FuelTech


# WBO2 NANO

Condicionador para Sensor Lambda Banda Larga

Wideband Lambda Sensor Conditioner

Condicionador para Sensor Lambda de Banda Ancha

**Manual de Instalação e Operação**

**Installation and Operation Guide**

**Manual de Instalación y Especificaciones Técnicas**

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# 1. Presentation

The FuelTech WB-O2 Nano is a tool used for monitoring and adjustment of combustion engines. This equipment conditions and reads the Bosch LSU 4.2 wideband O2 sensor quickly and accurately.

Its great advantages are the extremely compact size, the single and water proof connector plus CAN communication with FT500 and FT500LITE, which allows the sensor reading without using one of the analog inputs (white wire) of the FT500 or FT500LITE. There is also the 0-5V analog output to connect WB-O2 Nano with other FuelTech ECUs and dataloggers.
The display shows directly the lambda value and indicates error messages in the device connections.

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The WB-O2 Nano 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

Water proof (IP67 Certified)
Lambda readings shown on the display (5.14 to 146.9 AFR Gas)
CAN communication with FT500 and FT500LITE
Analog output 0-5V (8.7 to 16.2 AFR Gas)
It is possible to change the analog output values to 5.14 to 17.6 (Gas) or 9.55 to 19.11 AFR or 9.55 to 58.80 AFR or yet 9.55 to 146.9 AFR (Gas).
Dimensions: 2 3/8" x 1 3/4" x 1 7/16"

## 1.2 Package contents

WB-O2 Nano module
Wiring harness (optional)
Template for fixation holes
Instructions manual
4 screws for fixation
FuelTech sticker

*NOTE:*
*O2 sensor wiring harness it's available in two version 2 and 4,5 Meters.*

## 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.**

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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.

### Limited Warranty

All products manufactured by FUELTECH are warranted to be free from defects in material and workmanship for one year following the date of original purchase. Warranty claim must be made by original owner with proof of purchase from authorized reseller.

This warranty does not include sensors or other products that FUELTECH carries but did not manufacture. If a product is found defective, such products will, at FUELTECH's option, be replaced or repaired at cost to FUELTECH. All products alleged by Purchaser to be defective must be returned to FUELTECH, postage prepaid, within

one year warranty period.
This limited warranty does not cover labor or other costs or expenses incidental to the repair and/or replacement of products or parts.

This limited warranty does not apply to any product which has been subject to misuse, mishandling, misapplication, neglect (including but not limited to improper maintenance), accident, improper installation, tampered seal, modification (including but not limited to use of unauthorized parts or attachments), or adjustment or repair performed by anyone other than FUELTECH.

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The parties hereto expressly agree that the purchaser's sole and exclusive remedy against FUELTECH shall be for the repair or replacement of the defective product as provided in this limited warranty. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as FUELTECH is willing and able to repair or replace defective goods.

FUELTECH reserves the right to request additional information such as, but not limited to, tune up and log files in order to evaluate a claim.

**Seal violation voids warranty and renders loss of access to upgrade releases.**

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# 3. WB-O2 Meter Nano Electric Installation

The WB-02 Nano has a 12-way connector with 3 wire groups. One of them has the connector for the O2 sensor, the second makes the CAN communication with FT500/FT500LITE and the third is responsible for power and analog output.

By default, the analog output is set to values of 8.7AFR to 16.2AFR Gas, but can be configured to 5.14AFR to 17.6AFR Gas or 9.55 to 19.11AFR or 9.55 to 58.80AFR or yet 9.55 to 146.9AFR (Gas), if necessary.

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See the following wiring diagram for details about connections.

## 12-way connector

| Cor do Fio | Pino | Ligação | Observação |
|---|---|---|---|
| Red | 1 | O2 sensor | O2 sensor pin 6 - IP |
| Yellow | 2 | O2 sensor | O2 sensor pin 5 - sensor negative signal |
| Brown | 3 | O2 sensor | O2 sensor pin1 - Sensor positive signal |
| Red | 4 | Switched 12V | The use of a 10A fuse is recommended |
| Yellow/Red | 5 | 0-5V Analog Output | Analog output proportional to the lambda readings. Used for connection with data acquisition systems |
| White/Red | 6 | CAN | CAN (+): connected to FT500 or FT500LITE CAN port |
| Orange | 7 | O2 sensor | O2 sensor pin 2 - sensor resistor calibration |
| Green | 8 | O2 sensor | O2 sensor pin 3 - sensor heater positive |
| Blue | 9 | O2 sensor | O2 sensor pin 4 - Sensor heater negative signal |
| Black/White | 10 | Chassis/Engine Power Ground | Engine ground (head/block)<br>**Do not connect it directly to the battery negative.** |
| Black | 11 | Battery's Negative | Connected **directly** to the battery negative with no splices.<br>**Do not connectec this wire to the chassis engine block or head.** |
| Yellow/Blue | 12 | CAN | CAN (-): connected to FT500 ou FT500LITE CAN port |

## 3.1 Electrical Wiring Diagram

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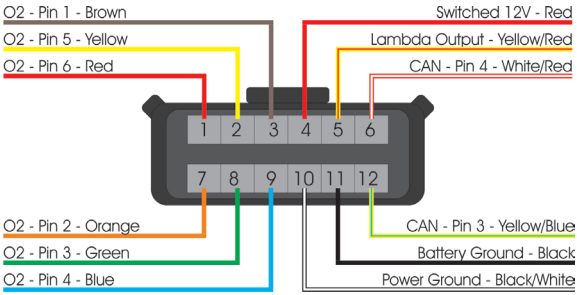


Harness Connector Rear View

## 4. Bosch LSU 4.2 Wideband O2 Sensor

Bosch LSU 4.2 sensor has an encased heating element and it is used to measure the air fuel ratio, which determines the lambda value in the remaining exhaust gas. Its signal indications vary from 5.14AFR Gas (0,35 λ) lambda (rich mixture) to open air lambda (infinite).

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-O2 Nano automatically calibrates the sensor.

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.

Whenever the sensor is installed in the exhaust and the engine is running, the sensor MUST be connected to FuelTech WB-O2 Nano, 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.

**Bosch Number: 0 258 007 057 or 0 258 007 351**
**VW Number: 021-906-262-B**

## 4.1 O2 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 80 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.

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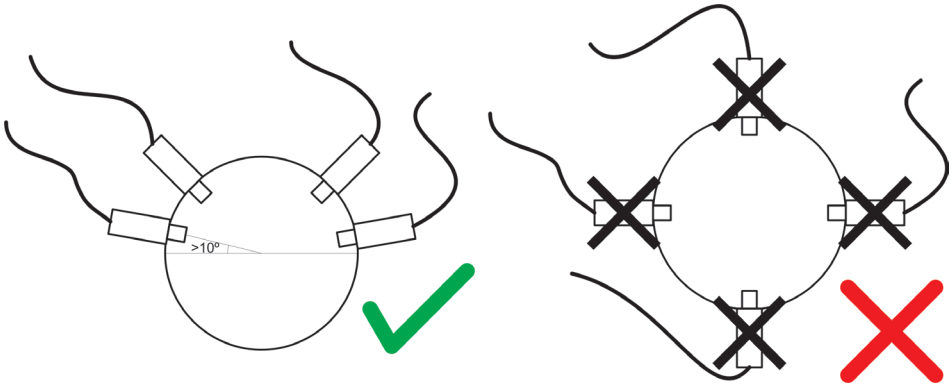
It is recommended that the sensor is installed at least one (1) meter away from the exhaust manifold to avoid excessive heat, and at least one (1) meter away from the exhaust external output to avoid incorrect readings caused by oxygen in the air outside the exhaust system.

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 must. Avoid placing the sensor close to the exhaust manifold joints, as some allow the inflow of air, resulting in incorrect readings.



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# 5. CAN Communication

The WB-O2 has CAN communication, which allows to send and to read various information of the FT500/FT500LITE that are not possible via the 0-5V analog output. On its harness there are two 4-way CAN connectors plug and play with FT500 and FT500LITE or other WB-O2 Nano units.

When connected to the CAN port, the WB-O2 Nano can read what the fuel and the measurement unit (lambda or AFR) that the FT500/FT500LITE is set, adjusting itself to these settings, disabling the analog output and sending the AFR value to FT500 in the range of 5.14 to 149.9 AFR Gas (0,35 λ to 9,99 λ).

When used in the rest of the product line (FT250 to FT400) the connection with the injection is only through the 0-5V analog output.

In the CAN network, during the O2 sensor heating period, the value displayed in the FT500/FT500LITE will be equal to 0 (zero) and the back of lambda gauge (FT500 only) will turn yellow.

In case of any error during work, in addition to the warning on WB-O2 Nano display, the error will be sent via CAN to the FT500/FT500LITE and recorded in "Status Events" log.

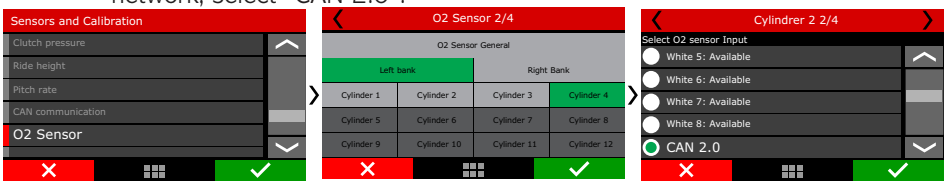
To connect the WB-O2 Nano via CAN to FT500/FT500LITE simply plug the 4-way cable to the ECU CAN port.

## 5.1 FT500 and FT500LITE Configuration

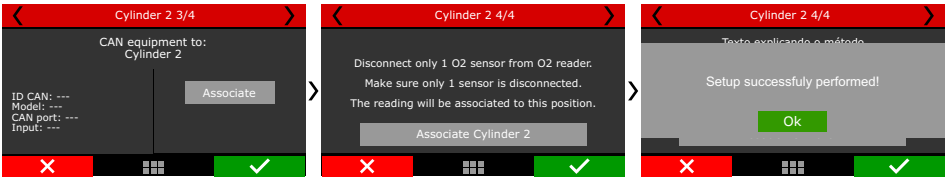
WB-O2 Nano CAN Communication can be setup through FTManager Software or through FT500/FT500LITE screen.

### To setup it through the ECU screen:

Go to “Sensors and Calibration” menu, then “O2 sensor”. Select the position where this O2 sensor is installed on the engine. Then for CAN network, select “CAN 2.0”.

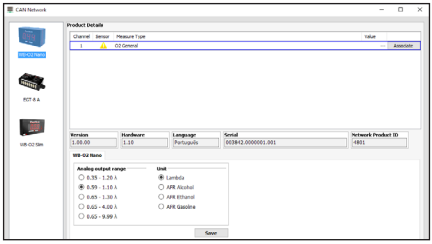


Disconnect the O2 sensor plug that you want to associate to this position and click “Associate”.



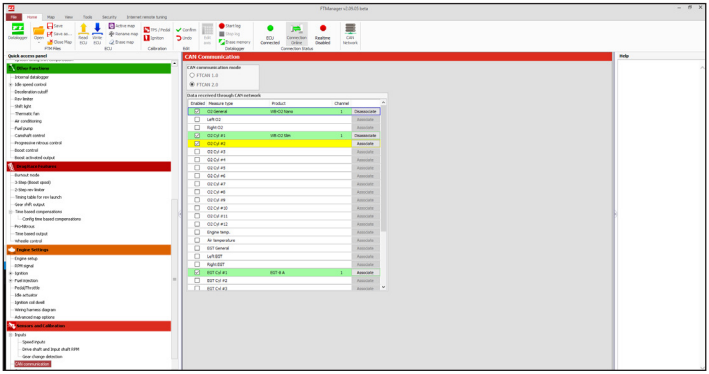

## Through FTManager Software:

Click “CAN Network” on the tool bar. All the equipment connected to the CAN Network will be listed on this screen. Right click on the equipment you want to associate and then select the position where it is installed.



The O2 sensor can also be associated through “Sensors and Calibration” menu, then “CAN Communication”.

To associate an O2 sensor to a reading, disconnect the O2 sensor plug and then click “Associate”. If there’s one O2 sensor only connected to CAN network, it is automatically associated when pressing “Associate” button.



## 5.2 Configuration to use WB-O2 Nano out of the CAN Network

WB-O2 Nano allows the selection of the display unit and O2 sensor reading scale, but, these settings are read from the FT500/FT500LITE during its initialization. In case it is removed from the CAN network, WB-O2 Nano goes back to factory configuration.

To setup these factory default configurations it is necessary to connect it to a FT500/FT500LITE through CAN network following this procedure:

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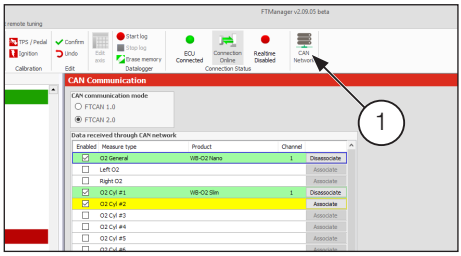
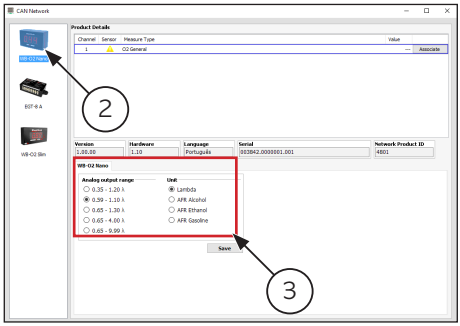
a) Select an empty map on your FT500/ FT500LITE (this step is very important in order to prevent your WB-O2 Nano from reading settings from the ECU map);




b) Connect the FT500/FT500LITE to the USB and WB-O2 Nano to the CAN network;

c) Open FTManager Software;

d) Click the “CAN network” button on the toolbar (1);




e) Click the photo os the product you want to setup (WB-O2 Nano) (2);

f) All the options regarding reading scale and O2 unit will be at the lower part of the screen;

g) The options selected in here is automatically sent and recorded as default on the WB-O2 Nano, not being necessary to click save or sand buttons.

*NOTE:*
*It’s recommended to make the configuration of a WB-O2 Nano to time connected CAN network to identification easy.*

To check if the settings are successfully done, simply turn the WB-O2 Nano off and then on again. The settings will be displayed on its display during startup.

# 6. Lambda Readings analog outputs

## 6.1 Lambda Analog Output in Volts – 5.14 to 17.6AFR

| Lambda | AFR Gasolina | AFR Metanol/ Etanol | Volts (V) |
|---|---|---|---|
| 0.35 | 5.14 | 2.3 | 0.20 |
| 1.20 | 17.6 | 7.7 | 4.80 |

## 6.2 Lambda Analog Output in Volts – 8.7 to 16.2 AFR (default)

| Lambda | AFR Gas | AFR Methanol/ Etanol | Volts (V) |
|---|---|---|---|
| 0.59 | 8.7 | 3.8 | 0.20 |
| 1.10 | 16.2 | 7.1 | 4.80 |

## 6.3 Lambda Analog Output in Volts – 9.6 to 19.1 AFR

| Lambda | AFR Gas | AFR Methanol/ Etanol | Volts (V) |
|---|---|---|---|
| 0.65 | 9.6 | 4.2 | 0.20 |
| 1.30 | 19.1 | 8.3 | 4.80 |

## 6.4 Lambda Analog Output in Volts – 9.6 to 58.8 AFR

| Lambda | AFR Gas | AFR Methanol/ Etanol | Volts (V) |
|---|---|---|---|
| 0.65 | 9.6 | 4.2 | 0.20 |
| 4.00 | 58.8 | 25.7 | 4.80 |

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## 6.5 Lambda Analog Output in Volts – 9.6 to 146.9 AFR

| Lambda | AFR Gas | AFR Methanol/ Etanoll | Volts (V) |
|---|---|---|---|
| 0,65 | 9,6 | 4.2 | 0.20 |
| 9,99 | 149,9 | 64.1 | 4.80 |

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 configure this output on external equipment, it is suffice to supply the first and last values of the table above.

# 7. WB-O2 Meter Nano Codes

## 7.1 Informative Codes

When turning WB-O2 Nano powers on, the following information appears on its display:

**Product name**

**Measurement unit (Lambda, AFR gasoline, AFR alcohol or AFR Methanol)**

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Analog output scale (as seen on chapter 6)

Cylinder identification (when connected via CAN with FT500 or FT500LITE): tells which cylinder the conditioner is reading, when used for individual cylinder adjustment.

Then the word HEATING indicates the O2 sensor heating for operation.

After heated, the word HI appears when AFR above 146.9 AFR Gas (64.1 AFR Alcohol) is read.

## 7.2 Error Codes

| Código | Descrição | Procedimento |
|---|---|---|
| E01 | E01: internal processor error | It is necessary to send the equipment to FuelTech for repair |
| E02 | E02: Sensor disconnected or damaged | Check connections of the O2 sensor |
| E03 | E03: Short circuit with the positive on the sensor's heater or damaged heating element | Check connections or replace the O2 sensor. Check power ground connection |
| E04 | E04: Short circuit with the positive on the sensor's heater or damaged heating element. Power ground problem. | Check connections or replace the O2 sensor. Check power ground connection |
| E05 | E05: short circuit with the ground on the signal cables | Check connections or replace the O2 sensor. Check power ground connection |
| E06 | E06: short circuit with the positive on the signal cables. | Check connections or replace the O2 sensor. Check power ground connection |
| E07 | E07: battery voltage under 10V (normal when cranking engine) | Check unit positive and negative connections. |
| E08 | E08: if it blinks during power on, it indicates a communication error. If this code keeps fixed on the screen, may indicate a damaged O2 sensor or WB-O2 Nano unit | Try another O2 sensor. If the problem still unsolved, it is necessary to send the equipment to FuelTech for repair |


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