Interfering Gases

Alphasense toxic gas sensors are built for optimum response to the target gas. Unfortunately, other "interfering" gases that may be present along with the target gas can create false signals.

Table 1 below shows the average cross sensitivity for the most common interfering gases. The number is the percent sensitivity; for example a 20% cross sensitivity means that 100 ppm of the interfering gas would read 20 ppm on the display.

Interfering Gas	ppm Applied	CO									H2S						
		AF	AX	AE	BF	BX	D4	CE	CF	CX	A1	AH	AE	B1	BH	BE	D4
CO	400										1.5	1.5	4	4	1	4	1.5
H_2S	20	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1							
H_2	400	60	4	75	65	5	70	60	60	4	0.2	0.15	0.25	1	0.25	0.2	1
SO_2	20	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	10	10	20	18	10	20	20
NO_2	10	0.1	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1	-20	-30	-20	-30	-30	-25	-25
NO	50	5	0.1	0.1	25	25	50	0.1	0.1	0.1	4	2	10	2	3	10	12
Cl_2	10	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	-25	-25	-25	-25	-25	-12	-25
C_2H_4	400	25	30	60	65	10	100	25	25	30	0.5	0.15	0.5	0.8	0.1	0.25	0.1
NH_3	20	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CO_2	5%																

Interfering Gas	ppm Applied	SO2				NO2			NO				CL2		
		AF	BF	AE	D4	A1	AE	B1	A1	AE	B1	D4	A1	B1	D4
CO	400	4	1	2	-0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
H_2S	20	0.1	0.1	0.1	-350	-40	ND	-100	30	50	60	30	-40	-100	-20
H_2	400	0.2	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SO_2	20					-2.5	nd	-2	3	5	4	3	-2.5	-2	1
NO_2	10	-100	-120	-140	-100				5	20	5	5	100	100	80
NO	50	4	-3	150	1	0.5	nd	0.5					0.5	0.5	0.5
Cl_2	10	-70	-50	-140	-100	100	nd	100	15	25	5	5			
C_2H_4	400	15	40	75	3	0.1	nd	0.1		0.1		0.1	0.1	0	0.1
NH_3	20	0.1	0.1	0.1	0.1	0.1	nd	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1
CO_2	5%	0	0	0	0	0.1	0	0	0.1	0.1	0.1	0.1	0	0	

Interfering Gas	ppm Applied	ETO-A1	HCN-A1	HCN-D4	PH3-A1	PH3-B1	PH3-BE
CO	400	30	0.3	0	0.7		6
H_2S	20	200	400	250	250	120	70
H_2	400	0.5	0.2	0.1	0.2	0.2	4
SO_2	20	50	180	50	50	30	30
NO_2	10	50	-150	-25	-80	-40	-20
NO	50	80	2	-10	-2	-8	10
Cl_2	10	-1	150	6	-25	-15	-5
C_2H_4	400	100	0.1	0	15	10	10
NH_3	20	0.1	1	5	0.2	0.2	0.1
CO_2	5%	0.1	0.1		0.1	0.1	0.1

Table 1. % sensitivity of interfering gases for Alphasense toxic gas sensors.

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Table 2 at the end of this Application Note shows the 95% confidence interval for interfering gases, showing that some interfering gases have very repeatable interferences, while other gases show a larger sensor to sensor variability. (NB: Table 2 requires update)

On reviewing Table 1, note that:

- Cross-sensitivities were measured at 20°C and the cross sensitivity of interfering gases is temperature dependent. Some gas interferences will increase at higher temperatures while others will decrease.
- Some interfering gases have a negative effect (for example NO_2 with H_2S sensors) This means that these interfering gases will decrease, rather than increase the signal. Beware that this could cause a situation where a target gas is at an alarm level but an interfering gas is preventing the detector from alarming.
- Refer to Table 1 when advising customers for typical applications. Refer to Table 2 when performing a thorough risk assessment.
- Some interfering gases do not simply reversibly interfere but actually poison the sensor, for example benzene or toluene will poison a H_2S sensor.
- Interfering gases act on the sensor in two ways:
  1 Most interfering gases (CO, H_2, H_2S) react on the working electrode, generating a current. The interfering signal rapidly stabilises.
  2 Some interfering gases (C_2H_4, NO) modify the reference electrode potential, causing a potential shift on the working electrode. This variable interference stabilises after typically 30 minutes.
- Chemical filters are used in the CO and SO_2 sensors. These chemical filters remove interfering gases by: adsorbing onto the chemical filter material, chemically absorbing the interfering gas, or catalytically reacting with the interfering gas.

These chemical filters have a finite lifetime that is different from the electrochemical gas cell lifetime. Therefore CO and SO_2 sensors will show increased cross sensitivity to certain interfering gases after heavy exposure to these interfering gases. Consult Alphasense for advice.

The list of interfering gases represents the most common interferents. Consult Alphasense for gases not included in Tables 1 and 2.

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% cross-sensitivity

Interfering Gas	ppm Applied	CO-AF		CO-AX		CO-AE		CO-B1		CO-BF		CO-BX		CO-DF	
		+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95
H_2S	20	0	0	0	0	0	0	330	305	0	0	0	0	0	0
H_2	400	75	30	1	5	60	0	62	25	62	25	4	3	62	30
SO_2	20	0	0	2	-1	0	0	69	60	0	0	0	0	-1	-2
NO_2	10	2	-2	3	-2	-4	0	-50	-40	2	-2	3	0	7	-7
NO	50	4	1	3	0			145	40	25	-7			43	20
Cl_2	10	-5	0	5	-3	-4	0	-50	-35	4	-1	2	-2	0	0
C_2H_4	400	35	20	35	15	45	22	140	120	70	35	9	3	105	85
NH_3	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO_2	5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0

% cross-sensitivity

Interfering Gas	ppm Applied	H2S-A1		H2S-AH		H2S-B1		H2S-BH		H2S-BE		H2S-D1	
		+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95
CO	400	1.2	0.5	1	0.3	4	2	1	0.5	40	-100	3	1.5
H_2	400	0.2	0	0.1	0	1	0.3	0.2	0.1	-0.6	0	1	0.5
SO_2	20	9	6	9	6	17	14	10	7	21	17	11	8
NO_2	10	-20	-18	-27	-21	-26	-23	-35	-20	-25	-18	-25	-10
NO	50	4	2	2	0	2	0	3	0	10	-10	0.6	0
Cl_2	10	-25	-18	-24	-18	-22	-18	-25	-15	-12	-5	-20	-1
C_2H_4	400	0.4	0	0.1	0	0.7	0.2	0.1	0	2	0	0	0
NH_3	20	1.2	0	0	0	0	0	0	0	0	0	0	0
CO_2	5%	0	0	0	0	0	0	0	0	0	0	0	0

% cross-sensitivity

Interfering Gas	ppm Applied	SO2-AF		SO2-BF		SO2-AE		NO2-A1		NO2-AE		NO2-B1		CI2-A1		CI2-B1	
		+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95	+95	-95
CO	400	0.4	0	0.7	0.3			0	0	0	0	0	0	0	0	0	0
H_2S	20	0.5	0	0	0	15	1	-40	-10	-85	-50	-100	-75	-40	-10	-100	-75
H_2	400	0.2	0	0.2	0			0	0	0	0	0	0	0	0	0	0
SO_2	20							-2	0	-5	-3	-2	0	-2	0	-2	0
NO_2	10	-110	-90	-130	-85	-120	-100							90	120	90	120
NO	50	3	0	-2	0			0.5	0.2	0.5	0.3	0.5	0.2	0.5	0.2	0.5	0.2
Cl_2	10	-65	-55	-50	-20			80	110	105	85	85	115				
C_2H_2	400	15	8	40	20	80	45					0.02	-.01	0	0	0.02	-.01
NH_3	20	0	0	0	0	0	0	0.2	0	0.4	0	0.5	0.04	0	0	0.5	0.4
CO_2	5%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. 95% confidence intervals for interfering gas cross sensitivity (as % sensitivity).sensors.

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