Wide Band Air Fuel Ratio meter (Bosch LSU 4.9 sensors)

Overview-

Air Fuel Ratio (AFR) meter & display Interfaces to DYNertia3 or data loggers, It can also be used as a rugged professional 'stand-alone' unit. A perfect tool for displaying AFR or Lambda, for both tunning and diagnostics.

Laboratory accuracy, workshop tough, portable and economical AFR/Lambda meter!

WB2 includes the latest Bosch LSU4.9 wideband oxygen sensor for reliable and accurate operation, not the outdated LSU4.2 like most competitors are still using.

The built in blue LED display is bright even in direct sunlight and with a flick of a switch the meter displays either Lambda or Air Fuel Ratio (AFR).

High accuracy and fast response are key design features of our AFR/Lambda meter and a range of λ = 0.65 - ∞ (Gasoline AFR: 9.56 to free air) ensures compatibility with different fuel types.

0-5V analogue linear output voltage is generated from a dedicated '10 bit' digital to analogue chip for precision and speed, not a cheap filtered PWM signal like many competitors.

The heart of the system is a special Bosch 'CJ125' lambda sensor control chip along with an automotive grade microprocessor. The CJ125 is rarely used in AFR meters due to cost, but Bosch use it wherever an LSU sensor is used in vehicles or even in their own "LT4" controller. Bosch know best when it comes to wideband oxygen sensor control!

Kit Contents-

- Small rugged AFR/Lambda meter with built-in bright LED display
- Bosch LSU 4.9 Lambda (Oxygen) sensor
- Long sensor harness (5m)
- Power supply harness (1.5m)
- Sensor 'weld–in' plug and bung
- Serial communication cable and dongle (for future updates if required)

WB2 Technical Specifications-

Power supply
• Input voltage range: DC 9V to 15 V (12V Typical)
• Input current: 50mA typical plus the heater current (1- 1.5A)
• Voltage protection : Reverse polarity protected, & overvoltage protected
• Load Dump Clamp : Maximum voltage

Sensor
• Bosch LSU 4.9
• Free air calibration: Not required (pumped reference)

Display
• 4 digit LED display, 2 digit floating numbers
• AFR, lambda (switchable)

Measurement
• Lambda range: λ = 0.65 ~ ∞ (Gasoline AFR: 9.56 to free air)
• Lambda accuracy: ±0.008 @ λ=1.00
±0.01 @ λ=0.80
±0.05 @ λ=1.70
• Air/Fuel Ratio: Fuel dependent (see lambda range and accuracy)
• 5ms updating rate (loop time)

Outputs
• Lambda analogue output: 0 to 5V linear (0.00V = λ 0.5, 5.00V = λ 2.00)
• Simulated narrow band sensor output (copies vehicles standard sensor)
• Analog accuracy: ±0.005V error with a 10-bit DAC chip

Heater
• PID control with Bosch CJ125
• Current Typical 1A; Max 1.5A
• Heater return: Separate wire from Ground

Communications
• RS232 or USB (via provided dongle) for field updates if required

Special features
• On-Board-Diagnosis and error report
• Self-learning of part-to-part variations, aging effect
• Functions with different types of fuels (gasoline, diesel, E85, etc.)

General
• Temperature range: -45C ~ +125 C
• Dimensions: 4" x 2.6" x 1"

Sensor installation-

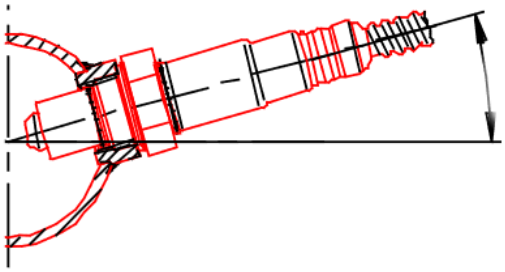
If a 'tail pipe' inserted probe is to be used then we recommend reviewing the technical document on our DTec website ("Design an accurate fuel mixture probe"), this can be found in the 'Tech Articles' section.

If mounting in the exhaust directly, then keep the sensor close to vertical (or worst case away from horizontal by at least 10°) to keep condensation from entering the sensor e.g. 90°-10° is acceptable range.

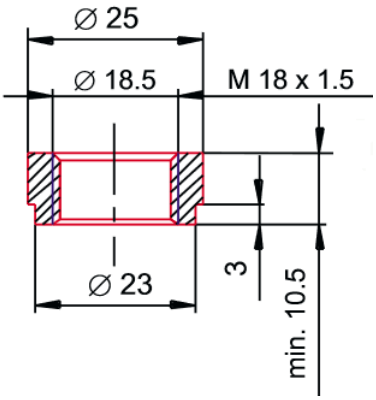
A mounting 'bung' for welding into the exhaust is provided but can also be made as per the drawing below. A hole of 18mm is suitable for the sensor; do not weld the bung with the sensor in it.

The sensor is best mounted before the catalytic convertor and typically about 60cm from the engine, we suggest about 90cm for turbo applications (therefore after the turbo).

Approximately 40Nm tightening torque is recommended for the sensors.



≥ 10°



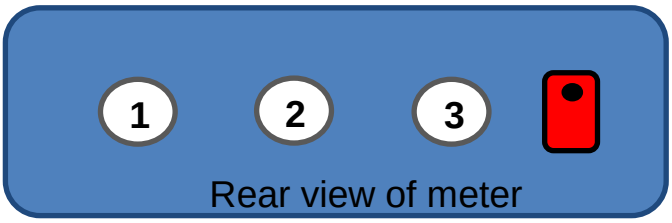
Warnings-

- Do not disconnect the sensor whilst the controller is powered.
- Do not have the sensor already operating before the engine is started. Condensation may enter into the sensor and if at operating temperature the hot ceramic sensor internals can fracture.

  When the sensor is in the exhaust it should be used with the controller within a short time period. An unpowered sensor will quickly build up carbon deposits and become unusable.

  Suggested sequence is to start the vehicle and then immediately turn on the WB2 meter.
- Operation with leaded fuels will limit the sensor life to 100-500 hrs and is therefore not recommended.
- Sensor gets hot. Avoid inflammable materials, especially if sensor operated outside of the exhaust system.

Harness connections & switch operation-



Item	Label	Wire	Description	Voltage
1	RS232	Harness	Serial communication harness	N/A
	NO2OUT	**Green**	Simulated narrow band sensor output	0V – 1V
	GND	**Black**	Ground (for NO2OUT)	0V
2	O2Sensor	Harness	Oxygen sensor connection harness	N/A
3	12V-	**Black** x2	Power supply & heater ground	0V
	12V+	**Red**	Power supply positive	9V – 15V
	ANOUT	**Blue**	Linear output to DYNertia3, data logger etc	0V – 5V
	GND	**Black**	Ground (for ANOUT)	0V

Switch Sets the display to either Lambda or gasoline Air Fuel Ratio (AFR) units.

Procedure-

Notes:

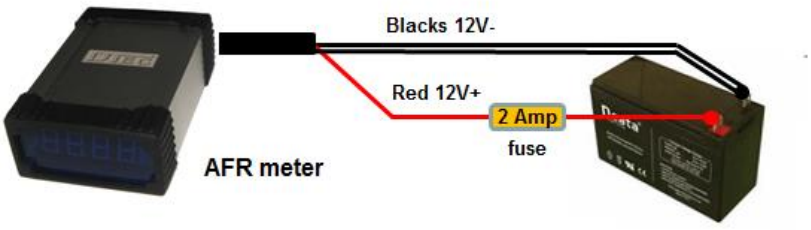
- Connector 1 is unlikely to be used so leave its harness safety stored for future use.
- It is strongly suggested you place a switch in the red power wire to allow easy turning on/off of the meter.
- There are 2 black wires joined together in the '12V-' terminal. One is the sensor heater ground path and the other is for the WB2 electronics. Keeping them separate like this up to the battery helps reduce interference from the sensor heater operation.

1) Connect the sensor harness into connector 2 and the power supply harness into connector 3.

2) Plug the 6 pin mating connector of the sensor harness into the oxygen sensor.

3) Connect the 12V+ (**Red**) wire to battery positive or DC power supply + (via a switch recommended).

4) Connect the 12V- (**Black**) wires to battery negative or DC power supply –.

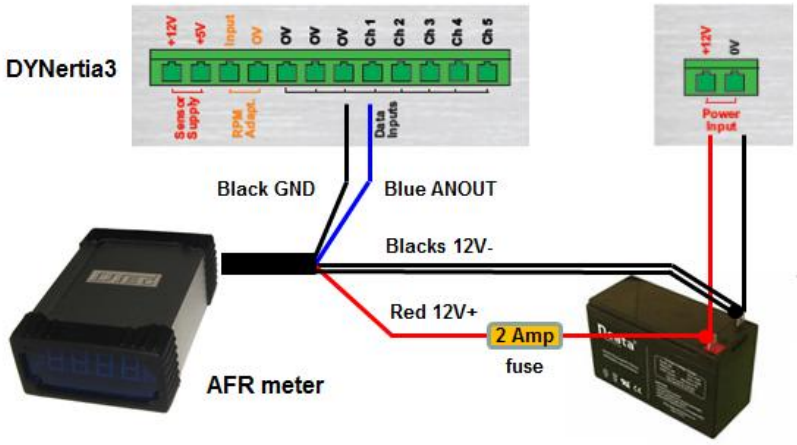


5) If you are using the ANOUT (Linear output voltage) to supply a voltage signal to another piece of equipment such as DYNertia3 dyno controller or a data logger, then connect GND (**Black**) to the sensor ground of the equipment. The ANOUT (**Blue**) wire will connect to the equipments input.

The ANOUT scaling is 0.00V = λ 0.50 (7.35 AFR)
5.00V = λ 2.00 (29.4 AFR)

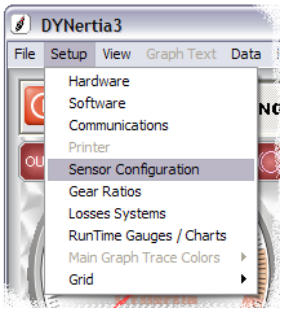
Connecting to DYNertia3-

We suggest you connect into channel1 of DYNertia3 as this is default for AFR meters. For simplicity the diagram below does not show a switch in the red WB2 power wire or a switch in DYNertia3 supply.



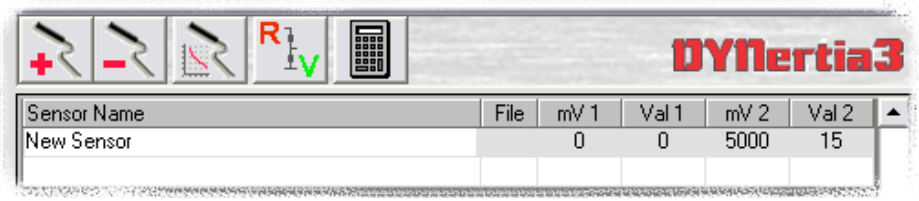
With an AFR meter connected the current draw from battery is higher (Lambda sensor heater can draw up to 1.5 Amps), so keep an eye on battery voltage!

Configuring a DYNertia3 input channel-



1. From within the menu option ‘Setup’/Sensor Configuration’ press the Icon of the sensor.

2. Click on the “+” Icon to add a new sensor.



3. Double click in the ‘Sensor Name’ field (It will say “New Sensor” by default)

mV 1	Val 1	mV 2	Val 2
0	0.5	5000	2.0

Type in “WB2 Lambda “, note a space either side of the word ‘Lambda’! Enter the values shown -

mV 1	Val 1	mV 2	Val 2
0	7.35	5000	29.4

Repeat above to add another sensor but type in “WB2 AFR “, note a space either side of the word ‘AFR’! Enter the values shown-

Note: Data and Settings are saved and channels configured when the Window is closed.

Additional functions-

Connector 1 harness has an N02OUToutput wire that can simulate a narrowband oxygen sensor. This output copies the narrowband sensors that are fitted as standard to nearly all vehicles (switches between 0V and 1V at an AFR of 14.7:1). This means you can fit your LSU4.9 sensor in place of the standard vehicle sensor to accurately monitor the AFR. Connecting the simulated output to the vehicle harness keeps the stock ECU's operating, however the old sensor may need to be partially connected as its heater circuit may also be monitored by the stock ECU.

NO2OUT	**Green**	Simulated narrow band sensor output	0V – 1V
GND	**Black**	Ground (for NO2OUT)	0V