



Lambda (Air/Fuel Ratio) Meter

Accurate, Reliable and Fast Response

- ◆ Fast Response Time
- ◆ Accurate to $\pm 1.5\%$
- ◆ Back-lit LCD
- ◆ Lambda or Air / Fuel Ratio Scales
- ◆ Alcohol, diesel, propane or gasoline
- ◆ Wide Range Heated Oxygen Sensor
- ◆ Correction Tables for Different Fuel Types
- ◆ Temperature Compensated
- ◆ Analog Output Option



The **MoTeC** Lambda Meter can be used to analyse the exhaust gas mixture strength under all driving conditions, hot or cold. The resulting readout is displayed on a back-lit LCD display in either lambda or air/fuel ratio for alcohol, diesel, propane or gasoline. With gasoline, the meter will display from rich air / fuel of 11 to 1 all the way up to a lean ratio of 23 to 1.

The two prime applications for the **MoTeC** Lambda Meter are for emission controlled vehicles and for use in motorsport.

Increasing standards for monitoring and identifying degradation of emissions related devices point to a need to accurately analyse the air / fuel ratio after combustion has taken place and before this gas stream reaches the catalytic converter. The catalytic converter operates most efficiently when the air/fuel ratio is kept as close to lambda (14.7 to 1) as possible. Without an optimal air/fuel ratio inside the combustion chamber it won't be long before the catalyst loses its ability to effectively clean up the exhaust gases.

Motorsport Applications

The highly competitive motorsport environment requires that all aspects of the vehicle are optimally calibrated and perhaps no area is more critical than the engine. An engine will give best performance at only one mixture strength and the **MoTeC** Lambda Meter lets you determine accurately the direction and magnitude of adjustments that need to be made to ensure this. The **MoTeC** Lambda Meter can be used equally effectively on fuel injected and carburetted vehicles.

Sensor

The **MoTeC** Lambda Meter uses a special wide range heated four wire oxygen sensor which will fit into a thread size of 18 x 1.5 mm. The size is most commonly found with zirconia oxygen sensors fitted as original equipment to most emission controlled vehicles. With this sensor in place and powered only by the vehicles 12 volt supply, the microprocessor controlled meter can now utilise its extensive linearization and temperature correction tables stored in ROM (Read Only Memory) to read out a high accuracy air / fuel ratio count on the display.

The vehicle's ECU can be kept in closed loop by selecting one of the nine different analog output modes and reading this into the oxygen sensor input of the ECU. This voltage swing is similar to that which the ECU would normally see from the vehicle's oxygen sensor.

The **MoTeC** Lambda Meter contains selectable correction tables for alcohol, diesel, propane and gasoline. In addition, the oxygen sensor is lead tolerant (although lead will reduce its life span), which allows it be used on all pre-catalyst type vehicles. The replaceable wide range sensor has a life time of approximately 500 hours with unleaded fuel, depending on volume flow and generally in excess of 50 hours on leaded fuel.

Sensor Mounting

The **MoTeC** Lambda Meter comes with a weld-in sensor bung and plug for use where the 18 x 1.5 mm tapping is not available. The bung and plug set allows access to the exhaust stream anywhere between the exhaust manifold header and the catalytic converter. Additionally, the bung can also be used to monitor both banks of a V6 or V8 engine which may have dual oxygen sensors.

Versatility

The analog output can be used for closed loop operation as described earlier or connected to a measurement instrument such as a Data Logger or Chart Recorder.

The versatility of the **MoTeC** Lambda Meter to read different fuel systems with a single sensor is useful for garages or fleet service stations which may work on more than one type of fuel system. With the **MoTeC** Lambda Meter you can read the air / fuel ratio before it enters the catalyst and determine if proper combustion is taking place.

Be Aware

Some competitive systems utilise the correct sensors and provide resolution to one decimal place, but do not provide the linearization and temperature correction contained in the **MoTeC** Lambda Meter.

Without temperature correction it is common to see errors in the mixture strength of up to 1.0 air / fuel ratio. In other words an indicated value of 12.9 to 1 would be in the range of 11.9 to 1 to 13.9 to 1 in reality, leading to either lack of power, poor fuel consumption and poor emissions performance, or potential engine damage from an overly lean mixture.

Specifications - Lambda Meter

General

Operating Voltage Range:	7 to 16 VDC
Operating Current:	0.3 A Max. (Excluding Sensors)
Reverse Voltage:	- 24 VDC Max.
Transient Protection:	10 Joules (100A/10ms) (Clamping Voltage 24V)
Operating Temperature:	0 to 60 Deg C
Operating Humidity:	0 to 80% Non Condensing
Measurement Range:	0.75 to 1.60 Lambda
Measurement Accuracy:	± 1.5% (0.75 to 1.05 Lambda) ± 2.5% (1.05 to 1.25 Lambda) ± 5.5% (1.26 to 1.60 Lambda)
Display Update Rate:	3.5 times per second
Response Time:	<150 mSec (to 63% of final reading)
Weight:	575 g
Dimensions:	142 x 48 x 96 mm (WxHxD)
Compatible Fuels:	Gasoline (Petrol) Alcohol Gas (LPG) Diesel

Analog Output (Optional)

Output Type:	Isolated (floating)
Output Isolation:	400 VDC Max.
Output Voltage Range:	0 to 5 VDC Max. (dependent on range selection)
Output Current:	1 mA Max.
Response Time:	100 mS (0.75 to 0.95 Lambda) 150 mS (0.96 to 1.05 Lambda) 50 mS (1.06 to 1.60 Lambda) (to 63% of final reading)

Sensor

Sensor Type:	Wide Band
Heater Voltage:	12 to 14 VDC
Heater Current:	1.5 A Nominal (Hot) 5.0 A Max. (Cold)
Operating Temperature:	250 to 800 Deg C (Heater ON) 450 to 930 Deg C (Heater OFF)
Lifetime*:	> 500 Hrs (Unleaded Fuel) > 50 Hrs (Leaded Fuel)
Thread Type:	M18 x 1.5

* Lifetime will vary depending on a number of factors

Conversion Table - Lambda to Air / Fuel Ratio

Lambda	Air / Fuel Ratio			
	Gasoline	Alcohol	Gas	Diesel
0.70	10.3	4.5	10.9	10.2
0.75	11.0	4.8	11.6	10.9
0.80	11.8	5.1	12.4	11.6
0.85	12.5	5.4	13.2	12.3
0.90	13.2	5.8	14.0	13.1
0.95	14.0	6.1	14.7	13.8
1.00	14.7	6.4	15.5	14.5
1.05	15.4	6.7	16.3	15.2
1.10	16.2	7.0	17.1	16.0
1.15	16.9	7.4	17.8	16.7
1.20	17.6	7.7	18.6	17.4
1.25	18.4	8.0	19.4	18.1
1.30	19.1	8.3	20.2	18.9
1.35	19.8	8.6	20.9	19.6
1.40	20.6	9.0	21.7	20.3
1.45	21.3	9.3	22.5	21.0
1.50	22.1	9.6	23.3	21.8
1.55	22.8	9.9	24.0	22.5
1.60	23.5	10.2	24.8	23.2

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