Q-TRAK™ XP
INDOOR AIR QUALITY MONITOR
MODEL 7585

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INTERFERING GASES AND CROSS SENSITIVITY

APPLICATION NOTE TSI-166 (US)

Interfering Gases and Cross Sensitivity

Cross sensitivity occurs when a sensor reacts to a gas that is not the target gas. This interfering gas causes a reaction in the sensor and displays a change to the readings even if the target gas is not present.

TSI® Incorporated 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.

Tables 1–8 show the average cross sensitivity for the most common interfering gases. The percent sensitivity is a measure of the magnitude of cross sensitivity; for example a 20% cross sensitivity means that 100 ppm of the interfering gas would read 20 ppm on the display (or 100 * 20% = 20 ppm).

Table 1: CO gas sensor cross-sensitivity to the most common interfering gases.

Carbon Monoxide (CO) Gas Sensor – 801401		
Interfering Gas	**PPM applied**	**% Sensitivity**
H_2S	5	<0.1
H_2 @20c	100	<50
SO_2	5	<0.1
NO_2	5	<-2
NO	5	<-2
CL_2	5	<0.1
C_2H_4	100	<0.5
NH_3	20	<0.1

Table 2: H_2S gas sensor cross-sensitivity to the most common interfering gases.

Hydrogen Sulfide (H_2S) Gas Sensor – 801402		
Interfering Gas	**PPM applied**	**% Sensitivity**
CO	5	<1
H_2	100	<0.5
SO_2	5	<15
NO_2	5	<-20
NO	5	<3
CL_2	5	<-8
C_2H_4	100	<0.5
NH_3	5	<0.1
CO_2	5%	<0.1

Table 3: NO_2 gas sensor cross-sensitivity to the most common interfering gases.

Nitrogen Dioxide (NO_2) Gas Sensor – 801405		
Interfering Gas	**PPM applied**	**% Sensitivity**
CO	5	<-3
H_2S	5	<-80
H_2	100	<0.1
SO_2	5	<-3
NO	5	<5
CL_2	5	<100
C_2H_4	100	<1
NH_3	20	<0.2
CO_2	5%	<0.1

Table 4: CL_2 gas sensor cross-sensitivity to the most common interfering gases.

Chlorine (CL_2) Gas Sensor – 801400		
Interfering Gas	**PPM applied**	**% Sensitivity**
CO	400	<0.1
H_2S	20	<-300
H_2	400	<0.1
SO_2	20	<-8
NO_2	10	100
NO	50	<3
C_2H_4	400	<0.1

Table 5: NO gas sensor cross-sensitivity to the most common interfering gases.

Nitric Oxide (NO) Gas Sensor – 801404		
Interfering Gas	**PPM applied**	**% Sensitivity**
CO	5	<0.3
H_2S	5	<20 (after3 minutes)
H_2	100	<0.1
SO_2	5	<4
NO_2	5	<7 (after3 minutes)
CL_2	5	<4
NH_3	5	<0.1
CO_2	5%	<0.1
Halothane	100	<0.1

Table 6: O_3 gas sensor cross-sensitivity to the most common interfering gases.

Ozone (O_3) Gas Sensor – 801406		
Interfering Gas	**PPM applied**	**% Sensitivity**
CO	5	<-3
H_2S	5	<-80
H_2	100	<0.1
SO_2	5	<-3
NO	5	<5
CL_2	5	<100
C_2H_4	100	<0.1
NH_3	20	<0.1
CO_2	5%	<0.1
Halothane	100	<0.1

Table 7: CH_2O gas sensor cross-sensitivity to the most common interfering gases.

Formaldehyde (CH_2O) Gas Sensor – 801409		
Interference Gas	**Concentration (ppm)**	**% Sensitivity**
Carbon Monoxide	50	1
Ethyl Alcohol	2000	0.01
Acetic Acid	2000	-0.02
Ethylene	100	0.3
Methyl Alcohol	100	0.1
Isopropanol	100	0.1

Table 8: NH_3 gas sensor cross-sensitivity to the most common interfering gases.

Ammonia (NH_3) Gas Sensor – 801403		
Interference Gas	**Concentration (ppm)**	**% Sensitivity**
H_2S	25	88
Ethanol	200	0.5

Review of Tables 1–8, note that:

- Cross-sensitivity of interfering gases is temperature dependent. Some gas interferences will increase at higher temperatures while others will decrease.
- Cross-sensitivities were measured at 22°C for CO, H_2S, NO_2, CL_2, NO, and O_3 while CH_2O and NH_3 were measured at 20°C.
- 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.
- Cross-sensitivity of interfering gases vary with test environment.
- Cross-sensitivity of interfering gases may vary between batches of sensors.
- 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 stabilizes and is stable.
  2. Some interfering gases (C_2H_4, NO) modify the reference electrode potential, causing a potential shift on the working electrode. This variable interference stabilizes after typically 30 minutes.
- Chemical filters are used in the CO sensor. This chemical filter removes 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 than the electrochemical gas cell lifetime. Therefore, CO sensor will show increased cross sensitivity to certain interfering gases after heavy exposure to these interfering gases.
- CO gas sensor has a H_2S filter with a capacity of 250,000 ppm-hrs.
- The NO_2 gas sensor has an O_3 filter with a capacity of >500 ppm-hrs.

References

Alphasense (www.alphasense.com) Application Note AAN 109-2

UNDERSTANDING, ACCELERATED

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