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LAMBDA controller V9.0
LSU 4.9 & LSU 4.2

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Brief description

The product LAMBDA controller works with a wideband Lambda sensor type LSU 4.9 and LSU 4.2 with extended function for PID mixture regulation using a Stepper motor control.

LAMBDA controller is based on circuit BOSCH CJ125 which serves basic function of oxygen sensor along with supporting microprocessor for filtering and control. Microprocessor also provides PID lambda regulation by Stepper motor control, Analog output – AO, diagnostic interface USB and CANbus in protocol SAE J1939.

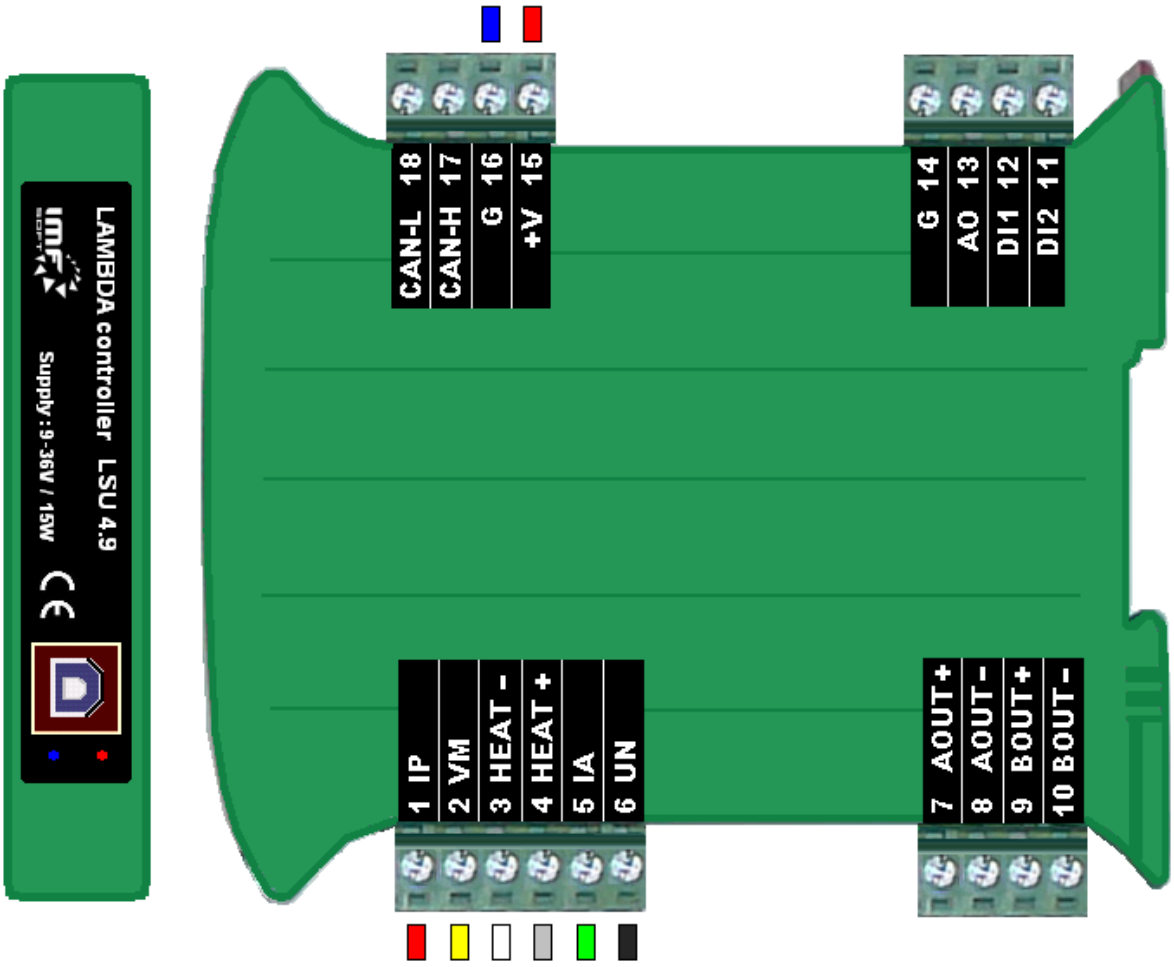
Lambda heater is controlled by PID regulator and the resistance of measuring cell (Nerns Cell) with auto-off option according to engine speed received from CANbus / J1939.

LAMBDA controller processes and visualizes data about Lambda mixture – λ, Oxygen – O2, Ratio – A/F, Sensor temperature – T [℃], Supply voltage – U[V], Analog output – AO [V] Actual step of stepper motor [-] and Engine speed – RPM (takes from CANbus / J1939).

Main Features

- ✔ Supply voltage range 9 to 36V (12V/24V)
- ✔ Consumption 15W (Lambda heater and Stepper motor)
- ✔ Operation temperature -40 to 85℃
- ✔ Support for Lambda sensor type: LSU 4.9 and LSU 4.2
- ✔ Used BOSCH CJ125 circuit and microprocessor support
- ✔ Visualization: Lambda – λ ..... 0.7 to 12.5 (± 0.1%)
  Oxygen – O2 ..... -7.5 to 20% (± 0.1%)
  Ratio – A/F ..... Gasoline, Diesel, Methanol, Ethanol E85, LPG, CNG, Hydrogen
  Temperature – T [℃] ..... -40 to 1050℃ (± 3℃)
  Supply voltage – U [V] ..... 7 to 50V (± 2%)
  Analog output – AO [V] ..... 0 to 5V (± 0.5%)
  Digital Input DI1/DI2 ..... 0 or 12/24V
  Engine hours ..... [h:m:s]
  Actual step ..... 0 to 65000 steps
- ✔ PID mixture regulation by Stepper motor control (microstep 1/32)
- ✔ Power source 11V inside for LAMBDA heating and Stepper motor supply
- ✔ CANbus support at protocol SAE J1939 (250kbps)
- ✔ Supported connection or integration with ECU MASTER
- ✔ Galvanically isolated USB – USB protection against earth fault and EMC disturbances
- ✔ PC application – configuration and visualization measured values
- ✔ Measuring the supply voltage
- ✔ Installation standard – DIN rail 35mm
- ✔ Protection class – IP20
- ✔ Dimensions 118x101x23mm

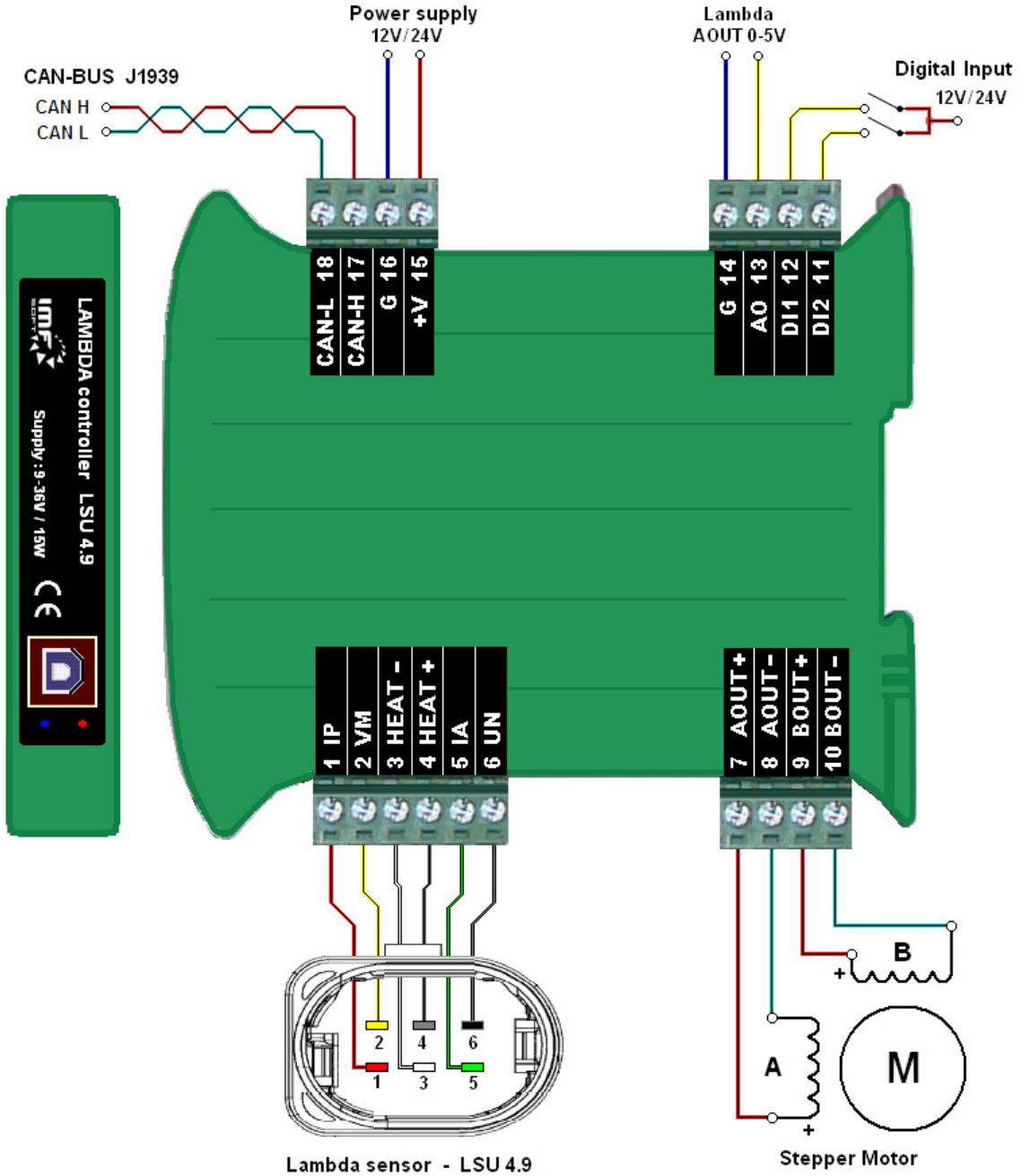
LAMBDA controller – signal description

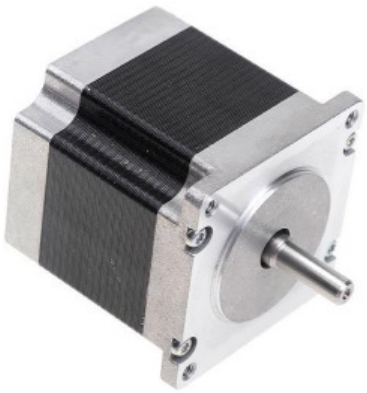


MARKING	MEANING	RANGE, ACTIVE LEVEL
+V	Power supply	9 to 36V (12V/24V)
G	Ground supply	0V
AOUT+	Stepper motor – Signal A+	Power 11V / 1A, microstepping 1/32
AOUT-	Stepper motor – Signal A-	Power 11V / 1A, microstepping 1/32
BOUT+	Stepper motor – Signal B+	Power 11V / 1A, microstepping 1/32
BOUT-	Stepper motor – Signal B-	Power 11V / 1A, microstepping 1/32
DI1 DI2	Digital input signal	0 or 12/24V (need active signal)
AO	Analog Output	0-5V (± 0.5%)
CAN H CAN L	CAN bus	SAE J1939 / 250kbps
	LSU 4.9 (LSU 4.2)	
IP (red)	Lambda LSU - pin 1 (6*)	IP/APE - pump current shunt input
VM (yellow)	Lambda LSU - pin 2 (5*)	VM/IPN - virtual ground output
HEAT- (white)	Lambda LSU - pin 3 (4*)	Uh-/H- - heating +
HEAT+ (grey)	Lambda LSU - pin 4 (3*)	Uh+/H - heating +
IA (green)	Lambda LSU - pin 5 (2*)	IA/RT - pump current control output
UN (black)	Lambda LSU - pin 6 (1*)	UN/RE - inverting input of pump

* Index of pins depends on Lambda sensor type

LAMBDA controller – wiring scheme





Application LAMBDA control – visualization software

Visualization is done from application LAMBDA *control* run on your PC. The application works under *Windows 95* and higher. Installation requires 4MB of free space at your hard disc.

To connect lambda to PC is used USB interface. Driver for USB is included on the installation CD.

Visualized information

- Revolutions [rev/min]
- Lambda – λ
- Oxygen – O2
- Ratio – A/F
- Temperature – T [°C]
- Supply voltage – U [V]
- Analog output – AO [V]
- Engine hours [h:m:s]
- Actual stepper motor possition [-]

Run the visualization

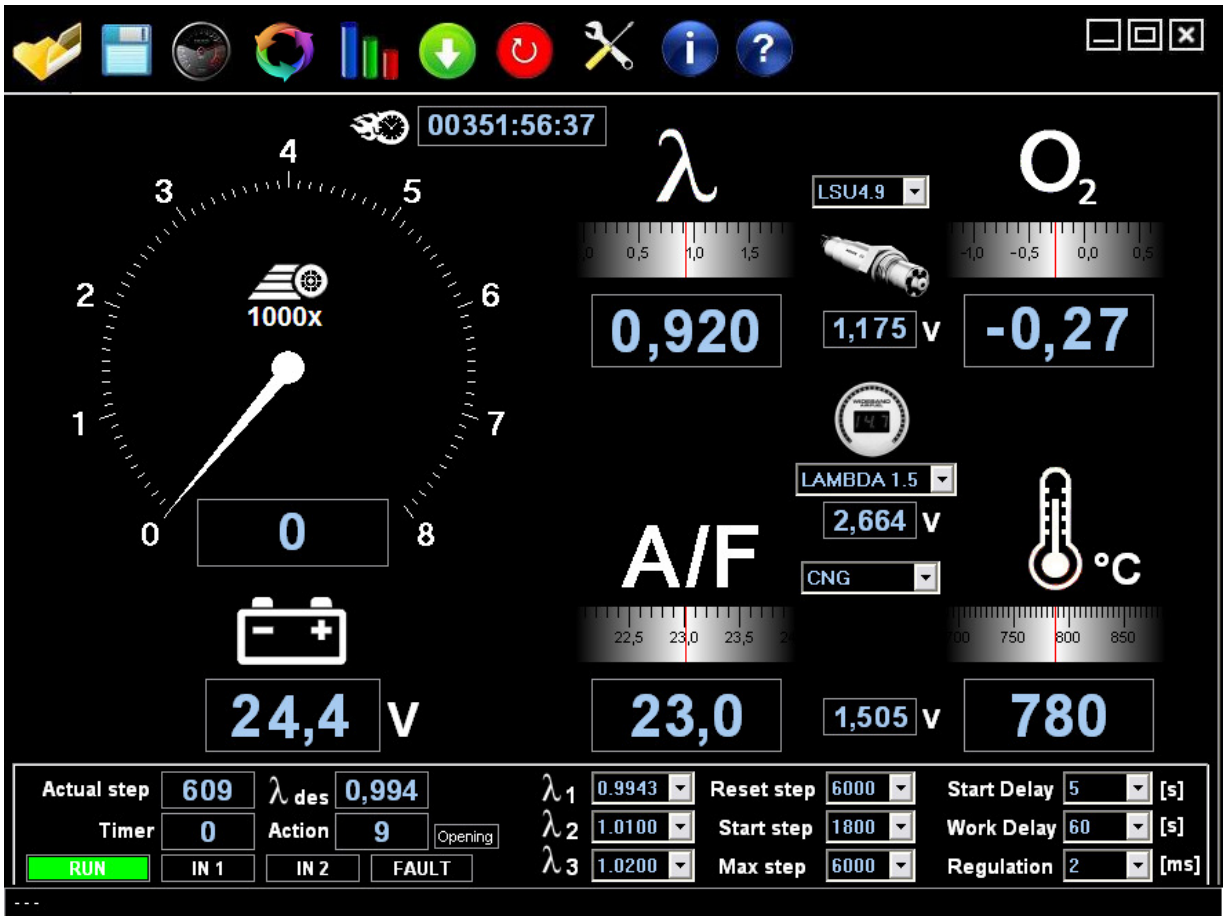
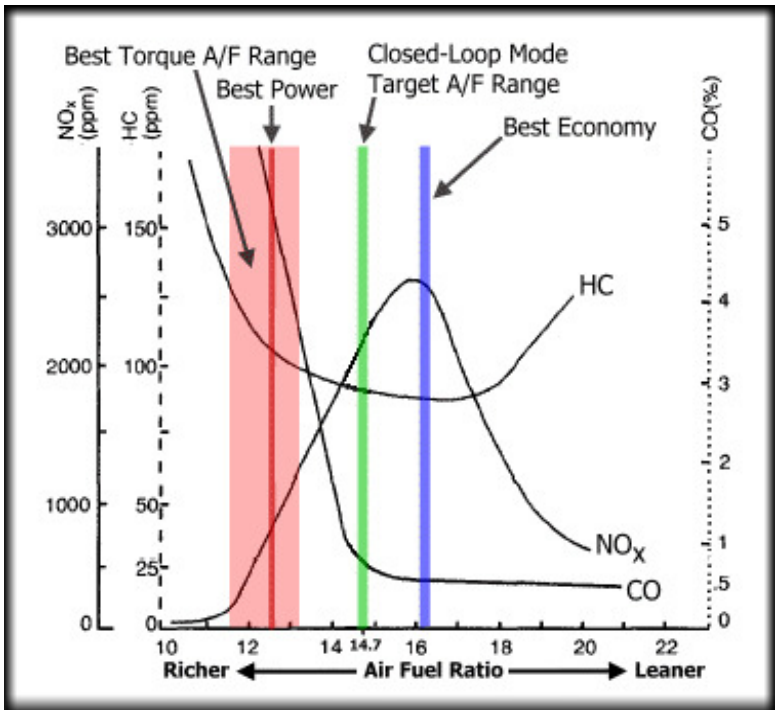


Table – AFR – Fuels

Gasoline, Diesel, Methanol, Ethanol, E85, Propane (LPG), Methane (CNG), Hydrogen

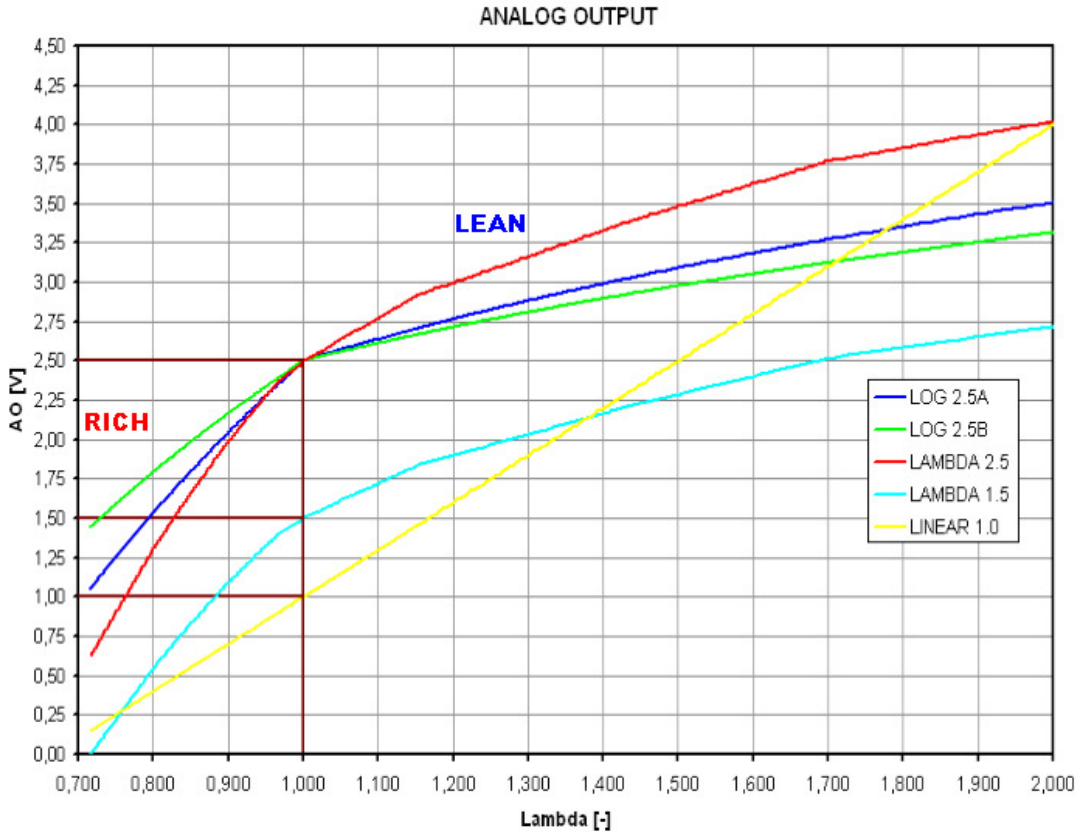
LAMBDA	AFR - Air Fuel Ratio							
	Gasoline	Diesel	Methanol	Ethanol	E85	LPG	CNG	Hydrogen
0.70	10.3	10.2	4.5	6.3	6.8	10.9	12.0	22.7
0.75	11.0	10.9	4.8	6.8	7.3	11.6	12.9	24.3
0.80	11.8	11.6	5.1	7.2	7.8	12.4	13.8	25.9
0.85	12.5	12.3	5.4	7.7	8.2	13.2	14.6	27.5
0.90	13.2	13.1	5.8	8.1	8.7	14.0	15.5	29.2
0.95	14.0	13.8	6.1	8.6	9.2	14.7	16.3	30.8
1.00	14.7	14.5	6.4	9.0	9.7	15.5	17.2	32.4
1.05	15.4	15.2	6.7	9.5	10.2	16.3	18.1	34.0
1.10	16.2	16.0	7.0	9.9	10.7	17.1	18.9	35.6
1.15	16.9	16.7	7.4	10.4	11.2	17.8	19.8	37.3
1.20	17.6	17.4	7.7	10.8	11.6	18.6	20.6	38.9
1.25	18.4	18.1	8.0	11.3	12.1	19.4	21.5	40.5
1.30	19.1	18.9	8.3	11.7	12.6	20.2	22.4	42.1
1.35	19.8	19.6	8.6	12.2	13.1	20.9	23.2	43.7
1.40	20.6	20.3	9.0	12.6	13.6	21.7	24.1	45.4
1.45	21.3	21.0	9.3	13.1	14.1	22.5	24.9	47.0
1.50	22.1	21.8	9.6	13.5	14.6	23.3	25.8	48.6
1.55	22.8	22.5	9.9	14.0	15.0	24.0	26.7	50.2
1.60	23.5	23.2	10.2	14.4	15.5	24.8	27.5	51.8

Table – AFR – Power / Emissions / Economy



LAMBDA – Analog Output – AO

LAMBDA controller is able to generate an analogue output depending on measurement of the immediate LAMBDA values. Output curve can be adjusted to five different waveforms, any further are possible to add upon your special requirement. The exact value of each voltage curves are displayed in a separate file LAMBDA_AnalogOUT (1002-0022-14).



LAMBDA sensor LSU 4.9 – BOSCH 0 281 004 148 or BOSCH 0 258 017 025

Assembly drawings