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Within, the Future

News Release

January 20, 2021
Maxell Holdings, Ltd.

Maxell started shipment of world's first[*1] environmentally friendly lead-free galvanic cell-type oxygen sensors with weak acid electrolyte solution

Lead-free galvanic cell-type oxygen sensors
KE-12LF (left), KE-25LF (center), KE-50LF (right)

Maxell, Ltd. (President and Representative Director: Keiji Nakamura, hereinafter "Maxell") announced that it started shipment of lead-free galvanic cell-type oxygen sensors. These sensors are fully compliant with RoHS directive[*2] and usable even in the coexistence of acid gases, which is enabled by originally developed weak acid electrolyte.

Main features of Maxell's lead-Free galvanic cell-type oxygen sensor

1. Compliant with RoHS directive[*2]
2. Virtually no influence from CO_2, H_2S, SO_2
3. Long life expectancy[*3] equivalent to conventional oxygen sensors (3 to 10 years)

In general, galvanic cell-type oxygen sensors offer simple and low-cost methods for measuring oxygen concentration, and are used worldwide in applications such as oxygen concentration measuring devices to prevent oxygen deficiency.

However, measuring oxygen concentration in the coexistence of acid gases may cause the risks of outlier detection and short-term breakdown affected by acid gasses, in case of using oxygen sensors with alkaline electrolyte solution. All of Maxell's oxygen sensors are entirely immune to CO_2, H_2S, SO_2 and is hardly affected by other acid gasses because it uses originally developed weak acid electrolyte solution. Therefore, they are widely used in fields such as combustion gas monitoring, biotechnology equipment, food storage, and education.

From environmental aspects, conventional oxygen sensors used anodes made from lead presented a risk of soil or ocean pollution or harmful impacts on the human body. Maxell has been researching and developing lead-free oxygen sensors for many years to reduce the load on environment and human body. To achieve lead-free oxygen sensors, drastic changes are necessary in the materials including electrolyte and cathode as well as using no lead as an anode material.

Due to a high degree of technical difficulty to achieve lead-free oxygen sensors, conventional oxygen sensors which contain lead are exempted from RoHS directive[*2], however, the exemption may eventually be expired in the future, whereas Maxell's lead-free galvanic cell-type oxygen sensors are fully compliant with RoHS directive[*2].

Furthermore, Maxell successfully developed a proprietary weak acid electrolyte solution which is suitable for lead-free anodes applying its unique technologies of oxygen sensors cultivated for many years. This enabled the lead-free oxygen sensors to be used even in the coexistence of acid gases like Maxell's other conventional oxygen sensors.

Moving forward, Maxell will enhance its product range in response to domestic and overseas market demands.

*1 world's first: According to the research in lead-free galvanic cell-type oxygen sensors with weak acid electrolyte solution by Maxell as of January 2021.
*2 RoHS directive: Refer to the description shown in 2011/65/EU and EU2015/863.
*3 Long life expectancy: Life expectancy when the product is used at 20˚C with a humidity of 60%RH and atmospheric pressure of 1013hPa, represented as a value of (Oxygen Concentration %) × (Time h)
The life expectancy of KE-25LF and KE-25F3LF is approx. 5 years. That of the new models KE-12LF and KE-12F3LF is approx. 3 years and that of KE-50LF is approx. 10 years, of which Maxell starts sample shipments.

Product details:

Galvanic cell-type oxygen sensor
https://biz.maxell.com/en/tokki/oxygen_sensors.html

Contacts:

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Inquiries: https://www.maxell.co.jp/inquiry/maxell/en/form.jsp?f=biz&q=tokki_en_biz

Appendix

Main characteristics of Maxell's lead-free galvanic cell-type oxygen sensor

1. Compliant with RoHS directive*1

2. Weak acid electrolyte solution enables entire immunity to CO_2, H_2S, SO_2

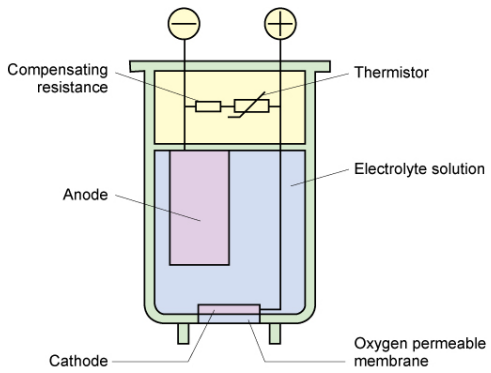
3. Long life*2 equivalent to conventional oxygen sensors

The life expectancy of KE-25LF and KE-25F3LF is approx. 5 years at 20˚C and atmospheric pressure of 1013hPa. That of the new models KE-12LF and KE-12F3LF is approx. 3 years and that of KE-50LF is approx. 10 years, of which Maxell starts sample shipments.

*1 RoHS directive: Refer to the description shown in 2011/65/EU and EU2015/863.
*2 Long life: Life expectancy when the product is used at 20˚C with a humidity of 60%RH and atmospheric pressure of 1013hPa, represented as a value of (Oxygen Concentration %) × (Time h)

Structure and operating principles of galvanic cell-type oxygen sensor

Galvanic cell-type oxygen sensor is a metal-air battery comprising a cathode, an anode, an electrolyte solution and a permeable membrane. The permeable membrane is integrated with the cathode and limits the volume of oxygen to reach the cathode. As the small amount of oxygen molecules diffuse through the permeable membrane, all of them are reduced at the cathode and the current which flows between the electrodes is converted to the voltage. The oxygen concentration in the gas mixture being measured, partial pressure of oxygen in a precise sense, is proportional to the converted voltage. Therefore, the voltage measurement leads to an accurate determination of oxygen concentration.



Structure of oxygen sensor

Specifications

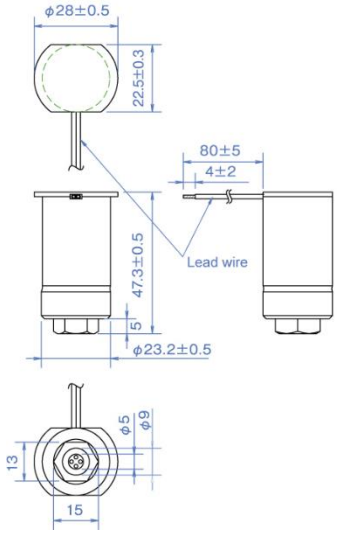
Model No.	KE-12LF *2	KE-12F3LF *2	KE-25LF	KE-25F3LF	KE-50LF *2
Measurement range	0 ～ 30% O_2				
Linearity accuracy	±1 % Full scale				±2 % Full scale
Operating pressure range	811 ～ 1216 hPa				
Operating Temp. range	5 ～ 40℃				
Response time (90%)	approx. 8 sec.		approx.15 sec.		approx.60 sec.
Life expectancy *1	approx. 55×10^4 %h approx. 3 years at 20℃		approx. 90×10^4 %h approx. 5 years at 20℃		approx. 180×10^4 %h approx. 10 years at 20℃
Appearance	Standard	Cylindrical Threaded top	Standard	Cylindrical Threaded top	Standard

*1 Life expectancy: when the product is used at 20˚C with a humidity of 60%RH and atmospheric pressure of 1013hPa, represented as a value of (Oxygen Concentration %) × (Time h)
*2 KE-12LF, KE-12F3LF, KE-50LF: Specifications of the sample products are subject to change without notice.

Dimensions

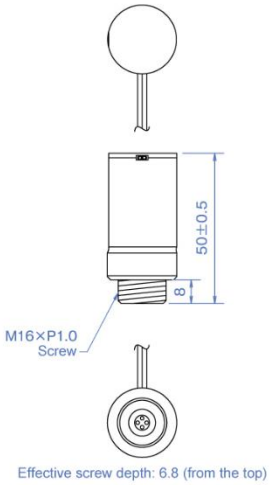
KE-●●LF

Standard type



KE-★★F3LF

Cylindrical type, threaded top



* ●● indicates 12, 25 and 50

* ★★ indicates 12 and 25

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