

## CUSTOM CONTAINMENT FILTRATION SYSTEMS

Chemical - Biological - Radiological



### Containment Filtration Systems for the Treatment of Contaminated Air Streams

In 1960, Barnebey Sutcliffe pioneered the use of special HVAC filter support systems for the nuclear power industry, now known as Containment Systems. They are installed wherever the air to be filtered contains potentially hazardous contaminants. Containment Systems include special features for service and maintenance, which provide greater safety for the operator. These features prevent release of the contaminants into the air surrounding the containment system.

After more than 40 years, we continue to manufacture and supply Containment Systems incorporating innovative filter clamping concepts and manufacturing techniques. Systems manufactured by Calgon Carbon provide high-efficiency air treatment with provisions for safety during service. These features satisfy current requirements for a wide range of applications.

Filter elements installed in Containment Systems include High-Efficiency Particulate Air (HEPA), Ultra Low Penetration Air (ULPA) filters, High-Efficiency Gas Adsorbers (HEGA), and associated pre-filters installed to increase service life of downstream filters.

Containment Systems are supplied with one of two alternative filter clamping methods:

**Gasket Seal (CM Series).** A spring-loaded clamping mechanism that compresses a filter gasket providing a positive seal between the filter face and the sealing surface of the housing.

**Knife-Edge Seal (KE Series).** A clamping arm is designed to manually engage the filter element into a knife-edge flange. The seal is made when the knife-edge flange penetrates a gel-filled channel provided with the filter element.

A complete Containment System is constructed of modular sections that are factory assembled and tested to suit the demands of a specific application. A typical system consists of an inlet isolation damper, a pre-filter with separate access, a 24" deep (in direction of air flow) housing section to accommodate a standard 11 1/2" deep HEPA or 12" deep HEGA filter, or a 30" deep housing section for a 16" or 18" deep HEGA filter, and an outlet isolation damper with pressure gauge assemblies and welded transitions. The scope can be expanded to include a skid, fan, controls, instrumentation, etc. We also offer installation, start-up, and operator training services.

### Equipment and Systems

Visit our website at [www.calgoncarbon.com](http://www.calgoncarbon.com), or call 800-422-7266 to learn more about our complete range of products and services, and obtain local contact information.

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### Quality Design and Protection

#### *Containment System Features:*

- Time and application proven modular design
- Safe and easy method to maintain filters without contaminating the area outside of the containment system
- Available in two basic configurations: CM and KE series
- Change up to three filters (placed in parallel) through a single access port
- All housings are factory leak-tested to ASME N510 Testing of Nuclear Air Treatment Systems (paragraphs 6 and 7)
- Available for use in vertical or horizontal airflow applications
- One piece front panel and back panel construction of rugged 300 series stainless steel
- Housings are designed to withstand 20" w.g. positive and negative pressures

#### *Gasket Seal (CM Series) Features:*

- Accommodates standard gasketed HEPA or HEGA filters
- A positive spring-loaded filter-locking mechanism that applies constant pressure on each filter
- The mechanism is operated from outside of the housing using standard tools
- No special filter clip is required for filter removal
- Clean-up of seal surfaces not required during filter change-out

#### *Knife Edge Seal (KE Series) Features:*

- Less clamping force required to maintain a proper seal
- Filter access door cannot be reinstalled unless filter latch is properly engaged

### Applications

#### *Homeland Security*

Government installations and public collective protection equipment and procedures require the protection of the public from the discharge of chemical, biological and radioactive agents (CBR), also known as nuclear, biological, and chemical agents (NBC).

#### *Hospitals and Medical Research*

Exhaust air from laboratory hoods, hospitals, and/or prison isolation wards may contain radioactive and infectious particulates, and/or gaseous contaminants. Containment Systems safely exhaust filtered air from these facilities to the surrounding environment.

#### *Chemical and Pharmaceutical Industry*

Control of air quality and protection of personnel working in the vicinity of lab hoods and research animals requires the use of HEPA filters and activated carbon filters. These filter elements are retained in a Containment System, which permits safe replacement of filter modules.

#### *Military*

Government installations evaluating equipment and procedures require the protection of military personnel from the discharge of chemical, biological, and radioactive agents (CBR), or nuclear, biological, and chemical (NBC) warfare agents. Containment Systems are incorporated in the HVAC ventilation systems to prevent release of these agents to the atmosphere.

#### *Schools and Public Buildings*

Air quality in schools and other public buildings that are vulnerable to toxic air require control. Protection is provided by overpressurizing the inhabited spaces with makeup air filtered through a Containment System.

#### *Educational Institutions and Industrial Research Facilities*

Many laboratories work with materials requiring special safety procedures. Containment Systems supplied with appropriate filters are used in conjunction with fume hoods to contribute to the safety of operators, service personnel, and the environment.

#### *Electronics and High Technology Industries*

The development of crystals and electronic chip production often requires the application of chemicals which could be toxic. Air exhausted from these facilities is filtered in a Containment System prior to venting to the atmosphere.

#### *Genetic Engineering*

Cultures are developed under controlled conditions with particulate and vapor phase filtration in exhaust and makeup air systems. These filter elements are contained in Containment Systems assuring the controlled conditions in the lab are extended to other parts of the facility.

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### Standard Features

Gasket Seal Design (CM series) and Knife Edge Seal Design (KE Series)

#### *Filter-Locking Mechanism — CM Series*

- Commercial gasketed filters are clamped securely with 1,400 pounds of force per filter using a spring-loaded top and bottom clamping mechanism.
- 300 series stainless steel construction is used with the exception of brass travel nuts to prevent galling.
- The filter-locking mechanism is actuated from outside the housing using standard tools.

#### *Bag-out Port*

- The change-out bag is safely secured around a porthole provided with smooth edges to prevent bag rupture.

#### *Removable Filter Access Door*

- Filters are easily accessed through a single neoprene gasketed door provided with four non-galling swing-away door clamps.

#### *Separate Pre-filter Door*

- Separate openings are provided to accommodate 2", 4" or 6" pre-filters, which permit changing of pre-filters without disturbing the critical HEPA or HEGA seals.
- Downstream contamination of the housing is prevented by locating the sealing surfaces on the upstream side of the filter.

#### *Construction*

- Stainless steel construction incorporating single piece front and back panels; limited number of seal welds means smooth internal surfaces to reduce the risk of leakage and accommodate decontamination.
- Welding is performed in accordance with Section IX of the ASME code.
- Housings are rated for 20" w.g. static pressure (both negative and positive).

#### *Filter Locking Mechanism — KE Series*

- Sealing of the filter elements is provided by 300 series stainless steel locking mechanisms.
- The locking mechanisms press and align the 3/4" wide fluid seal channel of the filter into a knife edge seal that is welded to the containment housing.
- This mechanism does not allow access door reinstallation if the filters have been incorrectly installed.

#### *Filter Change-out Accessories*

- The bag-out bags themselves are of 8 mil. PVC construction and are factory pressure-tested.
- An elastic shock cord is hemmed into the mouth of the bag for a positive fit when stretched over the collar of the porthole.
- A special sleeve to accommodate the stump from the old bag generated during the change-out procedure is formed into each bag.
- A safety strap is provided for operator security.
- Filter removal rods are provided as standard on two- and three-filter wide housings and are optional on one-filter wide housings. The rods are at the top and bottom of the porthole, and are accessed through the filter change-out bag. These rods are used to retrieve filter elements that cannot be easily reached.

#### *Pressure Testing*

- Each filter housing is factory pressure-tested to 20" w.g., the highest standard pressure rating in the industry.
- The maximum permissible leak rate per this specification is 0.2% of the housing volume per hour.
- The filter element sealing surface is also factory-tested by the pressure decay method.
- ASME-N510-1989 testing is available .

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### Available Options

**Side service housings** do not include the bag-in/bag-out feature, but retain all of the standard features and high quality of the CM-series (Gasket Seal) and the KE-series (Knife-edge Seal) housings that are designed to meet the requirements of ASME N509.

**Alternate door arrangements** allow for the locating of access doors on the right side, left side, or both sides of the housing. Door location is determined as right or left hand as viewed upstream of the housing and looking downstream. This permits access to filters and the filter removal rod from either side.

**A single-access door for the pre-filter and primary filter** is available with a common door servicing the pre-filter and the HEPA (or carbon) filters. While this is a more economical alternative, this arrangement does increase the potential risk of contamination by placing the sealing surface on the downstream side of the high-efficiency filter, thus exposing the entire filter element to the dirty air stream.

**An alternate exterior finish** is available as a glass-beaded finish.

**A removable and fully-gasketed weather cap** protects the entire top of the housing from accumulation of debris and water in outdoor installations. The material and finish are the same as the housing.

**Lifting lugs** can be attached to the top of each housing or bank of housings for ease of installation.

**Differential pressure gauges** are installed at each stage of filtration to monitor the pressure drop across particulate filters. They are also available with analog transmitters and adjustable pressure switches.

**Static pressure taps** can be provided across each stage of filtration for customer-supplied gauges or manometers.

**Tested seismic design** with supporting testing and documentation per ASME N510-1989, Section 10 or 12.

### System Integration

Containment Systems can be combined with air handlers fitted with heating/cooling coils (see picture on page 6).

**Inlet and outlet transitions** can be provided with flanges to attach directly to the customer's ducting.

**Test sections** are available. The filtration aerosol test housings offered are model TI (inlet), TC (combination), and TO (outlet). The test housings are designed and constructed to allow HEPA filter efficiency testing of each element per ASME N510-1989. We can provide a certified test report from an independent testing organization that states our test housings perform in accordance with customer-generated requirements.

**Venting filters** can be specified when the housing is supplied with isolation dampers. A small HEPA filter cartridge is used to equalize the pressure inside the housing with the ambient air during filter change-out.

**High-pressure housing designs** are available to withstand greater than 20" w.g. positive and negative pressures.

**Low-leakage or Bubble-tight isolation and/or control dampers** can be provided both upstream and downstream of the housing as part of a factory-installed and pressure-tested assembly.

**A filter change-out table** is available to expedite filter changing. The removable filter change-out table is designed to conveniently handle heavy carbon filters.

**Carbon Adsorbers** are fabricated by the only manufacturer of containment systems with 80+ years of carbon filtration experience. We have the technical staff to properly assess your application and apply the most cost-effective solution. We are uniquely qualified to offer this level of carbon application experience.

**DMMP qualified adsorber** filters are specifically designed for critical applications where Best Available Control Technology (BACT) is required.

**Drilled and reinforced flanges** for bolted duct connections.

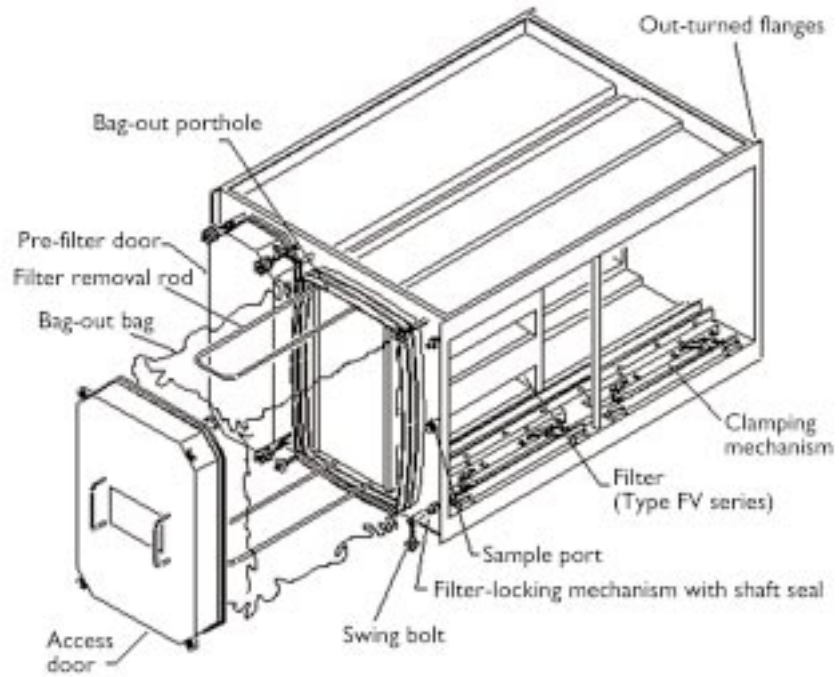
**Mounting bases and skids** are available.

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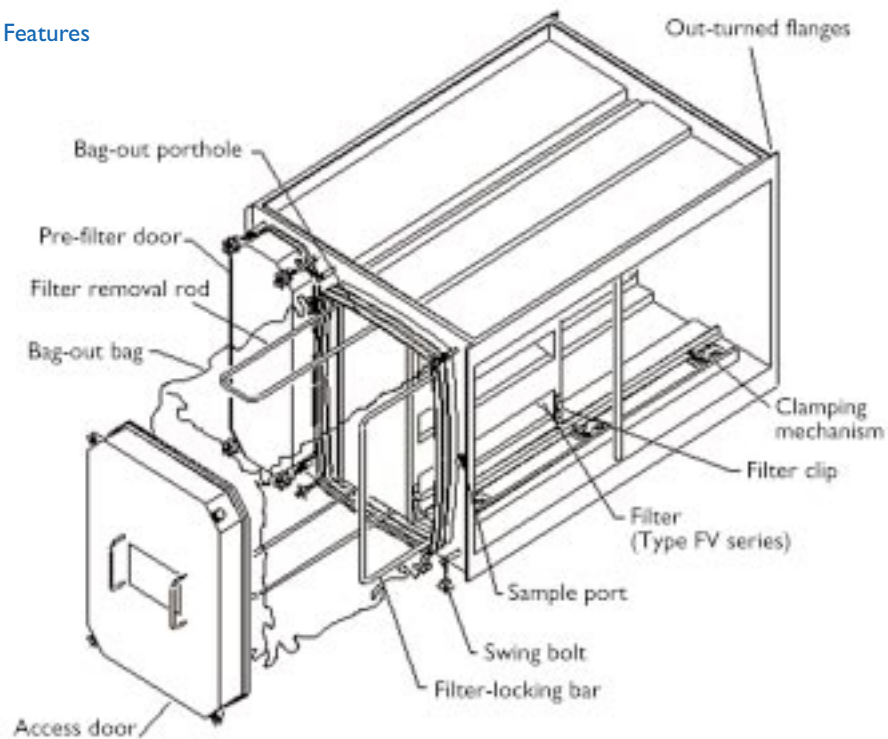
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## Modular Base Design

### CM Housing Standard Features



### KE Housing Standard Features



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## Containment Systems



### Applications:

War gas destruction off-gas treatment

### Location:

Arkansas, USA

### Equipment:

Blower, pre-filter, HEPA, DMMP carbon tray, test section, transitions



### Applications:

Prison collective protection

### Location:

Indiana, USA

### Equipment:

Blower, pre-filter, HEPA, DMMP carbon tray, test section, transitions



### Applications:

Biotechnology research laboratory facility

### Location:

Virginia, USA

### Equipment:

Bubble-tight damper, pre-filter, test section, refillable carbon tray, transitions



### Applications:

Collective protection system

### Location:

Maryland, USA

### Equipment:

Blower, pre-filter, refillable DMMP carbon tray, test section, transitions



### Applications:

Hospital lab hood exhausts

### Location:

Texas, USA

### Equipment:

Pre-filter, HEPA filter, and HEPA filter with type 787 carbon for control of radioactive isotopes

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## Radial Flow (Round) Military NBC Filtration

### Applications:

Military war gas air filtration

### Location:

Kentucky, USA

### Equipment:

Radial flow DMMP air filtration system combined with an air handler and blower sections



18,000 cfm



Control panel



24,000 cfm

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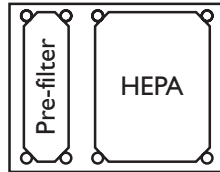
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# CUSTOM CONTAINMENT FILTRATION SYSTEMS

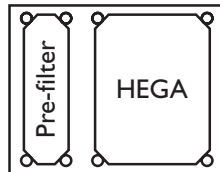
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## Containment Systems Custom Engineered From Modular Design

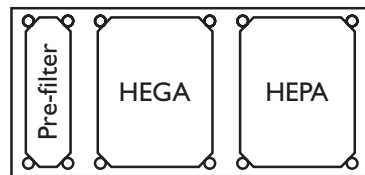
Containment system configurations can be customized to meet customer requirements. Below are typical configurations as they apply to several types of filtration applications.



Hood or process streams containing particles only

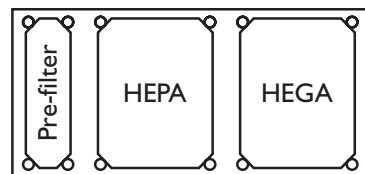


Exhaust stream with vapor phase contaminants only

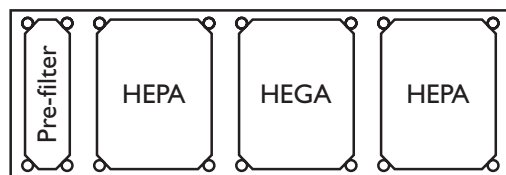


Intake and recirculating applications where both particulates and vapor phase contaminants are to be removed

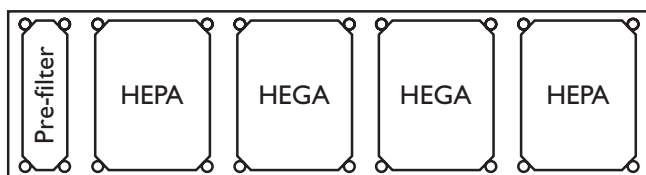
Direction of Airflow →



In exhaust applications where both particulates and vapor phase contaminants are to be removed, the HEGA is placed last to protect the carbon from particulates



Removal of particulates and vapor phase contaminants from intake air when recirculating into a controlled space



Removal of particulates and vapor phase contaminants from intake air; when recirculating into a controlled space in critical situations and a redundant HEGA is required

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## Containment Systems Model Nomenclature

**CMP 3S - 1 - 1 x 1 - R - 2/12**  
**A B C D E F G**

**A** **CM** gasket seal - no pre-filter  
**CMP** gasket seal with separate pre-filter door  
**KE** fluid seal - no pre-filter  
**KEP** fluid seal with separate pre-filter door  
**SS** gasket seal side service - no pre-filter  
**SSP** gasket seal side service with separate pre-filter opening  
**SK** fluid seal side service - no pre-filter  
**SKP** fluid seal side service with separate pre-filter opening

**B** **3S** type 304 stainless steel  
**3L** type 304L stainless steel  
**6S** type 316 stainless steel  
**6L** type 316L stainless steel

**C** Number of modules in entire series (1 and higher)

**D** Number of modules high (1 and higher)

**E** Number of modules wide (1 through 6)

**F** **R**ight or **L**eft hand orientation. More than 3 wide housings will have access doors on both sides.

**G** **2/12** 12" deep filter section with 2" pre-filter located in a separate pre-filter door  
(use for CMP, KEP, SSP and SKP only)  
**4/12** 12" deep filter section with 4" pre-filter located in a separate pre-filter door  
(use for CMP, KEP, SSP and SKP only)  
**6/12** 12" deep filter section with 6" pre-filter located in a separate pre-filter door  
(use for CMP, KEP, SSP and SKP only)  
**12/2** 12" deep filter section with 2" pre-filter mounted in the clamping track (CM and SS only)  
**12** 12" deep filter section  
**16** 16" deep filter section  
**18** 18" deep filter section  
**TS** test section  
**SC** scan section

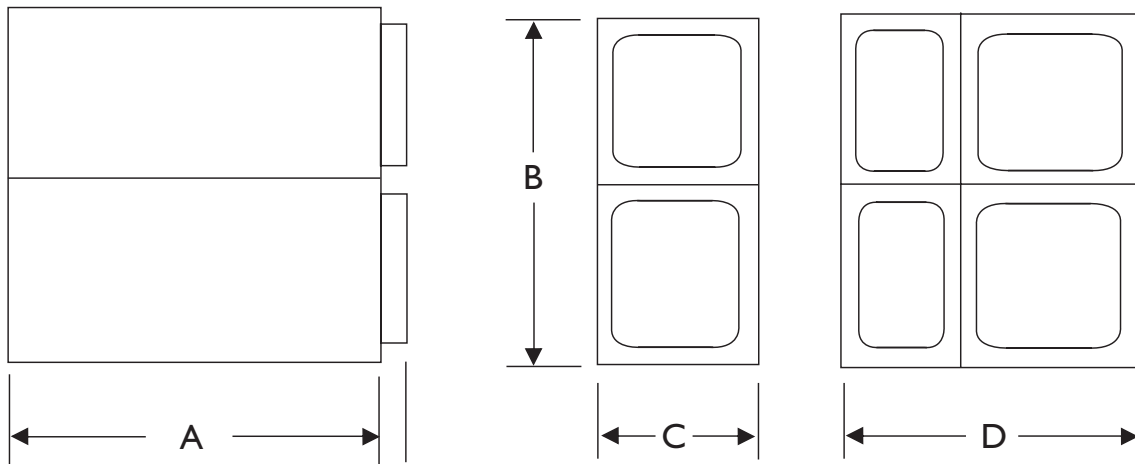
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## Dimension Table

### CM and KE - Standard Housing

Filter Arrangement HxW	A	B	C - CM/KE		D - With pre-filter			Approximate Shipping Weights (lbs.)														
			11 1/2" Filter	16"-18" Filter	Test Section	11 1/2" Filter	16"-18" Filter	11 1/2" Filter	16"-18" Filter	11 1/2" Filter	16"-18" Filter	Test Section										
1x1	27	30"	CM	CM	26"	38"	44"	150	170	186	206	130										
1x2	51							235	255	285	305	215										
1x3	75							320	340	382	402	295										
2x1	27	60"						KE	KE	26"	38"	44"	300	340	372	312	260					
2x2	51												470	510	570	610	430					
2x3	75												640	680	764	804	590					
3x1	27	90"											KE	KE	26"	38"	44"	450	510	558	618	390
3x2	51																	705	765	855	915	645
3x3	75																	960	1,020	1,146	1,206	885
4x1	27	120"	KE	KE	26"	38"	44"											600	680	744	824	520
4x2	51																	940	1,020	1,140	1,220	860
4x3	75																	1,280	1,360	1,528	1,608	1,180



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### Suggested Specifications for CM/KE Containment Housings

The filter housing shall be model CM. The top and bottom panels shall be manufactured from a minimum 14-gauge type 304 stainless steel. The front and back panels shall be each constructed from a single sheet of 11-gauge type 304 stainless steel. (Type 304L, 316, 316L and other stainless steels are also available.) All stainless steel sheet products shall have a 2-B mill finish. Each housing shall be a side service bank type arrangement. Welding shall be in accordance with applicable criteria of Section IX of the ASME Boiler and Pressure Vessel Code. The filter housings shall be designed in accordance with applicable sections of ASME AG-1 and ASME N509-1989, and to withstand an internal and external differential pressure of 20" w.g.

The filter housing pressure boundary shall undergo factory testing per ASME-N510-1989 to a minimum of 10" w.g., as specified in Table 4.5 of ERDA 76-21, Nuclear Air Cleaning Handbook. The maximum permissible leak rate per this specification is 0.2% of the housing volume per hour. The filter element sealing surface shall also be factory-tested by the pressure decay method as specified in ASME N509-1989, Table 4.4.

#### CM Series

The sealing action for the filter elements shall be provided by top and bottom-locking mechanisms. The locking mechanisms shall be spring-loaded to exert a minimum sealing force of 1,400 lbs. per filter over a minimum of 80% of the gasket surface filter element. The mechanism shall apply an even, uniform load along at least 80% of the top and bottom of each filter frame. The locking mechanism shall be located downstream of the filter elements and operated from the outside of the housing. All mechanical components of the filter-locking mechanism shall be stainless steel except for the brass travel nut.

or

#### KE Series

The sealing action for the filter elements shall be provided by top and bottom-locking mechanisms operated from a single handle. The locking mechanisms shall displace the filters toward a knife edge attached to the containment housing. The mechanism shall provide uniform displacement that will insure alignment of the filter gel seal and the housing knife edge. The locking mechanism bar shall also provide a device that will not allow the door to be installed on the containment housing unless the filters have been correctly installed and the gel seal initiated. The locking mechanism shall be located downstream of the filter elements. All mechanical components of the filter-locking mechanism shall be stainless steel and removable.

The housing shall have a removable access door for each tier and filtration stage. The housing shall have a separate access door for the pre-filter. There shall be four access door retainers which secure each door in place. The door retainers shall swing away from the access door to allow for easy removal of the access door. All parts of the door retainer mechanism shall remain attached to the housing when the access doors are removed. The access door seal shall be a continuous extruded neoprene gasket securely attached to the door lip. The neoprene access door gasket shall seal against the front panel of the containment housing.

Housings with two or more filter elements per tier or stage shall have a filter removal rod that will allow the operator to draw the filters toward the opening to facilitate bagging out. The filter removal rod shall be designed so that the containment is maintained while the filters are being drawn toward the opening.

The proper size bag-out bag shall be provided for each access door. Each bag shall be 0.008" thick poly-vinyl chloride plastic with an elastic retaining cord located at the mouth. Glove sleeves shall be incorporated into the bag to facilitate filter element removal. Each bag shall be provided with a nylon security strap and a separate holding strap. Each bag shall be individually tested and clearly marked with the bag stock number.

# CUSTOM CONTAINMENT FILTRATION SYSTEMS

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## System Components



HEPA and ULPA



Disposable Filters



Bubble-Tight Dampers



Control Panels



Refillable Trays



Activated Carbon



Gauge Panels



Blowers / Fans



Engineering



Technical Support



Media Service



Field Service

Visit our website at [www.calgoncarbon.com](http://www.calgoncarbon.com)



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