

# Mixing Venturi VMI-350

## For Mixing Air and Fuel to Gas Engines

- Precision control device
- Replaces carburetor
- Consistent fuel pressure at all loads
- Mixes fuel-air
- No moving parts
- Reduced maintenance
- Reduced emissions
- Superior mixing
- Load sensing
- Less pressure drop
- Reduced fuel consumption

### GENERAL DESCRIPTION

The Mixing Venturi is a device designed to precisely mix the fuel and air to be admitted to gas engines. The Venturi also measures the air flow to the engine. It is used with the ECV5 Emissions Control Valve to replace the carburetor and pressure regulator on both Rich-Burn and Lean-Burn gas reciprocating engines.

The VM-350 Mixing Venturi and the ECV5 can be used with any single- or dual-bank natural gas engine in any application where one or more carburetors are used to meter fuel. The fuel metering is very precise in the Venturi, which means engines using two or more carburetors can be balanced to provide the same air-fuel mixture from two or more Venturies. The ECV-5 Emissions Control Valve is used with an appropriate O2 sensor to precisely control the fuel mixture for compliance with the emissions regulations.

### APPLICATIONS

**RICH-BURN ENGINES** — The combination of the Venturi and the ECV5 constitutes a true electronic carburetor for natural gas engines, and when used with an O2 sensor in the exhaust, it is an ideal device to maintain a Stoichiometric fuel mixture required for use with a 3-way catalytic converter.

**LEAN-BURN ENGINES** — The ECV5 and Venturi are also for use with lean-burn engines. In this application, a wide range O2 sensor is used with the ECV-5 and the Venturi to maintain a constant lean mixture, or Lambda. The mixture can be programmed to change with the load signal if required. The wide range O2 sensor is provided by CCC as a part of the system.

### WHY IT WORKS SO WELL

Most carburetors include an air/fuel mixing section that is comprised of a spring mass diaphragm actuator which has the potential to create unstable engine performance due to interaction with the upstream pressure regulator. Mixtures in these carburetors between idle and full-load are controlled by the shape of the gas metering valve. These fuel valves that are included in the carburetor are designed to produce lean mixtures at light loads and increasingly rich mixtures at heavier loads and higher engine speeds. This fuel profile (lean to rich) will cause any air fuel controller that is controlling simply on the oxygen sensor, to constantly chase load changes. By replacing the carburetor with the Venturi Mixer, the fuel profile will become flat with the desired mix of air and fuel throughout the load range. If there is a large load change the Venturi will automatically accommodate the change by allowing just the correct amount of fuel for the amount of air to the engine. No mechanical action is required to make this fuel adjustment.



## Design Features

### IMPROVED MIXING

Traditional Gas Carburetors introduce the fuel into the center of the air stream from a single location. This can create a lean mixture at the outer edges of the flow stream and a richer mixture in the center. This can make it more difficult for the engine to completely burn all of the incoming fuel, which often results in higher exhaust emissions and a reduction in horsepower. The Mixing Venturi has a multitude of fuel inlet vanes and passages evenly dispersed throughout the low-pressure region of its throat. The fuel is more evenly distributed across the flow profile resulting in a homogenous air/fuel mixture entering the engine. The exhaust emissions are lower, easier to control, and the engine runs more efficiently.

### ENGINE BALANCING

Dual bank engines can be easily balanced by measuring the throat pressure of the Venturi using a manometer and the port provided on the Venturi. Adjust the fixed butterfly on the venturi until the two banks are at the same pressure, and the engine will be balanced.

### MECHANICAL DIMENSIONS

The Venturi is available in three sizes with variations within each size to accommodate a range of engine sizes. The size and number of fuel injection ports are adjusted for each engine type as necessary.

Dimensions of the VM-350  
(Sized for 350 horsepower Stoichiometric)

Length:..... 5 inches

Diameter:..... 6 inches

Flanges:..... As required

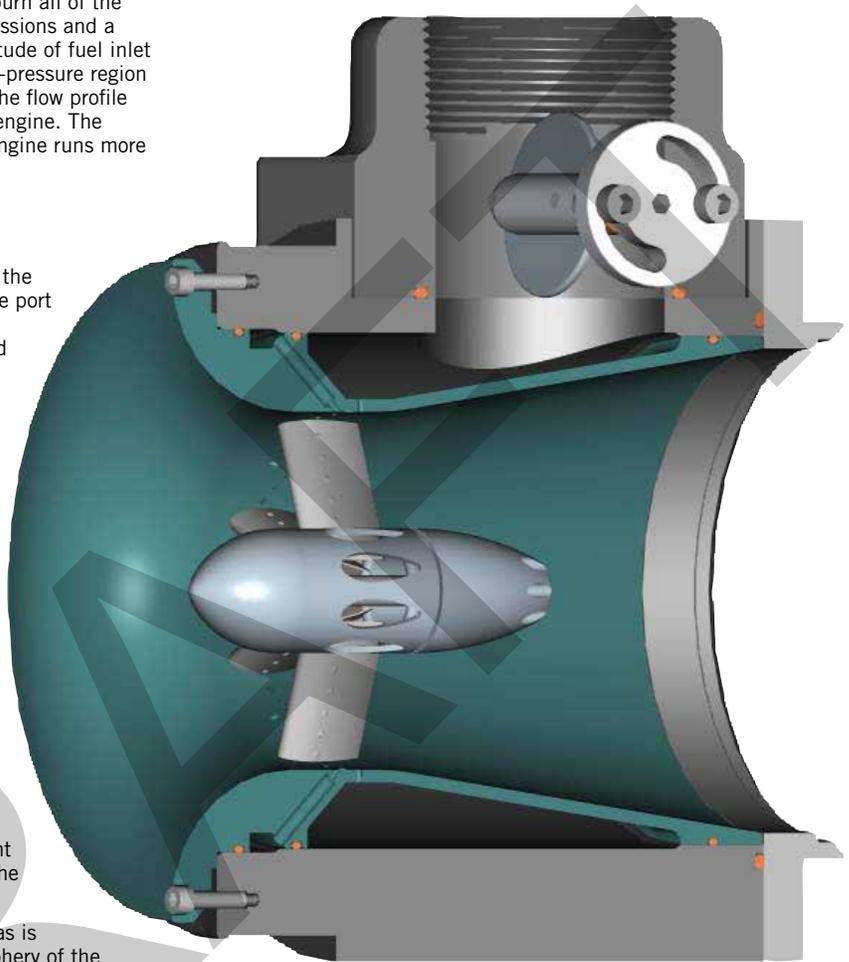
### DESCRIPTION OF THE CUT-AWAY

The air inlet of the Mixing Venturi is on the left of the cut-away drawing. The green annulus is the measurement of throat pressure and is a result of the airflow through the Venturi as sensed by the holes around the throat area.

The gas inlet is on the top of the Venturi drawing. The gas is injected through multiple holes located around the periphery of the throat and the many holes located in each of the air foils connected between the Venturi wall and the hub. The total area of the gas injection holes is sized to provide a pressure drop that matches the Venturi pressure drop in such a way that the fuel injection pressure is near zero at all load conditions. If the heating value of the fuel drops and a larger volume of fuel is required to maintain the mixture, the ECV-5 increases the injection pressure to maintain the correct mixture automatically

### WARNING

The carburetor with a diaphragm normally provides for one last gas shut-off. With the diaphragm removed, this final shut off is eliminated. The user is responsible for insuring that the control system has the ability to reliably shut off all fuel to the engine.



**altronic**

712 Trumbull Avenue, Girard, Ohio 44420  
(330) 545-9768 / Fax: (330) 545-3231  
Email: sales.altronic.girard@hoerbiger.com  
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