

# Oxygen Sensor

## Mini Oxygen Sensor Hose Connection

SO-E3-xxx (TO-8 for through hole mounting on a PCB)

SO-E3-xxx-DxxxxC (TO-8 with 6 pol cable and RAST 2.5 connector)

**SEN** **SORE**  
a DwyerOmega brand

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

### Description

The Sensore SO-E3 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, fast response and stable performance with minimal impact from temperature, pressure, or interfering gases. SO-E3 is optimized for flow through oxygen measurements with flow rate of 0.1 to 0.5 LPM (liter per minute).

### 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	125°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 and gas interface

Type	SO-E3
Housing	TO8 single hose connection
Dimensions	TO-8: Ø 15.3 mm, height = 23.9 mm (including hose connection) hose connection: Ø 4.8 mm
Housing temperature during operation	70 °C (at ambient temperature of 25°C)
Gas exchange	Gas convection flow into hose inlet (small outlet in TO-8 can)
Response time (t90)	< 5 seconds at 0.5 LPM
Flow rate	Gas flow rate could potentially influence the sensor performance, therefore the recommended gas flow is 0.1 - 0.5 LPM

### Part number ordering information

Sensor part number	Measuring range*
SO-E3-001	Housing not optimized for this range
SO-E3-010	Housing not optimized for this range
SO-E3-020	0.01 % O <sub>2</sub> – 2.0 % O <sub>2</sub> (~0.5 LPM)
SO-E3-050	0.05 % O <sub>2</sub> – 5.0 % O <sub>2</sub> (0,1-0,5LPM)
SO-E3-250	0.10 % O <sub>2</sub> – 25.0 % O <sub>2</sub> (0,1-0,5LPM)
SO-E3-960	1.00 % O <sub>2</sub> – 96.0 % O <sub>2</sub> (0,1-0,5LPM)

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

### Optional cable number

SO-E3-xxx	No cable, TO-8 for through hole mount
SO-E3-xxx-D012C	12cm cable, 6 pole, Rast 2.5 connector
SO-E3-xxx-D040C	40cm cable, 6 pole, Rast 2.5 connector

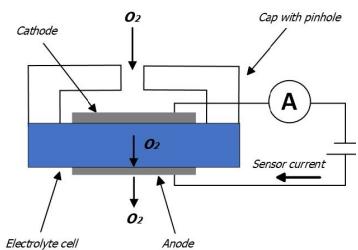
## Sensor specification for different O<sub>2</sub> measurement ranges with N2 balance

Sensor part number	Measuring range*	Output current at O <sub>2</sub> concentration	Accuracy	Reproducibility	Bias voltage
SO-E3-020	0.01 – 2.0 % O <sub>2</sub>	150 – 250 $\mu$ A at 2.0 % O <sub>2</sub>	$\pm$ 200 ppm O <sub>2</sub>	< 100 ppm O <sub>2</sub>	0.75 V <sub>DC</sub>
SO-E3-050	0.05 – 5.0 % O <sub>2</sub>	150 – 250 $\mu$ A at 5.0 % O <sub>2</sub>	$\pm$ 500 ppm O <sub>2</sub>	< 250 ppm O <sub>2</sub>	0.80 V <sub>DC</sub>
SO-E3-250	0.10 – 25.0 % O <sub>2</sub>	100 – 200 $\mu$ A at 20.9 % O <sub>2</sub>	$\pm$ 0.25 % O <sub>2</sub>	< 0.1 % O <sub>2</sub>	0.85 V <sub>DC</sub>
SO-E3-960	1.0 – 96.0 % O <sub>2</sub>	15 – 30 $\mu$ A at 20.9 % O <sub>2</sub>	$\pm$ 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

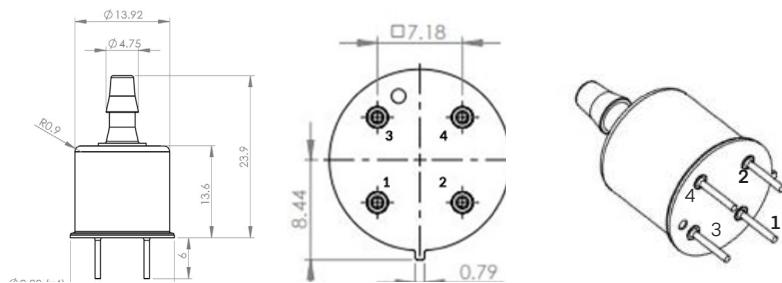
#### Sensor Characteristic

$$I_s(O_2) = -k \cdot \ln\left(1 - \frac{[O_2]}{100}\right)$$

Is (O<sub>2</sub>) Sensor current in  $\mu$ A  
 [O<sub>2</sub>] Oxygen concentration in %  
 k specific constant of sensor

### Pin layout

Nr	Function	6 pole cable
1	Heater H+ HS+ (sense)	violet 1 violet 2
2	Heater H- HS- (sense)	white 1 white 2
3	Sensor S+	red
4	Sensor S-	black



### 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.



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