

# FuelTech



## WB0<sub>2</sub> METER SLIM

Wideband Lambda Sensor Conditioner

Installation and Operation Guide

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## 1. Presentation

FuelTech Wideband Lambda (O<sub>2</sub>) Meter Slim is a tool used for monitoring and adjusting combustion engines. This equipment conditions and reads the Bosch LSU 4.2 wideband lambda sensor with speed and precision.

Its great advantages are its reduced size and the position of connectors, located on the back of the equipment, making it possible to place the module on the vehicle's dashboard and integrating it to the other instruments, improving the appearance and the finishing of the car.

Its display shows the lambda values and it is used to present error messages regarding to the equipment connections as well.

Additionally, the WB-O<sub>2</sub> Meter Slim has an isolated analog output, with value proportional to the lambda measured, which can be used with a Datalogger, such as the FuelTech WB-O<sub>2</sub> Datalogger or the PRO24 Datalogger.

On the back side of the equipment, two screws for support fixation can be found. These screws can be removed with no prejudice to the module's operation.

The WB-O<sub>2</sub> Meter Slim uses FuelTech's Advanced Self-Calibration Software, a technology that makes the lambda readings much more precise, and allows the reader in the lambda sensor to compensate for errors in the readings caused by the aging or fatigue of the lambda sensor. Moreover, it uses a Bosch processor, which calibrates automatically through the sensor connector's original laser calibration resistor, dismissing the need for calibration by the user.

### 1.1 Characteristics

Lambda readings shown on the display (9,56 to 19,11 AFR)

Analog output 0-5V (9,56 to 19,11 AFR)

Dimensions: 88mm x 47mm x 20mm

## 2. Warnings and Warranty Terms

The use of this equipment implies the total accordance with the terms described in this manual and exempts the manufacturer from any responsibility regarding to product misuse.

Read all the information in this manual before starting the product installation.

**This product must be installed and programmed by specialized auto shops and/or personnel with experience on engine preparation and tuning.**

Before starting any electric installation, disconnect the battery.

The inobservance of any of the warnings or precautions described in this manual might cause engine damage and lead to the invalidation of this product warranty. The improper adjustment of the product might cause engine damage.

This product does not have a certification for the use on aircrafts or any flying devices, as it has not been designed for such use purpose.

In some countries where an annual inspection of vehicles is enforced, no modification in the original fuel injection system is permitted. Be informed about local laws and regulations prior to the product installation.

Important warnings for the proper installation of this product:

- Always cut the unused parts of cables off – NEVER roll up the excess as it becomes an interference capturing antenna and it can result on equipment malfunction.
- Follow the negative wiring instructions, connecting where the Manual indicates.

### Limited Warranty

This product warranty is limited to one year from the purchase date and covers defects from manufacturing origin only.

Defects and damages caused by the misuse of this product are not covered by the warranty.

The sensors used in this equipment are not covered by FuelTech's product warranty.

**The violation of the seal results in the invalidation of the Product Warranty and the loss of any access to new upgrade releases.**

### 3. Bosch LSU 4.2 Wideband O<sub>2</sub> Sensor

A Wideband O<sub>2</sub> sensor is more complex than a conventional one, and it requires a special control unit, such as the FuelTech Wideband O<sub>2</sub> Slim, which conditions and reads its signals.

Bosch LSU 4.2 sensor has an encased heating element and it is used to measure the proportion of oxygen which determines the lambda value in the remaining exhaust gas. Its signal indications varies from 0.65 lambda (rich mixture) to open air lambda (infinite), and it can also be used as a universal sensor for measuring lambda in all necessary ranges.

The connector includes a calibration resistor (factory calibrated), which defines the characteristics of the sensor and it is necessary for its operation. It is with this resistor that the WB-O<sub>2</sub> Slim automatically calibrates the sensor.



*Bosch Number: 0 258 007 057 –VW Number: 021-906-262-B*

*Other Bosch LSU 4.2 sensors with the same connector are compatible with this equipment.*

**Never remove the O<sub>2</sub> sensor connector or cut its cables, as any modification in this part completely compromises the precision of the equipments.**

#### Features:

- Continuous response curve
- Lambda measurement range: from 9,56 AFR to infinite
- Quick response: < 100ms
- Resistant to dirt and grime accumulation effects and contamination
- Great resistance to high temperatures
- Resistant to corrosion
- Double protection case

#### Temperature Range:

- Exhaust gas at the sensor: 850°C
- Sensor encasing hexagon: < 570°C
- Seal joint:
  - By the sensor: < 250°C
  - By the cable: < 200°C
- Cable and wires seal: < 250°C
- Connector: < 120°C

#### Electronic Data:

- Heating element feed voltage: 9V minimum
- Heating element Power: 10W
- Sensor element: ZrO<sub>2</sub> (Zirconium Dioxide [or Zirconia] – Ceramic)

Bosch LSU Oxygen Sensors are not developed to operate with fuel containing lead, and its life cycle is drastically reduced to an estimated 50 to 500 hours if used in such conditions, depending on how much lead the mixture holds.

Whenever the sensor is installed in the exhaust and the engine is running, the sensor MUST be connected to FuelTech WB-O<sub>2</sub> Slim, which also needs to be in operation. That is to prevent the equipment from being rapidly damaged from exposure to the exhaust gas without heating control.

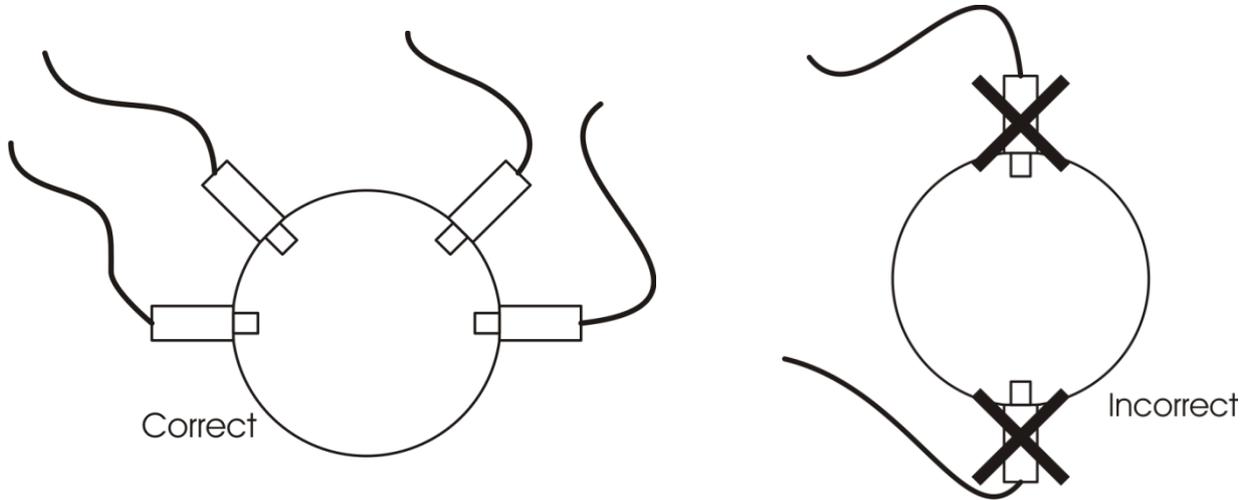
#### 4. O<sub>2</sub> Sensor Installation

The sensor must be inserted in the exhaust system with its tip exposed to the exhaust gas flow. It must stay in an angle between 10 to 90 degrees to horizontal position, that is, with its end downward, in such a way that steam droplets cannot be accumulated between the body of the sensor and its ceramic part, which could cause damage when the sensor is used. The sensor must not be placed vertically, as it becomes subject to excessive heat.

It is recommended that the sensor stays at least one (1) meter away from the exhaust manifold to avoid excessive heat, and at least one (1) meter away from the exhaust external output to avoid incorrect readings caused by oxygen in the air outside the exhaust system. Notice that such recommendations are not obligatory, as vehicles with a smaller exhaust system will need to have the sensor placed closer to the engine.

The sensor must stay away from the cylinder head and from areas where one cylinder might affect the exhaust air more than the others. Avoid placing the sensor close to the exhaust manifold joints, as some allow the inflow of air, resulting in incorrect readings.

The sensor must never be installed in the exhaust in the 6 o'clock position. The 12 o'clock position is not the most indicated, but can be used. The correct is to install the sensor in the 2, 3, 9 or 10 o'clock positions.



## 5. WB-O<sub>2</sub> Meter Slim Electric Installation

The WB-O<sub>2</sub> Meter Slim has two connectors, a 6-way and an 8-way. The 6-way cable is connected to the O<sub>2</sub> sensor through a standard connector.

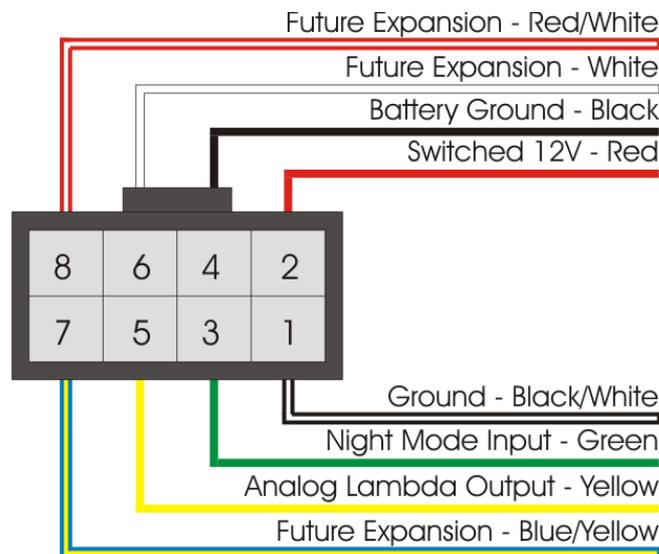
The 8-way connector is responsible for the feeding (12V) and it also gives access to the Night Mode input, which, when receiving positive (12V), dims the display for better visualization at night. This connector also has an analog output used to inform to a data acquisition system the lambda value read by the equipment through a 0 to 5V signal.

Notice the wiring table and diagram below for further details regarding the connections.

### 8-way Connector

Cable Color	Pin	Connection	Note
Black/White	1	Chassis Power Ground	Must be connected to the vehicle Chassis
Red	2	Switched 12V	The use of a 10A fuse is recommended
Green	3	Night Mode Input	When connected to 12V, dims the display. Can be connected with the vehicle's lighting key
Black	4	Battery's Ground - Negative Terminal	Must be connected directly onto the car battery's negative terminal
Yellow	5	Analog Output 0-5V	Analog output proportional to the lambda readings. Used for connection with Data Acquisition Systems
White	6	Future expansion	Leave these cables isolated
Yellow/Blue	7		
White/Red	8		

### 5.1 Electrical Wiring Diagram



## 6. Lambda Readings

### 6.1 Lambda and Analog Output in Volts – 9,56 to 19,11 AFR Table

Lambda $\lambda$	Volts (V)
9,56	0,200
9,70	0,271
9,85	0,342
10,00	0,412
10,14	0,483
10,29	0,554
10,44	0,625
10,58	0,695
10,73	0,766
10,88	0,837
11,03	0,908
11,17	0,978
11,32	1,049
11,47	1,120
11,61	1,191
11,76	1,262
11,91	1,332
12,05	1,403
12,20	1,474
12,35	1,545
12,50	1,615
12,64	1,686

Lambda $\lambda$	Volts (V)
12,79	1,757
12,94	1,828
13,08	1,898
13,23	1,969
13,38	2,040
13,52	2,111
13,67	2,182
13,82	2,252
13,97	2,323
14,11	2,394
14,26	2,465
14,41	2,535
14,55	2,606
14,70	2,677
14,85	2,748
14,99	2,818
15,14	2,889
15,29	2,960
15,44	3,031
15,58	3,102
15,73	3,172
15,88	3,243

Lambda $\lambda$	Volts (V)
16,02	3,314
16,17	3,385
16,32	3,455
16,46	3,526
16,61	3,597
16,76	3,668
16,91	3,738
17,05	3,809
17,20	3,880
17,35	3,951
17,49	4,022
17,64	4,092
17,79	4,163
17,93	4,234
18,08	4,305
18,23	4,375
18,38	4,446
18,52	4,517
18,67	4,588
18,82	4,658
18,96	4,729
19,11	4,800

When there is an output reading error, the analog output locks at 0.00V. Thus, it is possible to know if there is any problem or error in the equipment. To calibrate this output on external equipment, it is suffice to supply the first and last values of the table above.

## 7. WB-O<sub>2</sub> Meter Slim Codes

Using its display, the WB-O<sub>2</sub> Slim also transmits to the user some information and error codes, as specified below.

### 7.1 Informative Codes

Código	Descrição
	<b>LO</b> – This code is displayed every time the lambda value is lower than the minimum value set in the equipment, which is 9,56. That means the air-fuel ratio in the mixture is too rich.
	<b>HI</b> – This code is displayed every time the lambda value is higher than the maximum value set in the equipment, which is 19,11. That means the air-fuel ratio in the mixture is too lean.
	<b>HEATING</b> – This code is displayed when the Wideband sensor is being heated by the equipment. The heating process might take up to 60 seconds. The dots by each letter light up in a sequence to indicate that the sensor is reaching the temperature in which it operates.

### 7.2 Error Codes

Code	Description	Procedure
	<b>E01:</b> Error 01 – Internal processor error	It is necessary to send the equipment to FuelTech for repair.
	<b>E02:</b> Error 02 – Sensor disconnected	Check cables and connections or if the sensor is disconnected.
	<b>E03:</b> Error 03 – Short circuit with the ground on the sensor's heating element or damaged heating element.	Check cables and connections or replace the sensor.
	<b>E04:</b> Error 04 – Short circuit with the positive on the sensor's heating element or damaged heating element. Lack of power ground.	Check cables and connections or replace the sensor. Check power ground connection.
	<b>E05:</b> Error 05 – Short circuit with the ground on the signal cables	Check cables and connections or replace the sensor.
	<b>E06:</b> Error 06 – Short circuit with the positive on the signal cables.	Check cables and connections or replace the sensor.
	<b>E07:</b> Error 07 – Battery voltage under 10V	Check the battery and the alternator's feed voltage.
	<b>E08:</b> Error 08 - Internal processor error	It is necessary to send the equipment to FuelTech for repair.