

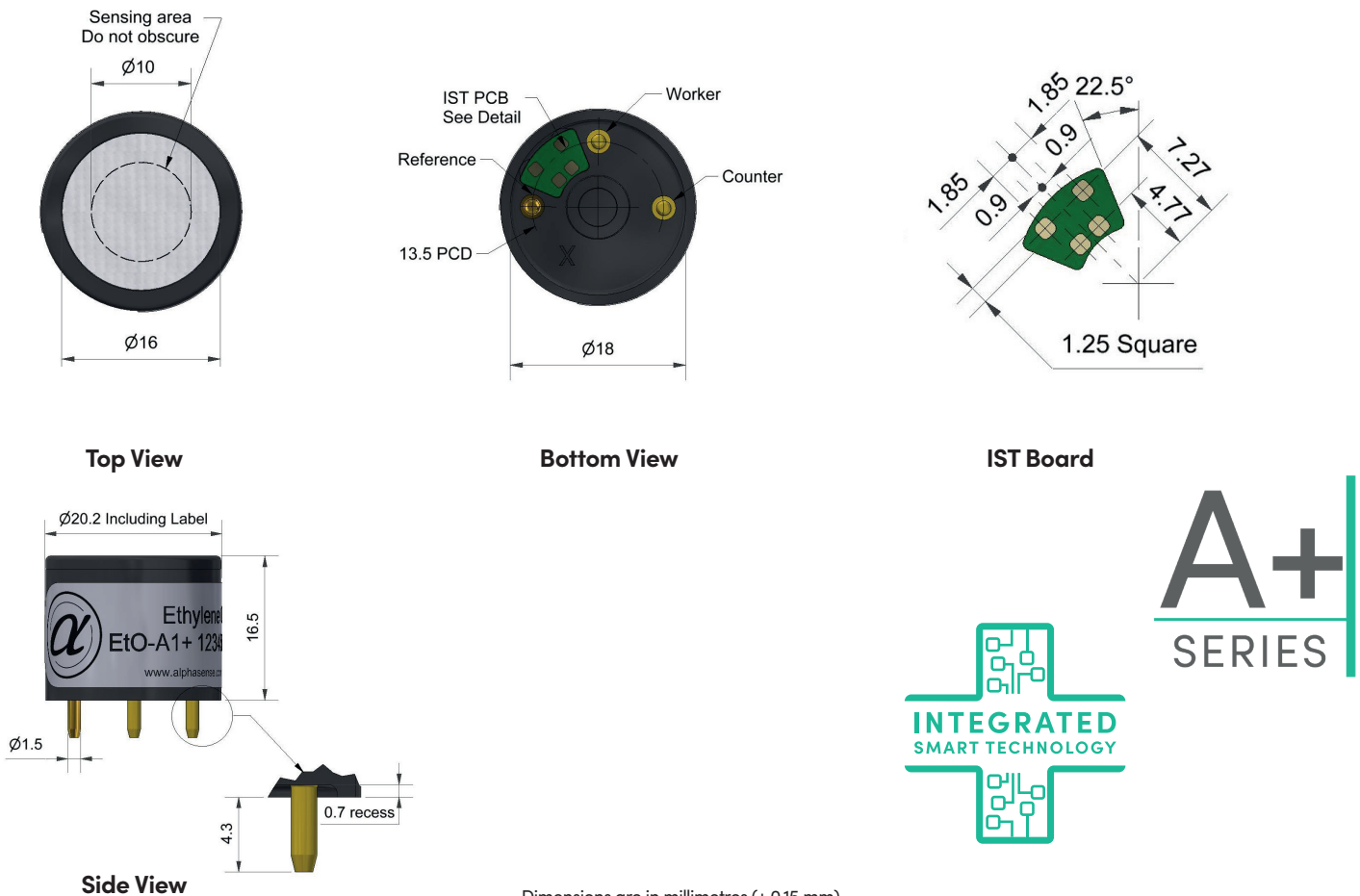
## ETO-A1/ETO-A1+ Ethylene Oxide Sensor

The ETO-A1 sensor is a PPM sensor that is designed for a broad variety of applications and instrumentation including portable gas detectors and fixed gas detection systems for industrial safety, environmental air quality analysis and process control. The A series is the most widely used sensor format for portable gas detection applications. It is available in our standard format (ETO-A1) and with our patented Integrated Smart Technology (ETO-A1+) that has an IST board with a memory chip and temperature sensor integrated in the sensor. The + sensors store specific calibration, specification, and identification data on every sensor allowing plug and play operation. The on-board temperature sensor improves the accuracy and simplicity of temperature compensation algorithms.

### ETO-A1 Ethylene Oxide Sensor – 3-Electrode



### PART+ Sensor Name – 3-Electrode (with Integrated Smart Technology)



Dimensions are in millimetres ( $\pm 0.15$  mm).

## Sensor Data

<b>Performance</b>	Sensitivity	nA/ppm in 20ppm EtO	2000 to 3200
	Response time	t90 (s) from zero to 20ppm EtO	< 150
	Zero current	ppm equivalent in zero air	< ± 0.6
	Resolution	RMS noise (ppm equivalent)	< 0.1
	Range	ppm EtO limit of performance warranty	100
	Linearity	ppm error at full scale, linear at zero, 40ppm EtO	5 - 10
	Overgas limit	maximum ppm for stable response to gas pulse	200

<b>Lifetime</b>	Zero drift	ppm equivalent change/year in lab air	nd
	Sensitivity drift	% change/year in lab air, twice monthly test	nd
	Operating life	months until 80% original signal (12-month warranted)	> 24

<b>Environmental</b>	Sensitivity @ -20°C	(% output @ -20°C/output @ 20°C) @ 400ppm CO	35 to 65
	Sensitivity @ 50°C	(% output @ 50°C/output @ 20°C) @ 400ppm CO	110 to 140
	Zero @ -20°C	ppm equivalent change from 20°C	< ± 0.5
	Zero @ 50°C	ppm equivalent change from 20°C	< 2 to 4

<b>Cross Sensitivity</b>	H <sub>2</sub> S sensitivity	% measured gas @ 20ppm	H <sub>2</sub> S	< 200
	NO <sub>2</sub> sensitivity	% measured gas @ 10ppm	NO <sub>2</sub>	< 50
	Cl <sub>2</sub> sensitivity	% measured gas @ 10ppm	Cl <sub>2</sub>	< -1
	NO sensitivity	% measured gas @ 50ppm	NO	< 80
	SO <sub>2</sub> sensitivity	% measured gas @ 20ppm	SO <sub>2</sub>	< 50
	CO sensitivity	% measured gas @ 400ppm	CO	< 30
	H <sub>2</sub> sensitivity	% measured gas @ 400ppm	CO	< 0.5
	C <sub>2</sub> H <sub>4</sub> sensitivity	% measured gas @ 400ppm	C <sub>2</sub> H <sub>4</sub>	< 100
	NH <sub>3</sub> sensitivity	% measured gas @ 20ppm	NH <sub>3</sub>	< 0.1
	HCHO sensitivity	% measured gas @ 4ppm	HCHO	90
CO <sub>2</sub> sensitivity	% measured gas @ 10ppm	CO <sub>2</sub>	< 0.1	

<b>Key Specifications</b>	Temperature range	°C	-30 to 50
	Pressure range	kPa	80 to 120
	Humidity range	% rh continuous	15 to 90
	Storage period	months @ 3 to 20°C (stored in sealed pot)	6
	Load resistor	Ω (recommended)	10 to 47
	Bias voltage	mV (working electrode potential above reference electrode potential)	300
	Weight	g	< 6

Figure 1 Sensitivity Temperature Dependence

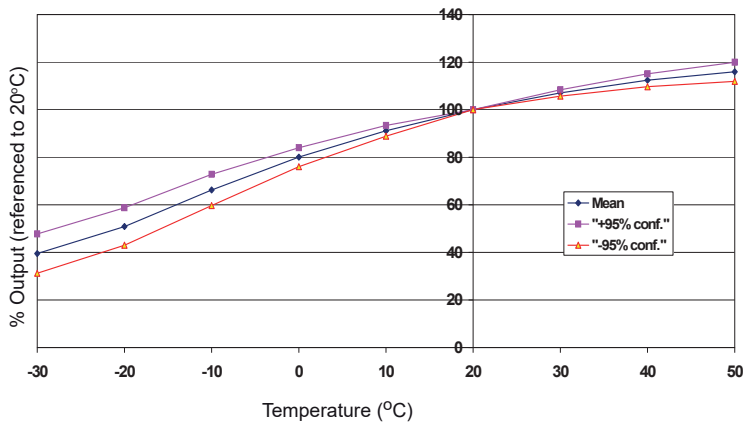


Figure 1 shows the variation in sensitivity caused by changes in temperature.

This data is taken from a typical batch of sensors. The mean and  $\pm$  95% confidence intervals are shown.

Figure 2 Zero Temperature Dependence

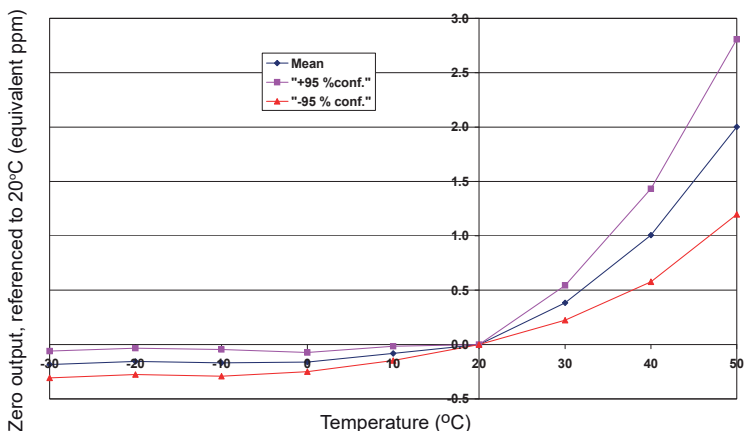
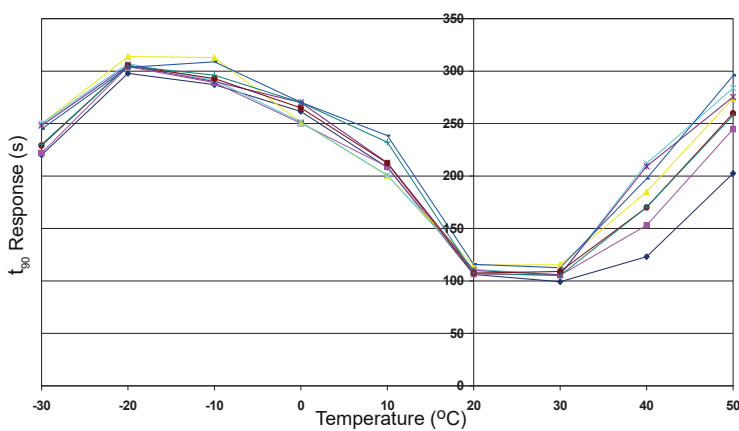


Figure 2 shows the variation in zero output caused by changes in temperature, expressed as ppm gas equivalent, referenced to zero at 20°C.

This data is taken from a typical batch of sensors.

Figure 3 Response Time Temperature Dependence



The response time depends on both gas properties and sensor electrochemistry.

Diffusion of VOCs can be very slow at low temperatures.

## IST Board Data

<b>Interface</b>	Communication Bus	Compatible with the 400 kHz I <sup>2</sup> C protocol
	Max. Bus Speed	Up to 1 MHz
	Input Logic Levels	High (Recessive) < 2.3 V   Low (Dominant) < 0.2 V
	Absolute Max. Input Signal	3.6 V
<b>Electrical</b>	Supply Voltage Range	1.7 V to 3.6 V
	Supply current – Stand-By	< 5 µA
	Supply current – Operating	< 0.15 mA (temperature reading only) < 2.15 mA (temperature reading + memory reading/writing)
	Power Supply Conditioning	Built-In 100 nF decoupling capacitor
	ESD Protection	4 kV (human body model) – Enhanced ESD / Latch-Up protection
	Bus Pins Input Capacitance	15 pF max.
<b>Performance</b>	Operational Temperature	-40 °C to +85 °C
	Temperature Sensor Accuracy	±1°C (-0°C to +70°C)
	Memory Data Retention	> 200 years
	Memory Write Cycles	> 4,000,000
<b>Data &amp; Communication</b>	Memory IC & I2C Address	M24128X-FCU   Device Address: R – 0xA0 / W – 0xA1
	Temperature IC & I2C Address	MAX31875R0TZS+T   Device Address: R – 0x90 / W – 0x91
	Product Data Start Address	0x0900
	Calibration Data Start Address	0x0B00
	User Data Area	0x0D00 – 0x18FF (3,072 Bytes)
	CRC Polynomial	0x 01 04C1 1DB7
	Digital Signature Algorithm	SHA-256

### Factory-populated data

<b>Product Data</b>
Data Format Version
Customer (OEM) ID
Product ID
Type of Sensor / Target Gas
Sensor Serial Number
End of Storage Period Date
Sensor Replacement Date
Product Data Checksum
Alphasense Digital Signature
Customer Digital Signature

<b>Calibration</b>
Calibration Data Units
Zero (clean dry air) Output
Calibration Span
Calibration Output
Sensitivity
Calibration Date
Calibration Data Checksum
Calibration Data Signature

<b>Sensor Specification</b>
Over-gas limit
Concentration Range
Temperature Range Low
Temperature Range High
Humidity Range Low
Humidity Range High
Pressure Range Low
Pressure Range High
Specification Checksum

### 15,000+ locations

<b>Customer Specific</b>
Custom Parameters
Re-Calibration Due Date
Operational Limits:
Low   High   STEL   TWA
Next Bump Test Due Date
User Data Area

At the end of the product's life, do not dispose of any electronic sensor, component or instrument in the domestic waste, but contact the instrument manufacturer, Alphasense or its distributor for disposal instructions. NOTE: all sensors are tested at ambient environmental conditions unless otherwise stated. As applications of use are outside our control, the information provided is given without legal responsibility. Customers should test under their own conditions, to ensure that the sensors are suitable for their own requirements.

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