

# Oxygen Sensor

## Mini Oxygen Sensor

**SO-E2-xxx (TO-8 for through hole mounting on a PCB)**

**SO-E2-xxx-DxxxC (TO-8 with 6 pol cable and RAST 2.5 connector)**

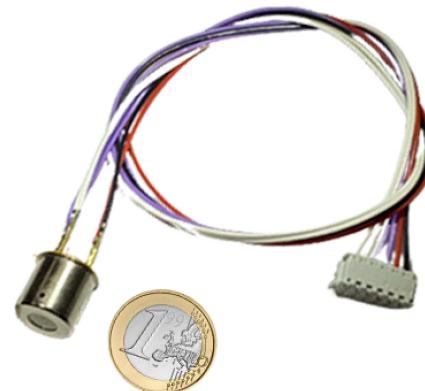
- Measurement ranges from 100 ppm to 96% oxygen
- Stable Sensor characteristic across range
- Sensor signal not affected by temperature
- Zirconium Dioxide (ZrO<sub>2</sub>) technology

### Description

The Sensore SO-E2 series delivers accurate oxygen measurement from 100 ppm to percent levels in a compact design. Using proven zirconium dioxide technology, these sensors provide long life and stable performance with minimal impact from temperature, pressure, or interfering gases. SO-E2 is optimized for applications that will frequently perform heater power cycles to save energy.

### Specifications

Sensor technology	
Measuring Gas	Oxygen (O <sub>2</sub> )
Measuring Principle:	Limiting current, ZrO <sub>2</sub> -cell
Sensor cell	
Bias voltage:	0.7...1.6 V <sub>DC</sub>
Resulting sensor current	0...250 µA 0...420 µA (96 % measurement range)
Sensor heater (platinum heater element)	
Basic heater operation	Constant heater voltage
Warm up procedure	30 seconds heater voltage ramp-up or heater current limitation <0.5 A
Constant heater voltage	3.6 VDC (depends on application)
Power consumption	1.5 W (depends on application)
Heater resistance at 25°C	3.25 Ω ± 0.25 Ω
Advanced heater operation	Active heater resistance control
Environmental conditions	
Maximum operating temperature	350 °C (with-out cable) 125 °C (with cable)
Humidity	non-condensing (max. 90 % r.h. @ 40 °C)
Pressure range*	700-1300 mbar (absolute)
*Contact SENSORE for extended pressure range options	
Reliability data under clean laboratory conditions	
Lifetime (MTTF)	typical 10 years
Calibration stability (MTTF)	typical 20 000 hours
Vibration resistance	sensors meet the European Norm EN60068-2-6 (Sinusoidal vibration tests)



Housing Types	
Type	SO-E2
Housing	TO8
Dimensions	TO-8: Ø 15.3 mm, height = 13.7 mm
Housing temperature during operation	70 °C (at ambient temperature of 25°C)
Gas exchange	Gas diffusion through mesh on top
Response time (t90)	< 12 seconds
Flow rate	Usually there is no convection flow in a E2 housing. Exposure to massive airflows might affect the sensor performance.
Part number ordering information	
Sensor part number	Measuring range
SO-E2-001	Chip design not optimized for this range Use SO-B0-xxx instead
SO-E2-010	0.01 % O <sub>2</sub> – 2.0 % O <sub>2</sub>
SO-E2-020	0.05 % O <sub>2</sub> – 5.0 % O <sub>2</sub>
SO-E2-250	0.10 % O <sub>2</sub> – 25.0 % O <sub>2</sub>
SO-E2-960	1.00 % O <sub>2</sub> – 96.0 % O <sub>2</sub>
*Operation outside the specified measuring range can cause permanent damage of the electrode	
Optional cable number	
SO-E2-xxx	no cable, TO-8 for through hole mount
SO-E2-xxx-D012C	12cm cable, 6 pole, Rast 2.5 connector
SO-E2-xxx-D040C	40cm cable, 6 pole, Rast 2.5 connector

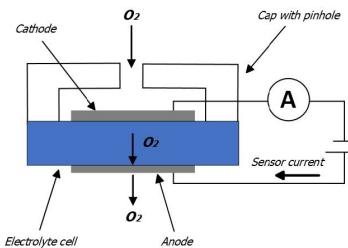
## Sensor specification for different O<sub>2</sub> measurement ranges with N<sub>2</sub> balance

Sensor part number	Measuring range*	Output current at O <sub>2</sub> concentration	Accuracy	Reproducibility	Bias voltage
SO-E2-020-D040C	0.01 % O <sub>2</sub> – 2.0 % O <sub>2</sub>	150 – 250 µA at 2.0 % O <sub>2</sub>	± 200 ppm O <sub>2</sub>	< 100 ppm O <sub>2</sub>	0.75 V <sub>DC</sub>
SO-E2-050-D040C	0.05 % O <sub>2</sub> – 2.0 % O <sub>2</sub>	150 – 250 µA at 5.0 % O <sub>2</sub>	± 500 ppm O <sub>2</sub>	< 250 ppm O <sub>2</sub>	0.80 V <sub>DC</sub>
SO-E2-250-D040C	0.05 % O <sub>2</sub> – 5.0 % O <sub>2</sub>	150 – 250 µA at 20.9 % O <sub>2</sub>	± 0.25 % O <sub>2</sub>	< 0.1 % O <sub>2</sub>	0.85 V <sub>DC</sub>
SO-E2-960-D040C	1.00 % O <sub>2</sub> – 96.0 % O <sub>2</sub>	15 µA – 250 µA at 20.9 % O <sub>2</sub>	± 1.00 % O <sub>2</sub>	< 0.2 % O <sub>2</sub>	1.00 V <sub>DC</sub> **

Operation outside the specified measuring range can cause a permanent damage of the electrode

\*\* If the sensor is mainly operated between 70 and 96.0% O<sub>2</sub> bias voltages up to 1.6 VDC can be applied

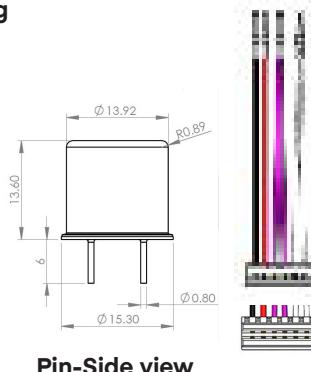
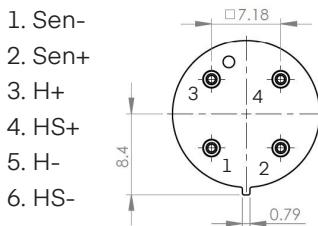
### Sensor principle



### Sensor characteristic

Sensor Characteristic	
$I_s(O_2) = -k \cdot \ln\left(1 - \frac{[O_2]}{100}\right)$	I <sub>s</sub> (O <sub>2</sub> ) Sensor current in µA [O <sub>2</sub> ] Oxygen concentration in % k specific constant of sensor

### Pin Connection Standard Housing



### RAST connector pinouts

Sensors with connecting leads (teflon isolation with temperature stability up to 250 °C):			
Rast - 2.5 plug keyring	Cable Colour	Sensor Pin Connection	Connected to sensor pin No.
1	Black	Sen-	4
2	Red	Sen+	3
3	Violet 1	H+	1
4	Violet 2	HS+	1
5	White 1	H-	2
6	White 2	HS	2

### For electronics control board option see Datasheet "GSB- Generic Sensor Board"

Generic Sensor Board (GSB) provides a standard connection for board (solder) or cable mount sensors.

Power supply: 12V<sub>DC</sub> 0.5 A. Linear signal outputs: 0-5V<sub>DC</sub>, 4-20 mA and digital RS232 outputs.

Customers should test under their own conditions to ensure the equipment is suitable for the intended application(s). We adopt a continuous development program, which sometimes necessitates specification changes without notice.



Improving the world, one measurement at a time™

