LAMBDA-MONITOR PRO-II

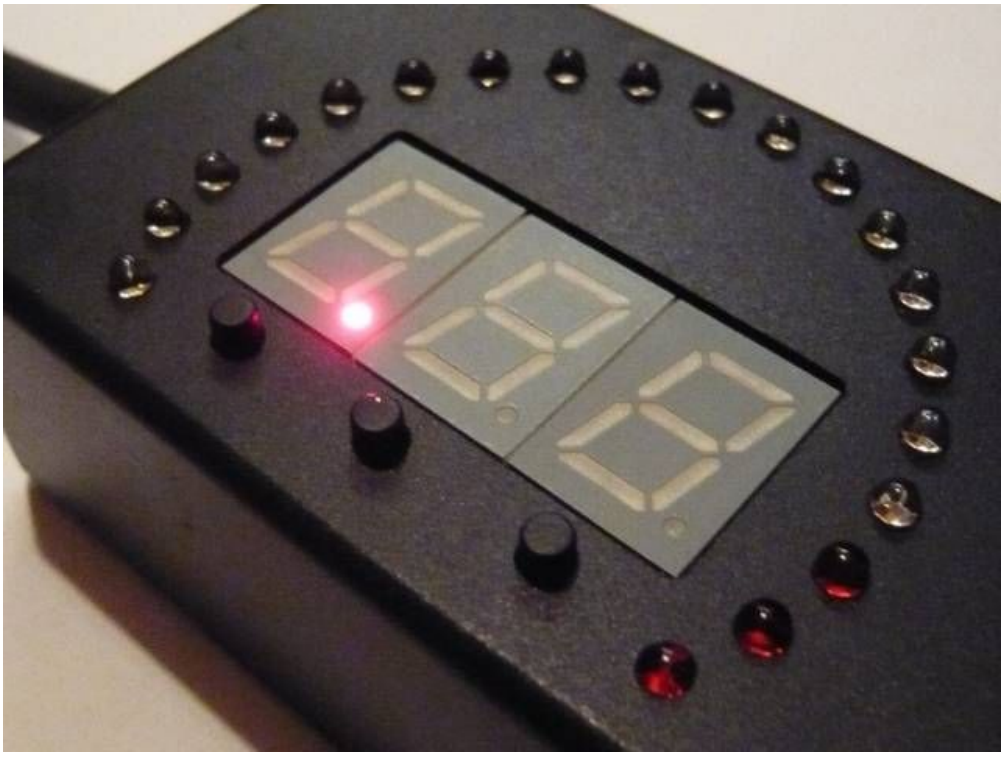
General Information

Purpose of LAMBDA-MONITOR PRO-II is to monitor the all-time Air/Fuel-ratio displayed as LAMBDA value based on the signal of the common and very popular Narrow Band Oxygen-sensor (NBO2).

Lambda value is displayed on digital display and very informative colored led-bar at the same time.

LAMBDA-MONITOR PRO-II is a very useful tool during setting the Air/Fuel-ratio of your vehicle to get maximum power at full throttle and minimum consumption at part throttle. Very dangerous lean mixture also can be detected to anticipate engine damage.

We suggest to use LAMBDA MONITOR Pro-II for naturally aspirated and low-pressure charged engines.



About power increasing

Vehicle manufacturers do not fine air-fuel mixture to the value that offers maximum power because of the environmemtal protection rules, so there can be a considerable amount of an untapped power in yor engine.

The amount of the mixed fuel can be increased by different tuning solutions:

ECU managed engine:
- Piggy-Back device
- Programmable tuning box
- Increasing fuel-pressure

Carburetor:
- Changing jets

You should choose any of the solutions mentioned above, first of all: It is a must to know the all-time Air/Fuel-ratio.

About lambda-value

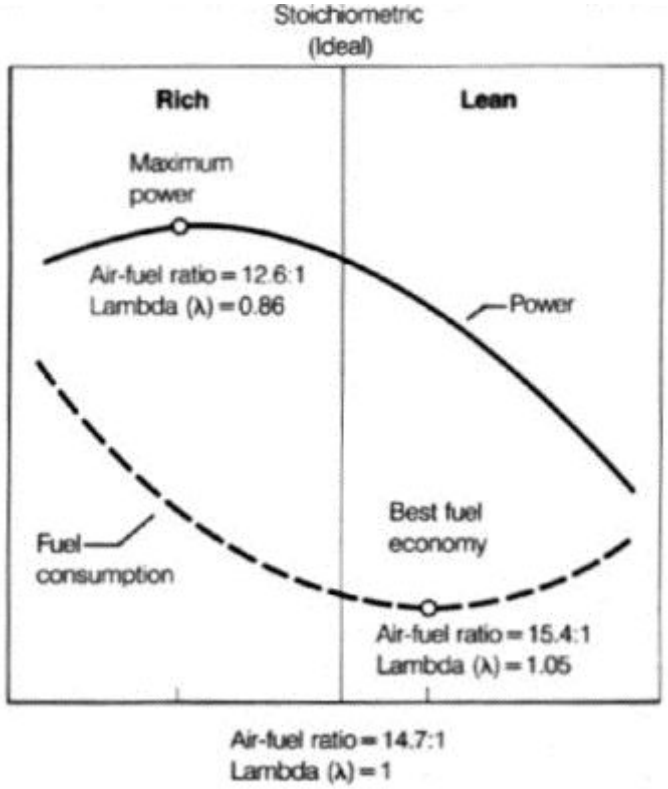
Too lean and too rich mixture also can lead to high fuel consumption and power loss at the same time.

Too lean mixture can effect over heating that can shorten life of the engine or –in extreme casescan damage the engine specially in case of charged engines.

Basically it is a must to correct Air/Fuel-ratio in case of appliing direct air filter or any other engine tuning solutions.

Changing to E85 (Ethanol) volume of the applied fuel must be increased by 22% to get the same Air/Fuel-ratio as it was when using common petrol. E85 offers less heat load, 10% extra power, more economical driving and it is also more environment friendly.

On the diagram below you can find relation among power, fuel consumption and lambda-value. Lean mixture is representated at the right side, rich mixture is at the left side.



Maximum power is at lambda=0.86, while the minimal consumption is at lambda=1.05.

The optimal point between consumption and power is at lambda=1.00.

The more fuel you apply, it cools the more the engine. In case of charged engines decreasing lambda value below lambda=0.86 (increasing fuel volume above the maximum power value) can decrease the huge heat load of the engine, although there is some power loss.

About Narrow Band Oxygen-sensor

Narrow Band Oxygen-sensor can measure:

- mixture leaner than 0.95: 100% accurate.
- mixture richer than 0.95: at least 95% accurate.

The accurate of measuring lambda-value in case of mixture richer than 0.95 depends on the temperature of the oxygen sensor (temperature of the exhaust gas).

It means, the Narrow Band Oxygen Sensor can measure Air/Fuel-ratio by a tolerable accuracy. First of all, the very dangerous lean mixture can be precisely detected and changing of the mixture can be traced.

It is suggested to measure mixture near lambda=0.85 after some hard acceleration after engine has reached its operation temperature to let exhasut gas warm up the sensor.

It is suggested to use heated oxygen sensor.

Suggested type: **BOSCH LSM-11** (0 258 104 002 / 0 258 104 004)

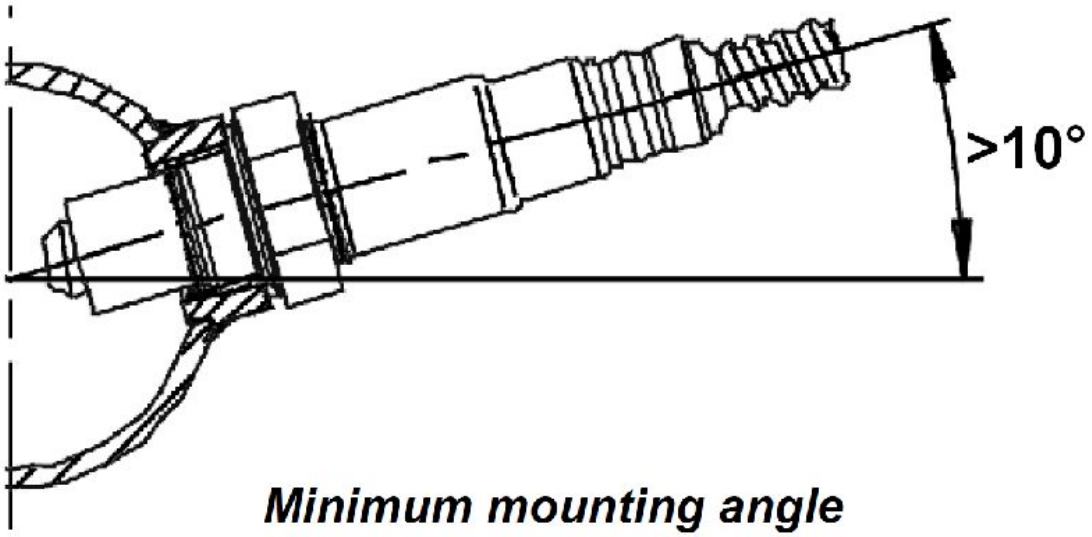
NOTE: LEADED FUEL DAMAGES ANY KIND OF OXYGEN SENSORS IMMEDIATELY!

How to install additional oxygen-sensor

Most of the vehicles has a factory built-in Narrow Band Oxygen-sensor that takes place at the front section of the exhaust system.

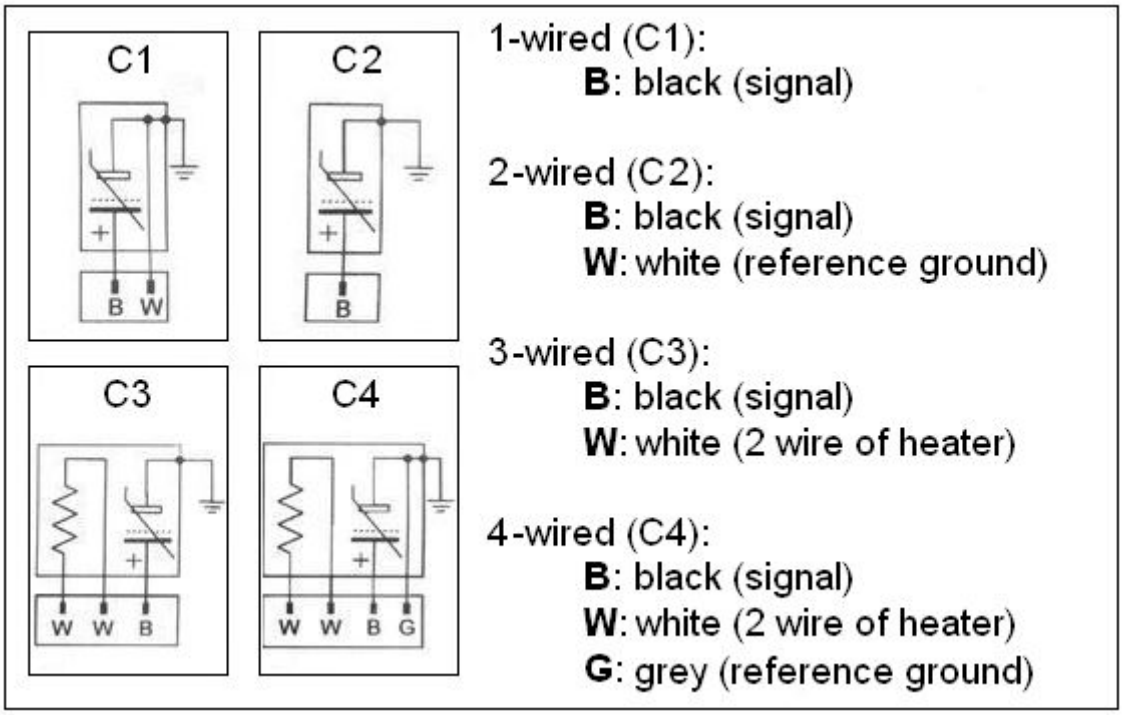
However, it is quite easy to install additional oxygen-sensor into the exhaust system using a screw-profile. Pay attention to the correct fiting position.

The closer the oxygen-sensor to the cylinder head, the higher the exhauxt gas temperature, so try to fit oxygen-sensor to the common section of the exhaust system as close to the cylinder head as possible. Installing the sensor to the common section of the exhaust system lets you measure Air/Fuel-ratio of every cylinder at the same time.



Minimum mounting angle

Pin-out of Narrow Band Oxygen-sensor



Installing LAMBDA-MONITOR Pro-II

- Please work carefully. Do not pull the cable or cable connections. Improper cable connections may result cable fires. Improper cable installations or cable connections may result malfunction or damages of the oxygen sensor. Correct laying and connection of cables is essential for long-term, proper working. The connector plugs of the oxygen-sensor have safety adjustments. Please be careful when unplug/plug the connector to avoid damage of pins.

- Install the cables along the original cable looms and use insulating tapes or cable binders

- We recommend to disconnect the battery before installing the cables

- **To avoid interference from the ignition system do not put the cables close to any parts of the ignition system**

- Please install the plug-in connectors at a suitable place where no splash water can reach them. Keep care not to detach from their position (use tape or cable binders).

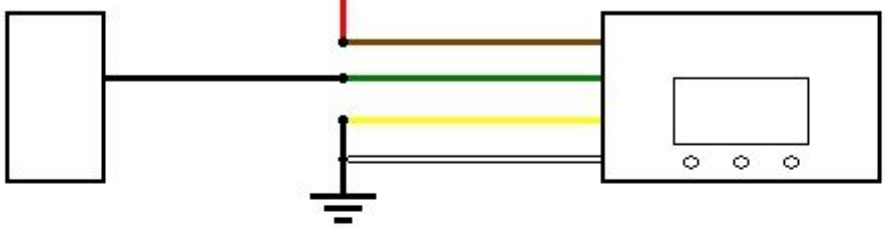
- Do not locate the cables near sharp edges, hot or moving parts.

- Please ask an expert if you have any problems during installation

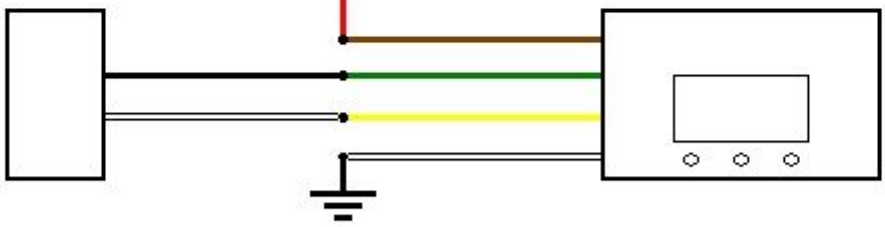
We are not responsible for consequential damages caused by incorrect installation.

Wiring LAMBDA-MONITOR Pro-II

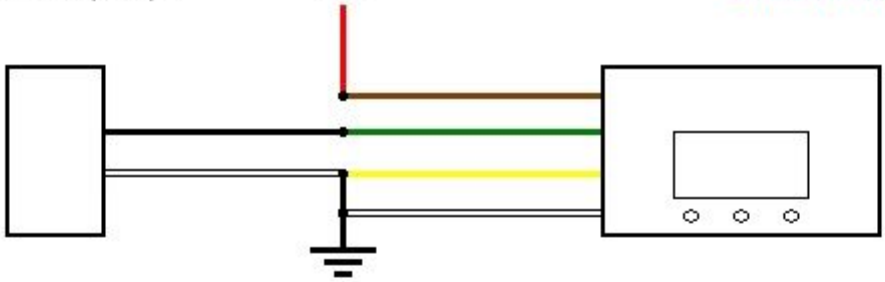
1-wired (C1): 12v



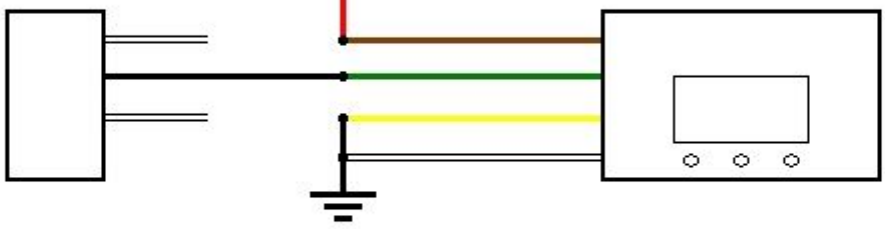
2-wired (C2): 12v factory built-in NBO2



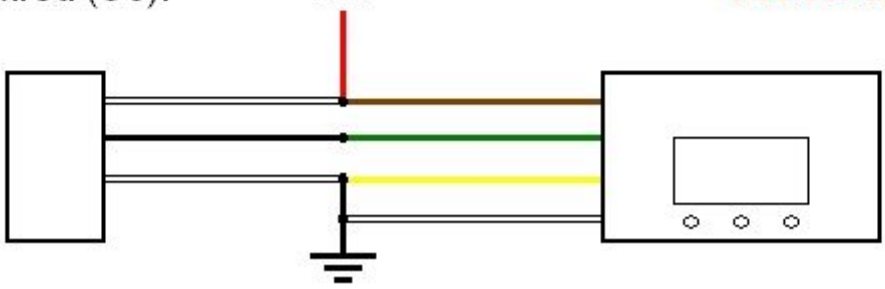
2-wired (C2): 12v additional NBO2

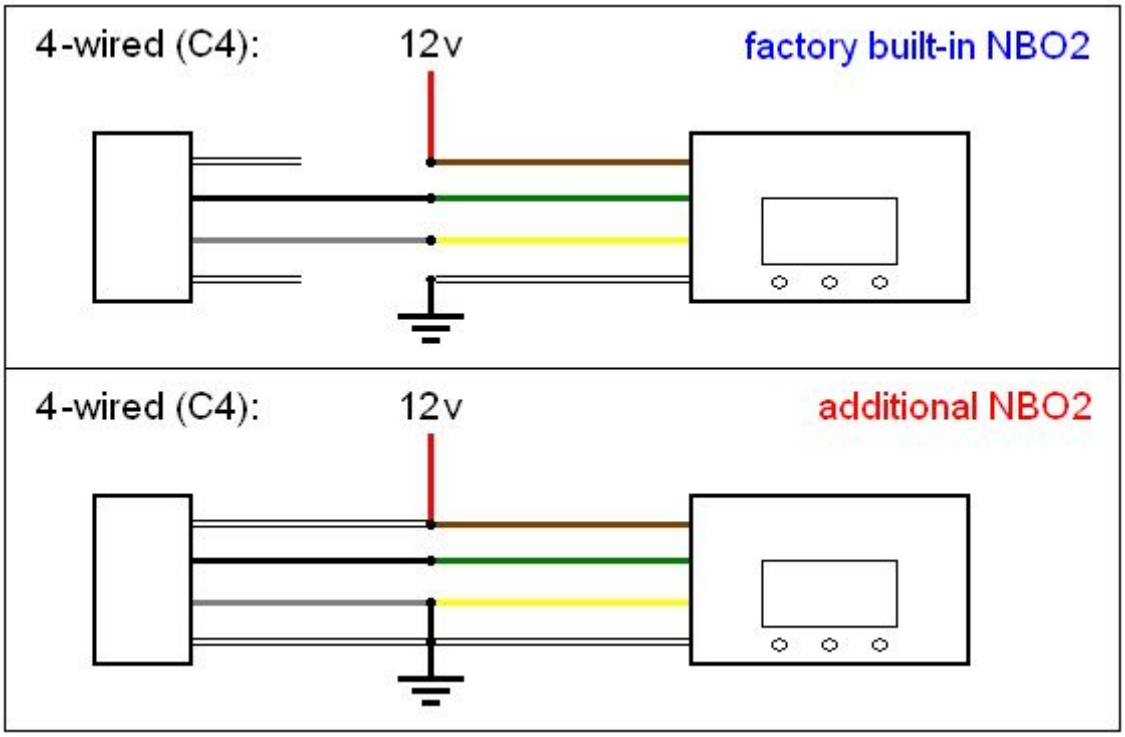


3-wired (C3): 12v factory built-in NBO2



3-wired (C3): 12v additional NBO2





Parameters

- Supply voltage: 10 – 15 V.
- Built in protection against reverese polarity and electronic disturbances.
- Input: 0-1000mV
- Display: 20pcs of blue/orange/green/red led and 3pcs of 7 segment red digital display
- 4 level adjustable brightness
- Dot/Bar led display mode
- Energy save STANDBY mode

Wiring

brown:	Ignition switch +12V
white:	Ground
green:	Oxygen-sensor signal
yellow:	Oxygen-sensor reference ground potential

or:

yellow-green:	Ignition switch +12V
black #1:	Ground
black #2:	Oxygen-sensor signal
black #3:	Oxygen-sensor reference ground potential

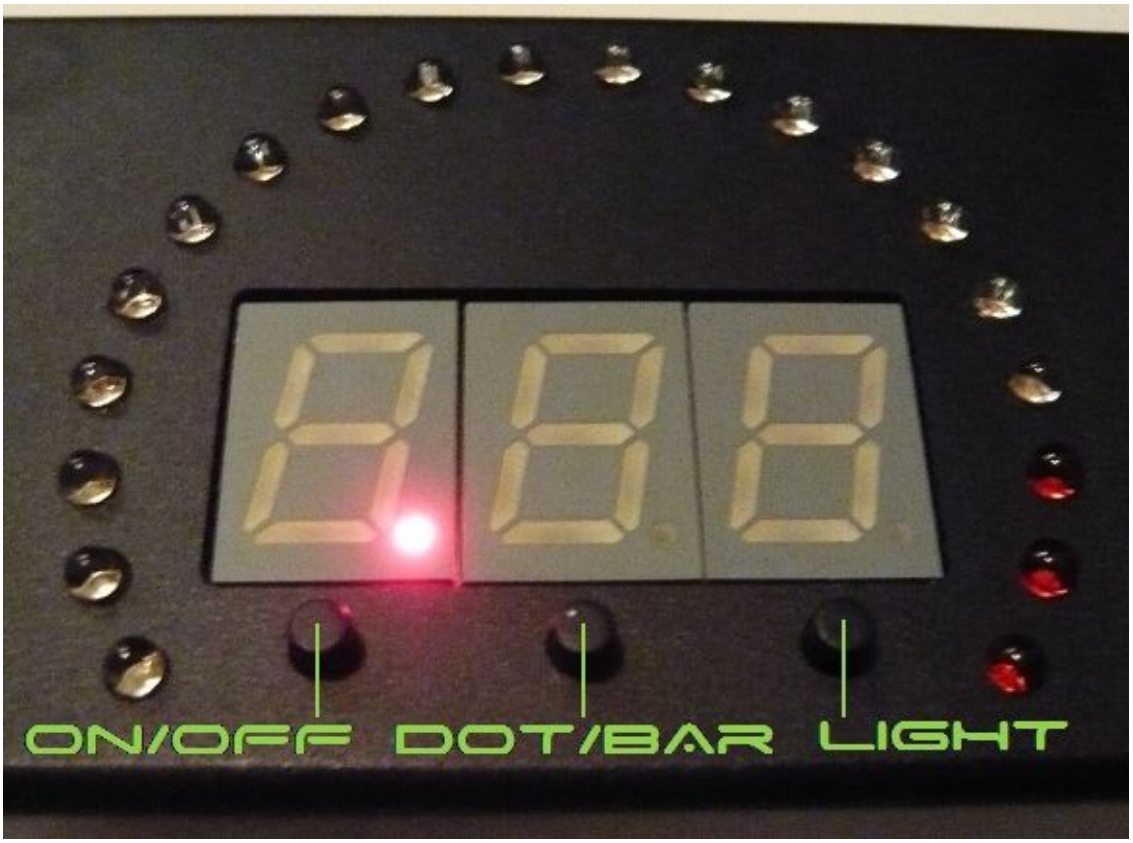
Notes:

Most accurate measurement can be reached by appliing 4-wired oxygen-sensor!

It is very important to use soldering or very low resistance connection when connecting LAMBDA MONITOR Pro-II to the oxygen-sensor, otherwise measurement will not be accurate enough!

User interface

There are three buttons on the user interface:



ON/OFF:

Turn power on and off. In case turned off only standby led lights. When device is turned on, an automatic test program runs while first every led lights, then every segment of the digital diplay.

DOT/BAR:

Change between dot and bar led display mode.

LIGHT:

Select among four different level of brightness to choose the most comfortable setting.

Lambda-values of led display

- Power maximum is at lambda=0.86
- Optimal point between consumption and power is at lambda=1.00
- Minimal consumption is at lambda=1.05
- The lower the lambda-value, the richer the mixture

Lambda-values of led display:

#	color	lambda
1.	**(blue)**	**-1.240**
2.	**(blue)**	**1.240-1.100**
3.	**(blue)**	**1.100-1.060**
4.	**(yellow)**	**1.060-1.045**
5.	**(yellow)**	**1.045-1.030**
6.	**(yellow)**	**1.030-1.015**
7.	**(green)**	**1.015-1.000**
8.	**(green)**	**1.000-0.985**
9.	**(yellow)**	**0.985-0.970**
10.	**(yellow)**	**0.970-0.955**
11.	**(yellow)**	**0.955-0.940**
12.	**(yellow)**	**0.940-0.925**
13.	**(yellow)**	**0.925-0.910**
14.	**(yellow)**	**0.910-0.895**
15.	**(yellow)**	**0.895-0.880**
16.	**(yellow)**	**0.880-0.865**
17.	**(yellow)**	**0.865-0.850**
18.	**(red)**	**0.850-0.800**
19.	**(red)**	**0.800-0.750**
20.	**(red)**	**0.750-**

Notes

In case of vehicles having catalitic converter the Engine Control Unit controls mixture at part throttle within a narrow band, so lambda-value changes continueusly within the rich and lean edge to reach an optimal average lambda-value, consumption and pollution level. In this case the displayed lambda-value also changes on the interface of LAMBDA-MONITOR PRO-II.

Oxygen-sensor having heater can measure mixture after few minutes ignition is switched on, so Air/Fuel-ration of c old engine can be monitored also.

Oxygen-sensor without heater reaches its opeartion temperature by the hot exhaust gas, so Air/Fuel-ratio of cold engine can not be monitored.