

Application Note AN-I-028

Dissolved oxygen in surface water

Fast, in-situ determination based on ISO 17289

Oxygen diffuses into water sources from the air by the process of aeration (e.g., when water flows turbulently down rapids or alternatively through photosynthesis by plants and phytoplankton).

Several factors can reduce the dissolved oxygen (DO) content in water. First, as water warms up, oxygen is released into the atmosphere as it is pushed out by increased ion mobility. Secondly, some bacteria and other microorganisms which feed on organic material (e.g., dead plants) consume oxygen. They will produce carbon dioxide from the organic material and oxygen. Last but not least, plants can also have a negative

influence on the oxygen content. If it is cloudy for several days, plants will fail to photosynthesize and begin consuming oxygen also during daytime. If the growth of plants has been stimulated by fertilizer runoff from a nearby source (usually agricultural), this effect can magnify.

Human-induced alterations can have a negative influence on surface water when DO values fall below crucial limits for maintaining the life supporting capacity of freshwater ecosystems. Therefore, monitoring the DO content in surface water by an optical sensor to assess its quality is important.

SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for a freshwater stream. The analysis is performed directly at the point of

interest, ensuring no falsification of the results which could be introduced by sample transport.

EXPERIMENTAL

This analysis is carried out on a 914 pH/DO/Conductometer equipped with an O₂-Lumitrode and a conductivity measuring cell to compensate for the higher salinity. Both sensors are calibrated before the measurement.

The sensors are both directly inserted into the surface water at the point of interest, to a depth of at least 3.5 cm.



Figure 1. Transport case including all accessories and a 914 pH/DO/Conductometer equipped with an O₂-Lumitrode and conductivity sensor for the determination of dissolved oxygen in a freshwater stream.

RESULTS

Results are taken after 60 seconds to ensure a stable temperature measurement. The obtained absolute

standard deviation is smaller than 0.1 mg DO/L or 0.9 μ S/cm, respectively.

Table 1. Content of dissolved oxygen (mg/L) and conductivity (μ S/cm) at a single point in a water stream (n = 3).

	DO content in mg/L	Conductivity in μ S/cm
Mean	12.11	521.5
SD(abs)	0.06	0.9
SD(rel.) %	0.45	0.17

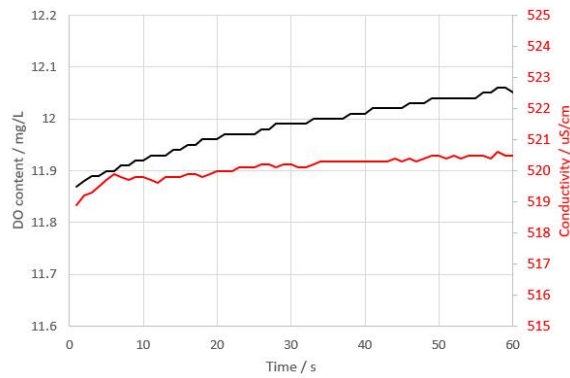


Figure 2. Example measurement curve of the DO content and the conductivity in a freshwater stream.

CONCLUSION

The dissolved oxygen content in surface water can be assessed quickly and locally in-situ by using a 914 pH/DO/Conductometer and the optical sensor O₂-Lumitrode. Stable, accurate results are obtained

within 60 seconds. Additionally, the sensor is completely maintenance-free. No need to worry about the quality of your sensor: if the O₂ cap needs to be replaced, the instrument will inform you.

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CONTACT

Metrohm Suisse SA
 Industriestrasse 13
 4800 Zofingen

info@metrohm.ch

CONFIGURATION



914 pH/DO/Conductometer avec coffret d'accessoires

pH-mètre/DO/conductimètre bicanal portable avec entrée de mesure analogique et numérique pour mesurer en parallèle le pH / la tension en mV / la conductivité ou l'oxygène dissous et la conductivité. Avec cet appareil de mesure fonctionnant sur batterie dans la mallette, vous êtes parfaitement équipé pour des mesures en extérieur.

- Mesure parallèle du pH et de la conductivité
- Mesure parallèle de l'oxygène dissous et de la conductivité
- Entrée de mesure de conductivité analogique pour les cellules de mesure de la conductivité à 4 fils de Metrohm
- Entrée de mesure numérique pour les électrodes pH intelligentes et l'électrode Lumitrode O2
- Boîtier robuste, étanche à l'eau et à la poussière (IP67), idéal pour une utilisation dans des conditions difficiles en extérieur et en laboratoire
- Écran d'affichage couleur à LCD rétro-éclairé pour une lecture facile des résultats
- Interface USB pour une exportation aisée des données sur ordinateur ou imprimante
- Mémoire interne de grande capacité (10 000 blocs de données)
- Modes utilisateur et expert protégés par PIN afin d'éviter toute modification accidentelle des paramètres
- Impression et exportation des données conformes aux BPL avec ID utilisateur et horodatage
- Mallette de transport robuste pour les mesures de routine sur le terrain