-D	24	24			500	1.0
GN-D	24	30			625	1.0

HEPA Filters: *Model Number Designating Code—High-Temperature*

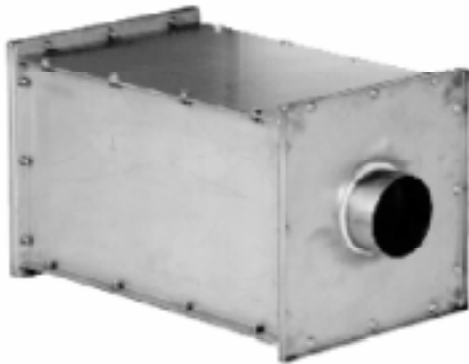
Hardware	None	0	EXAMPLE: <input type="checkbox"/> <input type="checkbox"/> -
	Bearing plates on filters for A-2/A-4/B-1 frames ordered before 6/1/75	H	
	Bearing plates on filters for C-Series housings ordered before 6/1/75	S	
	Extractor Clips on filters for fluid seal housings	T	
	U-Handles on wood-frame filters for Flanders G-Series housings	U	
Filter Medium	HEPA Media (High Capacity Separator-Style Filter Only)	011	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> -
	HEPA Media (PUREFORM® and Standard Capacity Separator-Style)	007	
Pack Style	Pleated flat sheet with corrugated aluminum separators (Std. Capacity)	C	<input type="checkbox"/> -
	Pleated flat sheet with corrugated aluminum spacers (High Capacity)	H	
Frame Material	Type 409 stainless steel	02	<input type="checkbox"/> <input type="checkbox"/> -
	Type 304 stainless steel	03	
Frame Style	Double-turn flanges both faces	03	<input type="checkbox"/> <input type="checkbox"/> -
	Channel for fluid seal on one face (390° F maximum)	05	
Sealant Material	Industrial grade with glass packing for 1000°F exhaust filter	IG	<input type="checkbox"/> <input type="checkbox"/> -
	Industrial grade with RTV silastic silicone for 500° F HT filters	IE	
	Industrial grade with hot melt sealant	IH	
	Laminar flow grade 99.99% efficient with fire retardant urethane	SU	
	Silicone bond, 99.99% efficiency and scan tested (500° F)	SE	
Gasket Type/ Location	TYPE (1st Box) 0. None 1. Neoprene 3. Silicone sponge	LOCATION (2nd Box) 4. Glass packing 5. BLU-JEL® Seal X. (Special Material)	<input type="checkbox"/> <input type="checkbox"/> -
		0. None 1. Upstream face 2. Downstream face 3. Both faces	
Faceguard Material/ Location	TYPE (1st Box) 0. None 1. Galvanized Steel 2. Stainless Steel	LOCATION (2nd Box) 3. PVC Plastic 4. Scrim x. (Special Material)	<input type="checkbox"/> <input type="checkbox"/> -
		0. None 1. Upstream face 2. Downstream face 3. Both faces	
Filter Size	Seven spaces are allotted for filter size codes, although all spaces may not be required. Standard size designators (GG-F, etc.) are entered flush left, including dashes. Special sizes (Alpha Numeric Designators and Z-drawings) are entered flush left with the prefixes (no dashes)		

HEPA Filters: Specialty Filters and Suggested Specifications

Round Filters

Round HEPA filters are available with Flanders' PUREFORM® filter element and with Separator-style elements.

Frames are made of galvaneal steel, aluminum and Type 304 and Type 409 stainless steel, and are available for both gasket or fluid seal applications. Round filters are also manufactured for high temperature applications.



Nipple-Connected Filters

Nipple-connected Nuclear Grade filters are available with one (N1) or two (N2) pipe connections, and with separatorless PUREFORM® or Separator-style filter elements. Frame materials are Type 304 or Type 409 stainless steel and ³/₄-inch fire-retardant plywood.

Suggested Specifications for HEPA Filters

Fill in the parentheses in the Suggested Specifications text with a selection from the indicated category. Refer to the Model Number Designating Code for each filter type for a listing of possible choices.

The filters shall be (*specify the entire model number*) as manufactured by Flanders Filters, Inc., Washington, N.C.

The filter media shall be all-glass microfiber with a wet-strength, water-repellent binder and shall be produced by the filter manufacturer.

To Specify the PUREFORM® Pack Style:

The filter shall have a (*specify Pack Style*). The filter pack shall be constructed without the use of spacers of any kind—including separators, tape strings or strips of medium—by pleating a continuous sheet of formed, corrugated medium back and forth upon itself so that it is self-supporting.

To Specify the Separator-Type Pack Style:

The filter shall have a pleated pack with corrugated aluminum separators. The filter pack shall be constructed by pleating a continuous flat sheet of medium back and forth over corrugated aluminum spacers whose edges have been hemmed to resist tearing of the medium at the fold.

The filter pack shall be permanently bonded to a (*specify the Frame Material*) integral frame with (*specify the Sealant*). The perimeter of the filter face shall be designed with (*specify the Frame Style*). (*Specify Location of Gasket or fluid Seal*) to seal the filter to its mounting frame in service. A label or a stamp indicating compliance by the manufacturer with the requirements of (*specify UL Qualification*) shall be attached to the each filter.*

*UL labels/stamps are optional and are applied to the filter only when specified by the buyer.

HEPA Filters: *Suggested Specifications and Environmental Conditions*

To Specify HEPA Filters

Each filter shall be tested for resistance to air-flow and penetration in accordance with Mil-Std-282 at the nominal rated capacity listed herein. The penetration shall not exceed 0.03%. HEPA filters shall be tested per the requirements of IES-RP-CC001.3, HEPA and ULPA Filters.

To Specify Scan-Tested HEPA Filters

Each filter shall have a minimum efficiency of 99.99% and shall be scan tested per Section 9.2 of IES-RP-CC001.3. The scan test shall consist of the filter being challenged with a high concentration of DOP and PSL Spheres (Polystyrene Latex Spheres) and by 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.

Each filter and filter carton shall bear identical labels indicating the filter model number, testing, the serial number and the resistance and penetration readings taken for the filter on the manufacturers Q107 Penetrometer. In addition, the manufacturer shall provide a filter test and certification of compliance report for the buyer's record when required.

All filters shall be packaged one filter per carton. Each filter shall be encased by a flanged, tight-fitting linerboard sleeve that fits within the carton, leaving a dead-air space on the four sides of the filter.

Environmental Conditions

Heat Resistance

In high-temperature applications, the filter media will exhibit loss of strength after the binder burns off. (This normally occurs in the 300°-325°F range.) The filter media becomes significantly weaker when the binder burns off; therefore, Flanders recommends only separator-style filters be used in high-temperature applications.

Humidity and Water Resistance

HEPA filter media will tolerate high humidity and some direct wetting, but not excessive amounts of moisture, either from airborne droplets or condensation, can plug the filter and result in failure by over-pressure.

Wood frames are unsuitable for high-moisture conditions, because wood expands or warps when wet, and it supports biological growth under humid conditions. Metal frame filters are more suitable for moisture-laden atmospheres. Because aluminum separators can corrode in some environments and slough particles downstream of the filter, separatorless PUREFORM® filters are also recommended for moist conditions, except in high-temperature or caustic applications.

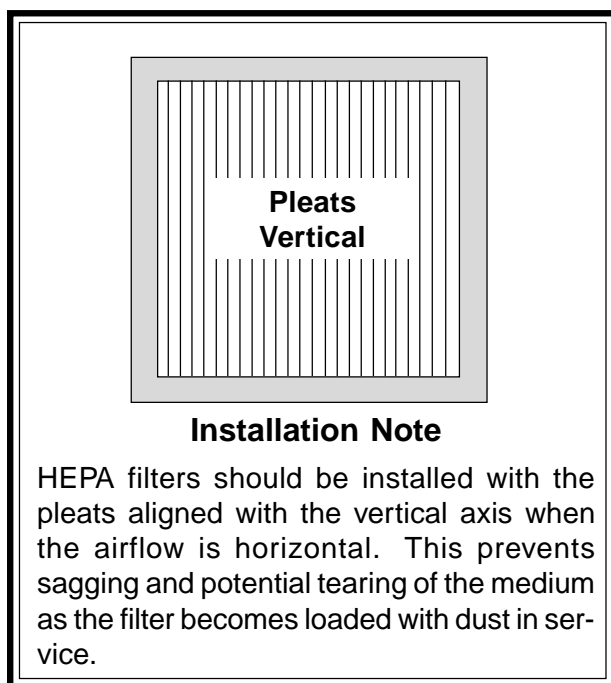
Chemical Resistance

All materials used in the filter have good resistance to most organic solvents and are resistant to many weak organic and inorganic alkalies and acids. Exposure to acids such as HF and those with NO_x radicals occurs in nuclear systems fairly often and with varying degrees of impact (HF attacks glass). Information about the potential effects of humidity, various chemical agents, heated air, and the interrelationship of the construction materials must be determined by the user through testing.

HEPA Filters: *Packaging, Palletizing, Storage and Shelf Life*

Packaging and Palletizing

The successful delivery of undamaged HEPA filters depends largely upon good packaging. Shipping damage is minimized by encasing each filter in a tight-fitting linerboard sleeve that is flanged outward at its top and bottom. This creates a 1 1/2-inch dead-air space around the filter to absorb impact. Flanders packages all filters 24" x 12" x 5 7/8" and larger in this manner. All filter carton material is tested for strength and certified to meet all construction requirements of the applicable freight classification. Additionally, all HEPA filters are palletized for shipment in groups of cartoned filters stacked side-by-side and stretch-wrapped to the pallet with vertical corner braces.



Receipt and Storage Requirements

HEPA filters should be stored in their original cartons in an environmentally controlled room. HEPA filters should be oriented vertically with their pleats vertical, and be stacked no more than three cartons (slightly over 6 ft.) high unless intermediate bracing or flooring is provided to prevent the weight of the upper tier

from bearing on the lower tier. Unless there is obvious damage to the cartons, HEPA filters should not be opened prior to use or removed from shipping pallets or skids until immediately ready for installation.

While in storage, items should be checked periodically to ensure that they are not exposed to detrimental conditions. Storage areas should be uncluttered and permit easy access to items without the necessity of moving other items to get to them. An item-control procedure is suggested for the storage area to ensure that items are not removed from the area without proper authority and to prevent improper or rejected items from being installed in the system. Materials and components should be moved a minimum number of times (receipt inspection, storage and release for installation only) and handled in a manner that does not damage the item or its packaging. If wrappings or cartons are removed for receiving inspection, they should be replaced and positively sealed immediately upon completion of the inspection. Receiving and storage personnel shall be informed of the necessity of proper handling of all components, especially the HEPA filters.

Shelf Life Information

Flanders recommends the filter be stored in its original carton to prevent it from being exposed to ultraviolet rays and possible damage to the filter media. The filter should be stored in a controlled area, 0-120°F, and should not be exposed to ozone depleting sources.

If these parameters are satisfied and storage requirements as detailed are maintained, the filter shelf life should be three (3) years from gasket cure date or three (3) years from manufacturing date for fluid seal filters.

HEPA Filters: *Guide Specifications*

Guide Specifications

1.0 General

- 1.1 HEPA filters shall be extended media (separator-type) (PUREFORM® separatorless-type) filters as manufactured by Flanders.
- 1.2 Filter sizes, capacities and construction options shall be as scheduled on the drawings.
- 1.3 Filters shall be (UL 900 Class 1) (UL 900 Class 2) listed.

2.0 Filter Construction

- 2.1 The filter pack shall be constructed by pleating a continuous sheet of non-woven water-resistant fiberglass media around hemmed-edge corrugated aluminum separators.
- 2.2 The filter pack shall be constructed by pleating a continuous sheet of formed, corrugated medium so that the pack is self-supporting without the use of spacers of any kind, including separators, tape strings, adhesives or strips of media.
- 2.3 The filter pack shall be sealed into a (galvaneal) (409 stainless steel) (304 stainless steel) (particleboard) (fire-retardant particle board) (fire-retardant plywood) frame with a fire-retardant (polyurethane foam) (solid urethane) sealant. (Steel frames shall be 16-gauge.) (Wood frames shall be $\frac{3}{4}$ -inch thick.)
- 2.4 A (40-durometer closed-cell neoprene gasket) (silicone gel in a channel) shall be provided on one or more sides to seal the filter in the mounting device.

3.0 Performance

- 3.1 Initial and final resistances shall not exceed the scheduled values.
- 3.2 HEPA Filters shall have a minimum efficiency of 99.97% on 0.3 micrometer particles when tested at rated capacity on a Q-107 Penetrometer. Each filter shall be challenged with an approved nearly monodispersed oil aerosol of 0.30 micrometer size. Measure the upstream and downstream concentration of these particles with a light scattering photometer, determine the penetration and calculate the efficiency.
- 3.3 HEPA Scan Tested HEPA Filters shall have a minimum efficiency of 99.99% on 0.30 micrometer particles. Scan Testing shall be in accordance with Section 6.2 of IEST-RP-CC034.1. The scan test shall consist of challenging the filter with a high concentration of an approved oil aerosol or PSL Spheres. Using a photometer or 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.

BLU JEL® Seal Data Sheet

The gel seal technique provides a simple solution to a problem that has long been associated with air filters used in critical applications: bypass leakage at the interface of the filter and its housing or supporting casework. This bypass can contribute to high particle counts in clean rooms and laminar flow work areas.

Bypass leakage occurs primarily where gaskets are used to seal filters. Many factors contribute to its occurrence: improper gasket joints; mating flanges that are not flat or have been distorted by clamping mechanisms used to compress the gasket; *memory loss* or aging of the gasket material; or, bad seals or welds in the filter mounting casework.

The gel seal technique, first developed and patented by Flanders in 1969, succeeds in eliminating bypass leakage because it avoids the major causative factors: the use of gaskets and the need for absolutely flat mating surfaces. The technique also eliminates clamping devices and allows easy installation and replacement of filters.

General Description

Flanders BLU-JEL® Seal is a unique, ice-blue silicone gel specially designed to create and preserve an airtight seal between high-efficiency particulate air filters and their holding cases or housings. The gel is factory-installed and factory-cured within the perimeter channels of filters designed for gel seal applications. The cured gel has the self-healing qualities of a liquid while retaining the stability and non-flow characteristics of a solid. These properties are maintained at both high and low temperature extremes and are not lost even when aged continuously at high temperatures. BLU-JEL® Seal exhibits excellent bonding to many materials. It is also highly self-adhesive, allowing knife edges to be cleanly withdrawn. The hydrophobic nature of the gel makes it ideally suited for applications that require long-

term sealing against moisture and other atmospheric contaminants.

Temperature Range

The recommended constant operating temperature range for BLU-JEL® Seal is -70°F to +392°F. Short terms (1-2 hours) at higher temperatures should be limited to 500°F. Exposure to either extreme will not alter the properties of the gel when returned to ambient temperature. Temperatures below -70°F will increase hardness; the gel will become brittle at -90°F and will be prone to cracking if subjected to mechanical shock. Continuous exposure to temperatures above +392°F will result in degradation of the polymer.

Fire and Explosion Data

Flash Point: Determined by Cleveland ASTM D92 Open Cup Method. Result: No flash at 450°F.

Exposure to Flame

A flame exposure test evaluating BLU-JEL® Seal's flammability and self-extinguishing characteristics was performed, following the same procedure used in the Underwriters UL 94-VO test. The gel turned to ash on the outer surface, but the inner core remained normal. The gel maintained its physical shape and did not run or melt. Based upon the testing, it is concluded that BLU-JEL® Seal is a self-extinguishing material that will perform its designed function as a filter-to-housing sealant until flame impingement totally turns the sealant to ash.

Volatility

The non-volatile content of BLU-JEL® Seal, as determined by testing 2 grams for 2 hours at 302°F (150°C), is 98%. The volatility rate of the gel, measured after it has been cured at the factory and is ready for shipment, is 0.2%.

HEPA Filters: *BLU-JEL® Seal Data*

Penetration

The effect of temperature on the hardness of BLU-JEL® Seal has been tested using a Penetrometer test machine. The following results are expressed in points of penetration (mm x 10⁻¹) as measured by the machine:

@-58°F: 35 @+77°F: 57 @+392°F: 34

Chemical Resistance

Information on BLU-JEL® Seal's resistance to a wide variety of oils, fuels, hydraulic fluids, solvents, silicone fluid, greases, food products, water and steam, acids, bases, salts and other chemicals is available from the factory upon request.

Radiation Effects

The expected radiation resistance of BLU-JEL® Seal is 20 megarads at room temperature, 10 megarads of radiation at 77°F. Radiation exposure at these levels will not affect the sealing properties of the compound. Exposure to higher levels of radiation and temperature will result in brittleness, which is not reversible. Further information on radiation testing is available from the factory.

Non-Nutrient

BLU-JEL® Seal is a non-nutrient and will not of itself support biological growth. The compound does not contain a fungicide.

Important Notice

For best results in the application of Flanders products, it is recommended that the buyer supply complete information about the operating conditions of the ventilation system to Flanders for prior evaluation. Flanders does not guarantee that its equipment will operate at the performance levels given on the identification labels or in the catalog specifications under all conditions of installation and use, nor does Flanders guarantee that suitability of its product for the particular end use which may be contemplated by the buyer. When the system components are supplied to the buyer or his agent for final installation and assembly in the field, it should be under the supervision of factory trained personnel who are equipped to test the installation and certify its performance and conformance to industry accepted specifications. Failure to follow these procedures may result in a compromised installation.



*The foremost designer and manufacturer of high efficiency
air filtration systems for science and industry.*

Flanders Corporation

Corporate Headquarters
St. Petersburg, FL 33713

Technical Inquiries:

531 Flanders Filters Rd
Washington, NC 27889

Tel: 252-946-8081 Fax: 252-946-3425

Email: ffi@ffi.flanderscorp.com

Web site: www.flandersffi.com

**Representatives of Flanders Corporation
are located throughout the world.**

**Your closest representative's office may be
found by contacting our manufacturing
and sales department.**

Represented by:

--

Flanders Corporation

Printed in USA 12/2003