



# Soil oxygen content analysis system

## OPERATING INSTRUCTIONS

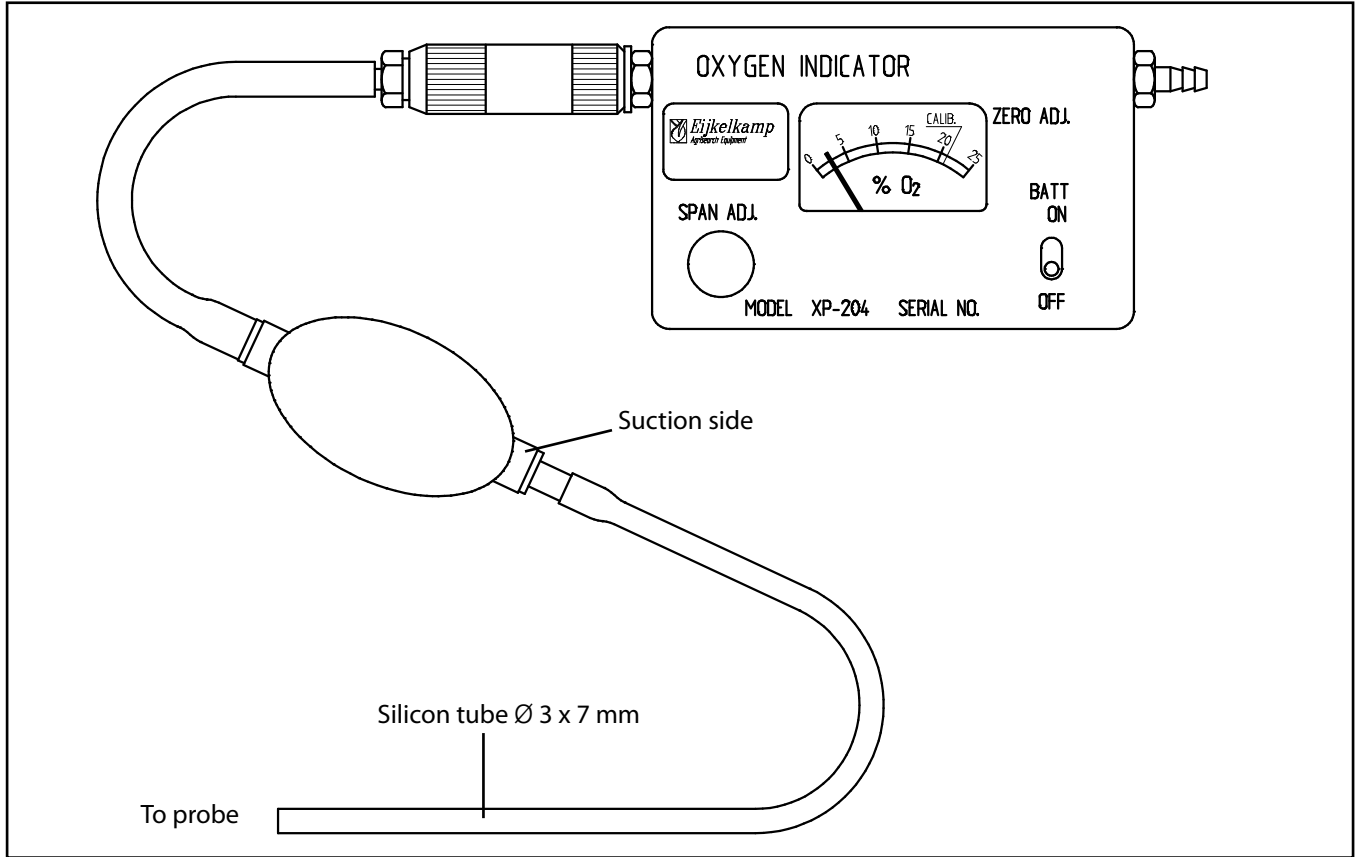


Figure 1: Soil oxygen meter

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## On these operating instructions



If the text follows a mark (as shown on the left), this means that an important instruction follows.



If the text follows a mark (as shown on the left), this means that an important warning follows relating to danger to the user or damage to the apparatus. The user is always responsible for its own personal protection.

*Text* **Italic indicated text indicates that the text concerned appears in writing on the display (or must be typed).**

### 1. Applying the meter

Remove the meter from the box. Check whether the batteries have been mounted by briefly switching to 'BATT ON' (see drawing page 1). The needle should deflect. If required, mount new batteries by removing the cover from the bottom of the meter (two 9 Volt block batteries). Make sure that the contact points are perfectly pressed to the batteries. With some batteries it is necessary to bend the connectors inward a little.

Screw the moisture proof filter with its transparent side to the suction nipple of the oxygen meter. Check whether there is a rubber sealing ring between the meter and the filter.

On the suction side of the bellow pump is a piece of silicone tube (3 x 7 mm). You will slide this tube on the suction nipple on the soil sampling probe during operation. The drawn-in air is blown into the meter via the pump.

It is also possible to mount the bellow pump in such a way that the air is sucked through the meter. We do not advise this however, if you use the meter in combination with a soil gas probe. Because of the relatively high vacuum needed to suck the air through the probe extensive differences in pressure occur in the measuring cell. This results in substantial measuring errors. In addition this method requires a higher degree of gastightness regarding the meter and the suction tubes. This method is useful however, if very little air is drawn-in, or if the air is drawn-in very slowly. As the bellow pump does not need to be filled first, the meter can be read earlier.

The lower level of accuracy should then be accepted.

### 2. Checking the gastightness of the soil gas probe

A leak in the suction tube or the soil gas probe will cause analyzing of the open air instead of the soil gas. This results in faulty measuring results.

This can be checked by sealing the suction opening at the bottom side of the probe with a piece of supple PVC insulation tape.

Now it is time to fit the tube. Slide the end of the tube, on the brass suction nipple on top of the probe. Empty the bellow pump. If the ball is filling slowly the leak in the return valve of the pump needs to be stopped first. This valve can be found at the blow-out side of the pump. For this reason it is advised to mount a roller clamp on the tube connect to the return valve and squeeze the tube until it is shut tight. If the ball is still filling slowly the brass suction nipple at the top end of the probe needs to be de-mounted and fitted with a new PTFE tape. If no leakages are found the equipment is ready for calibration.

### 3. Calibrating the oxygen content meter

The oxygen content measuring cell operates according a electrotechnical measuring principle. This cell has a limited life cycle. To be able to perform accurate measurements the apparatus needs to be calibrated frequently.

Do not switch the apparatus on yet. Check whether the needle points at zero. If this is not the case then adjustment is possible using a screwdriver to set the synthetic adjusting screw under the reading glass. If the fault occurred as the result of a blow or bump it may be necessary to repair the meter.

Now the apparatus can be switched on. If the needle does not move, the batteries in the bottom section of the meter need to be replaced.



**If one of the block batteries does not make proper contact the needle will deflect to the extreme right. The batteries should yield at least 5.5 Volt and should differ no more than 2 Volt.**

### 3.1 The first calibration point

Provide a gas without oxygen, preferably nitrogen as this is explosion safe. Also natural gas or propane or butane gas (Camping gas, lighter gas) can be used, provided you have taken the necessary safety measures (proper ventilation, no smoking, only apply electrical exhaust systems if these are absolutely explosion safe). Press the tube into the gas opening and allow the gas into the meter. The needle should be fixed on zero. If this is not the case, adjust for zero using the adjusting screw.

### 3.2 The second calibration point

Ordinary open air contains a concentration of oxygen stable enough to adjust the meter to its second point of calibration (=21%). Suck air into the pump and allow this air to flow through the meter. As you draw-in the air (not afterwards!) you adjust the needle to point at 21% (the 'CALIB' LINE) by slightly lifting and turning the white 'SPAN ADJUST' button. If the calibration fails the measuring cell is worn and should be replaced.

You are now ready to execute a series of measurements. After several measurements the second point of calibration is checked and adjusted again. The zero point does not require such frequent calibration.

## 4. Maintenance of the soil gas probe

Check whether the inner pin (Fig. 2 number 1) of the soil gas probe slides up and down properly. Clean the point (2) with a hard brush.

If this shows little result then you should take the probe apart. The required tools have been provided.

Remove the brass suction nipple (3) on top of the probe using a box spanner (turning anti-clockwise).

Remove the screw with spring washer (4) preventing the inner pin (1) from sliding out completely, using a screwdriver.

Remove the pin; clean the pin and the housing. Fit everything together again.

Replace screw and spring washer (4) and tighten the screw (do not use a normal washer, because it seals the inner pin).

Remove old PTFE tape on suction nipple and probe. Fit new tape and carefully screw the nipple into the probe.

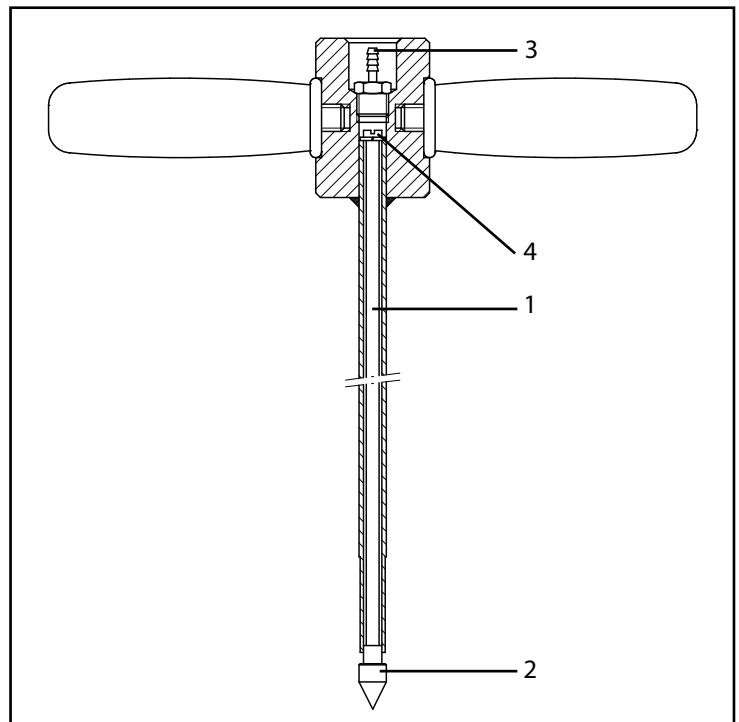


Figure 2: Soil gas probe



**Make sure that the nipple is screwed-in straight.**



**Check whether the probe is gastight.**

## 5. Application of probe and oxygen content meter

- Press the probe straight down until the desired depth is reached. Do not hammer. The probe is not strong enough.
- Pull the probe upward about 10 to 15 centimeter so that the point opens itself. Because of the special shape of the point, only air in the vicinity of the point will be drawn-up.
- Connect the tube and draw-up the air until the meter indicates a constant value (usually after several dozens of seconds).
- Read and register the measured value.
- Switch the apparatus off and extract the probe straight up from the soil with both hands.
- Clean the point of the probe with a dry brush and check the operation of the inner pin. The apparatus is now ready for the next measurement.

Note: Measurement is possible only in soils permeable to air and above groundwater level.

## 6. Air pressure

In case of changed air pressure (mountains, mine shafts) another calibration for 21% is required again.

## 7. Temperature

The oxygen content measuring cell is temperature compensated. This temperature compensation may vary a little between cells. For this reason it is recommended to calibrate the meter again for 21% if you enter a space with a substantially different temperature. The meter can be applied between 0 °C and 45 °C.



**The life cycle of the cell is reduced substantially at high temperatures. It is advised to store the meter in a cool place, for instance a cool box (car) or fridge (at home). Never place the meter in a freezer.**

## 8. Replacing the oxygen cell

If the meter can no longer be calibrated for 21% it may indicate that the oxygen cell no longer operates. A new cell needs to be fitted.



**Depending on the use, storage method and aggressivity of the measurement environment the cell has a one to two year life cycle.**

- Slacken both cross-slotted screws at the top end of the meter and take the apparatus apart.
- Remove the thick aluminum cover under which you will find the oxygen cell (a small black and round box).
- Disconnect the black round plug from the measuring cell (pull). Connect a new cell to the plug.
- When mounting the new cell it is important to ensure that the O-ring in the aluminum cover is placed correctly.
- Check quality and orientation of the rubber tubes, assemble the apparatus and tighten the screws.
- After calibration the apparatus is ready for use.

## 9. Specifications

Range	0 - 25% volume
Calibration	Oxygen
Detection method	Electrochemical sensor
Response time	6 seconds
Sampling method	Hand aspirated
Batteries	9 Volt transistor type
Operating hours	approx. 30
Operating temperature	-12 to +45 °C
Size	16.5 x 13.5 x 10.2 cm
Weight	1360 gr

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