

Wide Band- Low Cost Air Fuel Ratio unit (Bosch LSU 4.9 sensors)



Overview-

Low cost Air Fuel Ratio (AFR) system interfaces to DYNertia3 or data loggers, they have no display as they use the DYNertia3 (or 3rd party logger) software for display.

The precision analogue output voltage accurately represents the AFR or Lambda.
Lambda: 0V = λ 0.5, 5V = λ 2.0 (AFR: 0V = 7.35, 5V = 29.40)

WB-LC includes the latest Bosch LSU4.9 wideband oxygen sensor for reliable and accurate operation, not the outdated LSU4.2 like most competitors are still using.

High accuracy and fast response (5ms) are key design features of our AFR/Lambda unit and a range of $\lambda = 0.50 - 2.00$ (Gasoline AFR: 7.35 to 29.40) 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 controller with 0-5V output
- Bosch LSU 4.9 Lambda (Oxygen) sensor
- Harness (110cm from connector to wire end)
- Sensor 'weld-in' plug and bung



WB-LC Technical Specifications-

Power supply

- Input voltage: DC 12V
- Input current: 60mA typical plus the heater current (1- 1.5A typically)

Sensor

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

Measurement

- Lambda range: $\lambda = 0.50 \sim 2.00$ (Gasoline AFR: 7.35 to 29.40)
- Lambda accuracy: ± 0.008 @ $\lambda=1.00$
 ± 0.01 @ $\lambda=0.80$
 ± 0.05 @ $\lambda=1.70$
- Air/Fuel Ratio: Fuel dependent (see lambda range and accuracy)

Outputs

- Lambda analogue output: 0 to 5V linear (0.00V = λ 0.50, 5.00V = λ 2.00)
- Analog accuracy: ± 0.005 V error with a 10-bit DAC chip
- 5ms updating rate (loop time)

Heater

- PID control with Bosch CJ125
- Current Typical 1A; Peak 3.5A
- Heater return: Separate wire from Ground

Special features

- Self-learning of part-to-part variations, aging effect
- Functions with different types of fuels (gasoline, diesel, E85, etc.)

General

- Temperature range: -45C ~ +85 C
- Dimensions: 3.64" x 1.18" x 0.87"

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.

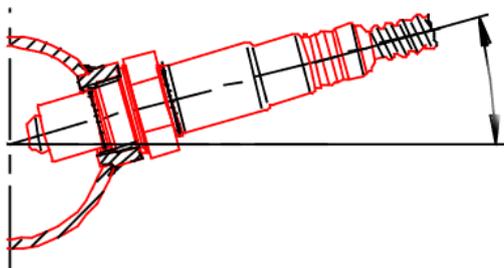


If mounting in the exhaust directly, then keep the sensor close to vertical (or worst case away from horizontal by at least 10°) to keep condensation from entering the sensor e.g. 90°-10° is acceptable range.

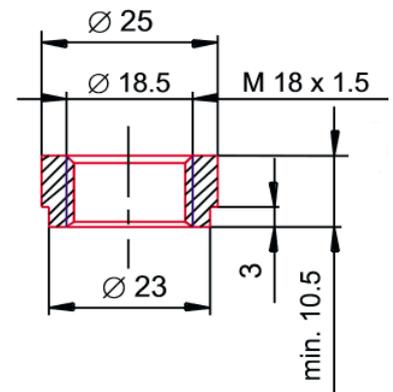
A mounting 'bung' for welding into the exhaust is provided but can also be made as per the drawing below. A hole of 18mm is suitable for the sensor; do not weld the bung with the sensor in it.

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.



$\geq 10^\circ$



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 (one of the most common failures).

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

Suggested sequence is to start the vehicle and then turn on the WB-LC unit, this helps give time for condensation to clear. This will require the WB-LC to have its own switched power supply.

- 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.**

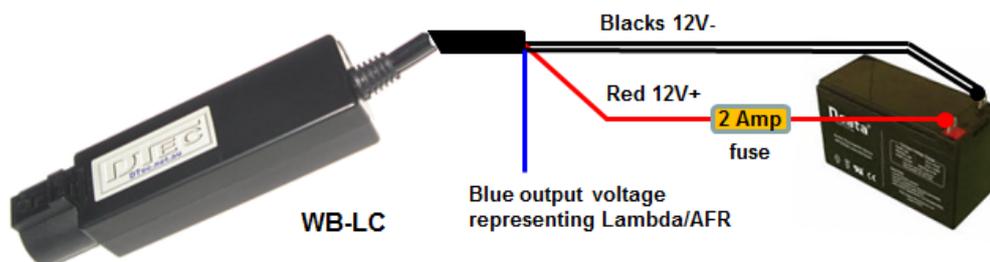
Harness connections-

Label	Wire	Description	Voltage
+12V	Red	Power supply positive	12V
GND-H	Black Thick	Heater circuit ground	0V
GND-R	Black Thin	Reference ground	0V
ANOUT	Blue	Linear output to DYNertia3, data logger etc	0V – 5V

Procedure-

Notes:

- It is strongly suggested you place a 2A fuse and a switch in the red power wire to allow easy turning on/off of the controller.
 - There are 2 black wires, join these together at the ground terminal. One is the sensor heater ground path and the other is for the WB-LC electronics. Keeping them separate like this up to the battery helps reduce interference from the sensor heater operation.
- 1) Connect the 12V+ (**Red**) wire to battery positive (via a 2A fuse and switch is best so engine can start before sensor is heated).
 - 2) Connect the 12V- (**Black**) ground wires to battery negative.



- 3) When 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 ground of the equipment to the GND of the WB-LC also. The ANOUT (**Blue**) wire will connect to the equipment's input.

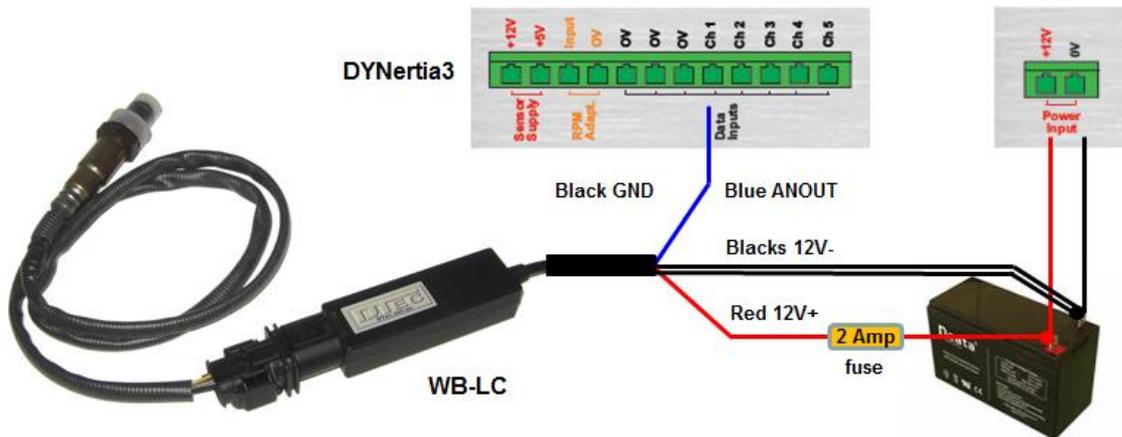
The ANOUT scaling is-

0.00V = λ 0.50 (7.35 AFR)

5.00V = λ 2.00 (29.4 AFR)

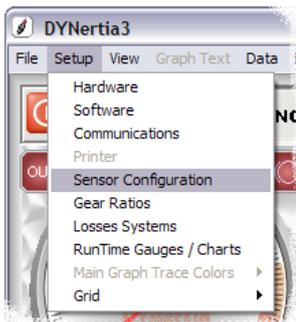
Connecting to DYNertia3-

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.

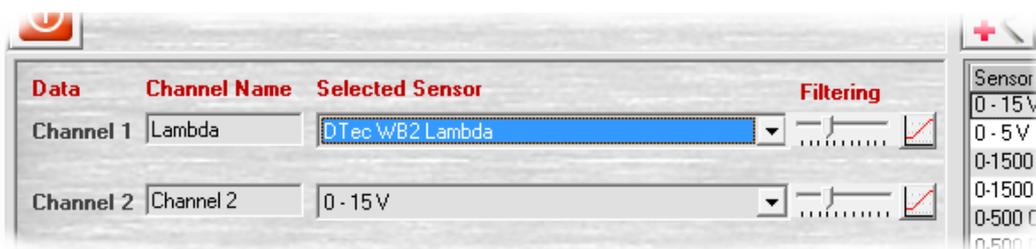


With an AFR unit connected the current draw from battery is higher (Lambda sensor heater can draw up to 1.5 Amps), so keep an eye on battery voltage!

Configuring a DYNertia3 input channel (WB-LC uses the same configuration as WB2 meter)-



1. From within the menu option 'Setup'/Sensor Configuration' choose from the dropdown menu (down arrow next to 'Selected Sensor' field) the "DTec WB2 Lambda" option or the "DTec WB2 AFR (14.7:1)" option, depending on the units you want to display i.e. AFR or Lambda units.
2. Give the channel a meaningful name in the 'Channel Name' field e.g. "lambda" or "Mixture", whatever you like.



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