

WB2

WB2 is a microprocessor-based controller designed to process signal from Bosch LSU4.9 wideband lambda sensor.

The controller converts current signals from lambda sensor to lambda number (λ). The lambda number value is converted to two customizable modifiable analogue inputs with range from 0.03V to 5 V. The values can also be transmitted using two data lines. The lines are UART (RS232) and CAN (High speed). The converter is equipped with one analogue input, which serves to correct the lambda number or voltage outputs. Using this input it is possible for example to regulate the measured lambda number by voltage proportional to the pressure in exhaust pipe where the lambda sensor is located. The controller also regulates the heating of lambda sensor according to the sensor manufacturer's specifications.

The device is encapsulated in a plastic box. The sensor connection is using original connector 1J0973713, and shall not be substituted. The power supply and output connection is using faston connectors. Counterparts of the connectors are supplied.

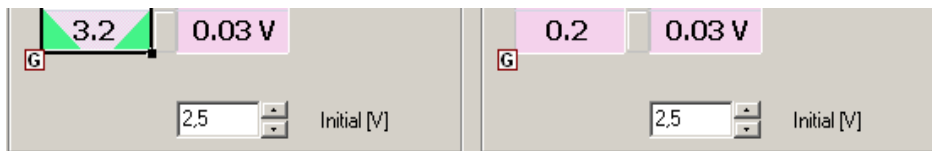
Controller Parameters

Supply voltage	12 – 15V
Power input	Maximum 13W
Output voltage	0.03-5V
Input range (optional, two ranges)	λ 0.65 – air and λ 0.8 – air
Output current maximum	10 mA
Speed of response of output to a step change of the gas composition	20ms

Functional Description

1) Start

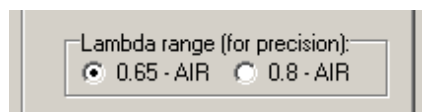
After power supply connection the controller adjusts both the output voltages to the desired value "initial" corresponding to the user-set value. On the left for output 1, on the right for output 2.



This value is maintained on the output until the sensor is properly warmed up and calibrated. This process usually takes 30-40 seconds. Afterwards the output circuit is redirected to the actual measured value. Constant temperature of 780 °C is kept on lambda sensor chip in normal operating conditions.

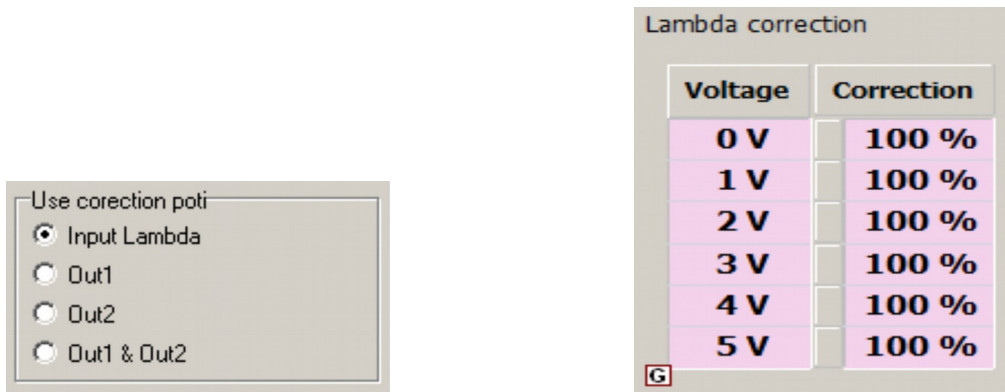
2) Conversion to lambda number

The lambda sensor works on the principle of measuring residual oxygen content in the fuel mixture. This means conversion of current signals from the lambda sensor to lambda number. There are two optional ranges for this conversion: 0.65 λ – air and 0.8 λ – air. It is better to use the range 0.8 – air to measure leaner mixtures.

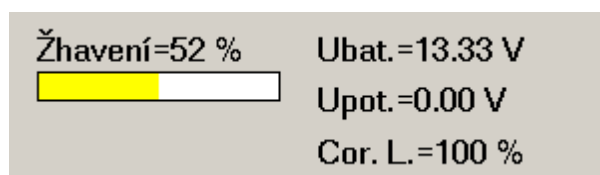


3) Analogue input correction

a) Where the analogue input function is set as "Lambda input", the result of conversion to lambda number is corrected as percentage from value according to "Lambda correction" table (expressing conversion of voltage from correction input to percentage multiplier of the lambda conversion). If we do not perform any correction, we set the whole column at 100%.



The correction and the current size of the analogue input voltage is visualized on the monitor as Upot (voltage on the input and Cor.L - currently calculated correction value from the table).



The resulting lambda number is used for analogue and data outputs.

b) Where OUT1 option is selected (only output1), or OUT2 (only output 2), or OUT1 & OUT2 (both analogue outputs), the lambda number correction is performed just for the purpose of relevant analogue outputs (lambda number displayed in the monitor, as regards sending via data lines it remains unregulated).

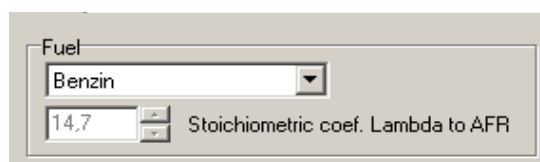
This function enables for example to regulate the output connected to the regulation lambda sensor (imitation of lambda sensor connected to the injection unit), and simultaneously using the second output or data line to follow the actual lambda number not influenced by "lambda correction" function.

4) Voltage outputs

To express the volume of residual oxygen in the measured mixture either notation λ in relative units can be selected, or AFR (air/fuel ratio).



When AFR is chosen it is necessary to correctly define the type of fuel used.



Predefined ratios are enlisted. If you use fuel that is not predefined, it is possible to choose "Option". Here the user can define a stoichiometric mixture ratio. The controller analogue output voltages follow the tabled adjustable by the user.

Lambda	Voltage
0.68	0.032 V
0.78	1.026 V
0.89	2.019 V
1	3.013 V
1.1	4.006 V
1.22	5 V

Lambda	Voltage
0.68	0.961 V
0.84	0.86 V
0.93	0.78 V
1.02	0.171 V
1.14	0.053 V
1.53	0.03 V

5) CAN data flow

The controller includes data output via CAN bus. Here you can enter three kinds of data formats.

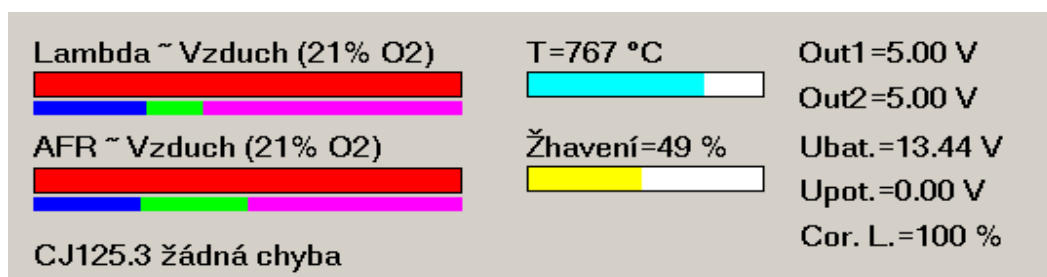
CAN

None 0 ECU
 Ignitech
 J1939 1 MBd CAN rychlost
 Proprietal

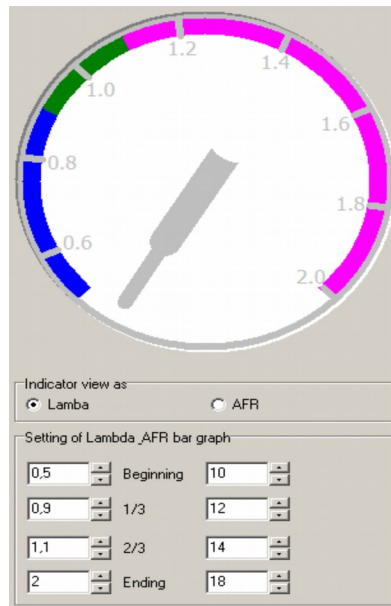
- 1) Ignitech - optional ID notification (decimal), adjustable speed. Notification structure: 0.1 BYTE - resulting AFR x 10 ; 2.3 BYTE - resulting λ x 100 ; 4.5 BYTE - voltage on OUT1[mV] ; 6.7 BYTE - voltage on OUT2[mV]. Little endian notification.
- 2) J1939 - message defined by J1939-71, v pgn 65193 as spn1119 , speed optional, number ECU (WB2 controller number) optional.
- 3) Proprietal - user-defined notification.

5) RS232 data flow

During operation of the controller all the important values are monitored and sent via RS232 to be displayed in the software. The basic values can be seen on the simple screen under the software control window.



There is analogue VDU located next to the control window. There are adjusting elements under the VDU, where you can change the range, the notification (lambda or AFR) and colour definitions of the display element.



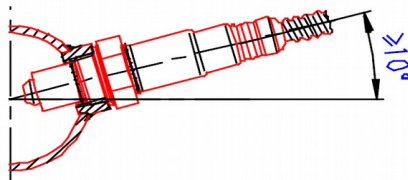
The colour definitions and corresponding values have separate sets of parameters for both lambda and AFR notification.

7) Controller connection

The sensor connection is using original connector 1J0973713, and shall not be substituted. The power supply and one output are using faston connector 4x6.3 mm. The power supply wires are red (+12 V) and dark blue (power ground). Output wires are orange (signal) and light blue (signal ground). In extreme cases the power and signal ground conductors may be linked, but it should be always kept in mind that they are interconnected!!! Other inputs and outputs are implemented via 2.8 mm connectors. The input circuit of follow-up equipment should have input resistance min. 10 kOhm to signal ground.

9) Lambda sensor installation

Lambda sensor has to be located (in the exhaust pipe) in a way to prevent water from condensing inside the measuring part. For this reason minimum gradient specified by the manufacturer is 10° from the horizontal axis - see image below. It is advisable to place the controller in a dry place with a temperature of up to 60°C . The controller does not require any special maintenance.



10) WB2 controller connection diagram

