

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 ₂ S	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 ₂ H 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	0.1
H ₂ S	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	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 ₂ H ₄	400	15	40	75	3	0.1	nd	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 ₂ S	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 ₂ H 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.

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 NO₂ with H₂S 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 H₂S sensor.
- Interfering gases act on the sensor in two ways:
 - 1 Most interfering gases (CO, H₂, H₂S) react on the working electrode, generating a current. The interfering signal rapidly stabilises.
 - 2 Some interfering gases (C₂H₄, 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 SO₂ 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 SO₂ 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.

% 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 ₂ S	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 ₂ H 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

Intefering 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 ₂ H 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		Cl2-A1		Cl2-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 ₂ S	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 ₂ H ₄	400	15	8	40	20	80	45					0.02	-0.01	0	0	0.02	-0.01
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).