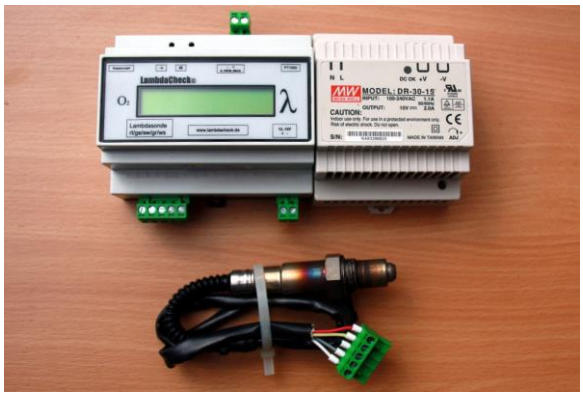
LambdaCheck®

Manual. Version 03/2020

LambdaCheck is an electronic measuring device for determining the oxygen content in exhaust gases from biomass combustion, as well as vehicles. The system uses a broadband probe of the type of LSU4 from Bosch. This probe is characterized by high precision in oxygen-rich media.

Picture1


Picture2 view of the complete system

The module is shown in Fig.1. It is mounted on a DIN rail.

The module has an optional temperature sensor input (for PT1000) to determine the combustion efficiency. Furthermore, the device provides an output signal (0 to 10 V, 0 to 20 mA), for the further processing can be used by subsequent measurement and control systems.
The integrated electronics is programmed that it can control an actuator for controlling the combustion air**.**
Conditions for the control of combustion air, see point 9 of this manual and the Safety.

Specifications:
- Power supply 12..15Volt, current approximately 1.5A (Startup)
- 2-line backlight display 16 characters
- Broadband probe LSU4
- Probe temperature control for stable readings at each operation (even in the cold exhaust gas)
- Output: 0..10V/0..20mA switchable for 0 .21% oxygen
- Autocalibration for review and adjustment of the probe
- Display of the oxygen content in%, and lambda
- Measuring range 0 .21% oxygen (lean) or lambda 0.8 .. 1 (rich)

The following features are prepared on the circuit board and optionally fitted:

- Relay contact output for a potential-free switching contact
- Input for the measurement of temperature (PT100/1000),
- USB output for serial transmission of the measured data
- Emulation of a simple oxygen sensor(LSM11) for existing regulations.

On the PCB, there are two buttons for operating control ("->" and "**M**").

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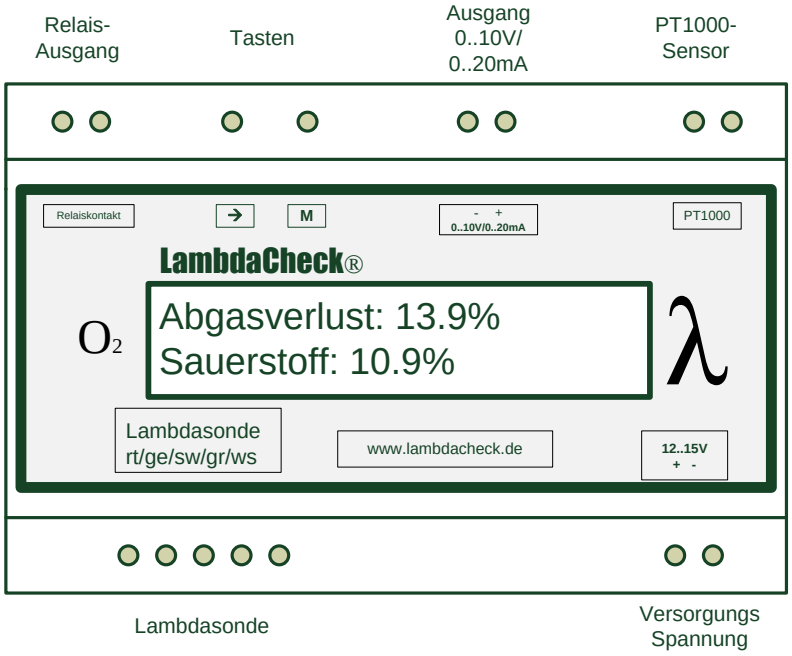
Manual

1. Electrical connections



View of the module

1.1 Power supply: connect module to the power supply 12 ...15V, 2A (attention to polarity!).
When operating with a 230V power supply, see the secure-regulations!!

1.2 Oxygen Sensor: The wideband sensor LSU4 has 5 cables:
Red, yellow, black, gray, white.
Red, Yellow, Black: Sensor connection of the probe, gray, white: heating of the probe.
Here, the lines may be extended.

2. Operating of the module:

For testing, the module can be checked in a pure atmosphere (21% O2).

After switching on the module displays the number of starts and operating hours for a few seconds. The module is heating up the probe very gently ("Aufheizphase") and after about 60 seconds the first readings are shown on the display. **Warning: The probe is hot !!!!!**

The measured value should be within 21% in free air. By breathing on the probe head, or by a Gas lighter the function of the measuring module can be checked easily.
In exhaled air the measured value moves from 20,9% to 15...18%.
So the test is completed and the probe can be installed permanently.

3. Mounting the Probe:

The oxygen sensor is mounted in the exhaust channel so that the probe head is exposed to the exhaust gases. The probe should show optimal obliquely downward to avoid condensation.
For example, they can be mounted directly in the flue connection of the oven. This is the exhaust pipe suitable to drill and fitted with a matching nut.
The connection of the probe should be sealed so that no secondary air can be sucked in (measuring distortion) and no exhaust gas can escape(danger of poisoning).

Warning:
It is essential to ensure that there is no danger of fire after installation the probe.
The black casing of the probe cable must have free access to pure air exhaust-free environment have, as a result, the reference values of the cell can be determined.
The probe cable can ,if necessary, be extended with wire to allow a suitable location of the module.
The module must not be exposed to direct heat radiation and heat the oven.

4. Calibration of the probe

The calibration of the electronics can avoid the tolerances of the probe.
This is very easy to perform and required if
- A new probe is connected
- Aging of the probe, if the measured values no seem longer more plausible.

It is used to control the accuracy and can be done as often as required.
After a single calibration it should be performed at least once beginning of the heating season.
Procedure:
The module is up and running.
The probe must be in clean air, and the furnace should be completely burned out.
Ideally, the probe is left to fresh air for few hours under power. It may possibly oxidying soot particles in the measuring cell. This ensures that the reference value (20.9% O2) in the probe predominates.

Then (with a thin object) press "M" button in the interior of the module.
Display shows: (if german language is used) "**Systemmenue <-> Kalibrierung"**

Calibration **abort: M go on:->**

To Abort peress **M** .
Go on: „->":

Probe to 21% O2? **abort: M go on:->**

If all is right: press „->":

Calibr. active **O=87 T=99 120**

Calibration is started the free-air-calibration.
The modules heats up the probe for few minutes.
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After calibrating the module shows:
->**0=89, Ref=561, I=3,865mA** (probe-data). Please write down this values for further analyzing of the system.
Press "M" for storing the data or power down the module to abort.
Calibration can be aborted now by power down the module.

Safe operation of the LambdaCheck:

It is essential that, when the secondary air will be adjusted there is no hazardous situation.
Safety precautions have in the primary air control to be present. In addition, the combustion chambers have to be sealed by appropriate valves, when the air supply is interrupted. The flames / fire must be able to stifle while shut down.
While an overheating of the boiler the STB(safety temperature limiter) is to be triggered and it must be ensured that the secondary fan is also set by the STB from service.

5. Displaying of the hourmeter

There is an power-up-counter and two hour-counters in the module

1. Number of power-ups of the LambdaCheck
2. Total power-time
3. Burning hours (O2 under19%)

6. Special hidden menue for general adjustment

The special menue is a hidden block of software, where it is possible to change

- Language (german,english)
- Output function (0..10V; 4..20mA…….)
- Adjust the output exactly to 20,0mA or 10,0V
- Switch the relay function to temperature, oxygen, normaly open/close.

Example: Change the output function

1. switch off power
2. press and hold key "->" while power up.
3. press until " special menue" appears.
4. release key and press it some times again, until "Output function" is displayed.
5. then press "M" to confirm. Display shows: "adjusted : 0..10V" or so
6. press "->", until "4..20mA" appears
7. confirm with "M".. to store

Ready.

Abort without saving with powerdown.

Other adjustments are changed in similar way, please play within the special menue to see, what is possible in your version of module.

The actual settings are shown shortly in display while power up.