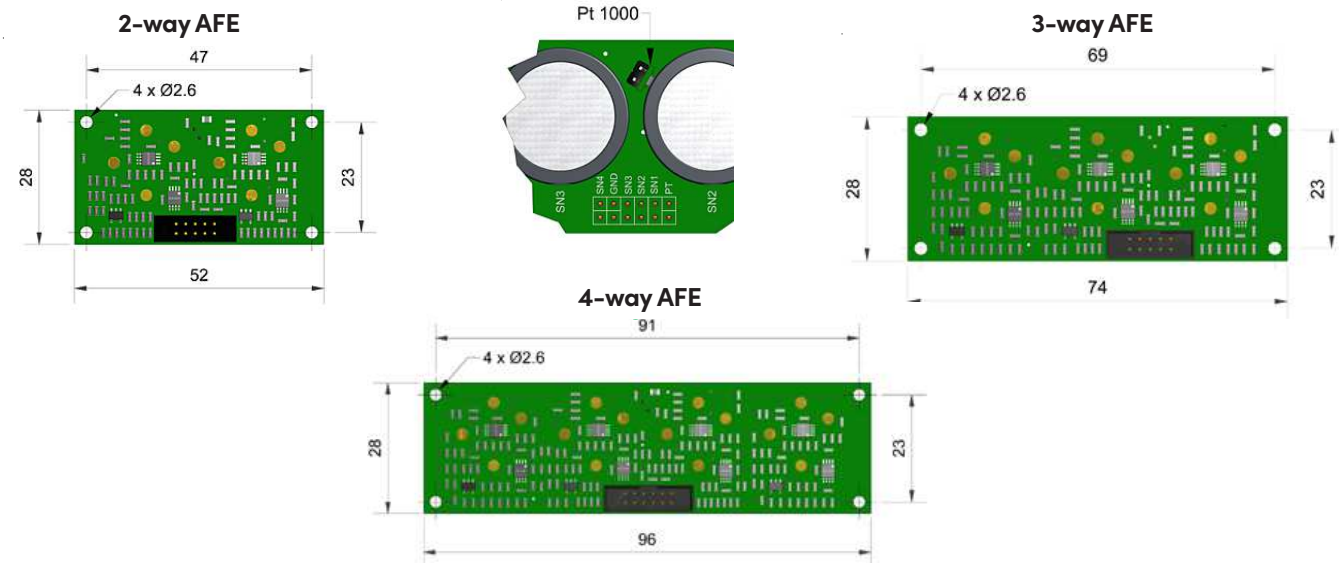
Analogue Front End (AFE) – A4 Air Quality Gas Sensors



Dimensions are in millimetres (+/- 0.15 mm).

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

The family of Analogue Front End (AFE) circuits is 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: 650µA 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

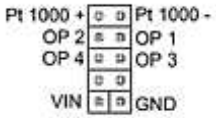
V_{in}	3.5 – 6.5 V
PID V_{in}	(1) 3.5 – 13.2 V (2) 3.2 – 3.6 V (3) 3.6 – 18 V Customer to specify power option. See notes (1) – (4)
I_{in}	< 2mA or < 35 mA with PID
V_{out}	V_{in} – 0.5 V. See note 5

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.

Figure 1 AFE pin-out and part numbers

2-sensor AFE

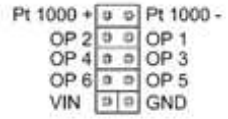
Pin-outs 2xA4 AFE with Pt 1000		
VIN	Power	
GND	Power	
OP 1	Sensor 1 (SN 1)	Working electrode
OP 2	Sensor 1 (SN 1)	Auxillary electrode
OP 3	Sensor 2 (SN 2)	Working electrode
OP 4	Sensor 2 (SN 2)	Auxillary electrode
Pt 1000	Pt 1000 +	See Notes
Pt 1000	Pt 1000 -	See Notes



Part number	SN1	SN2
810-0021-00	NO_2/O_3	NO_2/O_3
810-0021-01	NO_2/O_3	NO_2/O_3
810-0021-02	NO_2/O_3	NO_2/O_3
810-0021-03	NO/(CO/SO_2/H_2S)	CO/SO_2/H_2S/(NO)
810-0021-04	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)

3-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
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_2S/(NO)
810-0019-01	NO_2/O_3	CO/SO_2/H_2S/(NO)	NO/(CO/SO_2/H_2S)
810-0019-02	NO_2/O_3	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)
810-0019-03	NO_2/O_3	CO/SO_2/H_2S/(NO)	NO/(CO/SO_2/H_2S)
810-0019-04	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)

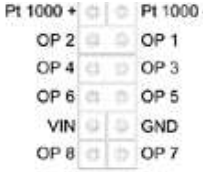
3-sensor + PID AFE

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_2S/(NO)	PID-AH or A1
810-0020-01	NO_2/O_3	NO_2/O_3	NO/(CO/SO_2/H_2S)	PID-AH or A1
810-0020-02	NO_2/O_3	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	PID-AH or A1
810-0020-03	NO_2/O_3	CO/SO_2/H_2S/(NO)	NO/(CO/SO_2/H_2S)	PID-AH or A1
810-0020-04	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	PID-AH or A1

4-sensor AFE

Pin-outs 4xA4 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
OP 7	Sensor 4 (SN 4)	Working electrode
OP 8	Sensor 4 (SN 4)	Auxillary 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_2S/(NO)	CO/SO_2/H_2S/(NO)
810-0023-01	NO_2/O_3	NO_2/O_3	NO/(CO/SO_2/H_2S)	CO/SO_2/H_2S/(NO)
810-0023-02	NO_2/O_3	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)
810-0023-03	NO_2/O_3	CO/SO_2/H_2S/(NO)	NO/(CO/SO_2/H_2S)	CO/SO_2/H_2S/(NO)
810-0023-04	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(NO)	CO/SO_2/H_2S/(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 Swagelok 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
000-0AFE-KIT	Fitting kit for AFE circuit boards	Includes 4-off Viton sealing rings