

# SEMTECH® ECOSTAR PLUS DUAL FID

## Real-Time THC Measurement

**Innovation.**

***Built on Experience.***

The SEMTECH® Dual FID (Flame Ionization Detector) simultaneously measures the Total HydroCarbon (THC) and Methane ( $\text{CH}_4$ ) fractions of a gaseous sample using two vacuum flame ionization detectors combined in a single assembly.

Only one sample line, one FID fuel line and one combustion air source are required to provide both measurements.

$\text{CH}_4$  measurement is provided by flowing the gaseous sample through a Non-Methane HydroCarbon (NMHC) cutter assembly which removes all hydrocarbons but methane from the original sample.

The system is designed to minimize the loss of hydrocarbons prior to analysis by maintaining the required temperature through the use of a heated filter, heated sample line and stainless steel fittings, all of which have low hydrocarbon adsorption characteristics. User-selectable measurement ranges ensure accuracy for a wide variety of test applications.

**Principle of Operation:** The SEMTECH® Dual FID uses two flame ionization detectors combined in a single assembly for the simultaneous measurement of the THC and  $\text{CH}_4$  fractions of a gaseous sample.

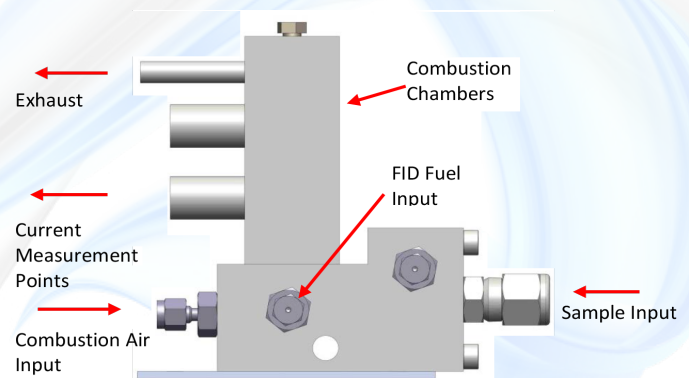
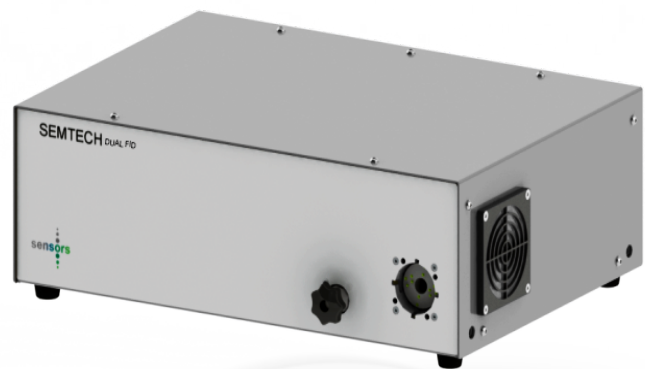
The FID chambers must first be heated to  $191^\circ\text{C}$ . The Warm-up time is approximately half an hour.

Once the dual FID chamber reaches set point temperature, FID fuel and combustion air are allowed in to the FID chambers and both flames ignite automatically.

The exhaust sample is injected in a single input manifold and is then split into two equal fractions. The first fraction is directed towards the THC channel FID chamber. The second fraction is initially directed towards a NMHC oxidation catalytic chamber for removal of the NMHC fraction from the sample, leaving only methane in the sample, which is then injected in the  $\text{CH}_4$  channel FID chamber.

The sample fractions are then injected in their respective FID chambers, where they are mixed with FID fuel and combustion air at the bottom of the detectors' flame jets and burned on the flames' tips.

As the hydrocarbons burn, they form positively charged ions. These ions are repelled by the jet's nozzle head to which a positive bias voltage has been applied. The positive ions are then attracted to the negatively charged collector plate, creating a current measured in real-time. Actual THC and/or  $\text{CH}_4$  concentrations are calculated from this measurement.



**Flame Ionization Detector**

**The Dual FID Module offers the following benefits:**

**Automatic Flame Ignition:** the FID flame will light automatically after approximately 30 minutes of warm-up time.

**Dual Flame Ionization Detector Assembly:** the single assembly dual detector system, coupled with an NMHC cutter assembly upstream the CH<sub>4</sub> FID, provides both THC and CH<sub>4</sub> measurements in real-time using only 1 sample line, 1 FID fuel line and 1 combustion air input.

**Measuring Range:** the Dual FID has 4 user-selectable measurement ranges for each channel, ranging from 0-100 ppmC<sub>1</sub> to 0-30000 ppmC<sub>1</sub>.

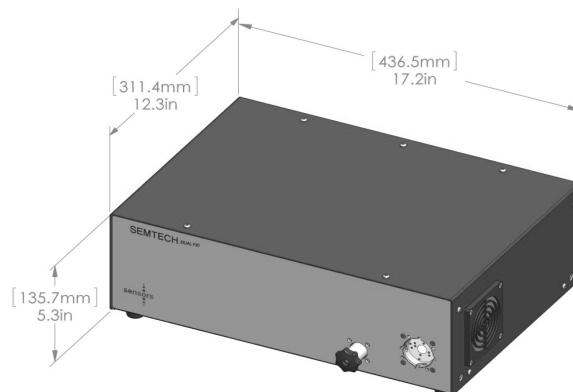
**Sample Handling:** the water trap and Nafion™ dryer are integrated into the SEMTECH® SCS module. A heated sample line (length varies with tested vehicle) delivers the sample to the dual FID chambers at 191°C. Particulate matter is removed using a built-in, disposable, user-replaceable filtration system.

**Combustion Air:** the Dual FID module includes a built-in catalytic converter for removal of all hydrocarbons from ambient air, thus providing hydrocarbon-free combustion air to the system.

**NMHC Cutter:** the system includes a built-in NMHC catalytic oxidation assembly for removal of the NMHC fraction from sample prior to analyzing the sample using the Dual FID's methane channel.

**Compliance:** the SEMTECH® Dual FID is compliant for gases regulated under the rules of UN-ECE. Reg. 49 and E.U. Commission Regulation No. 582/2011 and of US EPA 40CFR, Part 1065.

**Heated Line:** Sensors, Inc. has developed an innovative, low powered heated line that controls and maintains the temperature of the exhaust sample at 191±5°C.



GAS REQUIREMENTS & CONSUMPTION			SPECIFICATIONS	
Gas Use	Description	Consumption	Power requirements	12 V
FID fuel	H <sub>2</sub> 40% Bal. He [< 0.1 ppm THC]	330 ccm @ 300 kPa	Warm up time	30 minutes minimum; 60 minutes to meet performance specifications
Span Gas	C <sub>3</sub> H <sub>8</sub> and CH <sub>4</sub>	~ 1.5 LPM @ 150 - 200 kPa		
Zero Gas	Purified N <sub>2</sub> or Purified Synthetic Air	~ 1.5 LPM @ 150 - 200 kPa	Storage temperature	Dry -10 to 60 °C ambient
Total Sample Flow		< 1.0 LPM @ 100 kPa	Operating environment	-10 to 45 °C ambient
ANALYTICAL SPECIFICATIONS			Power Usage	< 300 Watts
Parameter	THC	CH <sub>4</sub>	Dimensions (W x D x H)	43.6 x 31.1 x 13.5 cm 17.2 x 12.3 x 5.3 in
Measuring Ranges	0-100 ppmC <sub>1</sub> / 0-40000 ppmC <sub>1</sub>		Weight	11.2 kg 24.6 lb.
Linearity (all ranges)	x <sub>min</sub> x (a <sub>1</sub> - 1) + a <sub>0</sub>   ≤ 0.5% of selected range Slope a <sub>1</sub> between 0.99 and 1.01 Standard Error of Estimates (SEE) ≤ 1% of selected range Coefficient of Determination r <sup>2</sup> ≥ 0.998		Data transmission	Ethernet
Accuracy	≤ ± 2% of reading or ≤ ± 0.3% of full scale of selected range, whichever is greater		Electromagnetic interference and susceptibility	CE Standards: IEC 61326: 2002-2
Repeatability	≤ ± 1% of point or < ± 1% of selected range, whichever is greater			
Precision	≤ 1% of selected range			
Noise	≤ 2% of selected range			
Zero Drift	≤ ± 1% of full scale of selected range over 1 hours			
Span Drift	≤ ± 2% of full scale of selected range over 8 hours			
Rise Time (T <sub>10-90</sub> )	≤ 2.5 seconds			
System Response Time (T <sub>10-90</sub> )	≤ 10 sec with rise time ≤ 2.5 seconds			
Data Rate	5 Hz			



**NOTE:** Specifications are subject to change without notice. While due caution has been exercised in the production of this document, possible errors and omissions can occur.