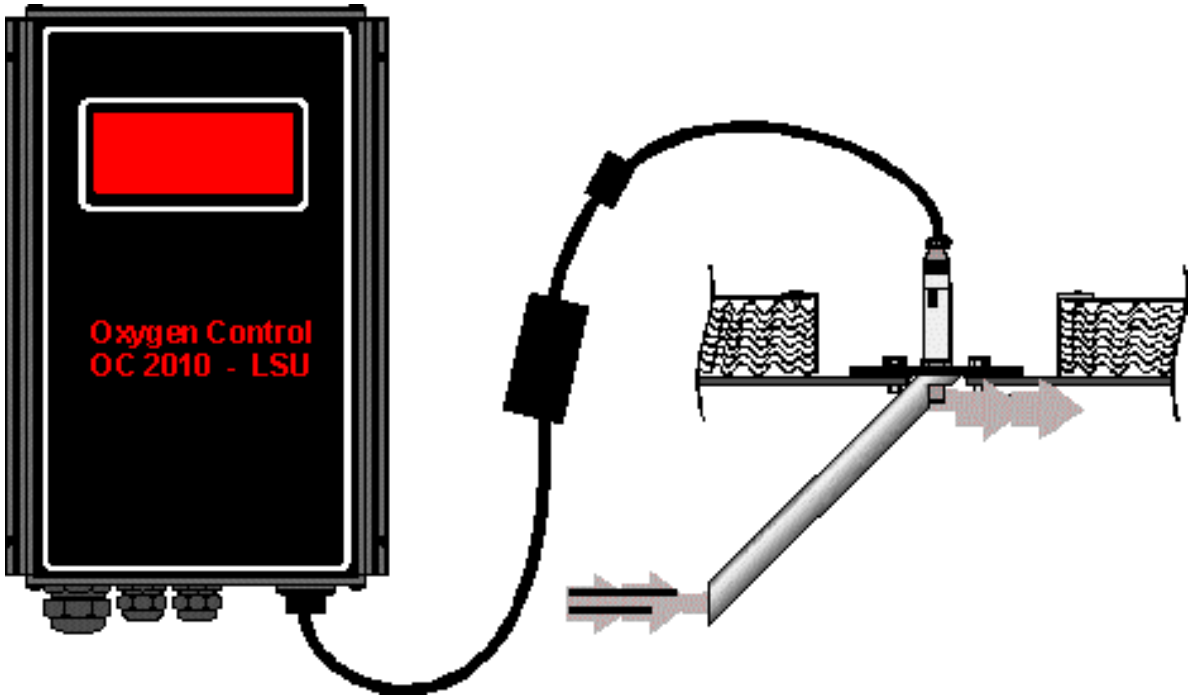
Oxygen Control



OC 2010 - LSU

Technical Information and User Guide

Oxygen Control OC 2010

Technical Information and Installation

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Warning!: Because of the internal heating of the probe, the probe is hot and can cause severe burnings to personnel if not handled with care.

1.0. General Information

1.1. Introduction

The oxygen control OC 2010-LSU is designed to measure the contents of oxygen directly in the flue-gas. The measurement is done using a heated cell made of zirconiumdioxide (ZrO_2) sitting with its active surface in direct contact with the flue-gas - hereby illiminating the use of filters and pumps during flue-gas sampling. Futhermore the instrument is unaffected by changes in the flue-gas temperature.

The probe

The probe is mounted in the flue-gas channel wall. The flue-gas is led to the measuring cell surface via a protective shield.

The probe is heated, and therefore contains an electric heating elment apart from the measuring cell probe.

Scan Tronic LSU-cable

This cable has been specifically developed for connecting the probe with the signal amplifire

Measuring/signal/amplifier

The signal coming from the probe is amplified, liniarized and shown in percent[%] of O_2 on the build -in display. Futhermore, the signal is forwarded as current signal for external use and used to activate two alarm relays,when two preset limits are exceeded.

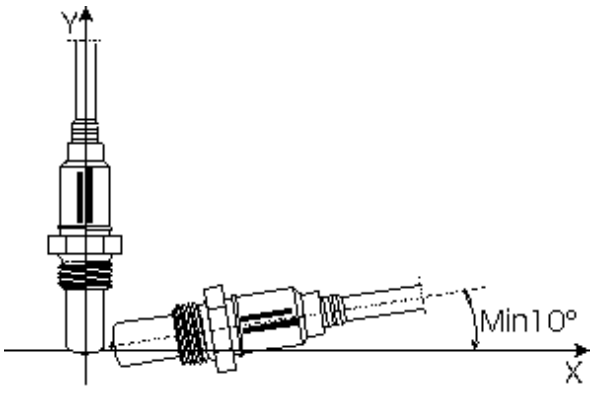
Beyond that,the measuring amplifier supplies power to the heating of the probe.

1.2. Principle of function

Concept:
The measuring instrument does not take an absolute but rather a relative measurement. The sensor constantly measures the contents of O_2 in the flue gas and in this way the combustion is controlled and the contents of the harmful substances in the flue gas will be minimized.
Function:

The wide band sensor is a complex and therefore very precise sensor, built as two tightly connected cells. The wall of the measuring cells consists of zirconium dioxide ZrO_2, which is heated to about 600° C with the help of a heating element. When the concentration of oxygen on the cell surfaces differs, there is a migration of oxygen Ions through the cell wall, thereby releasing electrons and forming electrical voltage.

There is a special built-in trimming resistor in the sensor's connector that defines the sensory properties which are necessary for the sensor's function.



Only in combination with the specially developed Scan Tronic cable can the wide band sensor function. This cable controls the power supply to the probe's heating element. In this way the sensor has optimal operating conditions. The signal from the sensor is transmitted through the cable to the signal repeater. The probe must be mounted minimum 10^0 in relation to the horizontal plane, best mounted vertically to avoid the possible accumulation of water inside the probe.

1.3. Technical specifications

1.3.1. Measuring Probe.

Insertion length	29 mm	**Exhaust gas pressure**	<1,5 bar
Cable length	850 mm	**Working temperature**	
		Exhaust gas temperature	0-900° C
		Ambient temperature	0-60° C
Thread..... .....M18x1,5		**Calibration interval**	6 month

1.3.2. Scan Tronic LSU- cable

A control cable specifically developed to connect the probe with the signal repeater. One end of the cable has a 4-pin multiplug that connects to the signal repeater, while the other end of the cable has a 6-pin multiplug that connects to the probe.

Cable length...... 1500 mm

Elektroniks box.. .l x b x h = 112 x 60 x 31 mm

Ambirnt temperatur.....0^0- 60° C

1.3.2. Signal amplifier

Indication

1.0% - 20.9% O_2

Displayed on a three digit seven segment display with light-emitting diodes.
A switch setting (inside the cabinet) selects displaying setpoints for two alarm relays.

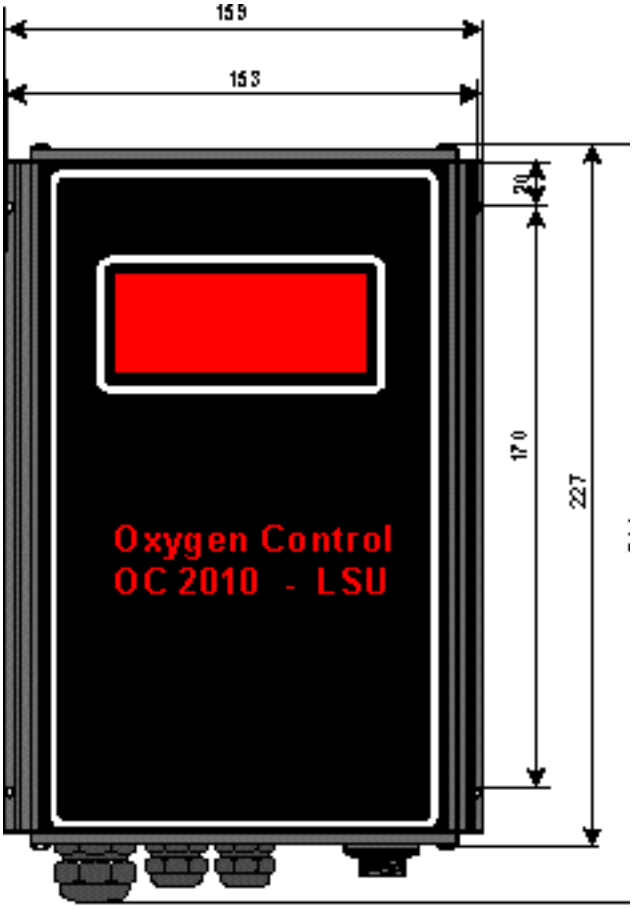
Output signal

0(4) - 20 mA
Corresponding to 0-20 % O_2
0 - 4 mA switch selectable.
Maximum series resistor 600 Ohm.
Maximum isolation voltage to ground 300 V DC.

Alarms

Potential free contacts, which are able to carry 6 A at 250 V AC.
The first relay contact opens below the O_2 setpoint (LO-alarm).

The second relay contact opens above the O_2 setpoint (HI-alarm).



Mains voltage connection

230 V -10 % / + 15 % 50/60 Hz

Power consumption

50 VA in the heating period of the probe (approx. 2 min) hereafter max. 30 VA.

Probe connection

4-pole multi-connector

Cable connections:

2pcs.	M 16 cable glands
1pcs.	M 20 cable gland

Ambient temperature

0-60 °C

Tightness

IP 54 (IP 64 on request).

Dimensions

Height:	244 mm (280 mm incl. multiplug)
With:	157 mm
Depth:	64.3 mm

Accuracy

Display:	± 1 on last digit
Current output:	±0,2 % of max. signal

2.0. Installation

2.1. Control at delivery

After unpacking, please confirm that the delivered items are in accordance with the packing list. Possible inconsistencies should be reported to the supplier immediately. If some parts are damaged please contact the shipping company.

2.2. Instrument identification

The oxygen control system OC 2010-LSU, as standard, consists of a measuring probe OS 2014, and signal amplifier OC 2010-LSU, a guide tube including a gasket and 4 mounting screws are optional.

Measuring probe

The measuring probe contains a measuring cell, a heating element and a connection cable with a multipole connector.

Signal amplifier

The measuring amplifier is built into an aluminium cabinet, and contains a power-supply, a measuring amplifier, a linearization unit, an alarm circuit and a current loop output circuit.

2.3. Place of installation

Satisfactory operation, faultless function and minimal maintenance is achieved by paying attention to the following notes:

1) The fitting place for the probe should be chosen in a way that protects the probe against mechanical damage. The fluegas-temperature has to lie within the given limits of the probe at the measuring point.

2) The gas, which passes the probe, must be representative. At large crosssections it is recommended to use the guide-tube (which leads the gas to the probe).

3) The flue-gas channel must be controlled for holes and leakages. Oozing of surrounding air into the channel, before and after the probe, influences the accuracy af to the oxygen measurement in an unwanted direction.

4) The zirkoniumdioxide measuring cell reacts on changes in the concentration of oxygen (e.g. the partial pressure of the oxygen), and on changes in the negative pressure at the measuring point.

   To keep this effect at a minimum, the probe must not be installed between id-fans and their regulation valves or in the immedate vicinity of these. The pressure difference must be kept under 100 mm water column (H_2O).

5) The installation place of the signal amplifier must be chosen so that the ambient temperature at any time lies over 0 °C, and below 60 °C.

6) The distance between measuring probe and signal amplifier cannot exceed 2,0 m.

7) At high gas-temperatures a special guide tube to be welded into the flue channel wall can be delivered.

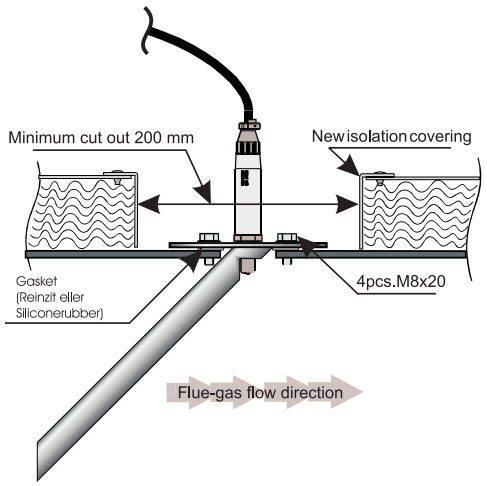
Attention

Mounting of the probe itself should not take place before the completion of all pipe- and flue-works at the boiler, and the burner is ready to start.

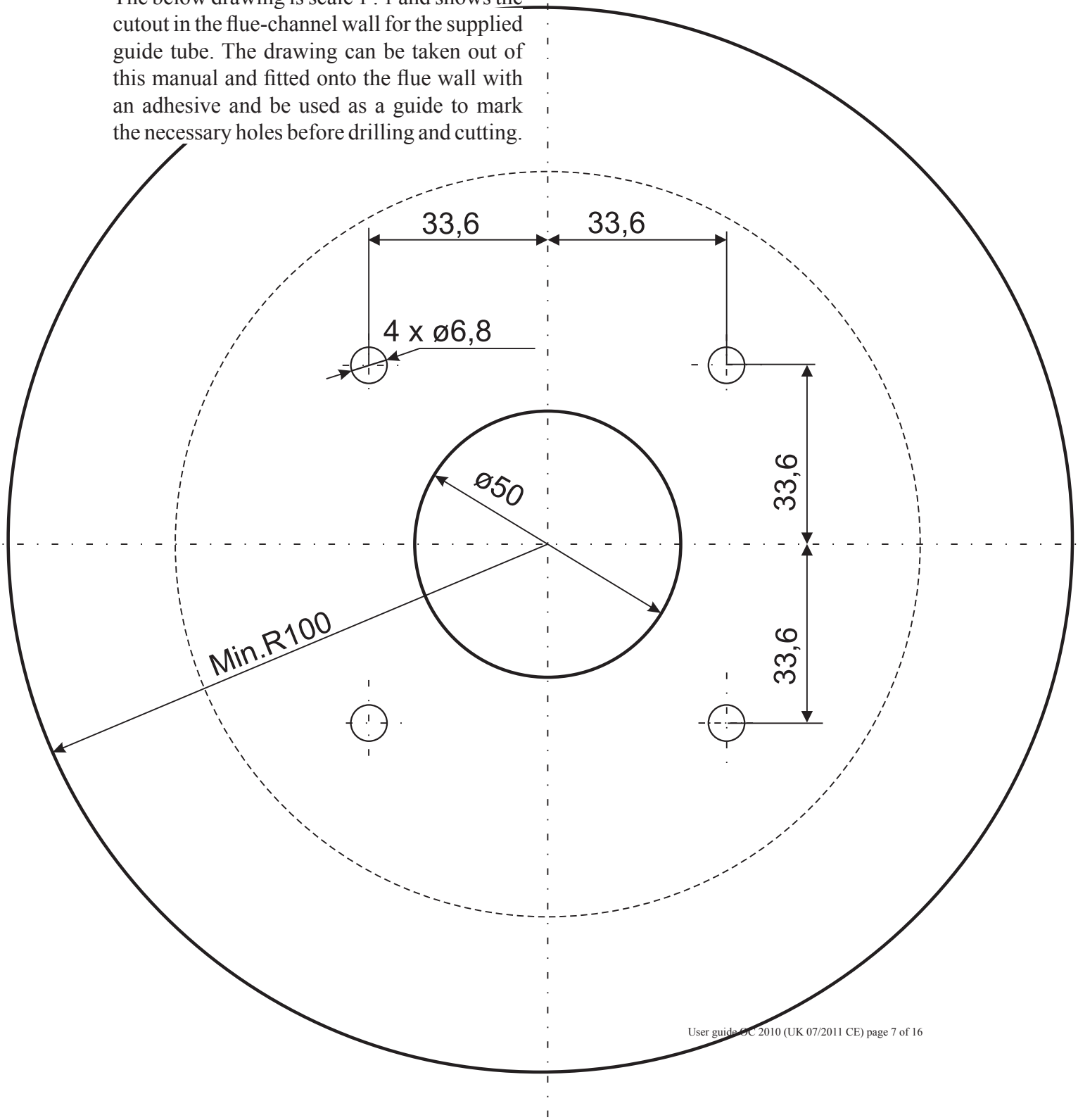
Care should be taken to assure that the system is constantly powered and the probe is heated also when the boiler is out of service.

2.4. Installation of the oxygen probe

The drawing shows the fitting of the probe in the flue wall. In minor flues, the probe is mounted in a M 18 x 1,5 mm thread hole. In larger flues the guide-tube is used. The flange of this guide tube is mounted onto the wall of the flue. If possible the probe must be mounted on the topside of the flue, assuring that any possible dust and oil carbon are not deposited around the probe.

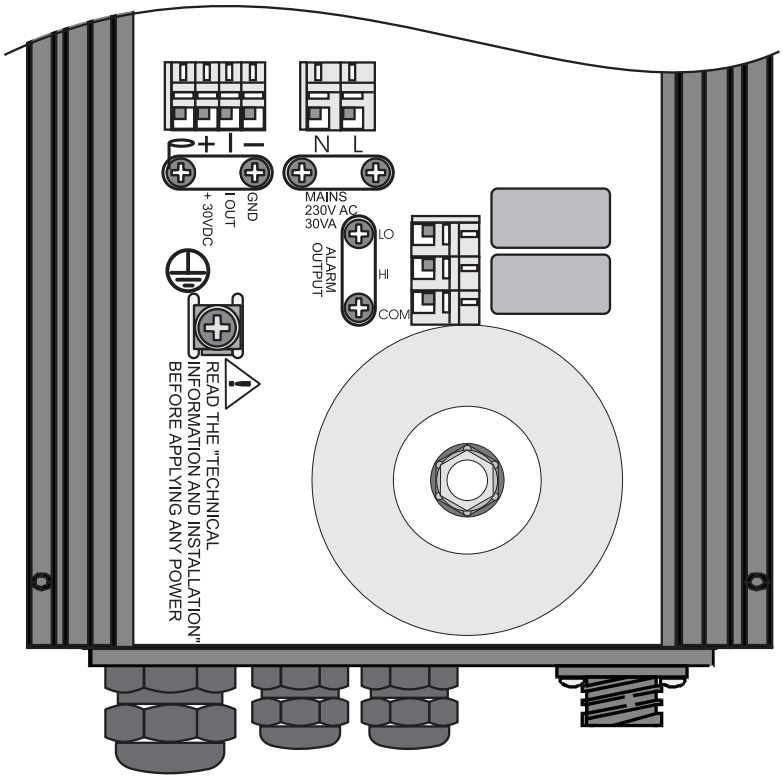


The below drawing is scale 1 : 1 and shows the cutout in the flue-channel wall for the supplied guide tube. The drawing can be taken out of this manual and fitted onto the flue wall with an adhesive and be used as a guide to mark the necessary holes before drilling and cutting.



2.5. Installation of the signal amplifier

The signal amplifier is mounted in eye-level immediately below or near the probe. The unit cannot be installed more than 2,0 meters away from the probe.



2.6. Cable connections

Access to the connection terminals of the signal amplifier is obtained by removing the top- and front plate of the cabinet and pushing the front printed circuit board half a length out of the cabinet.

A) Connection between the probe and the signal amplifier is established as the multipole connector of the probe is mounted in the socket of the signal amplifier.

B) Mains connection, phase, neutral and ground are established through a cable gland (M20), max. pre-fuse 10 A.

C) Signal connection is made through the other (M16) cable gland. Low voltage screened cable (2 conductors with shield) is to be used.

D) Alarm connection is made through the third (M16) inlet (3 conductors).

Urgent

The unit fulfill the EU Low Voltage directive, this means that all cable connections must be done accordingly. It is mandatory to use the cable clamps to secure the wires of the cables leaving no excess cable length between clamps and terminals, and to use terminal-tubes/core-protectors) if using multi cord wires. Supply wires to OC 2010-LSU must be disconnectable by a separate switch in the panel.

3.0. Operation

This paragraph describes normal operation, testing prior to use and procedure at operation stop.

3.1. Function of the signal amplifier

1. Current-loop output (0(4)-20mA) Gives a current loop signal rising with the O_2 % in accordance with the output signal of the probe. The mA-signal is typically used as input sinal for an O_2-regulator, but it can also be used for a pen recorder for instance. The output is galvanically isolated up to 300 V DC. If higher common mode voltages occur provisions must be taken to avoid higher common mode voltages between OC2010-LSU chassis and the negative output terminal of the signal amplifier.

2. Alarm switches.
   Two alarmswitches are available as a normally-closed contact.

3. Display.
   The signal amplifier is provided with a digital display. At normal operation the oxygen concentration is shown in percent [%] at the instrument. By means of 3 switches (which are accessed by removing the top plate of the cabinet) two set-points for the O_2-alarm are shown.

3.2. Testing prior to use.

1. Check that the probe and the signal amplifier are installed in accordance with the notes in paragraph 2.3.

2. Check that the signal amplifier are instaled in accordance with paragraph 2.4.

3. Check that the probe and the signal amplifier are installed in accordance with the notes in paragraph 2.5.

4. Check that wire connections are carried out in accordance with the instructions given in paragraph 2.6.

3.3. Start up.

1. Mains voltage is connected to signal amplifier. The display will indicate „LLL“while the probe is heaing up. Note: Because of smal quanties of oil from the prodution smoke may appear from the probe for a couple of minutes, but it is of no importance

2. While the probe (during approx. 2 min.) reaches its operation temperature, the oxygenmonitor will show a number of various oxygen concentrations, which will be stabilized when the probe has reached its opera tion temperature.

3. Optional recalibration, or test of calibration can be performed after 60 minutes. Calibra tion is carried out as described in paragraph 4.1.

3.4. Stops of operation.

Short stops of operation (less than 14 days):

The mains voltage may remain connected if the operation stop does not imply any pollution of the probe, as i.e. when the boiler is cleaned by white washing or high-pressure cleaning.

Long stops of operation (more than 14 days).

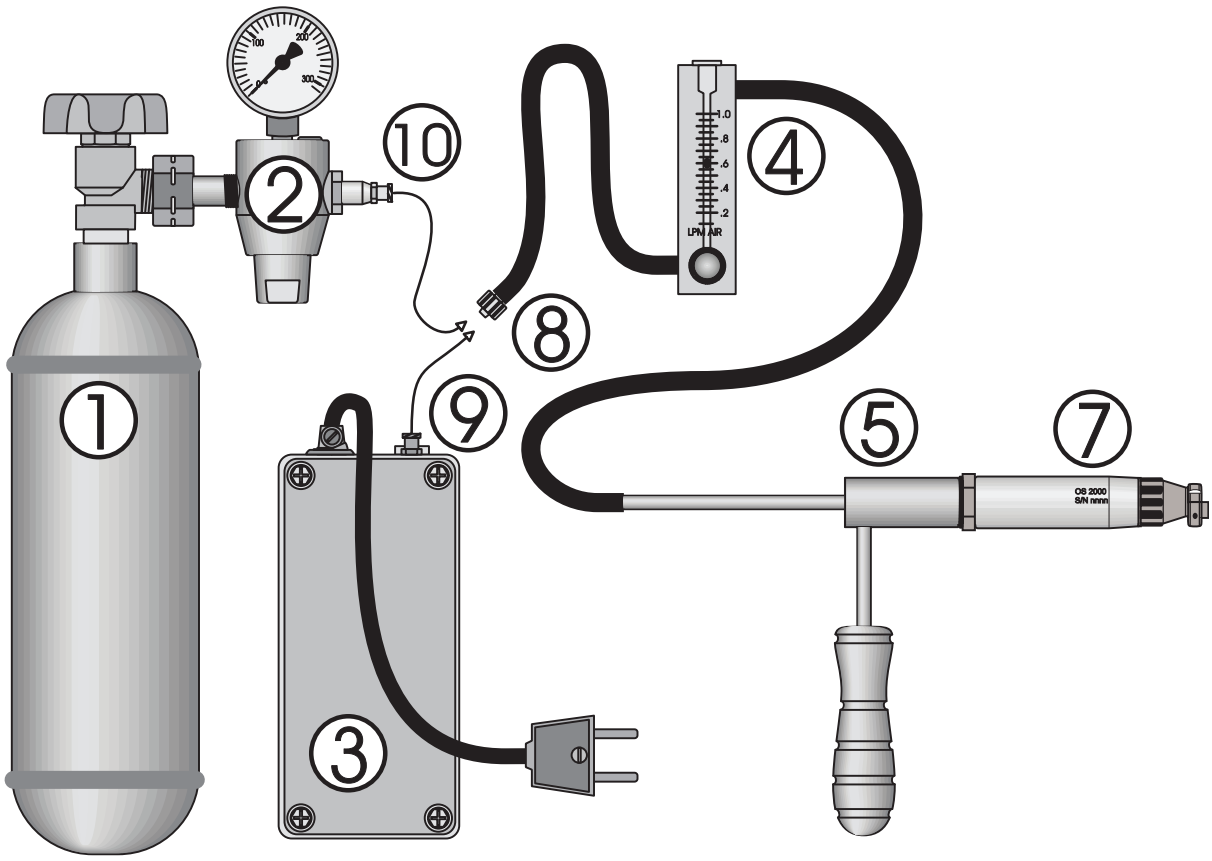
The mains voltage is disconnected and the probe is dismounted from the flue and stored in protected surroundings.

Warning!: Because of the internal heating of the probe, the probe is hot and can cause severe burnings to personals if not handled with care.

4.0. Adjustments and settings

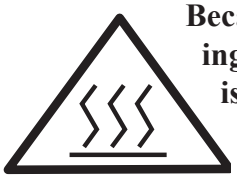
4.1. Routine calibration

The following paragraph describes routine calibration of the OS/OC 2010-LSU system. The units are calibrated prior to shipment and need no supplementary calibration before the first rutine calibration. Calibration is generally done every 6 months.



Introduction

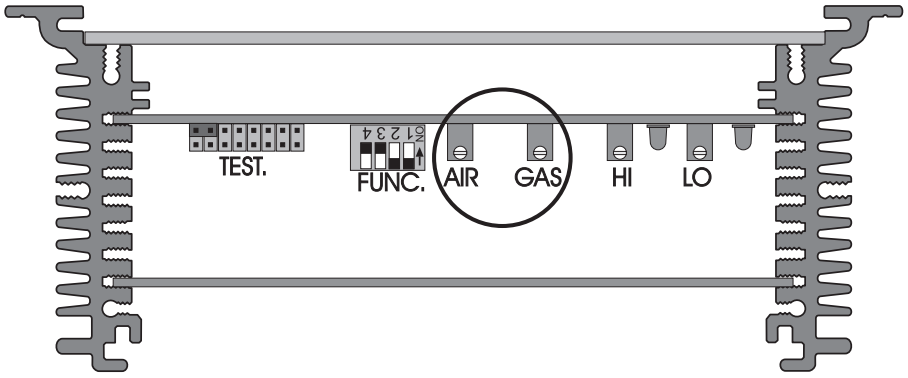
On calibration the measuring cell OS 20140 is removed from the flue channel and fitted into a special adapter and exposed to atmospheric air „AIR“ and to calibration gas „GAS“ (1 or 2% of Oxygen in Nitrogen) and the corresponding adjustments are done in the Signal Amplifier by removing its topplate.



Warning!:
Because of the internal heating of the probe, the probe is hot and can cause severe burnings to personnel if not handled with care.

Needed tools:

1. Cross-headed screw driver PZD no. 2
2. Screw driver for adjusting (3 mm flat).
3. Spanner for dismounting the probe(22mm fixed fork spanner)
4. Calibration gas 1% O_2 in N_2 (1)(2)
5. Air pump (3).
6. Flowmeter 0.2 - 1.0 l/min (4).
7. Calibration adaptor (5).



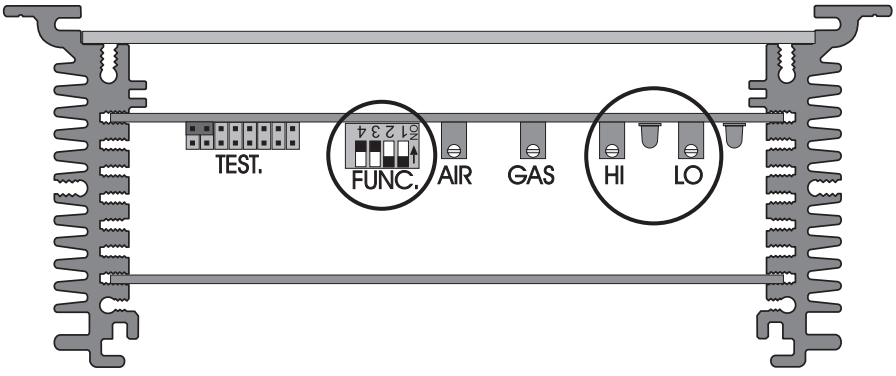
Procedure.

1. The multipole connection of the probe is removed from the signal amplifier.
2. The probe is removed from the guide tube or flue-wall and placed in the calibration adapter.
3. The multipole connection is remounted and the top cover is removed from the signal amplifier.
4. Apply calibration air from the pump (9) and adjust the flow to 0.6 Vmin.
5. After 10 minutes the „AIR“ potmeter is adjusted, as it is slowly turned to the right if the display shows less than 20.9%, and correspondingly left if the display shows „HHH“ until the display shows 20.9%.
6. Apply reference gas from the reduction valve of the calibration gas-bottle (10) and adjust the flow to 0.6 l/min (4).
7. When the display is stabilised, the „GAS“ potmeter is adjusted until the display is in accordance with the test certificate of the calibrationgas.
8. Repeat step 4 to 7 if needet.
9. Re fit the OS 2014 sensor.
10. Re fit the top cover of the OC 2010-LSU cabinet.

4.2 Setting of alarm limits

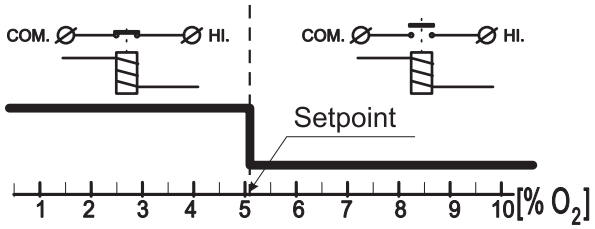
4.2.1. Alarms with normally closed contacts

Alarm setting can be accessed removing the top plate of the electronic unit. The display can be used as an indicator selecting the value to be displayed switching the „FUNC.“ switchs accordingly.



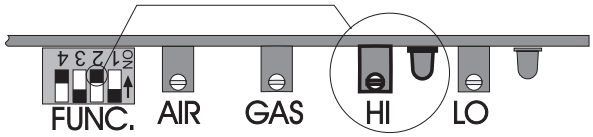
High Alarm

The output relay will remain energized as long as the Oxygen value remains below the adjusted setpoint.



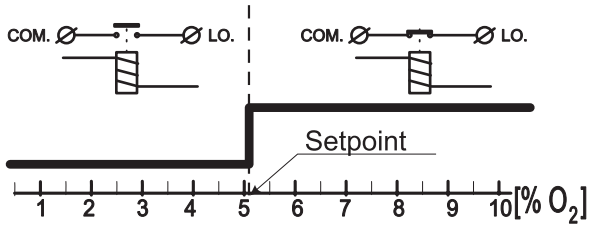
Setting

Slide switch 1 and 3 to „OFF“ position. Slide switch 2 to „ON“ position. Adjust the potentiometer marked „HI“ until the display reads the wanted value.



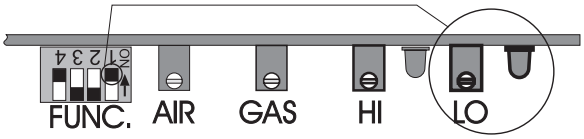
Low Alarm

The output relay will remain energized as long as the Oxygen value remains above the adjusted setpoint. The output contact will remain closed as long as the relay remain energized.



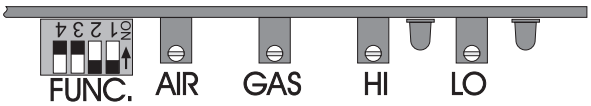
Setting

Slide switch 2 and 3 to „OFF“ position. Slide switch 1 to „ON“ position.
Adjust the potentiometer marked „LO“ until the display reads the wanted value.



Warning

Please remember to slide switch 1 and 2 to „OFF“ position and to slide switch 3 to „ON“ position to enable the display to indicate the measured Oxygen value.



Internal alarms.

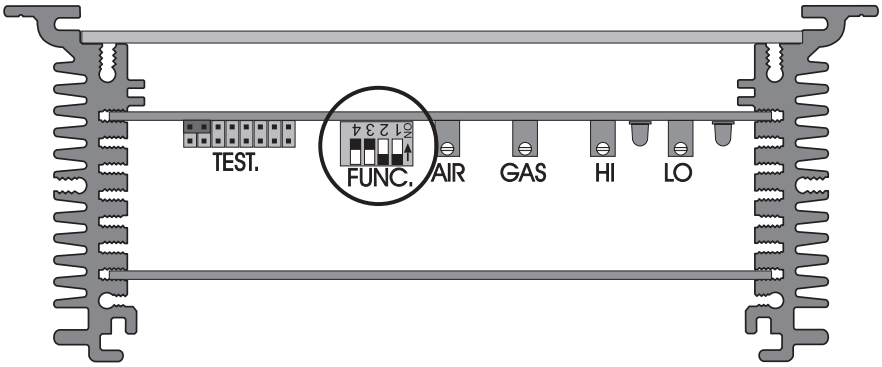
When an internal error occur in OC 2010-LSU or power is not supplied to the unit both „HIGH“and„LOW“alarmcontacts open. OC 2010-LSU is monitoring the OS 2014 measuring cell and at cell error the „LOW“ alarm relay contact will open.

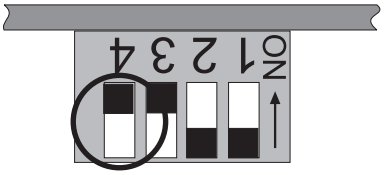
4.2.2. Alarms with normally open contacts

Alarms with opening contacts are not adapted in the OC 2010-LSU.
When using alarms with normal open contacts -„HIGH“ and „LOW“ alarm can be interchanged. Please observe that no internal alarms can be given and no proper cell error alarm can be expected

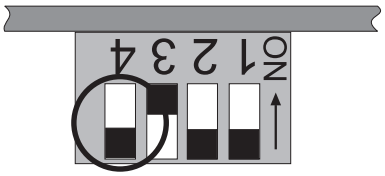
4.3. Selecting 0 - 20 or 4 - 20 mA output.

The current loop output signal from OC 2010 can - by sliding the „FUNC.“ switch - be selected either as 0 - 20 mA or as 4 - 20 mA. The „FUNC.“ switch can be accessed by removing the top cover of the Signal Amplifier.





Sliding switch 4 to „ON“ position selects the current loop to be 4 - 20 mA



Sliding switch 4 to „OFF“ position selects the current loop to be 0 - 20 mA

4.4. Connecting OC 2010-LSU to other equipment.

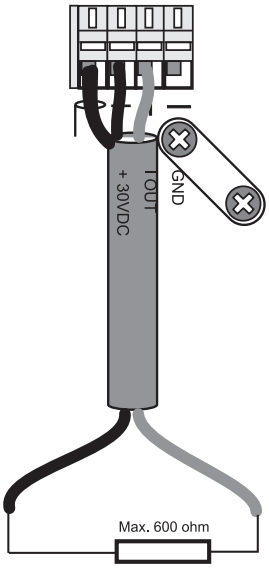
The current loop output of OC 2010-LSU is either 4 - 20 mA or 0 - 20 mA selected in accordance to chapter 4.3.
The loop is galvanically isolated from the internal circuits of OC 2010-LSU within a range of maximal 300 VDC.

Pending is shown two ways to connect OC 2010-LSU to other equipment.

4.4.1. Active loop:

In example 1 OC 2010-LSU is supplying the loop with power (active loop).

If in doubt whether to use an active or passive loop connection it is recommended to use an active loop as the first alternative.



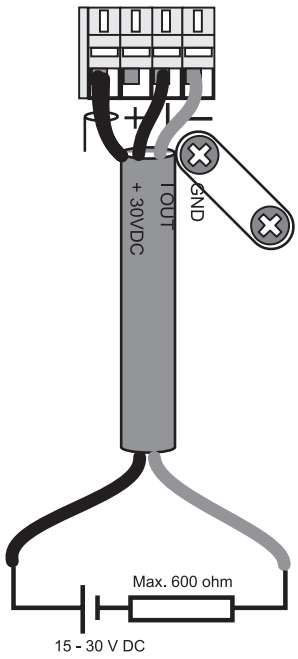
Example 1

4.4.2. Passive loop

In example 2 the receiver is supplying loop power (passive loop).

If in doubt whether to use an active or passive loop connection it is recommended to use an active loop (see previous page) as the first alternative.

Passive loop is normally only used on installations where a larger number of loop powered 4 - 20 mA transmitters are used (i.e. Pt_{100} sensors with integrated amplifier)



Example 2

Warning.

Avoid connecting a power source from both ends - or connecting the input of the receiver directly to both the + and - terminal of the OC 2010-LSU. This will destroy the internal fusing circuit of the OC 2010-LSU.

5.0. Maintenance

To obtain the best possible results using the OC 2010-LSU Oxygen control it is recommended to maintain the instrument as listed below:

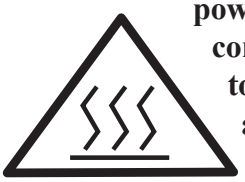
1) Every 6 or 12 months a routine calibrations performed according to paragraph 4.1.

   If calibration is no longer possible or feasible the cell must be exchanged.

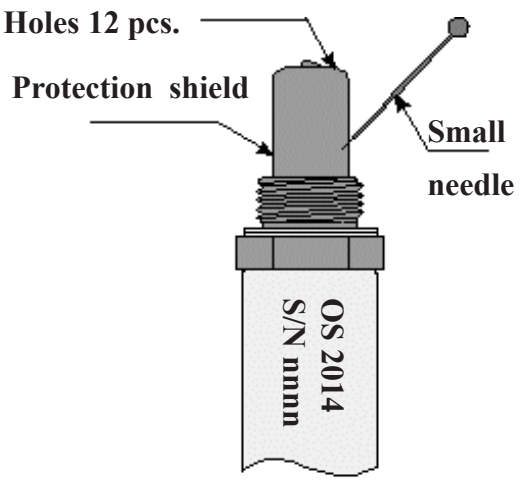
   It is recommended to let a certified technician (having the necessary special tools) perform this calibration.

2) When using the OC 2010-LSU on very dusty fuels (i.e. straw) it is recommended to dismount the OS 2014 measuring cell at intervals and inspect the four holes at the base of the protective shield of the cell. If the holes are blocked they can be opened with a small needle. The chamber between the shield and cell wall can then cleaned using pressureized air.

Warning!:



The cell is heated -therefore the power to the unit has to be disconnected and the cell needs to cool down by itself before any attempt to handle the cell is made.



6.0. Scalation

The current loop output of OC 2010-LSU is either 4 - 20 mA or 0 - 20 mA selected according to chapter 4.3.

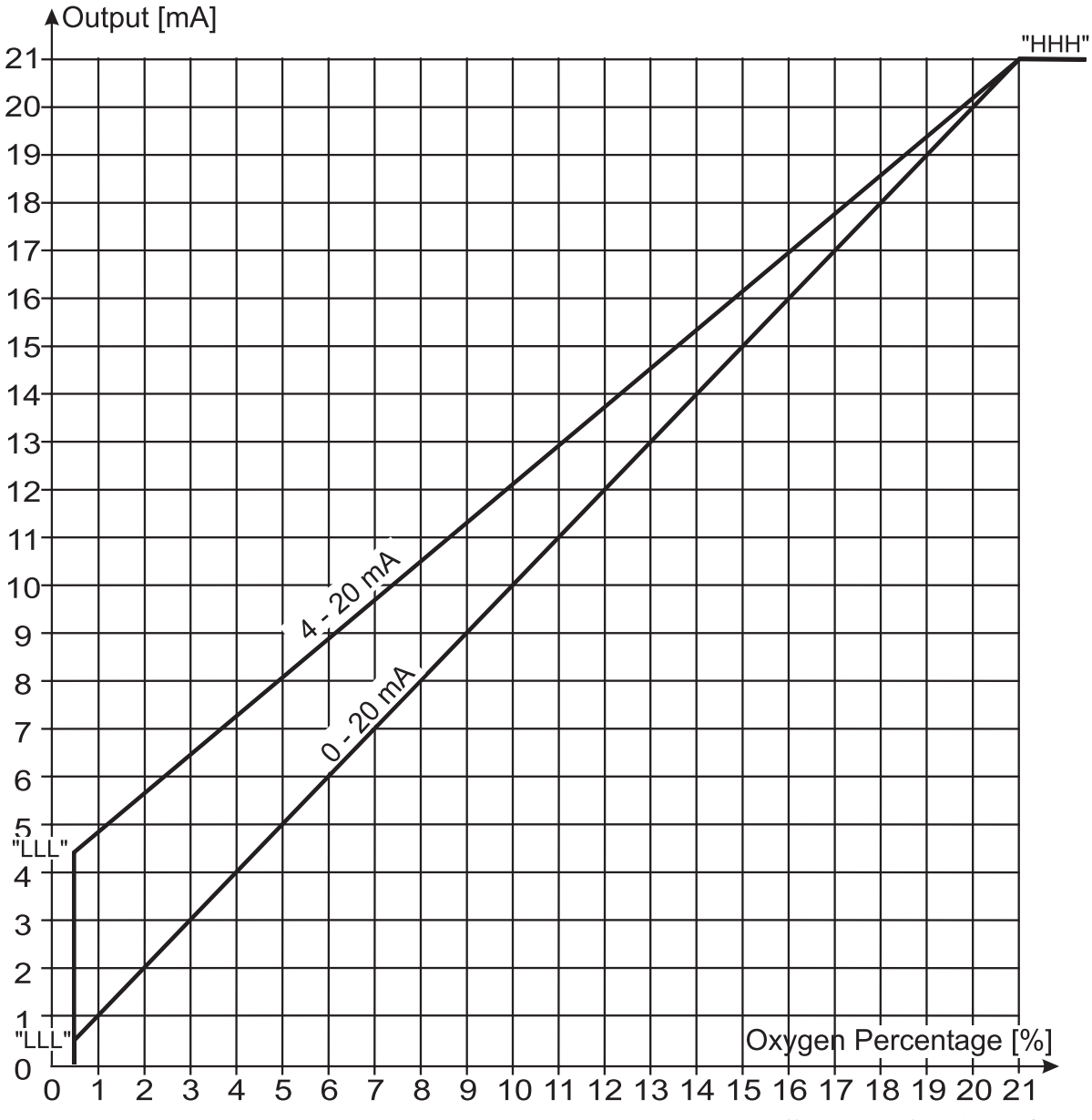
Selecting the 0 - 20 mA output one % of oxygen equals one mA (1 : 1).

Selecting 4 - 20 mA one % of oxygen equals 0.81 mA (n x 0.81) + 4 .

Actual measuring range is limited to 0.5 % through 20.9 % using the underrange below 0.5 % as error indication "LLL" and overrange above 20.9 % "HHH" for ambient air calibration.

Signal conversion of the logaritmic signal from the sensor to a linear output signal is done digitally and the output comes from an 8 bit D/A converter. This gives a finite resolution of 81.6 µA per step of the output signal and forms a staircase step increasing output.

The corresponding output mA to oxygen values are shown in the graph below:



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7.0. EU Declaration of conformity

ScanTronic
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According to the requirements set out by directive 93/68/EEC declare in sole responsibility that the products:

Oxygen control OC 2010 -LSU

to which this certificate applies, conform to the EMC directive 2004/108/EEC and its amendments and conform to the Low voltage directive 2006/95/EEC

To effect correct application of the EMC directive the standards EN 61000-6-4 and EN 61000-6-2 have been consulted.
To effect correct application of the Low voltage directive the standard EN 61010-1 has been consulted.
Comply with EU Directive 2011/65/EU (RoHS II).

Ove Kudahl Munch, Director

signature

April,2014

date