Gel Seal Filter Housings for
Bag-Out or Non-Bag-Out Applications

For Containment of Airborne Hazards in
In-Line Exhaust Systems

A Wholly Owned Subsidiary of Flanders Corporation
Flanders/CSC’s Quality Assurance Program was established to address the eighteen criteria structure of ASME NQA-1 (formally N45.2), “Quality Assurance Requirements for Nuclear Facility Applications”. As suppliers of High Efficiency Air Filtration products and services, there are three standards that govern the majority of Flanders/CSC’s activities.

1. ASME N509-1989 (reaffirmed 1996)  
   “Nuclear Power Plant Air-cleaning Units and Components”

2. ASME N510-1989 (reaffirmed 1995)  
   “Testing of Nuclear Air Treatment Systems”

3. ASME AG-1- 2009  
   “Code on Nuclear Air and Gas Treatment”

These standards and our customer’s specifications invoke many other standards and codes the Flanders/CSC’s Quality Assurance Program incorporates as standard practice.

There are a variety of Quality Assurance Programs that manufacturer’s implement to ensure product and service quality, two such systems are ISO-9001 and ASME NQA-1.

Abstracts of these programs include:

ISO 9001:2000 specifies requirements for a Quality Management System where an organization

1. Needs to demonstrate its ability to consistently provide product that meets customer and applicable regulatory requirements, and

2. Aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements.

All requirements of this international standard are generic and are intended to be applicable to all organizations, regardless of type, size and product provided.

ASME NQA-1: This Standard sets forth requirements for the establishment and execution of quality assurance programs for the siting, design, construction, operation, and decommissioning of nuclear facilities. Nonmandatory guidance is provided in the Appendices. NQA-1 establishes 18 criteria covering all aspects of quality, from purchase of raw materials, to design and testing.

Because ASME NQA-1 applies to the Nuclear Industry where containment and safety are of paramount concern, is generally seen to establish more checks and balances.

Containment air filtration started out as a critical requirement in the Nuclear industry to protect workers, the public and the environment. Today, containment air filtration is a critical issue in a variety of industries and applications; from pharmaceutical, health care, military, and the original nuclear applications among others. Because of the critical safety requirements of the nuclear industry, ASME N509, ASME N510, and ASME AG-1 are recognized as the standards for design and testing of containment air filtration systems. Each of these standards requires a Quality Assurance Program that meets the requirements of ASME NQA-1.

Flanders/CSC maintains a full scope Quality Assurance Program that meets the requirements of ASME NQA-1, 10 CFR 50 Appendix B, and DOE O 414 1A. Customers that require the stringent application of quality principles that only a mature and developed program can offer routinely audit this Quality Assurance program.

Flanders/CSC has evaluated the possibility of certification to ISO-9001 and determined that an ASME NQA-1 program better meets the critical needs of our customers. Although the two programs are comparable, an ASME study indicates that a ISO-9001 Quality Assurance Program will not meet the requirements of ASME NQA-1 without substantial modification.

1. ISO.org  
2. ASME.org  
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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-CC001.4 for HEPA filters:
- Industrial Grade
- Nuclear Grade
- Laminar Flow Grade
- Bio/Hazard Grade HEPA
- VLSI
- ULPA
- Pharmaceutical

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 on request.

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

Flanders/CSC 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/CSC 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.

NOTE . . . Throughout the CSC product bulletins we make reference to standards that may appear old and/or revised. Our purpose in specifying the older versions of standards is due to the nature of these products and where they are typically used.

During the years and numerous revisions, these standards have become less stringent than their original versions. We believe in manufacturing and referencing the critical versions to help the owners maintain the stringent requirements this industry originally intended.
Flanders/CSC Containment Housings: **BF-Series Bag-In/Bag-Out and KF-Series Non Bag-In/Bag-Out**

The BF-Series and KF-Series Gel Seal containment housings are typically used on critical processes where dangerous airborne particulate or gases must be prevented from entering the atmosphere.

**BF-Series Bag-In/Bag-Out:** The BF-Series housing features a side access bag-in/bag-out port which allows filters or carbon adsorbers that have been contaminated in service to be removed from the housing without direct contact with service personnel.

**KF-Series Non Bag-In/Bag-Out:** The KF-Series housing is designed for applications in which the bag-in/bag-out procedure is not necessary for filter change-out, but still requires high quality side servicing filter housings.

Basic housings are available in 1H1W, 1H2W and 1H3W configurations, allowing up to three (3) filters or adsorbers to be removed from a single access door. Each configuration may be provided with a separate slide-in prefILTER track behind the same door or with a separate access door. Prefilters may be 2, 4 or 6-inches deep. Units may be joined in parallel or series to build systems with capacities ranging from 1,000 CFM to 30,000 CFM (based upon 1,000 CFM per filter).

Many custom options are available, including static pressure taps, test ports, transitions, dampers and in-place test sections which allow the operator to perform individual filter system efficiency test without having to enter the system or otherwise disrupt its operation.

The BF-Series and KF-Series housings are designed for gel seal primary filters. Primary filters may be HEPA filters (for particulate filtration) or carbon adsorbers (for gas adsorption). To accommodate both particulate and gas phase filtration, HEPA units can be joined in series with carbon adsorber units.

**Notes:**

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**NOTE:** Throughout the product bulletin we make reference to standards that are old and or revised. Our purpose in specifying the older versions of standards is due the nature of these products and where they are typically used.

During the years and numerous revisions, these standards have become less stringent than their original versions. We believe in manufacturing and referencing the critical versions to help the owners maintain the stringent requirements this industry originally intended.
BF-Series Gel Seal Bag-In/Bag-Out Containment Housings

The BF-Series bag-in/bag-out housing is a side servicing filter housing that has been designed to meet the air filtration needs of industries and research facilities that handle dangerous or toxic biological, radiological or carcinogenic materials.

Once the initial filters are installed and the first bag attached, all filters, both dirty and new, are handled through the bag. These procedures are summarized on Page 11.

Depending on the user’s requirements, the BF-Series housing may have an assortment of filter arrangements, including prefilters, HEPA filters and carbon adsorbers. Regardless of the type of filters contained within the BF-Series housing, the filter change-out procedure is the same. BF-Series housings are designed to accommodate standard gel seal HEPA filters and carbon adsorbers.

Manufactured under stringent quality assurance controls, BF-Series housings are subjected to thorough inspections and leak tightness tests before leaving the factory, and are guaranteed to pass both DOP and/or Freon in-place tests. This guarantee is contingent upon the use of properly installed Flanders HEPA Filters and Flanders/CSC adsorbers.

System Configurations

3H2W Housings consisting of Prefilters, Upstream Test Sections, HEPA’s, Adsorbers and Downstream Test Sections. Access Doors on One Side Only.

3H4W Housings consisting of Two 3H2W Housings in parallel. Access Doors on Both Sides.

Basic Housings

1H1W with Separate Prefilter Door

1H1W

1H2W

1H3W

Note: All housings are available with optional prefilter sections behind primary filter door or with a separate prefilter door.
Safety Comes First

The Flanders/CSC reputation for excellence in the design and fabrication of critical air filtration systems is the result of decades of attention to the toughest environmental and safety standards in the world. Throughout the long development of the BF-Series containment housing, safety has been the first design priority and our track record reflects the confidence of our customers. Flanders/CSC containment systems are operating in hundreds of sites, including:

- Hospital Isolation Suites
- Pharmaceutical Facilities
- Microelectronic Sites
- Food Processing Areas
- Genetic and Biotech Labs
- University Campuses
- Industrial Process Exhaust Systems
- Chemical Process Facilities
- Animal Disease Labs
- Radioisotope Handling Facilities
- Nuclear Power Plants
- Strategic Nuclear Facilities
- HVAC Systems
- Department of Energy Facilities

...from the Leader in Air Filtration Technology.
B-Series and K-Series Comparisons

Flanders/CSC B-Series and K-Series housings are produced in an array of standard models that vary according to the features listed in the chart below. All B-Series and K-Series housings are factory tested to ensure that they meet the same high standards of design and performance. Although there may be differences in size and certain construction features among the various models, there is no difference in the quality of each housing’s essential task to filter hazardous contaminants. The quality of construction and performance integrity of every Flanders/CSC housing system is guaranteed.

<table>
<thead>
<tr>
<th>B-Series and K-Series Comparisons</th>
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</thead>
<tbody>
<tr>
<td><strong>Series Comparisons</strong></td>
</tr>
<tr>
<td>BF-Series Housing</td>
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<tr>
<td>BG-Series Housing</td>
</tr>
<tr>
<td>KF-Series Housing</td>
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<tr>
<td>KG-Series Housing</td>
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<tr>
<td>Sealing Method</td>
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<tr>
<td>Bag-In/Bag-Out</td>
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<tr>
<td>Locking Mechanism</td>
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<tr>
<td>300 Series Stainless Steel</td>
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<tr>
<td>Filter Removal Rods (for 2 and 3 wide housings)</td>
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<tr>
<td>Seismic Qualification</td>
</tr>
<tr>
<td>High Pressure</td>
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<tr>
<td>Quality Assurance</td>
</tr>
</tbody>
</table>
**Cinching Strap**

A cinching strap is provided with each bag to tie off the slack in the bag during the interval between filter changes. The cinching strap prevents the bag from being drawn into the housing during normal operations. The strap is tied at a point near the tip of the bag-in/bag-out port, drawing the bag tightly across the port and allowing the slack to fall off to the outside.

**Bag-In/Bag-Out Accessories**

If provided, the prefilters, HEPA filters and carbon adsorbers are shipped separately. Additionally, bags, straps and instruction manuals are shipped in the accessory box, separate from the housing.

**Bagging Ring**

The bagging ring is seal-welded around the access port of each BF-Series containment housing. The elastic shock cord of the PVC change-out bag is stretched around the bagging ring. The BF-Series bagging ring features a hemmed edge to prevent tearing the bag, and two (2) continuous ribs to secure the bag.
PVC Change-Out Bag

A PVC bag is included with each access door. The Flanders/CSC change-out bag is translucent and yellow in color with a clear section at the attachment end for change out viewing.

An elastic shock cord is hemmed into the mouth of the bag for a firm fit when stretched around the bagging ring.

Change-Out Port

The BF-Series change-out port, accessed by door removal, has two (2) ribs on the bagging ring to facilitate the bag-in/bag-out procedure.

Security Strap

An orange nylon strap is included with each access port. The strap is buckled with a “D” ring and has velcro strips to secure the end.

Elastic Shock Cord

The bag has three (3) built-in glove sleeves to facilitate the filter change out. Correct replacement bag sizes are engraved on the door label of each housing. Replacement bag size labels are also attached to the shock cord hemmed into the bag mouth. PVC bags of this design have been tested by an independent laboratory to prove the bag’s operability at extreme temperature ranges of 0°F—130°F.
Filter Change-Out Concept

Basic steps in changing contaminated filters in the BF-Series Bag-In/Bag-Out containment housing, illustrated below:

1. Carefully draw contaminated filter into bag and place filter (in bag) on stand or table. Remove arms from bag. Seal bag between access port and filter. Cut bag, leaving bag stub attached to access port.

2. Place new filter into a new bag. Place new bag over bag stub attached to access port. Remove bag stub using bag stub removal glove sleeve of the new bag. Draw stub into sleeve by turning sleeve inside out. Install new filter using glove sleeves. Seal and detach bag stub/glove sleeve. Fold new bag inside bagging ring and replace access door.

3. Remove access door, extend bag and place arms in filter handling glove sleeves of bag. Carefully draw contaminated filter into bag and place filter (in bag) on stand or table. Remove arms from bag. Seal bag between access port and filter. Cut bag, leaving bag stub attached to access port. Place new filter into a new bag. Place new bag over bag stub attached to access port.

Note: A complete step-by-step change-out instruction manual is furnished with each housing or system.
BF-Series Containment Housing: Standard Features

Housing Material and Finish

Materials are unpainted 14 and 11 gage Type 304 stainless steel, with a 2B finish. Housing welded joints and seams are wire brushed and/or buffed to remove heat discoloration, burrs and sharp edges.

Smooth Inlet Design

BF-Series and KF-Series housings feature a smooth inlet design that reduces the buildup of particulate material in the housing. All interior pressure boundary joints are continuously welded. These features help limit contaminant buildup.

Filter Access Doors

Units are designed to install or remove up to three (3) filters at each access door. Where prefilters are required, a separate access door can be provided. An extruded neoprene gasket provides a seal between the access door and the housing. See the access door arrangement chart below:

BF-Series and KF-Series Access Door Arrangement

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Single access door on one side of the housing</td>
</tr>
<tr>
<td>D2*</td>
<td>Single access door on each side of the housing</td>
</tr>
<tr>
<td>D3</td>
<td>Two access doors on one side of the housing: one prefilter door and one primary filter door</td>
</tr>
<tr>
<td>D4*</td>
<td>Two access doors on each side of the housing: two prefilter doors and two primary filter doors</td>
</tr>
</tbody>
</table>

*Made from two units welded in parallel back-to-back. Filters must be removed from each side.

Construction

All pressure retaining joints and seams are welded airtight per ASME Section IX, reinforced to withstand ten (10) inches water gage positive or negative pressure. All welds are free of burrs and sharp edges, with no visible pores.
Design Concept

The filter-to-housing gel seal is effected by means of a continuous knife edge on the interior of the housing, which mates to the gel filled perimeter channel on the face of the filter. To effect the seal, the locking mechanism forces the filter against the knife edge. The knife edge penetrates the gel and a uniform seal is produced on the filter face.

Description

The BF-Series and KF-Series housings have a standard replaceable filter locking mechanism arm in each tier to operate the filter locking mechanism. By operating the internal filter locking arm inside the PVC bag (in the BF-Series only) and access door, the filter is engaged on, or disengaged from the housing knife edge (internal sealing frame). The filter locking arm and the access door interface in such a manner that minimizes the possibility of the door being closed until the filters are correctly seated in the housing and sealed to the mounting frame.

The standard locking mechanism is manufactured of Type 300 series stainless steel. Optional materials are available for specific applications.
**BF-Series Containment Housing: Standard Housing Filter Accommodations**

**GGF or GG12 with One Access Door (D1)**

Designed to accommodate one, two or three primary filters of 12 inch (nominal) depth through one access door. Filter(s) have actual size of 24” x 24” x 11½” and have a gel filled perimeter channel on one side. Filter(s) may be standard HEPA filters, or ASHRAE rated full size 12 inch nominal particulate filters, or carbon adsorber(s) with 11½” depth. Since the housing is not designed to accept a prefilter, it is recommended that the primary filter seal be on the upstream side of the housing.

**GG16 with One Access Door (D1)**

Designed to accommodate one, two or three carbon adsorber(s) of 16 inch nominal depth through one access door. Adsorber(s) have actual size of 24” x 24” x 16” and have a gel filled perimeter channel on one side. It is recommended that the adsorber(s) seal be on the upstream side of the housing.

**2GGF or 2GG12 with One Access Door (D1)**

Designed to accommodate one, two or three prefilters of 2, 4 or 6* inch nominal depth and one, two or three primary filters of 12 inch nominal depth through one access door. Actual size of 2 inch prefilter(s) is 23¾” x 1¾”. Primary filters can be any of those described for the GGF or GG12 housings. Both prefilters and primary filters are loaded through the same access door. It is necessary for the primary filter seal to be on the downstream side of the housing.

* Note: The BF-Series housing will only accept a nominal 2 inch deep prefilter when a common access door is used. The KF-Series housing will accept a nominal 2, 4 or 6 inch deep prefilter when a common access door is used.

**GG16 with One Access Door (D1)**

Designed to accommodate adsorbers of 18 inch depth, used in some special applications.
2GG16 with Same Access Door (D1)

Designed to accommodate one, two or three prefilter(s) of 2-inch nominal depth and one, two or three carbon adsorber(s) of 16-inch nominal depth through one access door. Actual size of 2 inch prefilter(s) is $23\frac{3}{8}\times 1\frac{7}{8}$". Adsorber(s) have actual size of $24" \times 24" \times 16"$ and have a gel filled perimeter channel on one side. Both prefilter(s) and adsorber(s) are loaded through the same access door. A popular application of this housing is to position the housing so the prefilter is downstream of the adsorber, allowing the prefilter to collect carbon dust or “fines” that may come off the adsorber.

2GG16 with Separate Access Doors (D3)

Same housing design as the 2GG12 with separate access doors, except this housing accommodates nominal 16 inch deep carbon adsorber(s).

2GGF or 2GG12 with Separate Acces Doors (D3)

Designed to accommodate the same filters as the previously discussed 2GGF or 2GG12 with the same access door (as shown on page 14), except with this design the prefilters have a separate access door. The principal design advantage of housings with separate access doors for prefilters is to allow the primary filter to seal on the upstream side of the housing. When specifying a housing with separate access doors, give close attention to the access door arrangement code number in the housing’s model number.

Note: Standard 2GG18 housings with same or separate access doors are available. The 2GG18 with the same access door (D1) and the 2GG18 with separate access doors (D3) are the same as the 2GG16 arrangements shown on this page, except the adsorber(s) will be nominal 18 inch deep.
**Door Latches**
Standard latches are threaded studs with removable hand knobs. The studs align with the retainers provided at each corner of the door and are secured with the hand knobs. See Page 31 for optional swivel latches, available for BF-Series only.

**Bag-In/Bag-Out Port (BF Housing)**
The bag-in/bag-out port inside each access door provides a place for securing the change-out bag during filter replacement. This port is continuously welded on the inside. To prevent damage to the bag, the outer lip of the port is hemmed. The port itself has a smooth shape. Two (2) ribs around its perimeter provide a means of securing the bag with security strap.

**Filter Removal Rod**
Housings with two (2) or more filters per access door have a removal rod in each tier to draw the filters to the change-out position.

*Threated Studs with Removable Knobs*

*Two Ribs on Bagging Ring*
*Threaded Stud Door*
*Primary Filter Removal Rod Shown Partially Extended*
*Prefilter Removal Rod Shown Partially Extended*
Engraved ID Label

Each primary filter access door has a stainless steel label stitch welded to the surface. This label contains the housing model number, the Flanders/CSC order number and change-out bag(s) information. When provided, the label can also contain the owner’s system ID number and model numbers for the filters, adsorbers, and prefilters. This information is permanently engraved on the label to facilitate reordering of critical replacement parts and components.

Connections to Ductwork

Flanges are provided turned outside of the airstream for attaching the housing to ductwork. Flanges shown below can be drilled and gasketed for bolting. The bolting area is 1½ inches wide. Optional factory drilled flanges are available. See page 35.

Filter Locking Mechanism

The internal filter locking mechanism is assembled with components of Type 300-Series stainless steel. Other materials are available to meet special requirements.
Leak Testing

Both the filter sealing surface and the complete assembly pressure boundary are leak tested by the Pressure Decay Method, in accordance with ASME N510-1995 Reaffirmed, Testing of Air-Cleaning Systems, Paragraphs 6 and 7. Readings are recorded once a minute for five (5) minutes. Flanders/CSC’s standard acceptable maximum leak rate is 0.0005 CFM per cubic foot of housing volume at ten (10) inches water gage for the filter sealing surface, and 0.0005 CFM per cubic foot of housing volume at the design pressure for the housing pressure boundary.

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BF-Series Containment Housing: Ordering Information

**BF-Series Housing Reference Chart**

<table>
<thead>
<tr>
<th>Description</th>
<th>Height (inches)</th>
<th>Width (inches)</th>
<th>Depth (inches)</th>
<th>Weight (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BF1-1H1W-CCD/6-304-D1</td>
<td>18</td>
<td>15</td>
<td>19(\frac{7}{8})</td>
<td>75</td>
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<tr>
<td>BF1-1H1W-CGF/12-304-D1</td>
<td>18</td>
<td>27</td>
<td>25</td>
<td>85</td>
</tr>
<tr>
<td>BF1-1H1W-CG16-304-D1</td>
<td>18</td>
<td>27</td>
<td>32%</td>
<td>100</td>
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<tr>
<td>BF1-1H1W-GCF/12-304-D1</td>
<td>30</td>
<td>15</td>
<td>25</td>
<td>120</td>
</tr>
<tr>
<td>BF1-1H1W-GG16-304-D1</td>
<td>30</td>
<td>27</td>
<td>32%</td>
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<tr>
<td>BF1-1H1W-GG18-304-D1</td>
<td>30</td>
<td>27</td>
<td>32%</td>
<td>160</td>
</tr>
<tr>
<td>BF1-1H1W-GG18-304-D3</td>
<td>30</td>
<td>27</td>
<td>32%</td>
<td>165</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6CCF/12-304-D1</td>
<td>18</td>
<td>15</td>
<td>33%</td>
<td>90</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GGF/12-304-D1</td>
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<td>27</td>
<td>33%</td>
<td>115</td>
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<tr>
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<td>27</td>
<td>41</td>
<td>125</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG16-304-D1</td>
<td>18</td>
<td>27</td>
<td>41</td>
<td>145</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG16-304-D3</td>
<td>18</td>
<td>27</td>
<td>41 | 155</td>
<td></td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG16-304-D3</td>
<td>18</td>
<td>27</td>
<td>41 | 170</td>
<td></td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG18-304-D1</td>
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<td>15</td>
<td>37%</td>
<td>115</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG18-304-D3</td>
<td>18</td>
<td>15</td>
<td>37%</td>
<td>145</td>
</tr>
<tr>
<td>BF1-1H1W-2/4/6GG16-304-D3</td>
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<td>45%</td>
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The D/6 in this model number represents the following model numbers:
- **BF1-1H1W-CCD-304-D1** to contain a HEPA filter, or
- **BF1-1H1W-CC6-304-D1** to contain a Carbon Adsorber.

The F/12 in this model number represents the following model numbers:
- **BF1-1H1W-GGF-304-D1** to contain a HEPA filter, or
- **BF1-1H1W-GG12-304-D1** to contain a Carbon Adsorber.

**Note:** For multi-high housings, just add the height dimension as needed.
### BF-Series Containment Housing: Ordering Information

#### Housing Series
BF1 = Bag-Out Type for Gel Seal Filters

#### Nominal Depth of Prefilter
- 2 = 2 inch deep Prefilter
- 4 = 4 inch deep Prefilter
- 6 = 6 inch deep Prefilter
- Blank = No Prefilter

#### Housing Construction Material
- 304 = Type 304 SST (Standard)
- 304L = Type 304L SST
- 316 = Type 316 SST
- 316L = Type 316L SST

#### BF-Series Housing Reference Chart

<table>
<thead>
<tr>
<th>Description</th>
<th>Height (inches)</th>
<th>Width (inches)</th>
<th>Depth (inches)</th>
<th>Weight (pounds)</th>
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</table>

#### Number of Filters High
- 1H = One Filter High
- 2H = Two Filters High
- 3H = Three Filters High
- 4H = Four Filters High

#### Number of Filters Wide
- 1W = One Filter Wide
- 2W = Two Filters Wide
- 3W = Three Filters Wide
- W = Three Filters Wide

#### Size Designator of Primary Filter
(See Below)

#### Access Door Arrangement
- D1 = One Access Door
- D2 = Two Access Doors, One Per Side
- D3 = Two Access Doors on One Side (One for Primary Filter, One for Prefilter)
- D4 = Four Access Doors, Two on Each Side (One for Primary Filter, One for Prefilter)

### Filter Size Designator
(HEPA Filters and Carbon Adsorbers)

- Actual Filter Dimensions are Listed
- HEPA Filters
  - *CCD 12 x 12 x 5 3/4%
  - *CCF 12 x 12 x 11 3/4%
  - *CGF 12 x 24 x 11 3/4%
  - *GGF 24 x 12 x 11 3/4%
  - *GGF 24 x 24 x 11 3/4%
- Carbon Adsorbers
  - *CC6 12 x 12 x 5 3/4%
  - *CC12 12 x 12 x 11 3/4%
  - *CG12 12 x 24 x 11 3/4%
  - *GC12 12 x 24 x 11 3/4%
  - *GG12 24 x 24 x 11 3/4%
  - *CG16 12 x 24 x 16
  - *GC16 24 x 12 x 16
  - *GG16 24 x 24 x 16
  - *GG18 24 x 24 x 18

**Insert 2, 4 or 6 to indicate 2 inch, 4 inch or 6 inch prefilter track.

1 These housings are designed to accommodate prefilters only.
Suggested Specifications: BF1 Housings (Gel Seal)

The filter housing shall be Flanders/CSC Corporation BF1 Series bag-in/bag-out, side access design and shall be manufactured from unpainted 14 and 11 gage Type 304 stainless steel. The housing shall be adequately reinforced to withstand a negative or positive pressure of ten (10) inches water gage. The design and filter arrangement shall be a side servicing bank that will allow air to enter and exit the housing without changing directions.

Standard filter housing modules shall be seismically qualified based upon comparison to previous shake table testing and by analysis. These housing modules are qualified in accordance with the criteria of the International Building Code (IBC) or the Uniform Building Code (1994 & 1997) up to Seismic Zone 3 levels, higher levels are available.

The housing shall be a gel seal design which incorporates a knife edge that mates into the gel filled perimeter channel of the face on the filter. Access to the filter shall be on the side of the housing. There shall be a safety feature where the filter locking arm and access door shall interface in such a manner that minimizes the possibility of the door being closed until the filters are correctly seated in the housing. Prior to leaving the factory, each knife edge shall be checked with an alignment gage to insure proper alignment with the filter. The filter sealing mechanism shall be replaceable and shall be operated through the change-out bag by a locking handle. The mechanism shall exert equal force at the top and bottom edge of the filter when engaging or disengaging the filter from the knife edge.

Multi-wide housings shall be equipped with filter removal rods to draw the filters to the change-out position. The removal rods shall be operated from inside the change-out bag, and the filter(s) shall be removed by pulling against the bottom of the filter frame. All change-out operations shall be within the bag so there is a barrier between the worker and the filter at all times.

All pressure retaining weld joints and seams shall be continuously welded with no pores allowed. Joints and seams requiring only intermittent welds, such as reinforcement members, shall not be continuously welded. As a minimum, joints and seams shall be wire brushed and/or buffed to remove heat discoloration, burrs and sharp edges. All weld joints and seams that are a portion of any gasket sealing surface (e.g., filter seal surface, duct connecting flanges) shall be ground smooth and flush with the adjacent base metal.

The upstream and downstream flanges shall have a 1½ inch minimum flange width. Flanges shall be turned to the outside of the airstream to prevent contamination buildup and allow the customer to connect mating ductwork from outside the housing.

All welding procedures, welders and welder operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX. All production welds shall be visually inspected per Flanders/CSC Standard Procedure Number P-122, Visual Inspection of Welds, which incorporates the workmanship acceptance criteria described in Sections 5 and 6 of ANSI/AWS D9.1-1990, Specifications for Welding Sheet Metal.

All hardware on the housing and all mechanical components of the filter sealing mechanism shall be Type 300-Series stainless steel, except for the cast aluminum access door knobs.

The housing shall have a bagging ring around each filter access port. The bagging ring shall have two (2) continuous ribs to secure the PVC change-out bag. The outer edge of the ring shall be hemmed to prevent the bag from tearing. Each access port and bagging ring shall be covered by
a door having an extruded neoprene gasket that is manually replaceable after the door has been removed. When closed, the door One (1) PVC change-out bag shall be furnished for each filter access port. Each bag shall have the stock number rolled into the hem. The PVC bag material shall be eight (8) mil thick, yellow in color, with a translucent taffeta texture finish and shall not stick together. For visibility during change-out, the bag shall include approximately 16 inches of clear PVC at the mouth. Three (3) glove sleeves shall be built into the bag to facilitate handling of the filter during change-out. PVC bags of this design shall have been tested by an independent laboratory to prove the bag’s operability at extreme temperature ranges of 0°F—130°F (A test report verifying this testing shall be furnished upon request.) The elastic shock cord shall be hemmed into the mouth of the bag so that it fits securely when stretched around the bagging ring. To prevent the bag from sliding off the bagging ring during changeout operation, one (1) nylon security strap shall be provided with each filter access port. A nylon cinching strap shall also be provided with each access port to tie off the slack in the bag while the ventilation system is operating.

The filter housing shall be manufactured under a quality assurance program that meets the basic requirements of ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities. The manufacture shall submit documented evidence they have been independently audited by customers at least three (3) times within the last six (6) years to ASME NQA-1 requirements, and successfully passed all three (3) audits. The housing shall be tested for filter fit, operation of the filter clamping mechanism, knife edge alignment and leak tightness before leaving the factory. The final containment filtration system shall be completely fabricated, assembled, tested and cleaned at the manufacturers facility. Subassemblies from outside sources will not be acceptable. Both the filter sealing surface and the complete assembly pressure boundary shall be leak tested by the Pressure Decay Method, in accordance with ASME N510-1995 Reaffirmed, Testing of Air Cleaning Systems, Paragraphs 6 and 7. Pressure readings are recorded once a minute for five (5) minutes. There shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at ten (10) inches water gage.

A minimum of four (4) feet clearance in front of the filter access door is suggested for filter change-out.

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NOTE: Throughout the product bulletin we make reference to standards that are old and or revised. Our purpose in specifying the older versions of standards is due the nature of these products and where they are typically used.

During the years and numerous revisions, these standards have become less stringent than their original versions. We believe in manufacturing and referencing the critical versions to help the owners maintain the stringent requirements this industry orginally intended.
The Flanders/CSC KF-Series gel seal containment housing provides high quality and guaranteed performance in a non-bag-in/bag-out filter housing.

Industries and research facilities concerned with filtration of potentially hazardous airborne particulates or gases may have the need for a high quality, high efficiency filtration system, but do not need a system which includes the bag-in/bag-out feature.

The Flanders/CSC KF-Series is a high efficiency, side-servicing filter housing that has been designed to give the user maximum quality and performance in a non-bag-in/bag-out configuration. Manufactured under stringent quality assurance controls, KF-Series housings are subjected to thorough inspections and leak tightness tests before leaving the factory, and they are guaranteed to pass both DOP and/or Freon in-place tests. This guarantee is contingent upon the use of properly installed Flanders HEPA filters and Flanders/CSC adsorbers.

Depending upon the user’s requirements, the KF-Series housings may have an assortment of filter arrangements including in-place test housings, prefilters, HEPA filters and carbon adsorbers. KF-Series housings are designed to accommodate standard gel seal HEPA filters or carbon adsorbers.

**System Configurations**

3H2W Housings consisting of Prefilters, Upstream Test Sections, HEPA’s, Adsorbers and Downstream Test Sections. **Access Doors on One Side Only.**

3H4W Housings consisting of Two 3H2W Housings in parallel. **Access Doors on Both Sides.**

1H1W with Separate Prefilter Door

Basic Housings

Note: All housings are available with optional prefilter sections behind primary filter door or with a separate prefilter door.
From the image, we extract the following text:

**Door Latches**

Standard latches are threaded studs with removable knobs. The studs align with the retainers provided at each corner of the door and are secured with hand knobs, as shown. See page 31 for optional swivel latches available for KF-Series.

**Engraved ID Label**

Each primary filter access door has a stainless steel label that contains the housing model number and the Flanders/CSC order number. When provided, the label can also contain the owner’s system ID number and the model numbers for the filters, adsorbers and prefiltrers. This information, permanently engraved on the label, is to facilitate reordering of replacement parts and components.

**Filter Locking Mechanism**

The internal filter locking mechanism is assembled with components of Type 300-Series stainless steel. The locking arm mechanism is located behind the door of the KF-Series housings and is operated in the same manner as the BF-Series, as described on Page 13 of this publication.
The D/6 in this model number represents the following model numbers: KF1-1H1W-CCD-304-D1 to contain a HEPA filter, or KF1-1H1W-CC6-304-D1 to contain a Carbon Adsorber. The F/12 in this model number represents the following model numbers: KF1-1H1W-GGF-304-D1 to contain a HEPA filter, or KF1-1H1W-GG12-304-D1 to contain a Carbon Adsorber.

Note: For multi-high housings, just add the height dimension as needed.

**NOTES**

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<th>Description</th>
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<th>Width (inches)</th>
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### BF-Series Housing Reference Chart

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</table>

### Filter Size Designator

**HEPA Filters**
- *CCD 12 x 12 x 5 1/8*
- *CCF 12 x 12 x 11 1/8*
- *CGF 12 x 24 x 11 1/2*
- *GCF 24 x 12 x 11 1/2*
- *GGF 24 x 24 x 11 1/2*

**Carbon Adsorbers**
- *CC6 12 x 12 x 5 1/8*
- *CC12 12 x 12 x 11 1/8*
- *CG12 12 x 24 x 11 1/2*
- *GC12 24 x 12 x 11 1/2*
- *GG12 24 x 24 x 11 1/2*
- *CG16 12 x 24 x 16*
- *GC16 24 x 12 x 16*
- *GG16 24 x 24 x 16*
- *GG18 24 x 24 x 18*

*Insert 2, 4 or 6 to indicate 2 inch, 4 inch or 6 inch prefilter track.

These housings are designed to accommodate prefilters only.

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**KF-Serie Containment Housing: Ordering Information**

**Housing Series**
- **KF1** = Non-Bag-Out Type for Gel Seal Filters

**Nominal Depth of Prefilter**
- 2 = 2 inch deep Prefilter
- 4 = 4 inch deep Prefilter
- 6 = 6 inch deep Prefilter
- Blank = No Prefilter

**Housing Construction Material**
- 304 = Type 304 SST (Standard)
- 304L = Type 304L SST
- 316 = Type 316 SST
- 316L = Type 316L SST

**Number of Filters High**
- 1H = One Filter High
- 2H = Two Filters High
- 3H = Three Filters High
- 4H = Four Filters High

**Number of Filters Wide**
- 1W = One Filter Wide
- 2W = Two Filters Wide
- W = Three Filters Wide

**Size Designator of Primary Filter**
(See Below)

**Access Door Arrangement**
- D1 = One Access Door
- D2 = Two Access Doors, One Per Side
- D3 = Two Access Doors on One Side (One for Primary Filter, One for Prefilter)
- D4 = Four Access Doors, Two on Each Side (One for Primary Filter, One for Prefilter)
Suggested Specifications: KF1 Housings (Gel Seal)

The filter housing shall be Flanders/CSC Corporation KF1 Series non-bag-in/bag-out, side access design and shall be manufactured from unpainted 14 and 11 gage Type 304 stainless steel. The housing shall be adequately reinforced to withstand a negative or positive pressure of ten (10) inches water gage. The design and filter arrangement shall be a side servicing bank that will allow air to enter and exit the housing without changing directions.

The housing shall be a gel seal design which incorporates a knife edge that mates into the gel filled perimeter channel on the face of the filter. Access to the filter shall be on the side of the housing. There shall be a safety feature where the filter locking arm and access door shall interface in such a manner that minimizes the possibility of the door being closed until the filters are correctly seated in the housing. Prior to leaving the factory, each knife edge shall be checked with an alignment gage to insure proper alignment with the filter. The filter sealing mechanism shall be replaceable and shall be operated through the door by a locking handle. The mechanism shall exert equal force at the top and bottom edge of the filter when engaging or disengaging the filter from the knife edge.

Multi-wide housings shall be equipped with prefilter removal rods (optional for primary filter) to draw the filters to the change-out position. The removal rod shall be operated from inside of the door and the prefilter(s) shall be removed by pulling against the bottom of the prefilter frame.

All pressure retaining weld joints and seams shall be continuously welded with no pores allowed. Joints and seams requiring only intermittent welds, such as reinforcement members, shall not be continuously welded. As a minimum, joints and seams shall be wire brushed and/or buffed to remove heat discoloration, burrs and sharp edges. All weld joints and seams that are a portion of any gasket sealing surface (e.g., filter seal surface, duct connecting flanges) shall be ground smooth and flush with the adjacent base metal.

The upstream and downstream flanges shall have a 1-½ inch minimum flange width. Flanges shall be turned to the outside of the airstream to prevent contamination buildup and allow the customer to connect mating duct work from outside the housing.

All welding procedures, welders and welder operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX. All production welds shall be visually inspected per Flanders/CSC Standard Procedure Number P-122, Visual Inspection of Welds, which incorporates the workmanship acceptance criteria described in Sections 5 and 6 of ANSI/AWS D9.1-1990, Specifications for Welding Sheet Metal.

All hardware on the housing and all mechanical components of the filter sealing mechanism shall be Type 300 series stainless steel, except for the coast aluminum access door knobs.

Each access port shall be covered by a door having an extruded neoprene gasket that is manually replaceable after the door has been removed.

The filter housing shall be manufactured under a quality assurance program that meets the basic requirements of ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities. The manufacture shall submit documented evidence they have been independently audited by customers at least three (3) times within the last six (6) years to ASME NQA-1 requirements, and successfully passed all three (3) audits. The housing shall be tested for filter fit, operation of the filter clamping mechanism, knife edge alignment and leak tightness before leaving the factory. The final containment filtration system shall be completely fabricated, assembled, tested and cleaned at the manufacturers facility. Subassemblies from outside sources will not be acceptable.
Both the filter sealing surface and the complete assembly pressure boundary shall be leak tested by the Pressure Decay Method, in accordance with ASME N510-1995 Reaffirmed, Testing of Air Cleaning Systems, Paragraphs 6 and 7. Pressure readings are recorded once a minute for five (5) minutes. There shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at ten (10) inches water gage.

A minimum of three (3) feet clearance in front of the filter access door is suggested for filter change-out.

Notes:

Note: Throughout the product bulletin we make reference to standards that are old and or revised. Our purpose in specifying the older versions of standards is due the nature of these products and where they are typically used.

During the years and numerous revisions, these standards have become less stringent than their original versions. We believe in manufacturing and referencing the critical versions to help the owners maintain the stringent requirements this industry originally intended.
## BF and KF Series Available Options

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<td>• Air Blenders</td>
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<td>• Humidifiers</td>
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<td>• Fans/Controls</td>
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<td>• Seismic Design</td>
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<td>• Hansen Connectors</td>
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<tr>
<td>• Acid Resistant Materials</td>
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<td>• Insulation</td>
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<tr>
<td>• Silicone Door Gasket</td>
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<tr>
<td>• Filter Removal Rod (KF-Series)</td>
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</tbody>
</table>
Prefilter Sections

A slide-in prefilter track may be incorporated into the BF-Series and KF-Series housing with the same or a separate access door. Prefilters that are nominal 2, 4 or 6 inches deep can be used in the BF-Series and KF-Series housings when using a common or separate access door option.

The BF-Series housing will only accept a nominal 2 inch deep prefilter when a common access door is used.

The KF-Series housing will accept a nominal 2, 4, or 6 inch deep prefilter when a common access door is used.

Note: To help position the prefilter(s) when a common access door is selected, a strip of polyurethane foam material is used on the inside of the door.

Magnehelic Gages

Flanders/CSC can provide differential pressure gages factory mounted with brass fittings and copper tubing. Optional 300-Series stainless steel fittings and tubing are available as an option. Factory installed gages are mounted on brackets for systems indoors or outdoors. Factory installed gages have 300-Series stainless steel identification labels stitch welded to the mounting bracket. Photohelic gages are mounted in a covered panel for outdoor installation. These gages can also be provided (unmounted) as separate items.
Test Ports, DOP, PAO or Freon

Test ports are stainless steel ¼ inch half couplings with brass hex plugs located on the door access side of the housing for upstream sampling. A upstream injection port and downstream sample port may also be supplied for installation by others in the owner’s duct work.

Note: The upstream injection port and the downstream sample port should be located at least ten (10) duct diameters upstream and downstream (respectively) of the filter bank. These additional ports must be requested and will be shipped loose.

Swivel Door Latch

Swivel door latches are available on BF-Series and KF-Series housings. Swivel latches swing away from the door to facilitate its removal during the bag-in/bag-out procedure. The hand knobs are held captive on the swivel latch assembly as a precaution against dropping or losing them.

Static Pressure Taps

Static pressure taps are ¼ inch stainless steel half couplings with brass hex plugs. The taps can be located on the top or the back of the housing upstream and downstream of the prefilters and/or HEPA filters. The customer should specify the quantity and arrangement of the taps across the filters.

Note: A minimum of 2-¼ inches between the bottom of the housing and surface it sits upon is required to allow swivel latches full range of motion.
### Weather Cap

For outdoor service, weather caps can be provided. These weather caps are intermittently welded (and sealed with silastic) to the top of each housing. If the housing flanges are factory drilled for customer ductwork connections, removable weather caps are bolted to the housing to provide access to the top flanges. The weather cap helps minimize the pooling of water on top of the housing and also serves as a protective dust cover. It is available in the same materials and finish as the housing.

![Weather Cap](image)

### Isolation Damper

Flanders/CSC manufactures low-leakage and bubble-tight dampers for effective shut-off and isolation of containment.

**Note:** Damper bulletins are available upon request. Contact Flanders/CSC or your local representative for complete details.

### Transitions/Plenums

Customer ductwork connections can be joined by incorporating transitions, plenums and dampers. Flanders/CSC can fabricate these components as an integral part of the system, meeting the owners specific requirements. These options will be manufactured and tested with the same stringent requirements of the containment housings.

![Transition with Damper](image)

![Plenum/Ductwork Connections](image)
In-Place Test Housings

Where HEPA filters must be tested for efficiency while in service, Flanders/CSC provides DOP or Freon test housings that can be incorporated at the factory into the BF-Series and KF-Series system. These housings solve numerous problems associated with in-service testing. Properly installed test sections eliminate the need for injection ports and sampling ports to be located ten (10) duct diameters away from the filter bank. They allow individual filters to be tested for leakage, which is a more stringent test than testing an entire bank of filters at a time. The tests are conducted from outside the system, thereby avoiding exposure of test personnel to toxic materials.

Note: Test Section bulletins are available upon request. Contact Flanders/CSC or your local representative for complete details.

PrecisionScan Test Housings

The integrity of many containment systems is adequately determined by testing the overall efficiency of the filters. Other systems require individual filters to be scan-tested periodically while in service to locate “pinhole” leaks in the filters. If any are present, the filters may be replaced. This capability is achieved in a BF-Series and KF-Series system by incorporating Flanders/CSC PrecisionScan housings directly downstream of the filters to be tested.

Note: PrecisionScan Test Housing bulletins are available upon request. Contact Flanders/CSC or your local representative for complete details.

Bead Blast Finish

Housings are constructed using stainless steel with 2B mill finish. They are then bead blasted after fabrication to achieve a clean, smooth and neutral finish. This process is an environmentally safe glass bead blast system with aesthetic results.
BF and KF-Series Containment Housing: Available Options

Metal Door Pocket
An optional stainless steel door pocket is available for storage of an owner’s maintenance manual. A manual on the installation, operation, maintenance and spare parts of each housing is provided and enclosed in a waterproof vinyl envelope.

Moisture Drains and Valves
For applications with a potential for moisture condensation, an optional drain valve assembly is available. This assembly consists of a stainless steel ½ inch half-coupling, close nipple, with a stainless steel ball valve and brass plug. When moisture drain valves are provided, it is recommended that a mounting base be used.

Lifting Lugs
Lifting lugs of ¼ inch thick Type 304 stainless steel with a 1½ inch diameter lifting lug can be welded to the top or side of the housing.

Change-Out Equipment
Additional items for the filter bag-in/bag-out process including additional PVC bags, security straps, cinching straps, a banding kit and filter removal tray are available.

Banding Kit
The Flanders/CSC banding kit facilitates sealing off the bag between the housing and the spent filter. The kit contains a supply of 25 stainless steel bands and the tools necessary to perform the banding operation. An instruction/procedure manual is included in the banding kit.

Filter Removal Tray
The filter removal tray fits onto standard housings to provide support for the filter or adsorber that is being changed out, as well as for the replacement filter. It is especially recommended for the safe removal of heavy carbon adsorbers, and for any housings over two (2) filters high. The customer must specify standard or pivot-type door latches to receive the correct tray.
Drilled Duct Connection Flanges

Factory drilled bolt holes for duct connections are available. Flanders/CSC has established bolt hole patterns for each model size housing in the B-Series and K-Series, from the 1H1W housing to the 4H W housings. Holes are drilled $\frac{7}{16}$ inch diameter with spacing between holes no more than four (4) inches apart, as recommended in chapter 4, 4-23, of the Nuclear Air Cleaning Handbook, *DOE - HDBK-1169-2003. Flanges can also be reinforced to $\frac{1}{4}$ inch thickness to create a stronger flange connection. See the Standard Bolt Hole Pattern chart below for various bolt hole pattern dimension.

**STANDARD BOLT HOLE PATTERN**

<table>
<thead>
<tr>
<th>HOUSING SIZE</th>
<th>1H1W</th>
<th>1H2W</th>
<th>1H3W</th>
</tr>
</thead>
<tbody>
<tr>
<td>W WIDTH</td>
<td>27&quot;</td>
<td>51&quot;</td>
<td>75&quot;</td>
</tr>
<tr>
<td>A HORIZONTAL SPACES</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{19}{64}$&quot;, $3\frac{43}{64}$&quot;</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{19}{64}$&quot;, $3\frac{43}{64}$&quot;</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{19}{64}$&quot;, $3\frac{43}{64}$&quot;</td>
</tr>
<tr>
<td>NO. OF SPACES (A) BETWEEN CORNER HOLES</td>
<td>7</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>H HEIGHT</td>
<td>30&quot;</td>
<td>30&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>B VERTICAL SPACES</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;</td>
<td>$3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;, $3\frac{9}{16}$&quot;</td>
</tr>
<tr>
<td>NO. OF SPACES (B) BETWEEN CORNER HOLES</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

**MULTI HIGH BOLT PATTERNS**

NOTE: MULTIPLE HIGH OR WIDE UNITS WILL HAVE BOLT HOLE PATTERNS MADE UP OF 1 HIGH X 1, 2 OR 3 WIDE PATTERNS
**Design Considerations**

One important consideration to remember in any design layout involving a filter housing is the amount of room required to conduct the filter change-out. Flanders/CSC recommends a minimum of four (4) feet (for BF-Series housings) and three (3) feet (for KF-Series housings) be allowed between the housing access door and any obstructions.

Another consideration is left-hand or right-hand access doors on the housing. Because of special design requirements or options such as mounting skids, weather cover, top mounted static pressure taps, lifting lugs, etc., the housing system cannot be rotated on its airflow axis. In such cases, left or right access doors must be specified when ordering the filtration system. To determine left or right-hand access, imagine that you are standing, facing the housing, on the upstream side, so that the air flow would strike your back. If the access door is located on your left, the housing is left-hand access. If the access door is located on your right, the housing is right-hand access.

![Diagram of BF and KF-Series Containment Housing](image)

**Left-Hand Access**

Looking in the direction of air flow from the upstream side of the housing with the door on your left, the unit is left-hand access.

**Right-Hand Access**

Looking in the direction of air flow from the upstream side of the housing with the door on your right, the unit is right.
Prefiltration
Any BF-Series or KF-Series housing can incorporate a slide-in prefilter track. They can be provided behind the same door as the primary filter/carbon adsorber, or with a separate access door. Typically, prefilters are two (2) inches deep, pleat-ed media type, of 25 - 30% ASHRAE efficiency. Slide-in tracks for higher efficiency four (4) inch and six (6) inch prefilters may also be provided.

Particulate Filtration
High efficiency particulate filtration is achieved by the use of HEPA filters. A prefilter section should be located in the initial upstream position to extend the life of the HEPA filters. Subsequent stages of HEPA filters should not require additional prefiltration.

Gas and Particulate Filtration
Particulate housings combine with their gas phase counterparts in a single system for the removal of both particulates and gases. In most cases, the particulate housings will include a bank of prefilters and will be located upstream of the adsorber housings. This protects the adsorbers from particulate loading, so that additional prefilters are not required in the adsorber housings themselves.

Gas Phase Filtration
The removal of undesirable or hazardous gases from the airstream is achieved by the use of V-bed carbon adsorbers. In all cases, the adsorbers should be protected with particulate prefilters to stop dust which might otherwise load the carbon media beds. Particulate filters may also be needed downstream of the adsorbers to catch any fines from the carbon beds. Gas phase systems are designed so that the residence time — the time that a molecule of the target gas is in contact with the carbon media — is 0.125 seconds through a single bank of adsorbers. Often this is sufficient, but since many nuclear and chemical applications require at least 0.250 seconds residence time, two (2) or more banks of adsorbers are needed.

In-Place Test Sections
The In-Place Test Section (see Page 33) will allow the owner/user to insure complete testability of the containment filtration system design.
Seismic Qualification
The standard BF-Series housing modules are seismically qualified based upon comparison to previous shake table testing and by analysis. These housing modules are qualified in accordance with the criteria of the Uniform Building code (1994 & 1997) up to Seismic Zone 3 levels, higher levels are available. Qualifications can also be supplied in accordance with the criteria of the International Building Code (IBC) or other codes, IEEE 344, ASME AG-1 or DOE STD-1020 based upon the customer’s seismic loading requirements. Filter housing modules that are combined into filter banks and filter trains consisting of modules, test sections and other components can be qualified as required and, with proper reinforcement, can be supplied to meet even the most severe seismic requirements.

For seismic qualification, additional information must be supplied to Flanders/CSC so that the test results can be compared to the seismic loading requirements of the owner’s facility. This information is necessary before assurances can be made that the seismic qualification requirements are satisfied. The customer should provide seismic design information including author of design specifications, location, project name and required acceleration levels.

In-Place Efficiency Testing
In-place efficiency testing of HEPA filters and adsorbers should be considered for any system where toxic particulates or gases are present.

In-Place Scan Testing
While the integrity of many containment systems is determined by testing the average efficiency of an entire bank of HEPA filters, other systems require the individual filters to be scan tested periodically while in operation. This capability is achieved by incorporating Flanders/CSC PrecisionScan housings directly downstream of the filters to be tested. Contact the factory for details.

Vertical Flow Applications
Standard BF-Series and KF-Series housings are designed for horizontal airflow. Custom designs can be provided for applications where the airflow is vertical.

Plenums, Transitions and Dampers
Airflow control can be achieved by incorporating plenums, transitions and dampers. Flanders/CSC can fabricate these components as an integral part of the system meeting the owner’s site requirements. Dampers are available in a variety of designs Contact the factory for details.
Filters
HEPA filters should be selected to suit operating requirements and specifications. Flanders Filters, Inc., another subsidiary of Flanders Corporation, manufactures a complete line of high efficiency and HEPA filters for biological, nuclear and other critical containment applications. For information on filter applications that will be provided with original purchase, contact our factory.

Prefilters
Prefilters should be selected to suit operating requirements and specifications. Flanders manufactures a complete line of prefilters. For information on prefilter applications that will be provided with original purchase, contact our factory.

Adsorbers
Flanders/CSC personnel have many years experience with gas phase filtration systems and can provide assistance in the selection of adsorbents, residence time calculations and system configuration. Contact the factory for details.
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/CSC for prior evaluation. Flanders/CSC 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 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.

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Website: www.flanderscorp.com

Representatives of Flanders/CSC products are located throughout the world.

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

Represented by: