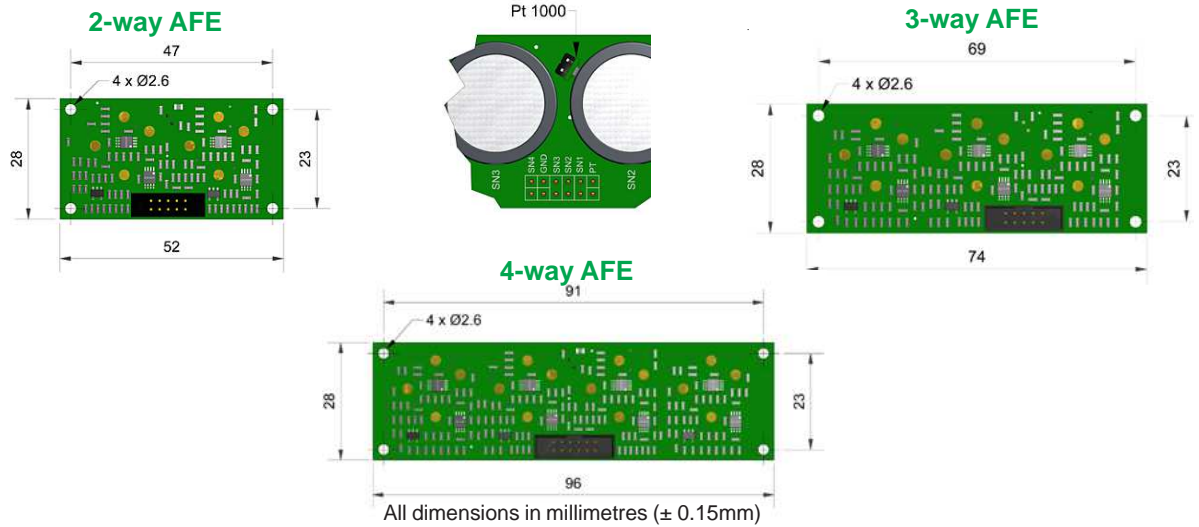




Analogue Front End (AFE) Alphasense A4 Air Quality Gas Sensors



Fig 1 AFE dimensions



Alphasense air quality sensors require low noise electronics to optimise their performance. We have worked for many years perfecting our circuits, so you can now take advantage of our low noise circuits for easiest use.

The family of Analogue Front End (AFE) circuits are designed for use with the A4 air quality sensors. Connect the AFE with A4 sensors to your multiplexed ADC and you are recording air quality data immediately.

Features of the AFEs include:

- 2 sensor, 3 sensor, 3 sensor+PID and 4 sensor versions are available. The AFEs are analogue potentiostat circuits with on-board power regulation and reference voltages: there is no digital circuitry on the AFEs.
- Power requirement: 650uA per channel; for example, 3 sensor AFE with sensors requires only 2 mA.
- Although electrochemical sensors require + and – power supplies, the negative supply is generated on the AFE so you need only supply 3.4 to 6.4 V (low noise) and analogue ground.
- Each AFE includes a Pt1000 located next to the centre sensor for correct temperature compensation. Pt1000 output is 1mV/°C but the room temperature must be set through your software.

AFEs are not user adjustable:

- Offset voltage for each sensor is defined in the calibration document (two offsets for each sensor: working electrode offset and auxiliary electrode offset) which you program into your software.
- AFE gain is preset. The calibration document also states the mV/ppb calibration for each working electrode which you program into your software.

Accessories include cables (specify 50 mm or 200 mm length), gassing hoods for calibration checks and mounting pillars, sealing gaskets and hardware for easy fitting to your hardware.

General Electrical Specifications

| | |
|--------------|--|
| V_{in} | 3.5 – 6.5 V |
| PID V_{in} | (1) 3.5 – 13.2 V (2) 3.2 – 3.6 V (3) 3.6 – 18 V Customer to specify power option. See notes (1) - (4) |
| I_{in} | < 2mA or < 35 mA with PID |
| V_{out} | $V_{in} - 0.5 V$ See note 5. |

1. Input range when the AFE voltage regulator is enabled which regulates the voltage to 3.3 V for a PID whose on-board regulator is disabled.
2. Input range when the AFE voltage regulator is disabled for a PID whose on-board regulator is disabled.
3. Input range when the AFE voltage regulator is disabled for a PID whose on-board regulator is enabled.
4. The PID sensor is powered separately from the other sensors to provide for the power options.
5. V_{out} is electronically offset to allow for sensor current changes less than the sensor zero current due to temperature and humidity effects.

In the interest of continued product improvement, we reserve the right to change design features and specifications without prior notification. The data contained in this document is for guidance only. Alphasense Ltd accepts no liability for any consequential losses, injury or damage resulting from the use of this document or the information contained in it (©ALPHASENSE LTD) Doc. Ref. AFE/OCT19



Analogue Front End (AFE) Alphasense A4 Air Quality Gas Sensors

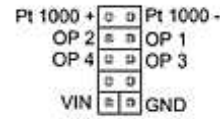


Technical Specification

Fig 2 AFE pin-out and part numbers

2 sensor AFE

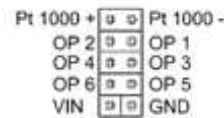
| Pin-outs 2xA4 AFE with Pt 1000 | | |
|--------------------------------|-----------------|---------------------|
| VIN | Power | |
| GND | Power | |
| OP 1 | Sensor 1 (SN 1) | Working electrode |
| OP 2 | Sensor 1 (SN 1) | Auxillary electrode |
| OP 3 | Sensor 2 (SN 2) | Working electrode |
| OP 4 | Sensor 2 (SN 2) | Auxillary electrode |
| Pt 1000 | Pt 1000 + | See Notes |
| Pt 1000 | Pt 1000 - | See Notes |



| Part number | SN1 | SN2 |
|-------------|---|---|
| 810-0021-00 | NO ₂ /O ₃ | NO ₂ /O ₃ |
| 810-0021-01 | NO ₂ /O ₃ | NO / (CO/SO ₂ /H ₂ S) |
| 810-0021-02 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) |
| 810-0021-03 | NO / (CO/SO ₂ /H ₂ S) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0021-04 | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) |

3 sensor AFE

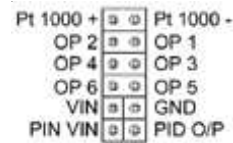
| Pin-outs 3xA4 AFE with Pt 1000 | | |
|--------------------------------|-----------------|---------------------|
| VIN | Power | |
| GND | Power | |
| OP 1 | Sensor 1 (SN 1) | Working electrode |
| OP 2 | Sensor 1 (SN 1) | Auxillary electrode |
| OP 3 | Sensor 2 (SN 2) | Working electrode |
| OP 4 | Sensor 2 (SN 2) | Auxillary electrode |
| OP 5 | Sensor 3 (SN 3) | Working electrode |
| OP 6 | Sensor 3 (SN 3) | Auxillary electrode |
| Pt 1000 | Pt 1000 + | See Notes |
| Pt 1000 | Pt 1000 - | See Notes |



| Part number | SN1 | SN2 | SN3 |
|-------------|---|---|---|
| 810-0019-00 | NO ₂ /O ₃ | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) |
| 810-0019-01 | NO ₂ /O ₃ | NO ₂ /O ₃ | NO / (CO/SO ₂ /H ₂ S) |
| 810-0019-02 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0019-03 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | NO / (CO/SO ₂ /H ₂ S) |
| 810-0019-04 | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) |

3 sensor + PID AFE

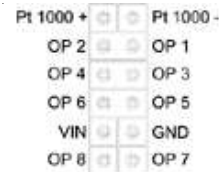
| Pin-outs 3xA4 + PID with Pt 1000 | | |
|----------------------------------|-----------------|---------------------|
| PID VIN | PID | |
| PID O/ P | PID | |
| VIN | Power | |
| GND | Power | |
| OP 1 | Sensor 1 (SN 1) | Working electrode |
| OP 2 | Sensor 1 (SN 1) | Auxillary electrode |
| OP 3 | Sensor 2 (SN 2) | Working electrode |
| OP 4 | Sensor 2 (SN 2) | Auxillary electrode |
| OP 5 | Sensor 3 (SN 3) | Working electrode |
| OP 6 | Sensor 3 (SN 3) | Auxillary electrode |
| Pt 1000 | Pt 1000 + | See Notes |
| Pt 1000 | Pt 1000 - | See Notes |



| Part number | SN1 | SN2 | SN3 | PID |
|-------------|---|---|---|--------------|
| 810-0020-00 | NO ₂ /O ₃ | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | PID-AH or A1 |
| 810-0020-01 | NO ₂ /O ₃ | NO ₂ /O ₃ | NO / (CO/SO ₂ /H ₂ S) | PID-AH or A1 |
| 810-0020-02 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | PID-AH or A1 |
| 810-0020-03 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | NO / (CO/SO ₂ /H ₂ S) | PID-AH or A1 |
| 810-0020-04 | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | PID-AH or A1 |

4 sensor AFE

| Pin-outs 4xA4 with Pt 1000 | | |
|----------------------------|-----------------|---------------------|
| VIN | Power | |
| GND | Power | |
| OP 1 | Sensor 1 (SN 1) | Working electrode |
| OP 2 | Sensor 1 (SN 1) | Auxiliary electrode |
| OP 3 | Sensor 2 (SN 2) | Working electrode |
| OP 4 | Sensor 2 (SN 2) | Auxiliary electrode |
| OP 5 | Sensor 3 (SN 3) | Working electrode |
| OP 6 | Sensor 3 (SN 3) | Auxiliary electrode |
| OP 7 | Sensor 4 (SN 4) | Working electrode |
| OP 8 | Sensor 4 (SN 4) | Auxiliary electrode |
| Pt 1000 | Pt 1000 + | See Notes |
| Pt 1000 | Pt 1000 - | See Notes |



| Part number | SN1 | SN2 | SN3 | SN4 |
|-------------|---|---|---|---|
| 810-0023-00 | NO ₂ /O ₃ | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0023-01 | NO ₂ /O ₃ | NO ₂ /O ₃ | NO / (CO/SO ₂ /H ₂ S) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0023-02 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0023-03 | NO ₂ /O ₃ | CO/SO ₂ /H ₂ S / (NO) | NO / (CO/SO ₂ /H ₂ S) | CO/SO ₂ /H ₂ S / (NO) |
| 810-0023-04 | CO/SO ₂ /H ₂ S / (NO) | CO/SO ₂ /H ₂ S / (NO) | NO / (CO/SO ₂ /H ₂ S) | CO/SO ₂ /H ₂ S / (NO) |

Optional AFE Accessories

| Cables | Description | Notes |
|--------------|---|--|
| 000-CBLE-00 | 10 Way IDC Cable (50mm) for 2/3 sensor AFE | Connectors are from Toby AO5 series connectors |
| 000-CBLE-01 | 10 Way IDC Cable (200mm) for 2/3 sensor AFE | |
| 000-CBLE-02 | 12 Way IDC Cable (50mm) for 3+PID/4 sensor AFE | |
| 000-CBLE-03 | 12 Way IDC Cable (200mm) for 3+PID/4 sensor AFE | |
| Gas Hoods | Description | Notes |
| 000-GSHD-04 | Gas Hood for 2 sensor AFE | Includes fitting kit supplied with two Sw agelok SS-400-1-2RT connectors |
| 000-GSHD-05 | Gas Hood for 3 sensor AFE | |
| 000-GSHD-06 | Gas Hood for 3+PID and 4 sensor AFE | |
| 000-TUBE-FEP | FEP Tubing (1.5m) | |
| Fixing kit | Description | Notes |
| 000-OAFE-KIT | Fitting kit for AFE circuit boards | Includes 4-off Viton sealing rings |