# ECM

Air-Fuel Ratio Analyzers

For Engine Calibration, Testing,

Air-Fuel Ratio (alternatively defined as Lambda or Equivalence Ratio) is the most influential parameter affecting the emissions, efficiency, and driveability of spark ignition engines. The accurate and tight control of AFR is mandatory in optimizing an engine's performance. With all that riding on this single parameter, a high-quality air-fuel ratio analyzer is a necessary component of any engine calibration, testing, development, or maintenance program.

ECM offers six high-quality AFR analyzers to meet your needs. All six analyzers measure AFR using UEGO (Universal Exhaust Gas Oxygen) sensors. The UEGO sensor has revolutionized AFR measurement because of its wide range, fast response, and ease-of-use. The sensor consists of a spark plug sized electrochemical cell which is placed directly in the engine's exhaust. The cell acts on O_2, CO, H_2, and UHCs in the exhaust to determine AFR, Lambda, Equivalence Ratio, and $\%O_2$ for fuels of any composition (i.e. H:C, O:C, and N:C ratios, including H_2).
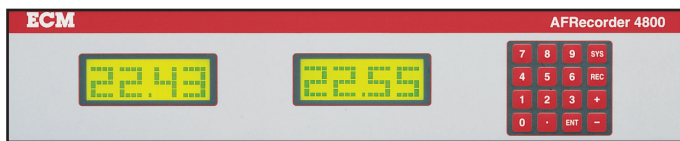
Dual AFR Meter • Rackmount • AC

The AFRecorder Model 4800 combines dual channel, fast response air-fuel ratio measurements with extensive computational capabilities. The Model 4800 displays the AFRs of each sensor, their simultaneous difference, their average, and each sensor's AFR deviation. The AFR deviation is the real-time variation of AFR and indicates engine roughness or misfire. Linearized programmable analog outputs and full analyzer control via RS-232 make for easy integration with data acquisition systems. Other features include: PC software, recording with built-in statistics, and programmable

simulated exhaust gas oxygen sensor (SEGO) outputs. SEGO outputs allow you to move the engine's control point off stoichiometric. This feature is useful for engine calibration or catalytic converter testing.
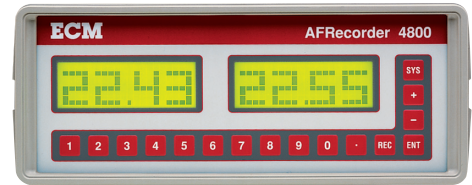
Dual AFR Meter • Benchtop • AC/DC

The AFRecorder Model 4800 is available in a rackmount (4800R) or benchtop (4800P) form. The Model 4800P can be powered by AC (line) or DC (vehicle battery). A variety of cabling options is available for the Model 4800.

AFR Meter • Spark Timing • Engine Speed
Manifold Pressure • Benchtop • AC/DC

The AFRecorder Model 2400 combines a single channel of AFR measurement with measurements of spark timing, manifold pressure, and engine speed. The combination of these four engine parameters in a single portable package has made the Model 2400 a popular tool with engine calibrators. Spark timing and engine speed can be measured with the supplied probes or by using signals from production sensors or the engine control module. Manifold pressure is measured using a sensor inside the AFRecorder. Linearized programmable analog outputs, RS-232 control, PC software, recording with built-in statistics, programmable alarms, a programmable SEGO, and AC or DC operation are other Model 2400 features.

Development, and Maintenance

AFR Meter • Benchtop • AC/DC

The AFRecorder Model 2000 is a single-channel AFR analyzer. The Model 2000 is the standard for high-quality AFR measurement in a package suitable for dynamometer and in-vehicle work. Features include: linearized programmable analog output, RS-232 control, PC software, recording with built-in statistics, programmable alarms, a programmable SEGO, and AC or DC operation.

AFR Meter • Handheld • AC/DC

The AFRecorder Model 1200 is a highly integrated full-featured AFR analyzer designed for in-vehicle applications. Although it is only about the size of an unfolded wallet, the Model 1200 packs features such as a linearized programmable analog output, RS-232 control, PC software, data recording, and a programmable SEGO. The Model 1200 is DC powered and comes with an external AC/DC adapter.
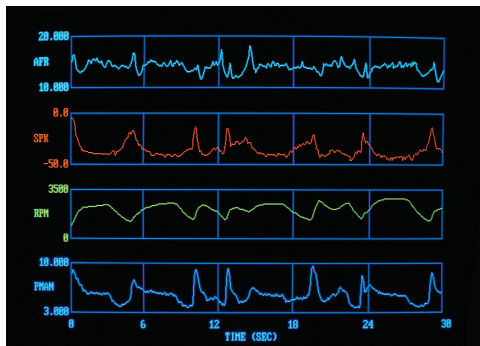
AFRemote Software Standard with any AFRecorder

AFR Meter • Handheld • DC

Lambda Pro is the simplest to use of all ECM's AFR analyzers. Lambda Pro has many of the features of the Model 1200, but with less programmability. But don't let this fool you, Lambda Pro has "big meter" features such as a linearized analog output, max/min AFR recording, and a stoichiometric SEGO.

AFR Sensor Simulator

All of ECM's AFR analyzers can perform field calibration of the AFR sensor using ambient air. To verify accurate operation of the analyzer's electronics, ECM offers a AFR Sensor Simulator. The AFR Sensor Simulator is connected to the analyzer in place of the AFR sensor. The simulator tests the analyzers' sensor heater control circuit and the analyzer should display the AFR associated with the simulator's switch position. The simulator is a calibrated device that can be returned to ECM for scheduled calibration verification. With the AFR Sensor Simulator, you can perform a quick checkout of your analyzer at your site.

For over ten years, thousands of engine calibrators, testers, developers, and maintenance personnel world-wide have selected an ECM AFR analyzer. With six choices available, there's an ECM AFR analyzer ready to work for you.

Specifications

Model	Range	Accuracy	Resp. Time	Calc. Time	Fuel Type	Analog Out	RS-232	SEGO	Recording	Statistics	Alarms	Power	Size
AFRecorder 4800R (Dual AFR)	6 to 150 AFR 0.4 to 10 λ 0.1 to 2.5 φ 0 to 22% O_2	±0.6% @ stoich. ±0.9% elsewhere	< 150 ms	1 ms	H:C, O:C, N:C, and H_2 can be specified	0 to 5 V, Linearized, Prog.	Yes, with software included	Yes Prog. Dual	Yes	Avg, Max, Min, SD	No	AC	19"x 3.5"x 14"
AFRecorder 4800P (Dual AFR)	6 to 150 AFR 0.4 to 10 λ 0.1 to 2.5 φ 0 to 22% O_2	±0.6% @ stoich. ±0.9% elsewhere	< 150 ms	1 ms	H:C, O:C, N:C, and H_2 can be specified	0 to 5 V, Linearized, Prog.	Yes, with software included	Yes Prog. Dual	Yes	Avg, Max, Min, SD	No	AC/ DC	10.2"x 4.6"x 13.3"
AFRecorder 2400 (Single AFR) *and* Spk. Timing RPM Manifold Pr.	6 to 150 AFR 0.4 to 10 λ 0.1 to 2.5 φ 0 to 22% O_2 -60 to 30 deg. 100 to 9,999 0.0 to 35.0 Psia	±0.6% @ stoich. ±0.9% elsewhere ±1 degree ±10 RPM ±1% FSO	< 150 ms	1 ms	H:C, O:C, N:C, and H_2 can be specified	0 to 5 V, Linearized, Prog. for all four parameters	Yes, with software included	Yes Prog.	Yes	Avg, Max, Min, SD	Yes	AC/ DC	10.2"x 4.6"x 13.3"
AFRecorder 2000 (Single AFR)	6 to 150 AFR 0.4 to 10 λ 0.1 to 2.5 φ 0 to 22% O_2	±0.6% @ stoich. ±0.9% elsewhere	< 150 ms	1 ms	H:C, O:C, N:C, and H_2 can be specified	0 to 5 V, Linearized, Prog.	Yes, with software included	Yes Prog.	Yes	Avg, Max, Min, SD	Yes	AC/ DC	10.2"x 4.6"x 13.3"
AFRecorder 1200 (Single AFR)	6 to 150 AFR 0.4 to 10 λ 0 to 22% O_2	±0.6% @ stoich. ±0.9% elsewhere	< 150 ms	1 ms	H:C, O:C, N:C, and H_2 can be specified	0 to 5 V, Linearized, Prog.	Yes, with software included	Yes Prog.	Yes	Avg, Max, Min, SD	No	AC/ DC	7.5"x 4"x 1.2"
Lambda Pro (Single AFR)	8.0 to 25.5 AFR 0.55 to 1.75 λ	±1% @ stoich. ±2% elsewhere	< 150 ms	2 ms	Lambda, Gasoline, Methanol (others avail.)	0 to 5 V, Linearized	No	Yes Stoic. only	Yes Max, Min Only	Max, Min	No	DC	7.5"x 4"x 1.2"

AFRSIM-200   (AFR Sensor Simulator) Simulates lean, stoichiometric, rich AFRs, and tests AFR sensor heater control circuit

Specifications subject to change without notice.