

CleanAIR PERMIT™ Filter

For Stationary Engines

The PERMIT™ Advantage:

- Works with All Diesel Engines
- Passive Regeneration with Wall-Flow Ceramic Filter Design
- Reduces Diesel Particulate Matter by Greater than 85%
- Reduces Carbon Monoxide (CO) and Hydrocarbons (HC) by up to 99%
- Available as Standard Filter Design, Filter/Muffler Design, or Filter/Silencer Design
- Available with V-Clamp or Welded Design
- All Stainless Steel Construction

Applications:

- Generator Sets
- Pumps

The CleanAIR™ Difference:

- CARB Verified for emergency and prime power stationary engines
- Custom Engineering and Design
- Integrated Manufacturing
- Product Optimization for Space Availability
- 304L Stainless Steel Housing
- Durable Product Manufacturing for Operation Under Extreme Conditions

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CleanAIR
SYSTEMS

The CleanAIR PERMIT™ Filter – Catalyzed Particulate Filter for Stationary Engines

The [CARB verified](#) PERMIT™ Filter for diesel engines is designed to reduce [diesel particulate matter \(PM\)](#), [carbon monoxide \(CO\)](#) and [hydrocarbons \(HC\)](#). Applications for the PERMIT™ Filter include stationary diesel engines used for power generation and water pumps, as well as on-road and off-road equipment.

The wall-flow filter is coated with a unique, high performance catalyst and housed within a stainless steel canister. The PERMIT™ Filter is available in standard designs, muffler combination, and silencer configurations (for critical sound attenuation). In many large diesel engine applications, multiple PERMIT™ Filters are integrated into a silencer which can take the place of a standard exhaust silencer.

How the PERMIT™ Filter Works

The wall-flow design of the CleanAIR PERMIT™ Filter captures [diesel PM](#) as soon as the engine is started and continues through operation, dramatically reducing PM and visible black smoke.

Due to the PERMIT™ Filter's unique catalyst incorporated within the wall-flow filter, the captured PM is then oxidized into CO₂ while the engine is operating. This results in a [self-cleaning \(or regenerating\) filter](#) without the need for manual intervention. Regeneration is dependent upon exhaust temperature and fuel sulfur level. Also, emissions of carbon monoxide and hydrocarbon are significantly reduced when exhaust gases interact with the filter's unique catalyst.

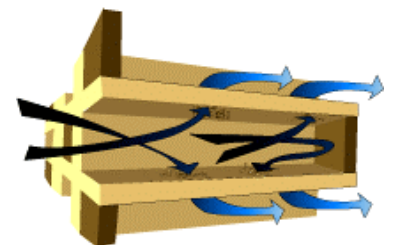
The easy-to-install, CARB verified CleanAIR PERMIT™ Filter works with all diesel engines and [diesel fuels](#) for compliance with air quality regulations.



The PERMIT™ Filter/Silencer Unit manufactured by CleanAIR Systems utilizing an innovative light-weight design made with corrosion-resistant stainless steel.



PERMIT™ Filter/Silencer Unit Installed on Diesel Back-up Generator



Exhaust Flow of PERMIT™ Filter

Emissions Reduction Summary

Control Technology	Fuel	CO	HC	PM
PERMIT™ Filter for Stationary Engines	ULSD (< 15 ppm S)	Up to 99%	Up to 99%	Over 85%
	LSD (< 500 ppm S)	Up to 99%	Up to 99%	Varies with fuel and engine
	HSD (> 500 ppm S)	Up to 99%	Up to 99%	Varies with fuel and engine
	Biodiesel (<15 ppm S)	Up to 99%	Up to 99%	Over 85%

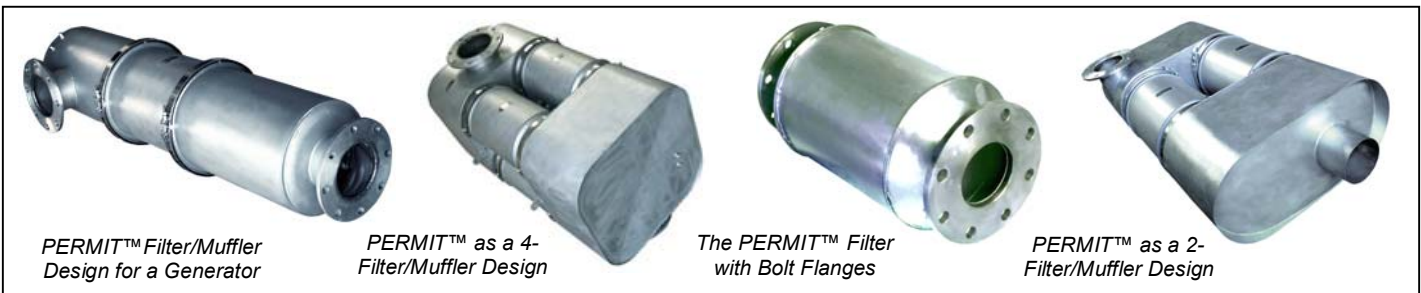
Results are fuel dependent and may vary with application.

PERMIT™ Filter Package Designs for Stationary Engines

The CleanAIR Systems' PERMIT™ Filter is packaged in a 304L stainless steel shell and finished by bead blasting to give a highly corrosion-resistant product that will last for years. The packaged filter can be incorporated into many different configurations depending upon the application requirements. The most basic configuration is a packaged filter with cones on both inlet and outlet ends. Typical sound attenuation for this design is 12 dBA.

Replacement muffler designs are used for applications where space is too tight to add the filter separate from the existing muffler. Special inlet or outlet configurations and brackets can be used on the PERMIT™ Filter/Muffler combination that will allow the filter to replace an existing muffler. Typical sound attenuation for this design is 15-20 dBA.

A filter/silencer replacement design is available for applications that require higher levels of sound attenuation or that require multiple PERMIT™ Filters. The corrosion-resistant stainless steel shell has a removable panel allowing full access to the filters mounted inside. The PERMIT™ Filter/Silencer is available in several sound reduction levels.



PERMIT™ Filter/Muffler Design for a Generator

PERMIT™ as a 4-Filter/Muffler Design

The PERMIT™ Filter with Bolt Flanges

PERMIT™ as a 2-Filter/Muffler Design

**HiBACK USB™
Data Logging and Alarm System**

The [HiBACK USB™](#) is a microprocessor-based data logger and alarm system used in conjunction with the CleanAIR PERMIT™ Filter System as both an alarm and a data logger to record time, backpressure and temperature data. The [HiBACK USB™](#) unit can warn the operator of possible problems with excessive backpressure, can track the duty cycle of the engine and allow analysis for operation time, exhaust temperature and backpressure profiles. Data collected by the [HiBACK USB™](#) can be downloaded to a computer for detailed analysis using optional software. (Optional software sold separately. The HiBACK USB™ is required for warranty of the PERMIT™ Filter.)



Silencer Type	Typical Attenuation
Industrial Grade	22 – 29 dBA
Critical Grade	27 – 35 dBA
Super Critical Grade	30 – 38 dBA

Inside view of Filter/Silencer Design Using PERMIT™ Filters



**How Sulfur in Fuel Affects
The PERMIT™ Filter Performance**

The PERMIT™ Filter is designed to operate on fuel sulfur content as high as 8000 ppm. However, maximum performance is achieved when [low sulfur fuels](#) are used.

Sulfur Content by Weight	Regeneration Temp.	% Run Time Required
< 15 ppm	280° C (536° F)	>30%
< 500 ppm	360° C (680° F)	>30%
> 500 ppm	390° C (734° F)	>30%