



ACESEFI



Air–Fuel Ratio Meter: Technical Specifications

I. Measurement Performance

1. Compatible sensor model: Bosch style LSU 4.9 planar wideband oxygen sensor
2. Measurement target: Oxygen content and air–fuel ratio (λ) in gasoline
3. Core measurement range: $\lambda = 0.65$ – 10.12 (from rich mixture to ambient air), corresponding to exhaust O_2 concentration 0%–18.93% (O_2 in N_2 environment)
4. Measurement accuracy: Based on the sensor's nominal characteristics. Under standard test conditions (pressure 1013 hPa, sensor ceramic temperature 780 °C), λ deviation $\leq \pm 5\%$ (before compensation for pressure/temperature dependence of the sensor signal)
5. Response time: Sensor activation ("light-off") ≤ 20 s (from heater ON to stable output)
6. Channel count: 2 channels, fully independent

II. Electrical & Physical Parameters

(A) System power requirements

Operating voltage range: 10.8–16.5 V DC, nominal 12 V. Do not connect directly to 24 V supplies (use an appropriate DC-DC converter).

(B) Sensor parameters

1. Heater control: Closed-loop PID based on CJ125, PWM power control supported, control frequency 200 Hz
2. Heater resistance characteristics:
 - Nominal cold resistance at room temperature (incl. cable & connector): 3.2 Ω
 - Minimum cold resistance at -40 °C: 1.8 Ω
 - Nominal power ~ 7.5 W at 7.5 V supply in air thermal equilibrium
3. Heater voltage limits:
 - Maximum initial voltage at start: 8.5 V
 - Condensation phase: ≤ 2 V (to prevent ceramic thermal shock)
 - Short-term maximum: ≤ 13 V (each instance ≤ 30 s, cumulative ≤ 200 h)
 - Continuous operation maximum: ≤ 12 V

4. Sensor connector & pinout (6-pin, color codes):
 - Pin 1 (red): Pump current APE
 - Pin 2 (yellow): Virtual ground IPN
 - Pin 3 (white): Heater negative H−
 - Pin 4 (gray): Heater battery H+
 - Pin 5 (green): Trim current RT
 - Pin 6 (black): Nernst voltage RE+

(C) Communications interface

1. Primary interface: 1 × CAN 2.0B
2. Baud rate: 500 kbps
3. Payload: Per-channel λ , AFR, sensor status flags, etc.
4. Peers: ECU, diagnostic tools

(D) Environmental & mechanical

1. Operating temperature: −20 °C to 90 °C
2. Storage temperature: −20 °C to 120 °C
3. Vibration tolerance: Random vibration, peak $\leq 300 \text{ m/s}^2$
4. Ingress protection: Enclosure IP54 (dust-protected, splash-resistant)
5. Connector: Automotive-grade waterproof connector
6. Product model: — (TBD/not specified)

III. Other Parameters

1. Insulation resistance requirements:
 - At room temperature, between the enclosure and each heater/sensor circuit pin: $\geq 30 \text{ M}\Omega$ (still air, heater OFF, new sensor)
 - At 600 °C hex-nut temperature, between sensor signal circuits and heater circuit: $\geq 1 \text{ M}\Omega$; between sensor signal pin APE and housing: $100 \text{ k}\Omega$
 - Vehicle harness insulation: Between all sensor signal pins $\geq 2 \text{ M}\Omega$ (across full life and environmental conditions)
2. Storage conditions: Dry environment, keep in original packaging; maximum storage duration 2 years