PROTECT VS
Carbon Adsorber Canisters

Description

The PROTECT VS vapor phase carbon adsorber canisters are air or vapor treatment units that can treat higher flow rates or contain larger beds of activated carbon, but with the convenience of an economical canister. PROTECT VS 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 unlined carbon steel with a stainless steel screen bed support for use with activated carbon in air treatment.

The PROTECT VS vapor phase carbon adsorber canisters are available in 3 sizes that can contain up to 8,000 pounds of granular activated carbon for treating air or vapor sources typically up to 4,500 cfm. The PROTECT VS canisters can be used in operating pressures up to 1 psi and a moderate vacuum of up to 5 inches Mercury.

The PROTECT VS vapor phase adsorbers can be provided with any of Calgon Carbon's wide variety of vapor phase activated carbon products that can be selected for a specific air or vapor treatment application. Most commonly used are Type AP4-60 grade virgin activated carbon, 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, or Type VPR quality controlled reactivated grade vapor phase carbon for a more economical carbon product for general air treatment.

Features

The PROTECT VS vapor phase carbon adsorber canisters offer several important features that make it an effective value driven option for many air or vapor phase treatment applications:• Sturdy carbon steel construction

- Sturdy carbon steel construction
- Capable of operating up to 1 psig which will manage most vent or exhaust fan situations.
- Exterior painted with a durable urethane finish
- Operating temperature up to 200 degrees F
- Top 16 inch diameter access port for activated carbon media fill and removal
- 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.
- Top lifting lugs and bottom fork guides for portability

Specifications

Canister	Sturdy carbon steel canister with ¼" thick steel shell and ¼" steel flat bottom and top heads (⅜" thickness for Model VS-8)
Pressure	Recommended 1 psig maximum operating pressure (shop hydrotested in excess of recommended pressure)
Vacuum	Recommended maximum 5" Hg vacuum operation
Temperature	Recommended 200˚F (max)
Internal Coating	None – unfinished steel
External Coating	Direct-to-Metal polyurethane
Inlet (bottom side)	6"-12" RF weld neck 150# flange (refer to chart for sizes for each Model)
Inlet Distributor	Stainless steel screen bed support on galvanized steel grating
Outlet (top side)	6"-12" RF weld neck 150# flange (refer to chart for sizes for each Model)
Drain (2 on bottom)	¾" FPT coupling with ¾" threaded plug
Access Port	16" diameter access port with threaded clamp ring and BUNA-N gasket.
Dimensions	Refer to Model Chart

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Installation

PROTECT VS canisters are shipped ready for installation with the dry activated carbon fill installed 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 PROTECT VS 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 flow for the PROTECT VS canisters are listed in the table. If higher flows are anticipated, then either a larger canister should be utilized or two or more PROTECT VS canisters should be placed in parallel operation.

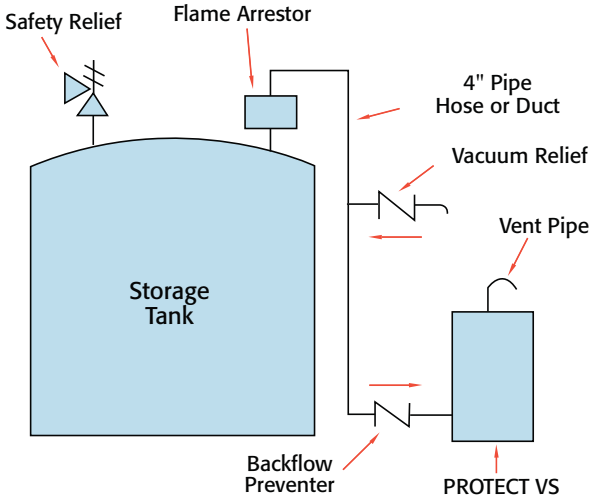
The recommended maximum static pressure and vacuum capabilities are also listed. These ratings should not be exceeded, as the canister could be irreparably damaged.

PROTECT VS 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 PROTECT VS 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.

Typical Protect VS Installation at Storage Tank



If PROTECT VS 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.

Carbon Exchange or Replacement

When the treated air or vapor exceeds the desired contaminant concentration, the granular activated carbon in the PROTECT VS 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 "supersacks" by loading into the canister through the top access port. Refer to the table for the recommended amount of carbon to be used. Once the fresh carbon is installed and the bed leveled, 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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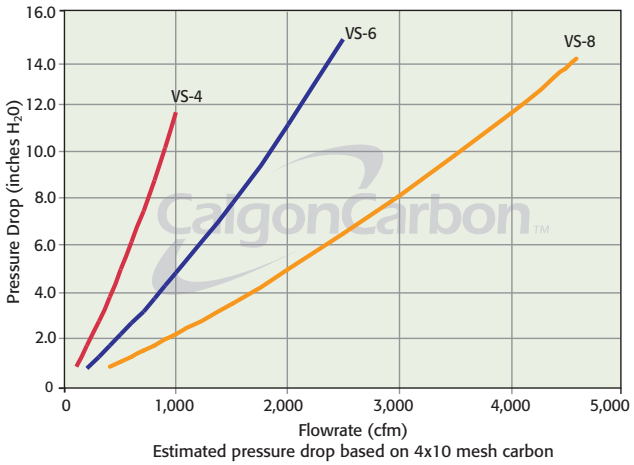
Pressure Drop Curve

Pressure drop through a PROTECT VS 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 1 psig, regardless of the pressure drop across the unit.

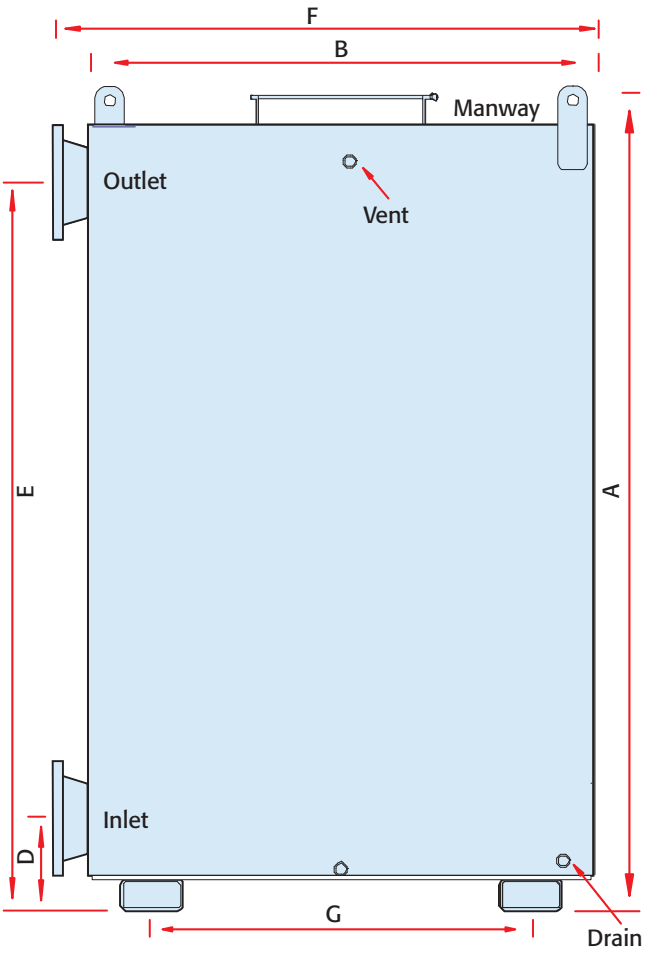
Pressure Drop Curve



Estimated pressure drop based on 4x10 mesh carbon

Calgon Carbon Air Purification Systems

The PROTECT VS canister is designed for a variety of air or vapor applications at air flows up to 4,500 cfm and pressures up to 1 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. Contact Calgon Carbon for resupply of the carbon products for effective water treatment. Calgon Carbon can also provide complete turnkey services, including removal and management of the spent carbon and refilling the unit with the fresh carbon.



Model Information

Model Number	VS 4	VS 6	VS 8
GAC or media volume (cu ft)	72	180	288
GAC amount (pounds)	2,000	5,000	8,000
Recommended max flow rate (cfm)	1,100	2,500	4,500
Weight, empty (pounds)	1,760	3,340	4,900
Approximate operating weight (pounds)	3,760	8,340	12,900
Cross sectional area; square feet	16	36	64
Overall Height (A) in. (approx)	78	103	103
Width of side (B) in. +/- ¼"	49	73	97
Inlet /Outlet (C) 150# RF flange	6	8	12
Height to inlet (D) in. (approx)	8	10	13
Height to outlet (E) in. (approx)	70	92.5	89
Length including inlet/outlet flanges (F) +/-	52	77	101
Width of Forkguides (G) in	36	48	48

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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 PROTECT VS 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 PROTECT VS 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.

Safety Message

Activated carbon will preferentially remove oxygen from air. In closed or partially closed containers or vessels, oxygen depletion may reach hazardous levels. If workers are to enter a container or vessel containing activated carbon, appropriate air sampling and work procedures for potentially low oxygen content spaces should be followed, including all applicable Federal and State requirements.

Warranty

Calgon Carbon Corporation warrants that the PROTECT VS canister will be free from defects in materials and workmanship for a period of 90 days following the date of purchase. In the event of a breach of this warranty, Calgon Carbon Corporation will, in its discretion, repair or replace any defective parts or the complete unit during the warranty period. This warranty does not apply to defects caused by (i) normal wear and tear, (ii) accident, disaster or event of force majeure, (iii) misuse, fault or negligence of or by Buyer, (iv) use of the PROTECT VS canister in a manner for which it is not designed, (v) external causes such as, but not limited to, power failure or electrical power surges, or (vi) improper storage and handling of the PROTECT VS canister. **Except as expressly provided in this warranty statement, Calgon Carbon Corporation disclaims all other warranties, whether express or implied, oral or written, including without limitations all implied warranties or merchantability or fitness for particular purpose. Calgon Carbon Corporation does not warrant that the PROTECT VS canisters are error-free or will accomplish any particular result. Any advice or assistance furnished by Calgon Carbon Corporation in relation to the PROTECT VS canister provided for hereunder shall not give rise to any warranty or guarantee of any kind. This warranty will take precedence over any and all other warranties unless specifically disclaimed and referenced by Calgon Carbon Corporation.**

Limitations of Liability

Carbon Carbon Corporation' liability and the Buyer's exclusive remedy for any cause of action arising out this transaction, including, but not limited to, breach of warranty, negligence and/or indemnification, is expressly limited to a maximum of the purchase price of the canister sold hereunder. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. Under no circumstance shall Calgon Carbon Corporation be liable for any incidental, consequential, punitive, exemplary, or special damages of any kind arising as a result of or in connection with the PROTECT VS canisters regardless of the cause giving rise to any claim. Nor shall Calgon Carbon Corporation be liable for loss of profits or fines imposed by governmental agencies. In no event shall Calgon Carbon Corporation's liability exceed the purchase price paid by purchaser, for any reason, whether by reason of breach of contract, tort, indemnification, warranty or otherwise. This limitation of liability statement will take precedence over any and all other liability provisions unless specifically disclaimed and referenced by Calgon Carbon Corporation.

Making Water and Air Safer and Cleaner

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