PROTECT HIGH FLOW VS

Carbon Adsorption Canisters

Emisssion Control Unit

Description

Calgon Carbon Corporation's PROTECT High Flow VS (HFVS) vapor phase carbon adsorber canisters are air or vapor treatment emission control units that can treat a wide range of emission rates and contain up to 3,000 pounds of activated carbon, but with the convenience of an economical canister. HFVS canisters contain all of the operating elements required for utilization of granular activated carbon in air or vapor treatment, including a flat carbon bed support across the entire bed cross sectional area and plenum area below this support for effective air introduction and distribution across the bed. The canisters are constructed of carbon steel with an internal epoxy coating and a stainless steel screen bed support for use with activated carbon in air treatment.

The HFVS vapor phase carbon adsorber canisters are available in 4 sizes that can contain up to 3,000 pounds of granular activated carbon for treating air or vapor sources typically up to 3,000 cfm. The HFVS canisters can be used in operating pressures up to 3 psi, but are not recommended for vacuum service.

The HFVS vapor phase adsorbers can be provided with any of Calgon Carbon's wide variety of vapor phase activated carbon products. Commonly used is AP4-60, which is a 4mm pelletized activated carbon with a Carbon Tetrachloride Number of 60 for higher purity air or vapor, or optimal usage for low levels of organic contamination. Also commonly used is our VPR quality controlled reactivated grade vapor phase carbon for an economical and sustainable solution.

The vapor phase carbon in the HFVS vapor phase adsorber canister can be easily removed and a fresh charge installed for economical operation and quick turnaround to keep the emission control units on line.

Features

The HFVS vapor phase carbon adsorber canisters offer several important features that make it an effective value driven option for many applications:

- Square or rectangular design optimizes space requirements for canisters
- Delivered with GAC installed for rapid installation and startup
- Capable of operating up to 3 psig which will manage most vent or exhaust fan situations.
- Interior carbon steel epoxy coated
- Exterior painted with a durable epoxy finish
- Operating temperature up to 140°F with excursions to 200°F
- Top 20 inch diameter access port for activated carbon media fill and removal
- Bottom fork guides for portability
- Carbon bed support across the full canister cross sectional area, consisting of 20 mesh type 316 stainless steel screen placed on steel grating for vapor distribution across the entire bed for maximum activated carbon utilization and low pressure drop.

Safety Message

Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

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Specifications	PROTECT HIGH FLOW VS
Canister	Sturdy carbon steel canister with 3/16" thick steel side shell and 3/16" steel flat bottom and top heads
Pressure	Recommended 3 psig maximum operating pressure
Vacuum	Not rated or recommended for operation under vacuum
Temperature	Maximum continuous operation at 140°F; but with excursions to 200°F maximum
Internal Coating	Epoxy coating of all carbon steel surfaces
External Coating	Gray epoxy
Inlet (bottom side)	6"-14" plate flanges drilled to ANSI 150 lb bolt pattern (refer to chart for sizes for each Model)
Inlet distributor	Stainless steel screen bed support on epoxy coated carbon steel grating
Outlet (top side)	6"-14" plate flanges drilled to ANSI 150 lb bolt pattern (refer to chart for sizes for each Model)
Drain (on bottom)	½" FPT coupling with ½" threaded plug
Access Port	20" diameter access port with bolted cover (16 threaded bolts)
Dimensions	Refer to Model chart

Installation

HFVS canisters are shipped ready for installation with the dry activated carbon pre-filled in the unit. The canisters are self supporting and should be set on a level, accessible area as near as possible to the emission source. Standard installation does not utilize any anchoring devices. Installation is simple, requiring a flexible hose, duct or pipe to connect the vent or emission source to the flanged bottom inlet of the canister.

The HFVS canister's treated air discharge is a flanged connection on the upper side of the vessel and can be left open or equipped with flexible hose, duct or pipe to direct the treated air to a desired discharge point. If the canister is located outside, and to be vented directly, then a U-shaped outlet pipe or rain hat (such as a pipe tee) is recommended to be installed to prevent precipitation from entering the unit.

The recommended air flows for the HFVS canisters are listed in the table. If higher flows are anticipated, then either a larger canister should be utilized or two or more HFVS canisters should be placed in parallel operation.

The recommended maximum ratings should not be exceeded, as the canister could be irreparably damaged.

HFVS canisters can be used to treat vents directly from storage tank or other process vessels. The motive force for the air or vapor can be produced by either a blower or by using the positive pressure inside the tank or process vessel. In many cases, the pressure or surge of pressure within the tank or vessel is sufficient to overcome the pressure drop across the canister, thus eliminating the need for a blower. Please consult the pressure drop data in this bulletin for more information.

When HFVS canisters are used to control vapors from organic solvent storage tanks, refer to the typical installation drawing in the bulletin and the following recommended precautions:

- A safety relief valve must be provided on the storage tank. This protects the storage tank should the canister become plugged or blocked in any fashion. Such a vent would open in an emergency situation, thereby relieving pressure within the storage tank.
- Under appropriate conditions, a flame arrestor and/or backflow preventer must be installed as shown in the typical installation drawing. This prevents backflow of air through the canister when the storage tank is being emptied.
- High organic compound concentration in the vented air or vapor – defined as being greater than 0.5 to 1.0 volume % - may cause an elevated heat of adsorption in the carbon bed. This effect can be dissipated by pre-wetting the carbon to provide a heat sink, adding dilution air to the vented air or vapor to reduce the concentration, or by adding water spray to the vented air or vapor to provide an ongoing heat sink.

If HFVS canisters are used to control organic compound emissions from air-strippers, soil venting or other high moisture content air or vapor streams, then it is recommended that the humidity in the air stream be reduced to under 50%. High humidity may cause water vapor to condense within the carbon pores, filling the pores with water and preventing the air or vapor with organic contamination from accessing the internal surface of the activated carbon where adsorption takes place. Therefore, lower humidity will optimize the adsorptive capacity of the activated carbon. Also, for applications that may carry condensed water, it is recommended to install a drain or condensate trap on the inlet duct or piping.

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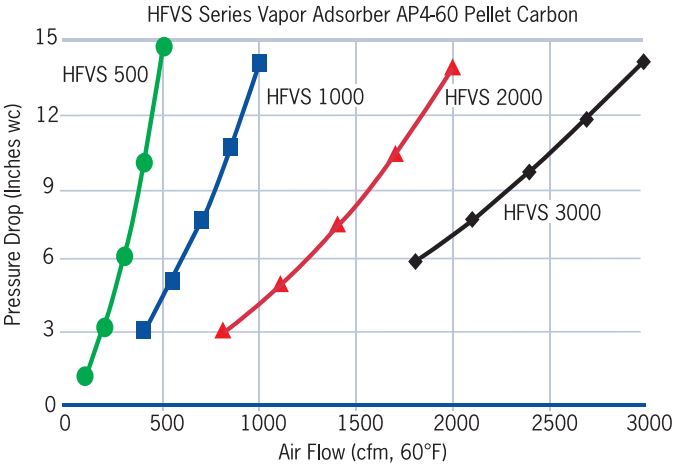
Pressure Drop

Pressure drop through a HFVS canister is a function of the process air flow as shown in the graph. If higher flows or lower pressure drop is needed, multiple canisters can be installed in parallel operation. The maximum pressure in the canister should not exceed 3 psig, regardless of the pressure drop across the unit.



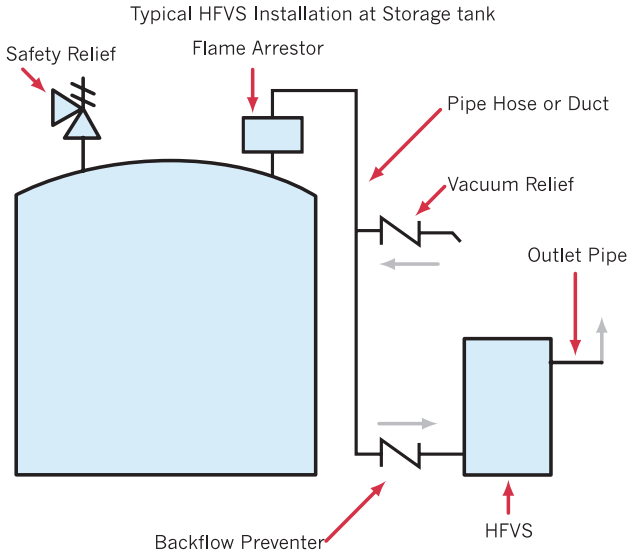
Carbon Exchange or Replacement

When the treated air or vapor exceeds the desired contaminant concentration, the granular activated carbon in the HFVS canister should be replaced with fresh activated carbon. The canister is to be isolated from the process by either closing and locking the inlet and outlet valves, or physically disconnecting the canister from the inlet and outlet pipe or hose. The carbon exchange procedure can either take place where the canister is installed, or the disconnected canister can be moved to another location for this activity.

The spent granular activated carbon can be removed by using a vacuum media removal procedure through the top access port. Fresh granular activated carbon can be filled using bags or

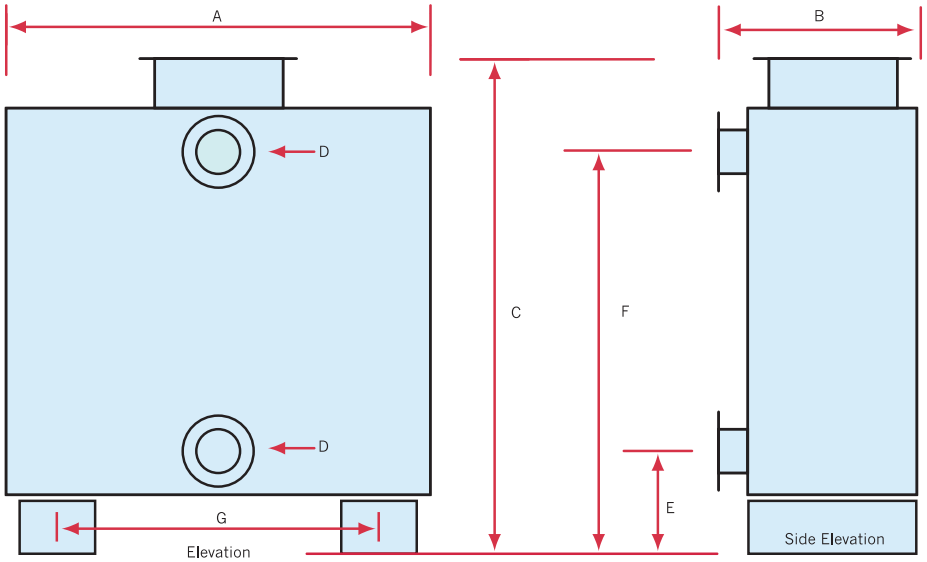
Calgon Carbon Air Purification Systems

The HFVS canister is designed for a variety of air or vapor applications at air flows up to 3,000 cfm and pressures up to 3 psi. Calgon Carbon Corporation offers a wide range of carbon adsorption systems and services for a range of air or vapor flow rates and pressures to meet specific applications.



"supersacks" by loading into the canister through the top access port. After the carbon is installed, the surface of the bed should be leveled using a rake or similar device. Once the fresh carbon is installed, the access port securely closed, and the inlet and outlet connections are reestablished, follow the procedures under the Installation section.

Contact Calgon Carbon Corporation for resupply of the carbon products for effective air or vapor treatment. Calgon Carbon Corporation can also provide complete turnkey services, including removal and management of the spent carbon and refilling the canister with the fresh carbon.



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Model Information

Model Number	HFVS 500	HFVS 1000	HFVS 2000	HFVS 3000
GAC or media volume (cu ft)	18	36	72	108
GAC amount (pounds)	500	1,000	2,000	3,000
Recommended max flow rate (cfm)	500	1,000	2,000	3,000
Weight, empty (pounds)	600	1,000	1,700	2,500
Approximate operating weight (pounds)	1,100	2,000	3,700	5,500
Cross sectional area (square feet)	6	12	24	36
Width of front side (A) in.	36	45	72	72
Depth of side including nozzle (B) in.	27	42	51	75
Overall Height (C) in. (approx)	66	68	76	79
Inlet /Outlet (D) 150# flange drilling	6	8	12	14
Height to inlet (E) in. (approx)	10	10	11.5	12.5
Height to outlet (F) in. (approx)	57.25	58.25	64.375	67
Width of Forkguides (G) in.	24	24 / 67	24 / 67	24 / 67

Safety Considerations

While complying with the recommended installation instructions, plant operators should also be aware of these additional heat-related safety considerations:

- When in contact with activated carbon, some types of organic chemical compounds, such as those from the ketone and aldehyde families and some organic acids or organic sulfur compounds, may react on the carbon surface causing severe exotherms or temperature excursions. **If you are unaware or unsure of the reaction of an organic compound on activated carbon, appropriate tests should be performed before placing a HFVS canister in service.**
- Heat of adsorption can lead to severe temperature excursions at high concentrations of organic compounds in the inlet air or vapor. Heating may be controlled by diluting the inlet air or adding water vapor as a heat sink, by time weighting the inlet concentration to allow heat to dissipate, or by pre-wetting the carbon.
- **Do not use HFVS canisters with ST1-X carbon in petrochemical or chemical industry applications.**
- ST1-X carbon can liberate heat by reacting chemically with oxygen. To prevent heat buildup within a canister, the carbon must not be confined without adequate air flow to dissipate the heat. In situations where there is insufficient or disrupted air flow through the vessel, the chemical reaction can be prevented by sealing the inlet and outlet connections to the canister.

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