Electrochemical Oxygen Analyzer

Overview

SMART Electrochemical trace/percent Oxygen Analyzer uses a Micro-Fuel Cell sensor, which can measure trace oxygen (ppm level) or percentage oxygen (% level), achieving high-precision and high-repeatability oxygen measurement. It is suitable for a variety of industrial process gas monitoring.

Principle

The core of the electrochemical oxygen analyzer is a micro fuel cell sensor, which works on the principle of selective electrochemical reduction of oxygen molecules. Oxygen diffuses into the sensor through a polytetrafluoroethylene (Teflon) membrane, where a reduction reaction occurs at the platinum-catalyzed cathode:

$$4e^- + 4H^+ + O_2 \rightarrow 2H_2O$$

When the oxygen is reduced at the cathode, lead is simultaneously oxidized at the anode:

$$2Pb + 2H_2O \rightarrow 2PbO + 4H^+ + 4e^-$$

The overall reaction for the fuel cell is the SUM of the half reactions above:

$$2Pb + O_2 \rightarrow 2PbO$$

The electrons released at the surface of the anode flow to the cathode surface when an external electrical path is provided. The current is proportional to the amount of oxygen reaching the cathode. It is measured and used to determine the oxygen concentration in the gas mixture.

If the total pressure increases, the rate that oxygen reaches the cathode through the diffusing membrane will also increase. The electron transfer, and therefore the external current, will increase, even though the oxygen concentration of the sample has not changed. It is therefore important that the sample pressure at the fuel cell (usually vent pressure) remain relatively constant between calibrations.

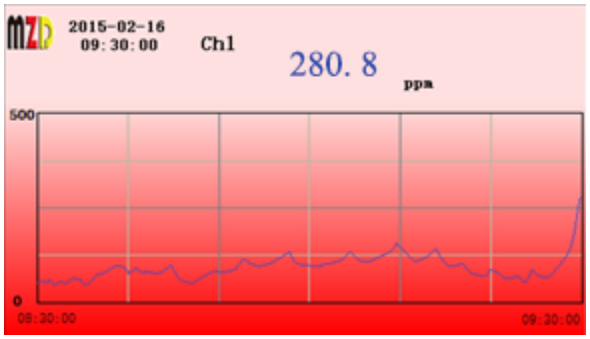
Application

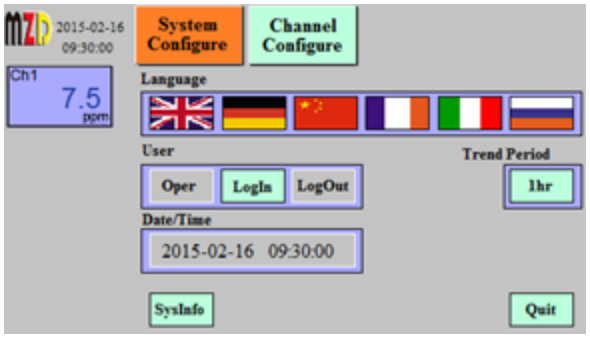
- Air separation and liquefaction
- Pure, gaseous hydrocarbon stream monitoring
- Emissions monitoring
- Protective atmosphere blanketing of primary liquid feedstocks and flammable liquids
- Process monitoring of gaseous monomers - vinyl chloride, propylene, butadiene, isoprene or ethylene
- Gas purity certification
- Semi conductor manufacturing

Advantage

- ❖ Advanced micro fuel cell, suitable for ppm or percentage level detection.
- ❖ Suitable for most gas backgrounds.
- ❖ Insensitive to flow changes.
- ❖ Strong environmental adaptability, built-in temperature compensation technology.
- ❖ Strong anti-gas interference capability.
- ❖ Accurate and reliable measurement, good repeatability.
- ❖ Rugged and durable design.
- ❖ Quick installation and easy operation.
- ❖ The technology is mature, it is widely used, and its cost is relatively low.

Trace/Percent Oxygen Analyzer





Features

❖ **Quick and convenient**

The navigation menu contains 6 languages, which can be operated easily.

❖ **Process safety**

4.3” or 7" large size color LCD touch screen, convenient and safe touch operation and debugging

Large size screen with red flashing alarm, clearly visible from long distances and in dark areas

Alarm immediately, safe the process

❖ **Alarm event record**

Real-time data curve display

Record function for up to 6,000 alarms

❖ **Expert calibration function**

Multi-point calibration function up to 9 point

❖ **Powerful self-diagnosis function**

Built-in heartbeat monitoring function and watchdog

Monitor the status of analyzer and sensors, and promptly remind customers to take necessary maintenance

High-standard hardware and software security and password protection

❖ **Powerful control function**

High(low) limit control function

Optional: Timer control(automatic cleaning) function

Optional: analog PID control function

Optional: PWM control function

❖ **Flexible fieldbus communication functions for IOT4.0**

Optional fieldbus MODBUS, HART, Foundation Fieldbus FF, PROFIBUS PA, PROFIBUS DP, etc.

Electrochemical Oxygen Analyzer

Parameters

Measuring principle	Electrochemical		
Display	4.3” or 7" industrial color touch screen		
Language	Multi-Language (English, German, Chinese, French, Italian, Russian or Customized)		
Range	0 ~ 10ppm up to 10000ppm or 0 ~ 1% up to 100%		
Linearity	2% FS		
Repeatability	1% FS		
Sensitivity	1ppb or 0.01%		
Response Time (T90)	<10s		
Sample gas temperature	0 ~ 50°C		
Gas pressure	<1bar		
Gas Flow	10 ~ 60Nl/h		
Analog Output(Galvanic)	4~20mA, maximum load 500Ω		
Relay Output(Galvanic)	Relay (2A, 230V AC freely set alarm), System alarm		
Diagnosis function	Flow monitoring, Sensor and analyzer self-diagnosis, Heartbeat monitoring		
Event Logger	Internal Flash, up to 6,000 alarm records		
Control function	Optional Timer control function, PID, PWM		
Calibration	Expert calibration function, Multi-point calibration function up to 9 point		
Communication	RS485 MODBUS RTU, HART, Foundation Fieldbus FF, PROFIBUS PA, PROFIBUS DP, MODBUS TCP/IP, etc		
Power	80~264V AC,1A or 19~28V DC,3A		
Electrical protection	EMI / RFI CEI-EN55011 – 05/99		
Ambient Temperature	0 ~ 50°C		
Storage and transport temperature	-25 ~ 70°C		
Ambient Humidity	0 ~ 100%RH		
Diameter of connecting pipe	6mm		
Wall-mounted(1~2Channels)	ABS,Gray RAL7045	213x185x84mm	IP65
	Aluminum,Gray	230x200x157mm	IP65, Exd IICT4
Laboratory Desktop(1~2Channels)	Aluminum,Black	250x144x184mm	IP40
Portable(1~2Channels)	ABS,Yellow	420x325x180mm	IP67
19" Rack(1~6Channels)	Aluminu,natural-coloured	483x133x238mm	IP40

Trace/Percent Oxygen Analyzer

Overview

The Electrochemical oxygen analyzer is cost-effective and suitable for stable and continuous measurement of the trace/percentage oxygen content of most gases.

Application

- Air separation and liquefaction
- Pure, gaseous hydrocarbon stream monitoring
- Emissions monitoring
- Protective atmosphere blanketing of primary liquid feedstocks and flammable liquids
- Process monitoring of gaseous monomers - vinyl chloride, propylene, butadiene, isoprene or ethylene
- Gas purity certification
- Semi conductor manufacturing

Measuring principle	Electrochemical
Display	1.8" industrial color LCD, 160*128Pixel
Language	English Menu
LED Light	Status LED Light (NAMUR NE107)
Keypad	Magnetic keypad
Range	0 ~ 10ppm up to 10000ppm or 0 ~ 1% up to 100%
Linearity	2% FS
Repeatability	1% FS
Sensitivity	1ppb or 0.01%
Response Time (T90)	<10s
Diagnosis function	Self-diagnosis, heart beat monitoring
Analog Output	4~20mA
Relay Output	3 Relays, NO, 5A 250VAC/30VDC
Communication	RS485, MODBUS RTU
Power	19 ~ 28V DC Power,1A
Gas Flow	10 ~ 60Nl/h
Gas pressure	<1bar
Process Connection	6mm pipe
Ambient Temperature	0 ~ 50°C
Ambient Humidity	0 ~ 100%RH
Electrical protection	EMI / RFI CEI-EN55011 – 05/99
Housing Material	Aluminum and Stainless steel
Explosion-proof	Exd IICT4 Controller optional

Electrochemical Oxygen Analyzer

Background Gas Compatibility

NO	Chemical Name	Formula	OEC-x series	OEC-xA series
1	Acetic Acid (vapor)	CH3COOH	Not Suitable	Suitable, Liquid Filter Suggested.
2	Acetone (vapor)	(CH3)2CO	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
3	Acetonitrile	C2H3N	Suitable	Not Suitable
4	Acetylene	C2H2	Suitable	Suitable
5	Acrylonitrile	C3H3N	Suitable	Suitable
6	Air	N2+O2+Ar	Suitable	Suitable
7	Ammonia	NH3	Limited use 2-3 hrs daily; flush with N2	Not Suitable
8	Argon	Ar	Suitable	Suitable
9	Arsine	AsH3	Not Suitable	Not Suitable
10	Bromine	Br	Not Suitable	Not Suitable
11	Butadiene (shorter Life)	C4H6	Limited life 3-4 months	Not Suitable
12	Butene	C4H8	Suitable	Suitable
13	Butane	C4H10	Suitable	Suitable
14	Carbon Dioxide	CO2	Suitable < 5000 PPM CO2	Suitable
15	Carbon Disulfide	CS2	Suitable < 1000 PPM CS2	Suitable
16	Carbon Monoxide	CO	Suitable	Suitable
17	Carbon Tetrachloride	CCl4	Suitable	Not Suitable
18	Chlorinated Hydrocarbons	C+H+Cl	Suitable	Suitable
19	Chlorine	Cl2	Not Suitable	Not Suitable
20	Chloro-fluorocarbons	H+F+Cl+C	Suitable	Suitable
21	Cyclopentane	C5H10	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
22	Diborane	B2H6	Suitable; remove B2H6 > 15 PPM	Suitable; remove B2H6 > 15 PPM
23	Dimethyl Ether (vapors)	C2H6O	Suitable	Not Suitable
24	Ethane	C2H6	Suitable	Suitable
25	Ethyl Acetate	C4H8O2	Suitable	Suitable
26	Ethylene	C2H4	Suitable	Suitable
27	Fluorine	F2	Not Suitable	Not Suitable
28	Formaldehyde (vapors)	CH2O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
29	Helium	He	Suitable	Suitable
30	Heptanes	C7H16	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
31	Hexanes (shorter Life)	C6H14	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
32	Hydrocarbons	H+C	Suitable	Suitable
33	Hydrochloric Acid (vapors)	HCl	Not Suitable	Suitable, Liquid Filter Suggested.
34	Hydrogen	H2	Suitable	Not Suitable
35	Hydrogen Cyanide	HCN	Suitable	Suitable

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NO	Chemical Name	Formula	OEC-x series	OEC-xA series
36	Hydrogen Fluoride	HF	Not Suitable	Not Suitable
37	Hydrogen Sulfide	H2S	Suitable; remove H2S > 15 PPM	Suitable; remove H2S > 15 PPM
38	Iodine	I	Not Suitable	Not Suitable
39	Isopropyl Acetate	C5H10O2	Suitable	Suitable
40	Isopropyl Alcohol (IPA)	C6H8O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
41	Methane	CH4	Suitable	Suitable
42	Krypton	Kr	Suitable	Not Suitable
43	Ethanol EtOH (vapors)	CH3OH	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
44	Methanol MeOH (vapors)	CH4O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
45	Methyl Iodide (vapors)	CH3I	Suitable; requires filter, condenses at room temp	Suitable; requires filter, condenses at room temp
46	Methyl Mercaptan (vapors, shorter life)	CH4S	Suitable, Remove CH4S > 15 PPM	Suitable, Remove CH4S > 15 PPM
47	Methyl Propenoate (acrylate)	C4H6O2	Not Suitable	Suitable, Liquid Filter Suggested.
48	MTBE (vapors)	C5H12O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
49	Neon	Ne	Suitable	Not Suitable
50	Nitric Oxide	NO	Low PPM NO concentrations only	PPM NO concentrations only
51	Nitrogen	N2	Suitable	Suitable
52	Nitrogen Dioxide	NO2	Not Suitable	Not Suitable
53	Nitrous Oxide	N2O	Low PPM NO concentrations only	Low PPM NO concentrations only
54	NOx	NO, NO2	Low PPM NOX concentrations only	Low PPM NOX concentrations only
55	Octafluorocyclobutane	C4F8	Suitable	Suitable
56	Ozone	O3	Not Suitable	Not Suitable
57	Pentane (vapors)	C5H12	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
58	Phosgene	COCl2	Not Suitable	Not Suitable
59	Phosphine	PH3	Not Suitable	Not Suitable
60	Propane	C3H8	Suitable	Suitable
61	Propylene Aldehyde (vapors)	C3H4O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
62	Propionic Acid (vapors)	C3H6O2	Not Suitable	Suitable, Liquid Filter Suggested.
63	Propylene	C3H6	Suitable	Suitable
64	R142b	C2H3F2Cl	Suitable	Suitable
65	R152a	C2H4F2	Suitable	Suitable
66	Radon	Rn	Suitable	Suitable
67	Silane	SiH4	Not Suitable	Not Suitable
68	Styrene	C8H8	Suitable	Suitable
69	Sufuric Acid (vapors)	H2SO4	Not Suitable	Suitable; remove H2SO4 > 15 PPM
70	Sulfur Dioxide	SO2	Low PPM SO2 concentrations only	Low PPM SO2 concentrations only

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NO	Chemical Name	Formula	OEC-x series	OEC-xA series
71	Sulfur Hexafluoride (limits life)	SF6	Suitable	Suitable
72	Tetrafluoroethylene (vapors)	C2F4	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
73	Tetrafluoromethane (vapors)	CF4	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
74	Tetrahydrofurane (vapors)	C4H8O	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
75	Toluene (vapors)	C7H8	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
76	Trimethylaluminum (vapors)	(CH3)6A12	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
77	Terpene (vapors, limits life)	(C5H8)n	Remove low concentrations; otherwise Not Recommended	Remove low concentrations; otherwise Not Recommended
78	Vinyl Acetate (vapors)	C4H6O2	Suitable, Liquid Filter Suggested.	Suitable, Liquid Filter Suggested.
79	Vinyl Chloride (vapors)	C2H3Cl	Suitable	Suitable
80	Xenon	Xe	Suitable	Not Suitable
81	Xylene	C8H10	Suitable	Suitable

Note:

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MZD Analytik GmbH
Enderstraße 94
01277 Dresden, Germany
Tel: +49-(0)351-850-710-10
Email: info@mzdd.de