Apollo

# Data Sheet
# Oxygen Sensor Interface Board

## FEATURES

- **Interface circuit boards for all SST oxygen sensors**
- **Oxygen partial pressure range 1 to 250mbar (0 to 25% oxygen) or 1 to 1000mbar (0 to 100% oxygen) in normal atmosphere**
- **Function testing and calibration in ambient air**
- **Linear 0 to 10V or 4 to 20mA output of measured oxygen content**
- **High accuracy**
- **Low power consumption**

**DE800**

**Oxymac50**

## SPECIFICATIONS

**Maximum ratings**

| | |
|---|---|
| Supply voltage | |
| DE800 | $24V_{DC}$ ± 20% |
| Oxymac50 | $24V_{DC}$ ± 20% |

Heater Supply
DE800 - Internal Adjustable Heater Supply
Oxymac50 - Separate heater supply required

| | |
|---|---|
| Sensor Heater Voltages* | |
| Porous Lid Cap Sensor | $4.00V_{DC}$ (1.7A) |
| Full Porous Cap Sensor | $4.35V_{DC}$ (1.85A) |

| | |
|---|---|
| Temperature limits | |
| Storage | -10 to 60°C |
| Operating | -10 to 60°C |

* Measure heater voltage as near to the sensor as possible.

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# DE800 Oxygen Sensor Interface Board

## PERFORMANCE CHARACTERISTICS

| Characteristics | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|
| Measuring ranges (oxygen partial pressure) | 1 | | 250 | mbar |
| | 1 | | 1000 | |
| Accuracy | | | 2 | % FS |
| Resolution | | | 0.04 | V |

## OUTLINE DRAWING & ELECTRICAL CONNECTION

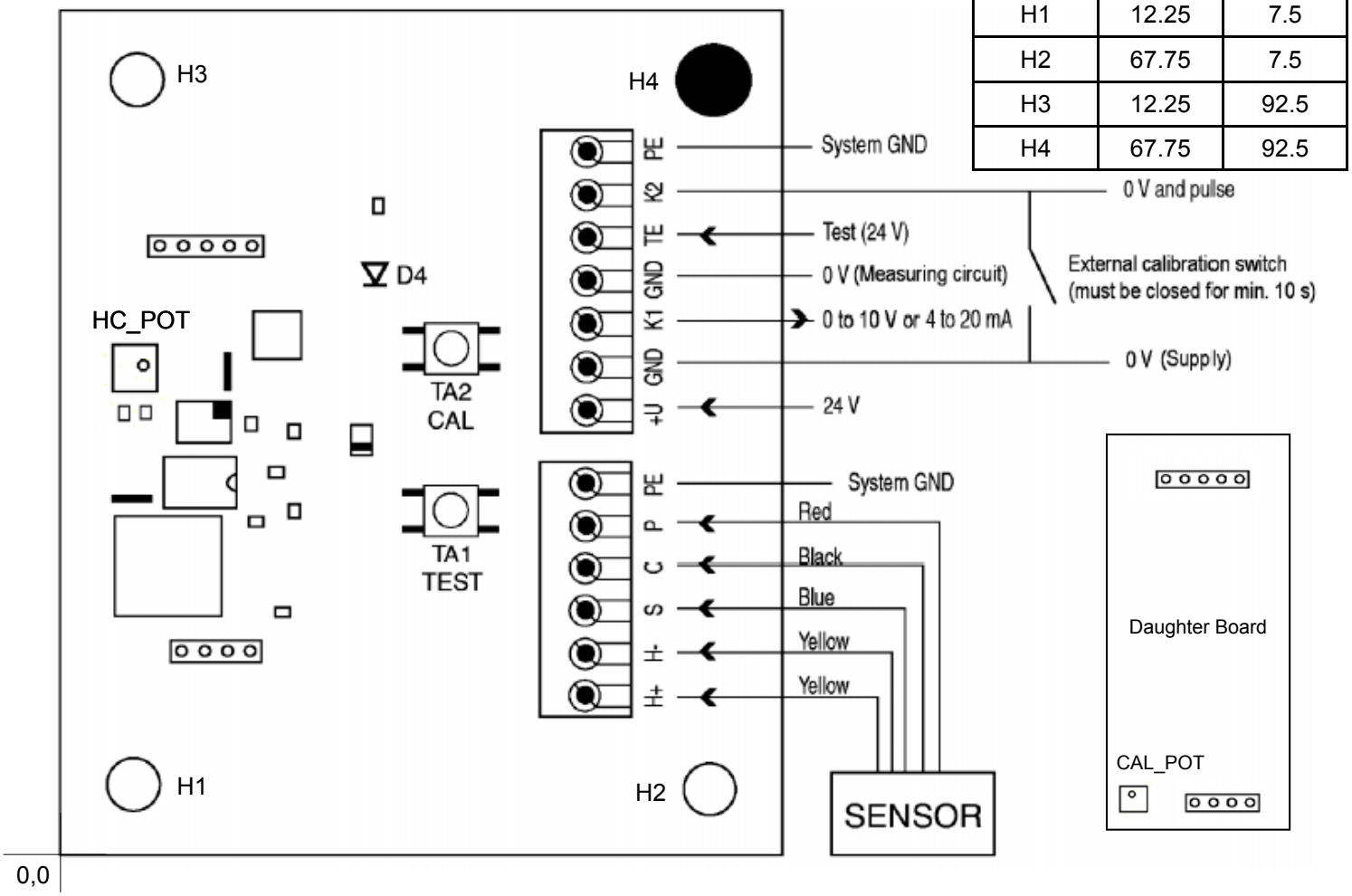
**DE800 Interface board**

**Dimensions:**
80 x 100mm
Ø 6.5mm mounting holes
Mass: 57g

**Connector:**
Screw connector block

D4 = Green LED
HC_POT = Heater Control POT
CAL_POT = Calibration Span POT

| Hole Co-ordinates | | |
|---|---|---|
| Hole No. | X (mm) | Y (mm) |
| H1 | 12.25 | 7.5 |
| H2 | 67.75 | 7.5 |
| H3 | 12.25 | 92.5 |
| H4 | 67.75 | 92.5 |





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# Data Sheet
# DE800 Oxygen Sensor Interface Board
## OPERATING AND CALIBRATION NOTES

### Heater adjustment

1. Check the sensor heater setting: using a volt meter measure the voltage across H+ and H-. The heater voltage should be as stated on page one with respect to cap style. If using long cables (>1m) measure the voltage as close to the sensor as possible.
2. If the heater voltage needs to be altered then follow the next four steps.
3. With the power off, remove the daughter board and expose the heater voltage control pot.
4. Apply power to the board.
5. Using a volt meter measure the heater voltage across H+ and H– and adjust the pot (HC_POT) until the voltages correct. See page 1 for the correct voltage levels for a porous lid cap and a full porous cap.
6. Switch the power off and re-assemble and the daughter board.

### Auto-calibration of the sensor and board (only available for DE800.V.1, DE800.A.1 and DE800.A.1.NF):

Note: Auto-calibration assumes that the sensor is in a normal atmosphere with a typical $O_2$ concentration of 20.7%, this takes into account typical humidity levels. The board adjusts its output to 20.7%/ 25% of full scale.

1. Ensure the sensor is in ambient air (20.7% $O_2$). Remove or purge application environment.
2. Switch the power on and leave for 10 minutes and allow to stabilise.
3. The green LED (D4) should be blinking, this indicates normal operation.
4. **Voltage output devices:** Measure the voltage at the K1 output and the 0V (measuring circuit) terminal
   The reading should be approx. 8.25V.
   **Current output devices:** Measure the current at K1 output terminal through an external load resistor (typ. 200Ω).
   The reading should be approx. 17.25mA.
5. If the reading is not correct then press and hold the calibration button (TA2) for a minimum of 10s until the reading is correct. This may also be achieved using an external calibration switch (normally open) placed across GND (0V supply) and K2 (see outline drawing) or by externally pulling K2 low.
6. Once released the green LED should start blinking again to indicate normal operation.
7. The system is now calibrated. (Please note that only NF variants retain their calibration after power loss, for all other variants steps 1-8 must be repeated).
8. Note that the auto-calibration will only work if the output is within 20% of the correct target value. If this is not the case, the PCB will not allow auto-calibration and will indicate this by setting the green LED (D4) constantly on until the power is cycled. If this occurs it is necessary to manually calibrate the system as described below.

### Manual calibration of the sensor and board:

Manual calibration may be performed at any known $O_2$ content including normal air.

1. Ensure the sensor is in an atmosphere with a known $O_2$ content (see table below for examples of calibration values)
2. Switch the power on and leave for 10 minutes and allow to stabilise.
3. The green LED (D4) should be blinking, this indicates normal operation.
4. **Voltage output devices:** Measure the voltage between the K1 output and 0V (measuring circuit) terminal.
   **Current output devices:** Measure the current at K1 output terminal through an external load resistor (typ. 200Ω).
5. If the reading is incorrect then adjust the calibration control potentiometer (CAL_POT on daughter board) until the desired output is produced. Turn the potentiometer clockwise to decrease the output value and counter clockwise to increase the output value. Because it takes sometime for the output signal to stabilise following adjustment, make small calibration changes and allow the output to settle for 30s each time. See table below for examples of calibration values.
6. If the board is calibrated manually the DE800 will retain its calibration after power loss.

### Board Test:

| O2 concentration in normal atmosphere | Calibration Values | | | | | |
|---|---|---|---|---|---|---|
| | DE800.V.1 | DE800.V.1.NF | DE800.V.2 | DE800.A.1 | DE800.A.1.NF | DE800.A.2 |
| 20.7% | 8.28$V_{DC}$ | 8.28$V_{DC}$ | 2.07$V_{DC}$ | 17.25mA | 17.25mA | 7.34mA |
| 90% | - | - | 9.0$V_{DC}$ | - | - | 18.4mA |
| 25% | 10.0$V_{DC}$ | 10.0$V_{DC}$ | 2.5$V_{DC}$ | 20mA | 20mA | 8.0mA |
| 5% | 2.0$V_{DC}$ | 2.0$V_{DC}$ | 0.5$V_{DC}$ | 7.2mA | 7.2mA | 4.8mA |

1. The green LED (D4) should be blinking to indicate normal operation.
2. If the test button (TA1) is pressed a 20% drop in the reading indicates normal operation.

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# Data Sheet
# Oxymac50 Oxygen Sensor Interface Board

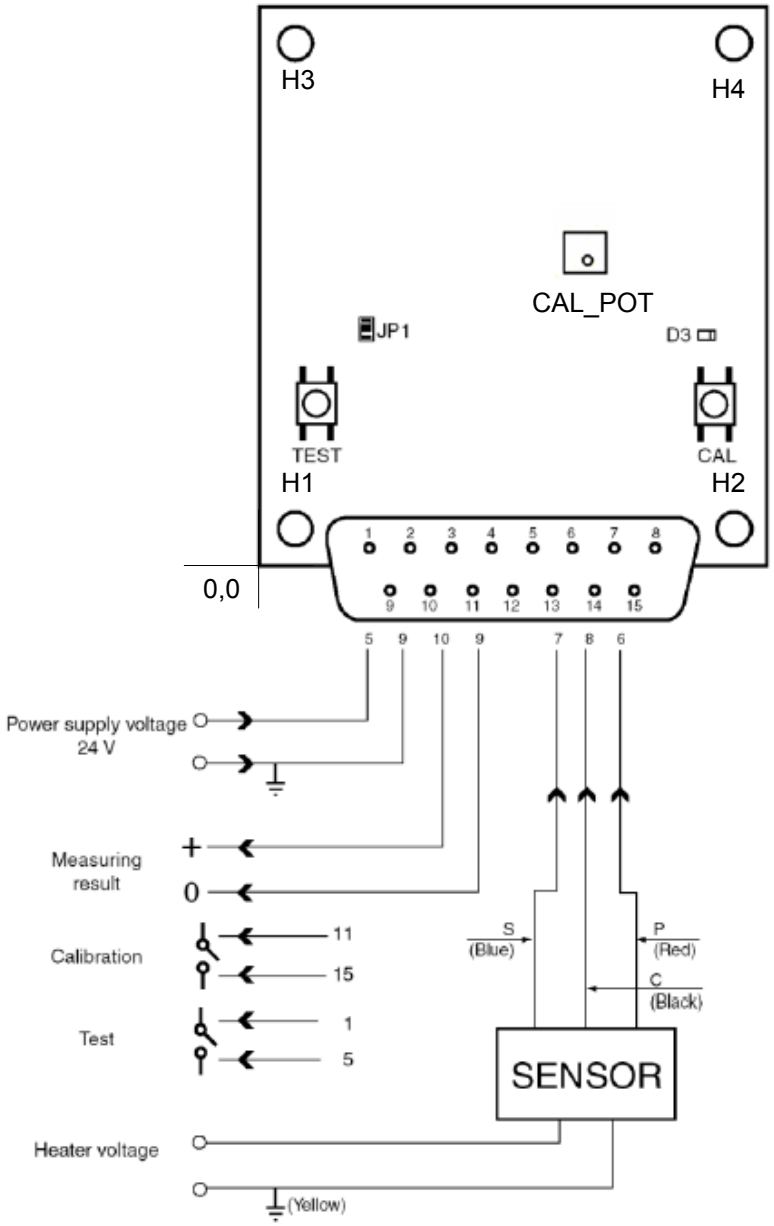
## OUTLINE DRAWING & ELECTRICAL CONNECTION (cont.)

**Oxymac50 Interface board**

**Dimensions:**
63 x 108mm
Ø 4mm mounting holes
Mass: 42g

**Connector:**
15 pin male D connector

D3 = Green LED
CAL_POT = Calibration Span POT




| Hole Co-ordinates | | |
|---|---|---|
| Hole No. | X (mm) | Y (mm) |
| H1 | 6 | 6 |
| H2 | 57 | 6 |
| H3 | 6 | 102 |
| H4 | 57 | 102 |

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# Data Sheet
# Oxymac50 Oxygen Sensor Interface Board

## OPERATING AND CALIBRATION NOTES

**Auto-calibration of the sensor and board (only available for Oxymac50.V.1 and Oxymac50.A.1):**
Note: Auto-calibration assumes that the sensor is in a normal atmosphere with a typical $O_2$ concentration of 20.7%, this takes into account typical humidity levels. The board adjusts its output to 20.7%/ 25% of full scale.

1. Ensure the sensor is in ambient air (20.7% $O_2$). Remove or purge application environment.
2. Switch the power on and leave for 10 minutes and allow to stabilise.
3. The green LED (D3) should be blinking, this indicates normal operation.
4. **Voltage output devices:** Measure the voltage across the measuring result output (Pin 10) and 0V (Pin 9). The reading should be approx. 8.25V.
   **Current output devices:** Measure the current at the measuring result output (Pin 10) and 0V (Pin 9) through an external load resistor (typ. 200Ω). The reading should be approx. 17.25mA.
5. If the reading is not correct then press and hold the calibration button (CAL) for a minimum of 10s until the reading is correct. This may also be achieved using an external calibration switch (normally open) placed across Pins 11 and 15 (see outline drawing).
6. Once released the green LED should start blinking again to indicate normal operation.
7. The system is now calibrated. The Oxymac.50 does not retain it's calibration on power loss and steps 1-8 must be repeated.
8. Note that the auto-calibration will only work if the output is within 20% of the correct target value. If this is not the case, the PCB will not attempt to calibrate and will indicate this by setting the green LED constantly on (until removal of power). If this occurs it is necessary to manually calibrate the system as described below.

**Manual calibration of the sensor and board:**
Manual calibration may be performed at any known $O_2$ content including normal air.

1. Ensure the sensor is in an atmosphere with a known $O_2$ content (see table below for examples of calibration values)
2. Switch the power on and leave for 10 minutes and allow to stabilise.
3. The green LED (D3) should be blinking, this indicates normal operation.
4. **Voltage output devices:** Measure the voltage across the measuring result output (Pin 10) and 0V (Pin 9).
   **Current output devices:** Measure the current at the measuring result output (Pin 10) and 0V (Pin 9) through an external load resistor (typ. 200Ω).
5. If the reading is incorrect then adjust the calibration control potentiometer (CAL_POT) until the desired output is produced. Turn the potentiometer clockwise to decrease the output value and counter clockwise to increase the output value. Because it takes sometime for the output signal to stabilise following adjustment, make small calibration changes and allow the output to settle for 30s each time. See table below for examples of calibration values.
6. If the board is calibrated manually the Oxymac50 will retain its calibration after power loss.

| O2 concentration in normal atmosphere | Calibration Values | | | |
|---|---|---|---|---|
| | Oxymac50.V.1 | Oxymac50.V.2 | Oxymac50.A.1 | Oxymac50.A.2 |
| 20.7% | 8.28$V_{DC}$ | 2.07$V_{DC}$ | 17.25mA | 7.34mA |
| 90% | - | 9.0$V_{DC}$ | - | 18.4mA |
| 25% | 10.0$V_{DC}$ | 2.5$V_{DC}$ | 20mA | 8.0mA |
| 5% | 2.0$V_{DC}$ | 0.5$V_{DC}$ | 7.2mA | 4.8mA |

**Board Test:**

1. The green LED (D3) should be blinking to indicate normal operation.
2. If the test button (TEST) is pressed a 20% drop in the reading indicates normal operation. This may also be achieved using an external test switch (normally open) placed across Pins 1 and 5 (see outline drawing).

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# Data Sheet
# Oxygen Sensor Interface Board

## ORDERING INFORMATION

| Part number | Description | Calibration Type | Measuring Range | Output Type |
|---|---|---|---|---|
| DE800.V.1 | Includes power supply for sensor heating element | Auto/ Manual | 1 to 250mbar | 0 to $10V_{DC}$ |
| DE800.V.1.NF | Includes power supply for sensor heating element, saves auto calibration after power down | Auto/ Manual | 1 to 250mbar | 0 to $10V_{DC}$ |
| DE800.V.2 | Includes power supply for sensor heating element | Manual | 1 to 1000mbar | 0 to $10V_{DC}$ |
| DE800.A.1 | Includes power supply for sensor heating element | Auto/ Manual | 1 to 250mbar | 4 to 20mA |
| DE800.A.1.NF | Includes power supply for sensor heating element, saves auto calibration after power down | Auto/ Manual | 1 to 250mbar | 4 to 20mA |
| DE800.A.2 | Includes power supply for sensor heating element | Manual | 1 to 1000mbar | 4 to 20mA |
| Oxymac 50.V.1 | Requires external power supply for the sensor heating element | Auto/ Manual | 1 to 250mbar | 0 to $10V_{DC}$ |
| Oxymac 50.V.2 | Requires external power supply for the sensor heating element | Manual | 1 to 1000mbar | 0 to $10V_{DC}$ |
| Oxymac 50.A.1 | Requires external power supply for the sensor heating element | Auto/ Manual | 1 to 250mbar | 4 to 20mA |
| Oxymac 50.A.2 | Requires external power supply for the sensor heating element | Manual | 1 to 1000mbar | 4 to 20mA |

**For detailed information on the sensor operation please refer to the following application note: AN0043 Operation Principle and Construction of Zirconium Dioxide Oxygen Sensor.**

| | |
|---|---|
| **WARNING**<br>**Personal Injury**<br>DO NOT USE these products as safety or Emergengy Stop devices or in any other application Where failure of the product could result in Personal injury.<br>**Failure to comply with these instructions could Result in death or serious injury.** | **CAUTION**<br>Do not exceed maximum ratings and ensure sensor is operated in accordance with all requirements of AN0043<br>**Failure to comply with these instructions may result in product damage.** |

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