



PERFORMANCE ELECTRONICS

30-2200 Flex Fuel Sensor Kit (Barbed)
30-2201 Flex Fuel Sensor Kit (-6AN)

Introduction



The AEM Flex Fuel Ethanol Content Sensor Kit provides the ability to measure a vehicle's fuel ethanol content and temperature. The sensor may be connected to a display, data logger, or engine management system. Users may optimize engine calibration for current fuel content, in real time, when the sensor is integrated with a standalone engine management system such as the AEM Infinity or Series 2 ECUs. The kit comes with a plug and pin kit for electrical connections as well as -6AN (P/N 30-2201) or hose barb (P/N 30-2200) fittings for integration into the fuel system.

Kit Contents

30-2200 FLEX FUEL SENSOR KIT, BARBED

Qty	PN	Description
1	3-2200-3	CONNECTOR, FLEX FUEL 3 PIN
3	3-2200-S	TERMINAL, 3-2200-3
3	3-2200-W	WIRE SEAL, 3-2200-S
1	35-2200	SENSOR, FLEX FUEL
1	35-2201	FITTING, BARB TO 3/8"SAE 2PK

30-2201 FLEX FUEL SENSOR KIT, -6AN

Qty	PN	Description
1	3-2200-3	CONNECTOR, FLEX FUEL 3 PIN
3	3-2200-S	TERMINAL, 3-2200-3
3	3-2200-W	WIRE SEAL, 3-2200-S
1	35-2200	SENSOR, FLEX FUEL
2	35-2202	FITTING, -6AN TO 3/8"SAE

Background

Flex Fuel is a fuel mixture of ethanol (alcohol) and gasoline. It is typically made from corn (or sugar cane) and is used for cleaner emissions, higher octane, and is less expensive per volume. However, ethanol's energy density is lower so gas mileage is compromised. But from a performance standpoint, the extra fuel lowers exhaust gas temperatures which is a benefit. Furthermore, ethanol has a higher latent heat of vaporization compared to gasoline so air charge cooling is further improved. When burning ethanol, the fuel tuning should be based on a oxygen sensor because reading spark plugs is much more challenging as the color is not as evident.

Flex Fuel Composition

Gasoline and ethanol have different compositions: Gasoline: $H_{1.65}C$, Ethanol: C_2H_5OH . Ethanol has oxygen as part of its structure (gasoline does not) and is often referred to as "oxygenated gasoline". Because of this, the stoichiometry of the two fuels are drastically different.

Flex Fuel Stoichiometry

Gasoline stoichiometry: 14.68 AFR

"E85" stoichiometry: 9.87 AFR

Ethanol stoichiometry: 9.00 AFR

Flex Fuel Content

Most gas stations label their flex fuel as E85 (85% ethanol and 15% gasoline). However, this can be very misleading. Most cold climates use a winter blend which is E70. In order to determine the proper amount of blend that is being used at any given time, a FCS (fuel composition sensor) must be used.

Electrical Connections

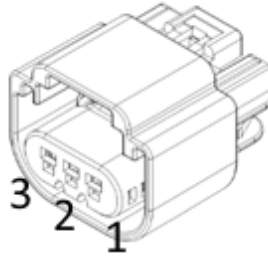


Description	Value
Battery Voltage	9 to 18 V
Maximum flow	400 liters per hour
Operating Temperature	-40 to 150 degC
*Sensor Output (12V) Pull-Up Resistor	2.2 - 10.0 kOhm

*Sensor Output Pull-Up Resistor

A pull-up resistor is **NOT** required when the AEM Ethanol Content Sensor is used with an AEM Infinity or Series 2 ECU. Please consult the appropriate manufacturer when using the content sensor with third party devices. A resistor (2.2 - 10.0 kOhm) may need to be placed between pins 1 (Vout - Sensor Output) and 3 (Vcc - Battery 12V.)

Sensor Pinout



Pin	Description
1	Vcc - Battery 12V
2	GND - Battery Ground
3	Vout - Sensor Output

Sensor Output

The AEM Flex Fuel Ethanol Content Sensor measures the ethanol content percentage and fuel temperature of the fluid passing through it. The frequency of the output signal is linearly related to the ethanol percentage of the fuel. The positive pulse width of the output signal is linearly proportional to the temperature of the fuel. Please reference Figure 1.

Description	Calibration	Conversion Formula
Ethanol Content (%)	50 Hertz = 0% ethanol 150 Hertz = 100% ethanol	$\text{ethanol \%} = [\text{Frequency (Hz)} - 50]$
Fuel Temperature (degC)	1 millisecond pulsewidth = -40 degC 5 milliseconds pulsewidth = 125 degC	$\text{degC} = 41.25 * [\text{Pulsewidth (ms)} - 81.25]$

Figure 1

ECU / Datalogger

Please reference the specific ECU or datalogger manual for pinout and/or tuning information. The flex fuel sensor must be connected to a 12V tolerant digital/frequency type input with an internal pull-up; if an input with an internal pull-up is not available then one must be placed externally in the harness.

Fuel System Integration

The sensor must be installed in the fuel return line between the fuel pressure regulator and the fuel tank, reference Figure 2. The sensor may be installed in any orientation; the direction of flow through the sensor does not matter. It should be noted that the entirety of the fuel flow returning from the fuel rail is not required to travel through the sensor. This may be useful on very high flow systems with a larger than typical return line. In these cases, the sensor can be run in a smaller parallel circuit to measure just a portion of the return flow so that the sensor does not become a restriction for the entirety of the return fuel flow.

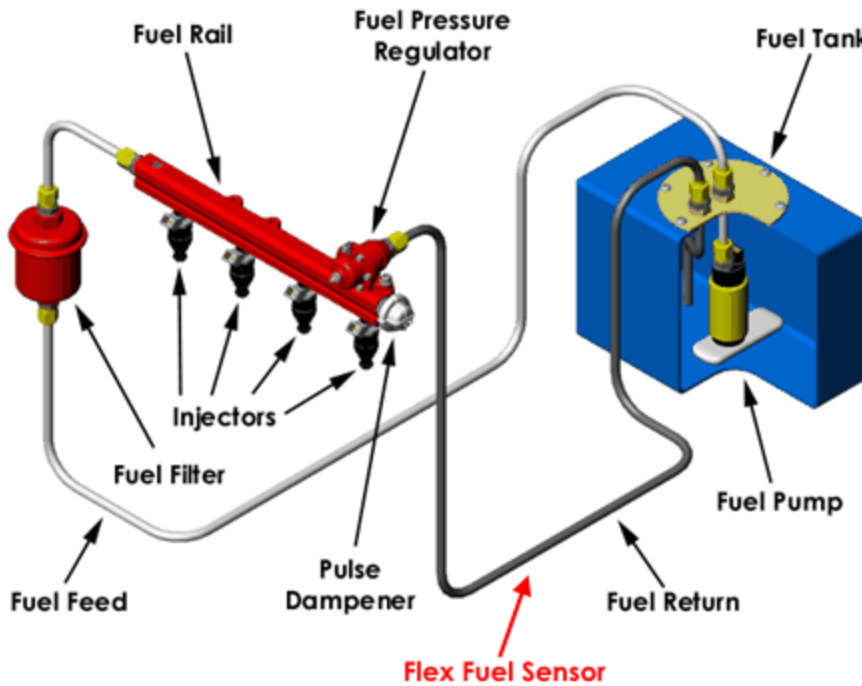


Figure 2 - Install Ethanol Content Sensor in Fuel Return Line

The AEM Flex Fuel Ethanol Content Sensor Kit is available with either barbed or -6AN fitting adapters as shown in Figure 3. Please ensure that these are installed securely and verify the system is completely leak free before proceeding.

Barbed Fittings



-6AN Fittings



Figure 3 - Sensor Fuel Fitting Adapters