

Southland Sensing

M02 Series Trace and Percent Oxygen Sensor's

Principle of Operation:

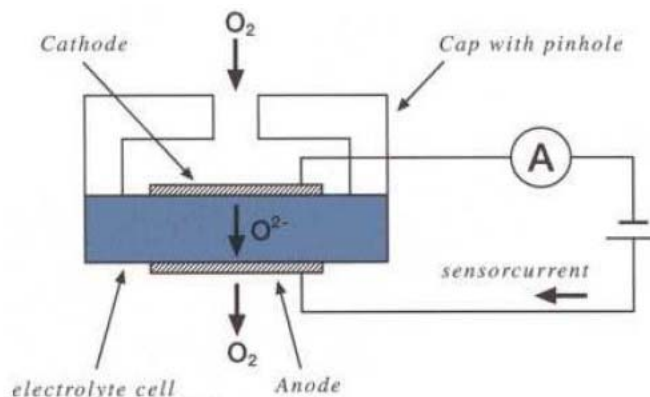
When voltage is applied to a zirconia electrolyte cell, oxygen is pumped through the zirconia disc from the cathode side to the anode side because the carriers of the current flowing through the zirconia electrolyte are oxygen ions. By attaching a cap with a pinhole on the cathode side of the cell and by increasing the voltage over the cell the current shows saturation due to the rate limiting step in the transfer of oxygen to the cathode. This saturation current is called limiting current and is nearly proportional to the ambient oxygen concentration. Below the advantages of the oxygen sensor:



- measuring range 10 ppm to 96% oxygen
- High accuracy
- For many types a more or less linear characteristic
- Small temperature dependence of the sensor signal
- Low interference with other gases
- Long service life
- "Single point calibration" only necessary once

Application:

- Combustion control, control of gas or oil burners by measuring the oxygen concentration in exhaust gases
- Measuring equipment
- Exhaust gas measuring, gas analysis
- Medical treatment, oxygen enricher, incubators, respiration control and equipment
- Biochemistry, fermentation equipment, incubator
- Food packaging, measuring of residual oxygen
- Safety controls in shafts, green houses, food storage
- Climate control, air quality monitoring, oxygen monitoring
- Chemical industry
- Industrial driers equipment
- Diving sport



Schematic of Sensor Element

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Characteristic Data:

measuring parameter: oxygen concentration
measuring medium: gaseous atmosphere
measuring principle: limiting current type sensor
measuring ranges:

MO2 - 1	1 — 1000 PPM
MO2 - 2	0.1 — 25 Percent
MO2 - 3	1.0 — 96 Percent

output-characteristic:

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

$I_s(O_2)$.. sensor current in μA
 $[O_2]$.. oxygen concentration in %
 k .. specific constant of sensor

output-signal:

0 - 412 μA
 (depends on sensor type and oxygen concentration)

accuracy:

1% of measuring range

response time (t90): 2 to 10 sec. (depends on sensor type)

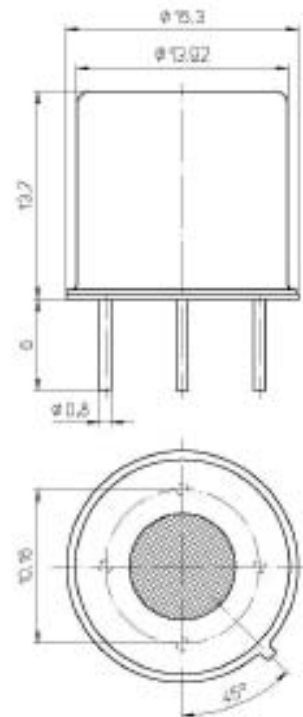
sensor voltage: 0,7 to 1,6 Volt

heating voltage: 3.6 – 4.4 Volts (1.3 to 1.8 Watts, depends on application and packaging)

warm up time: approx. 2 min.

max. packaging-temperature: approx. 250 °C (measured by room temperature)

max. ambient temperature: 350 °C



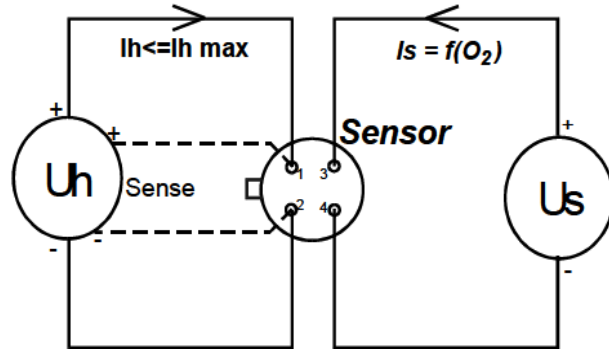
Package TO 8

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Basic circuit of the sensor

There are additional leads named sense drawn in the basic circuit shown beside. With this leads the exact heater voltage at the sensor pins can be adjusted. This four wire measuring system is recommended for heater operation with constant voltage. In case of operation with constant heater resistance mode it is absolutely necessary to use this for wire measurement system.



** Southland Sensing also provides an optional Electronics Board, CMD-430 for OEM Applications

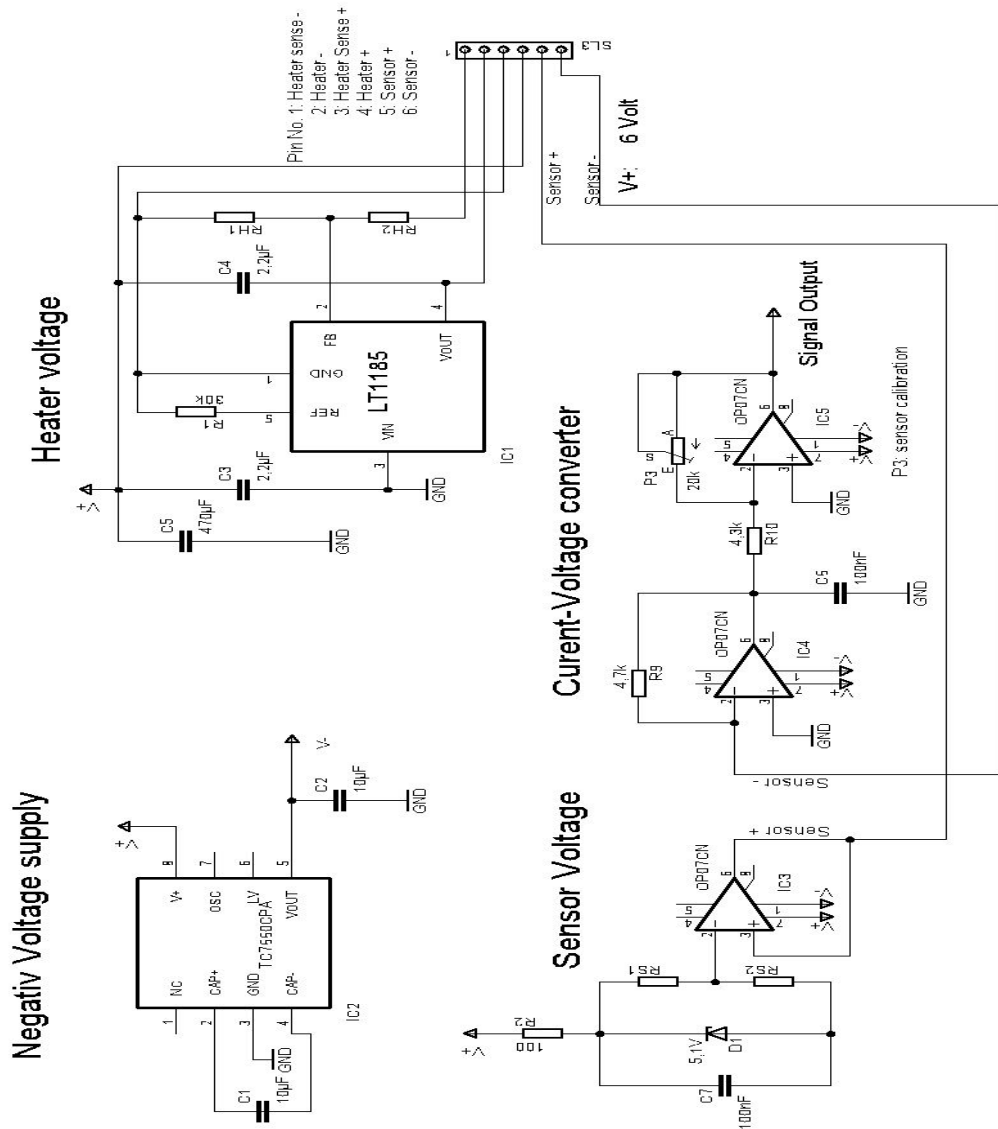
Warning

Permanent damage to the sensor can occur due to the following circumstances:

- Sensor is in the unheated state in exhaust gas which contains H_2S or SO_x
- Contact with water or condensed humidity
- Contact with gases which contains halogens like F, Cl, Br
- Contact with organic vapors

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Heater voltage adjustment

Uout (V)	Rh1 (kΩ)	Rh2 (kΩ)
3,6	2,49	1,3
3,7	2,37	1,33
3,8	2,37	1,43
3,9	2,61	1,69
4,0	2,37	1,62
4,1	2,37	1,74

Sensor voltage adjustment

U sens (V)	Rs2 (kΩ)	Rs1 (kΩ)
0,7	11,3	71,5
0,75	11,8	68,1
0,80	11,8	63,4
0,85	11,8	59,0
1,3	13,7	40,2
1,6	14,7	32,4