



G-Series Filter Housings
Bag-In Bag-Out

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/CSC Corporation 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/CSC 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 of Flanders/CSC 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/CSC may use the latest state-of-the-art methods in providing its products and services.

The Quality Assurance Program at Flanders/CSC Corporation has been audited and approved several times by the Nuclear Utilities Procurement and Inspection Committee, NUPIC. This committee was established by nuclear electric utilities to ensure that suppliers of goods and services can meet all applicable regulatory and quality requirements.

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/CSC, through its limited warranty, guarantees that the products described herein will meet all specifications agreed to by the buyer and the seller.
- 3 ASME N509 *Nuclear Power Plant Air-Cleaning Units and Components*.
- 4 ASME N510 *Testing of Nuclear Air Treatment Systems*.

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

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

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

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.

G-Series Filter Housing

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G-Series Filter Housing

For Particulate Filtration and Gas Filtration

The Flanders/CSC G-Series bag-in/bag-out filter housing allows for the installation of a single filter element (prefilter, HEPA filter or gas adsorber) in a low CFM ventilation system. The G-Series filter housings are designed for particulate filtration and gas filtration. The G-Series design allows the housing to be tested in place and is flexible in that it allows various arrangements of inlet and outlet ports to fit particular applications.

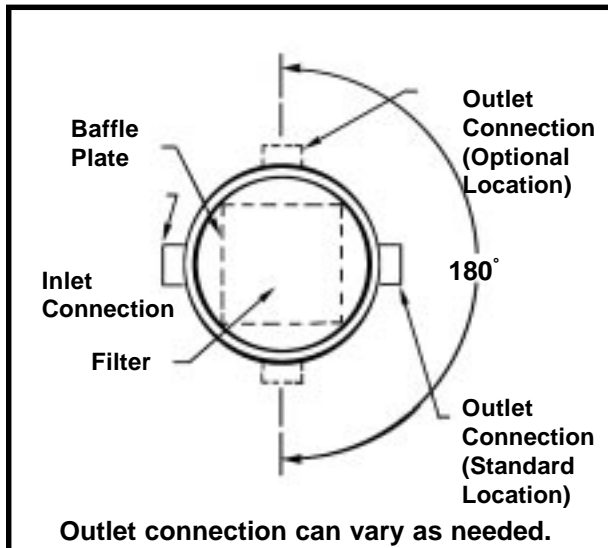


Figure 1

One of the primary uses of HEPA filters is for the containment of toxic materials. When filters become contaminated in-service with these materials, a method for their removal without direct operator contact is necessary. The bag-in/bag-out feature of the G-Series allows the operator to change filters without coming into direct contact with the toxic materials (such as viable organisms, radioactive dust, and carcinogens) that have been collected by the filter element during its service life. Air is supplied to and exhausted from the G-Series housing through round inlets and outlets that are connected to the owner's pipe or ducting.



The G-Series gas filtration housings are capable of accepting standard V-bed adsorbers which are used to remove toxic gases (as opposed to particulates from the airstream). The standard V-bed adsorber used in the G-Series has carbon beds of various sizes, compound, and each system must be designed separately.

Flanders/CSC has many years experience in the design of gas filtration systems, and can provide a variety of adsorbers to achieve the proper removal efficiency.

G-Series Filter Housing

Description

The G-Series housing is designed for single filter replacement from the top of the unit (contact factory for multi-stage units). The housing can be installed for side access, but Flanders/CSC does not recommend that the unit be supported by the inlet and outlet connections. Instead, a mounting stand or some other means of support should be used.

There is no specific diameter for inlet and outlet connections for the G-Series housing, since requirements vary considerably. The purchaser must specify the required pipe sizes and lengths. The G-Series inlet and outlet connection can be a standard rolled stainless steel sheet metal nipple or optional stainless steel piping.

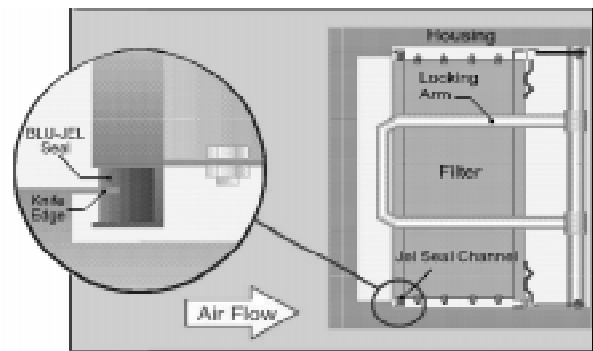
Welding is performed by qualified welders in accordance with ASME Section IX as specified in ANSI-N509-1996 "Reaffirmed", Sec. 7.3.



G-Series inlet/outlet connection shown. Standard airflow indication label optional. 150 lbs class slipon raised front flange. Option State Pressure Tap

The Jel Seal

The filter-to-housing fluid seal is effected between the housing and the filter by means of a continuous knife edge in the housing. The knife edge mates into a channel on the upstream (air entering) side of the filter. This channel is filled with a highly viscous nondrying sealing compound. The knife edge seal is guaranteed to pass an in-place DOP test (when used with properly selected, undamaged Flanders filter, and when tested per ASME-N510-1995 "Reaffirmed").



This illustration shows how the knife-edge mates to the gel-filled groove in filter.

G-Series Filter Housing

Housing Material

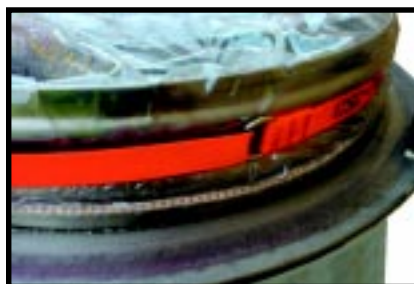
The standard G-Series filter housing is constructed from 14 and 11 gauge Type 304 stainless steel. All joints and seams are welded airtight per ASME Section IX with no visible pores and welds are free of all burrs and sharp edges.



Door Latches

A minimum of four tie-down latches are provided per access door. The latches pivot away from the bag-in/bag-out port after release so they do not impede the bag-in/bag-out process. The knob of the door latch is designed to spin free for door removal, but is captive on the threaded stud.

Security Strap



A one inch wide nylon security strap provided with each G-Series filter housing fits around the lip of the bag-in/bag-out port, in between the two ribs and over the mouth of the bag. This supplements the elastic band in the bag and helps reduce the possibility of the bag pulling away from the lip in case the filter is accidentally dropped during replacement.

Bag-In/Bag-Out Port

The housing's bag-in/bag-out port is designed so that a heavy duty PVC bag can be securely fastened around it after the original filter has been installed. When the door is eventually removed to change the filter, the bag provides



a barrier between the operator and the contaminated filter. When the door is closed, the bag remains in the door.

Cinching Strap

During the interval between filter changes, the strap is tied at a point near the lip of the bag-in/bag-out port, drawing the bag tightly across the port and allowing the slack to fall off the outside.



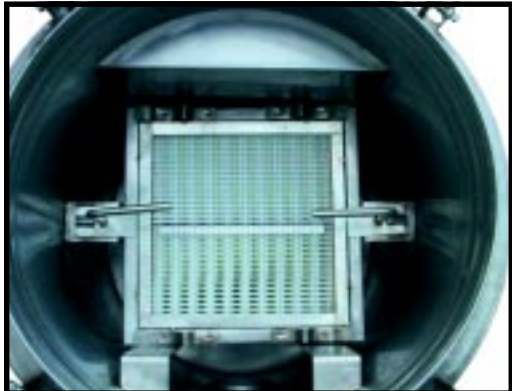
G-Series Filter Housing

Filter Clamps

Stainless steel filter clamps secure the filter during operation. Filter elements that are 12" x 12" require two clamps and 24" x 24" filter elements require four clamps. The clamps are spring loaded and have a rod handle that is turned 90 degrees by the operator to lock the filter in the sealed position.



Filter Clamp in locked position without a filter installed.



Filter Clamps locked with filter installed.

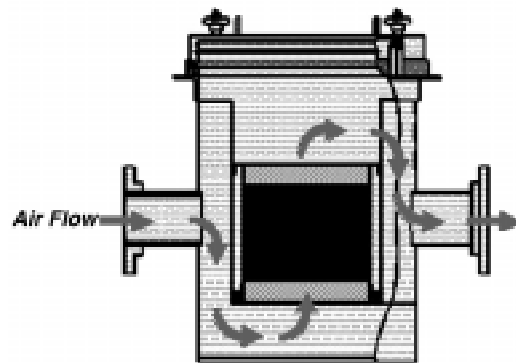
PVC Bag

Each G-Series housing is provided with a durable, 8-mil thick translucent yellow PVC bag, with a smooth, non-sticking finish. The bag-in/bag-out procedure is described in detail in the G-Series Installations, Operations, Maintenance and Spare Parts Manual.

To prevent the bag from being drawn into the housing, a cinching strap is provided with each housing for use in tying off the slack in the bag.

Baffle Plate

The G-1 housing features a permanently welded baffle plate. The air entering the housing is diverted twice before reaching the filter element, creating a turbulent mixture suitable for in place testing (with optional test ports in place).



Door Gasket

The door of the G-Series housing is sealed to the housing by means of a replaceable extruded closed-cell neoprene gasket adhered to the lip of the door.



G-Series Filter Housing



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 until pressure decays to 75% of the test pressure or for 5 minutes. The maximum allowable leak rate for the filter sealing surface is 0.0005 CFM per cubic foot of housing volume when tested at 10 inches water gage. The maximum allowable leak rate for the housing pressure boundary is 0.0005 CFM per cubic foot of housing volume when tested at 10 inches water gage.

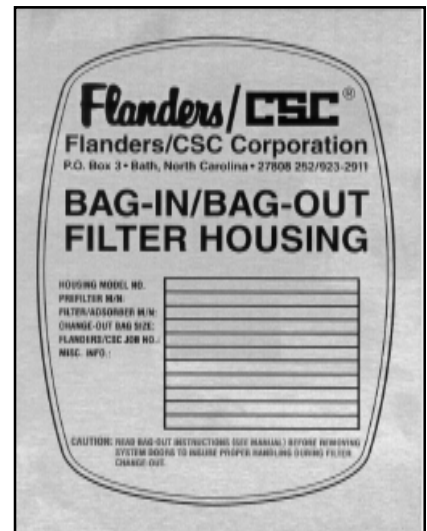


Test Port

Engraved ID Label

To facilitate reordering of critical replacement parts and components, each housing has a stainless steel label with the following information permanently engraved on the label:

- manufacturer’s name
- housing model number
- filter model number (or filter size)
- change-out bag number
- manufacturer’s order number
- owner’s ventilation system number (when specified)



Options

Metal Door Pocket

An Installation, Operation, Maintenance and Spare parts Manual, which is enclosed in a waterproof vinyl envelope, is provided with each housing. An optional stainless steel door pocket is available for storage of this manual. (See Figure 4, Page 8)

Static Pressure Taps

Static pressure taps allow the measurement of pressure drop across the filter. Taps consist of stainless steel $\frac{1}{4}$ inch half-couplings with brass plugs, and are located on the inlet and outlet connections of the housing. (See Figure 4, Page 8)

DOP Test Ports

To allow in-lace efficiency testing of the installed filter, a DOP injection port ($\frac{3}{4}$ inch coupling with brass plug) is located on the inlet side of the housing. Sample ports ($\frac{3}{8}$ inch couplings with brass plugs) are located upstream and downstream of the filter. (See Figure 4, Page 8)



Test Port

High Pressure Design

Flanders/CSC has designed special high pressure G-Series housings capable of pressures up to 15 psi positive or 14.7 psi negative. Welds are performed per ASME Section IX.



Drain With Valve

For applications with a potential for moisture condensation, an optional drain valve assembly is available, consisting of a stainless steel $\frac{1}{2}$ inch half-coupling with a stainless steel ball valve and brass plug. (See Figure 4, Page 8)

Low Leak Test

The Low Leak Test required in the "Nuclear Air Cleaning Handbook, ERDA 76-21 (Table 4.5)" is offered as an alternative to the standard leak test (See Page 5). It is a considerably more stringent test, allowing a leak rate of no more than 0.2% of the housing volume per hour at a pressure of 10 inches water gage. This equates to 0.000033 CFM per cubic foot of housing volume.

G-Series Filter Housing: *Options*

Filter Removal Tray

The filter removal tray provides safe and convenient support for filters during the change-out procedure. The tray attaches to the housing, using the door latches after the door is removed. Filter removal from the vertical (top) or horizontal (side) orientation must be specified to insure correct design.

Banding Kit

The Flanders/CSC banding kit facilitates clamping 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.



Flanges

Flanges are available for bolting the inlet and outlet connections to the ventilation system. Available in 1/4" thick stainless steel fabricated plate flange, angle ring flange, or 150 lb. class Type 304 stainless steel, in standard NPS sizes. Special sizes and types are also available. (Fig. 3, Page 8)

Custom ID Tags

Standard labels include the housing model number, the filter model number, Flanders/CSC original order number, and the owners system number (when specified). Custom engraved stainless steel ID Tags are welded to the housing in cases where the owner requires additional information to be displayed.

Mounting Options

Mounting options include drilled angle ring mounting base or custom mounting stands of various shapes, sizes and designs. Typically 304 stainless steel is used in the construction of mounting rings and stands. Other materials are available upon request. Contact the factory.

Seismic Qualifications

Seismic qualifications testing has been performed on some units to certain levels. The owner or design engineer should contact the factory with design requirements and specifications to insure that the manufacturer's test results are in accordance with the seismic loading requirements of the owner's facility and plant site.

The following information is required before Flanders/CSC can provide a quotation:

- Design specifications and author
- Project name
- Project location
- Required acceleration levels
- Required response spectra curves

High Temperature Design

High temperature design is available to 450 degrees F.

G-Series Filter Housing: *Ordering Information*

Ordering Information

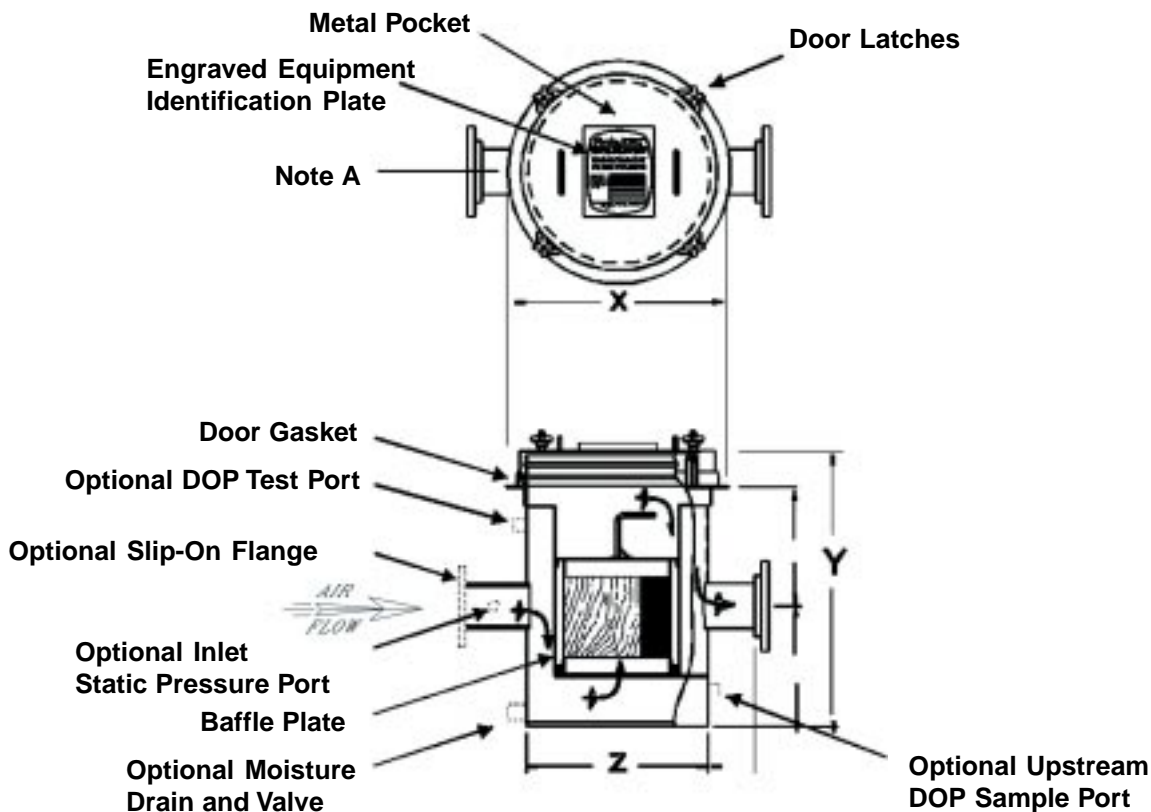


Figure 3

Filter and options are not included in the base price. Buyer must specify by schedule, O.D., thickness, bolt hole size, bolt hole circle diameter, etc., as required. Pipe connections can be ordered in various angular configurations (see Figure 1, Page 1). Contact the factory for specific information.

Note: Inlet and Outlet connections are available in rolled and seam welded nipple connections, or standard pipe or tubing sizes. Connections are 6 inches long unless otherwise specified.

G-Series Filter Housing: *Ordering Information*

Primary Filter Size

G1F - GGF - 304

Housing Series/Type

G1F = Bag-In/Bag-Out Gel Seal
 G1G = Bag-In/Bag-Out Gasket Seal
 (for non-bag-out applications delete bags and straps)

Housing Material Type

304 = Type 304 Stainless Steel*
 304L = Type 304L Stainless Steel
 316 = Type 316 Stainless Steel
 316L = Type 316L Stainless Steel
 *standard material

FILTER SIZE	FILTER dimension (inches)			
	height	width	depth	
CCD	12	12	5 7/8	(filter)
CCF	12	12	11 1/2	(filter)
CC12	12	12	12 1/4	(adsorber)
GGD	24	24	5 7/8	(filter)
GGF	24	24	11 1/2	(filter)
GG12	24	24	12 1/4	(adsorber)
GG16	24	24	16 3/4	(adsorber)
GG18	24	24	18 3/4	(adsorber)

MODEL NUMBER	FILTER SIZE	HOUSING dimension (inches)			FILTER dimension (inches)			RATED CAPACITY
		X	Y	Z	height	width	depth	
G1F-CCD-304	CCD	22 1/8	24	18 1/8	12	12	5 7/8	105 CFM
G1F-CCF-304	CCF	22 1/8	24	18 1/8	12	12	11 1/2	160 CFM
G1F-CC12-304	CC12	22 1/8	24	18 1/8	12	12	12 1/4	165 CFM
G1F-GGD-304	GGD	40 1/8	24	36 1/8	24	24	5 7/8	500 CFM
G1F-GGF-304	GGF	40 1/8	24	36 1/8	24	24	11 1/2	1000 CFM
G1F-GG12-304	GG12	40 1/8	24	36 1/8	24	24	12 1/4	1000 CFM
G1F-GG16-304	GG16	40 1/8	28	36 1/8	24	24	16 3/4	1000 CFM
G1F-GG18-304	GG18	40 1/8	28	36 1/8	24	24	18 3/4	1250 CFM

High Pressure Housings

Add 7 1/2 inches to the "Y" (height) dimension for High Pressure G-Series Housings and use the Suffix "SP" in the model number.

Example: G1F-GGF-304(SP) SP=High Pressure Design. Customer to specify pressure.

G-Series Filter Housing: *Suggested Specifications*

G-Series Bag-In/Bag-Out Housing

(Gel Seal): Standard Pressure Design

The filter housing shall be Flanders/CSC Corporation G-Series bag-in/bag-out design manufactured from unpainted 14 and 11 gage type 304 stainless steel. The housing shall be adequately reinforced to withstand a positive or negative pressure of 10 inches water gage. The housing shall be cylindrical with a lid type door on the top held in place by tie-down latches. The latches shall be manufactured in such a manner that they pivot away from the bag-out port after release so they do not impede the bag-in/bag-out process.

The inlet and outlet connections shall be rolled and seam welded nipple connection sizes up to 12" long, or as specified by the design professional. The inlet and outlet connections shall be ___ inches in diameter by ___ inches long. As air enters the housing, a baffle plate shall turn the air downward. At the point where air hits the bottom of the housing, the air turns upwards and passes through the filter element. After passing through the filter element, the air hits the top of the housing and is turned again, thus forcing the air out of the filter housing. To accommodate gel seal filters, the housing shall incorporate a knife edge that mates into the gel filled perimeter channel on the face of the filter. Access to the filters shall be from the top or side of the housing depending on the mounting arrangement. Prior to leaving the factory, each knife edge shall be checked with an alignment gage to insure proper orientation with the filter. Filter sealing clamps shall be operated through the change-out bag. Spring-loaded filter clamps on the housing shall secure the filter during operation. Clamps— two (2) required on CCF and four (4) on GGF size housings —shall be constructed of type 304 stainless steel with a $\frac{3}{8}$ inch stainless steel rod handle.

Note: Specification continues on following page.

G-Series Bag-In/Bag-Out Housing (Gel Seal): High Pressure Design

The filter housing shall be Flanders/CSC Corporation G-Series bag-in/bag-out design and manufactured from unpainted 14 and 11 gage type 304 stainless steel. The housing shall be adequately reinforced to withstand positive 15 PSIG and negative 14.7 PSIG. The housing shall be cylindrical with a lid type door on the top held in place by tie-down latches. The latches shall be manufactured in such a manner that they pivot away from the bag-in/bag-out port after release so they do not impede the bag-in/bag-out process. For safety, if the design pressure is greater than positive or negative 7 PSIG, the door shall be held in place by bolted and gasketed flanges located on the door and housing.

The inlet and outlet connections shall be rolled and seam welded nipple connection sizes up to 12" long, or as specified by the design professional. The inlet and outlet connections shall be ___ inches in diameter by ___ inches long. As air enters the housing, a baffle plate shall turn the air downward. At the point where air hits the bottom of the housing, the air turns upwards and passes through the filter element. After passing through the filter element, the air hits the top of the housing and is turned again, thus forcing the air out of the filter housing. To accommodate gel seal filters, the housing shall incorporate a knife edge that mates into the gel filled perimeter channel on the face of the filter. Access to the filters shall be from the top or side of the housing depending on the mounting arrangement. Prior to leaving the factory, each knife edge shall be checked with an alignment gage to insure proper orientation with the filter. Filter sealing clamps shall be operated through the change-out bag. Spring-loaded filter clamps on the housing shall secure the filter during operation. Clamps— two (2) required on CCF and four (4) on GGF size housings —shall be constructed of type 304 stainless steel with a $\frac{3}{8}$ inch stainless steel rod handle.

Note: Specification continues on following page.

G-Series Filter Housing: *Suggested Specifications*

The handle turns in one direction only and locks when in the closed position. The mechanisms shall exert equal force on the filter when maintaining the filter on the knife edge. All changeout operations shall be within the bag so there is a barrier between the worker and 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., access door surface duct connecting flanges) shall be ground smooth and flush with the adjacent base metal.

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 the 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, "Sheet Metal Welding Code".

All hardware on the housing and all mechanical components of the filter sealing mechanism shall be 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 shall not press against the bag-out port and PVC bag, thus eliminating the possibility of the bag being cut by this pressure.

One (1) PVC change-out bag shall be furnished for each filter access port. Each bag shall have its stock number rolled into the hem. The PVC bag material shall be 8 mil thick, amber in color, with a translucent, matte textured finish and shall not stick together. For visibility during changeout, the bag shall include approximately 12 inches of transparent PVC at the mouth. Three (3) glove sleeves shall be built into the bag to facilitate handling the filter during change-out.

A 1/4 inch diameter 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 the change-out operation, one (1) nylon security strap shall be provided with each filter access port. A cinching strap shall also be provided with each bag-out 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 requirements of ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities". The housing shall be tested for filter fit, operation of the filter clamping mechanism, knife edge alignment and leak tightness before leaving the factory. 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. Record pressure readings once a minute until pressure decays to 75% of the test pressure or for 5 minutes. There shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at 10 inches w.g. for the filter sealing surface.

Additionally, there shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at 10 inches water gage for the housing pressure boundary. A housing integrity pressure test shall be performed as required by the owner. A minimum of four (4) feet clearance is suggested for filter change-out.

G-Series Filter Housing: *Optional Features*



Mounting Stand



Door Hinge Mounting Legs



**High-pressure Design
Mounting Legs
Off-set Connection
Locations**



**Mounting Legs
Factory-mounted Gage
Test Ports
Tri-Clove Connections**



**150 lbs Flange
Test Port
Static Pressure
Tap Drain Port**

**1/4 inch thick
Plate Flange
Static Pressure
Tap**



Important Notice

For best results in the application of Flanders/CSC® 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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Representatives of Flanders/CSC® products are located throughout the world.

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FLANDERS/CSC^a

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