



CO Sensor Cross-Sensitivity And Removal With A Charcoal Filter

The table below shows data on the cross-sensitivity of the CO sensor* used in RAE Systems single-gas and multi-gas meters, both with and without carbon-impregnated filter pads (p/n 008-3006-005 for pack of 5) in front of the CO sensor. These filters can be used to reduce organic vapor cross-sensitivity. The filters should be stored sealed

and replaced frequently, especially after exposure to high organic concentrations. The CO sensor responds significantly to hydrogen, ethylene and isobutylene, and TCE, and hardly at all to ammonia, hydrogen sulfide, propane, hexane, and others.

Gas & Concentration	PID (10.6 eV)	New CO Sensor	New CO/filter	Used CO Sensor
100 ppm isobutene	100	9	4	≤100
500 ppm isobutene	548	30	20	≤170
1000 ppm isobutene	1060	28 ^a	22	≤260
2000 ppm isobutene	2030	80 ^a	70	≤680
100 ppm propane	0	0	0	0
100 ppm butane	0	1	1	
100 ppm hexane	25	0	0	0
250 ppm acetylene	250	250		
200 ppm ethanol	20	0	0	0
125 ppm ethylene oxide	~10	≥40		
100 ppm ammonia	7	0	0	0
10 ppm H ₂ S	~2	0	0	≤9
15 ppm H ₂ S	~4	1	0	≤13
100 ppm MEK	99.5	0	0	0
100 ppm TCE	189	25	15	0
5 ppm SO ₂	0	0	0	≤3
35 ppm NO	~6	1	1	≤5
5 ppm NO ₂	≤0.5	0	0	≤2
1000 ppm (0.1%) H ₂	0	420	360	≤600
100 ppm H ₂	0	40	31	≤50
100 ppm ethylene	10	24	20	≤100

* Data were taken using RAE Systems CO sensors.

^a Values after 2 minutes; after 5 minutes the apparent CO readings increase about 25% more.

New vs. Used CO Sensors

The RAE Systems CO sensor has a built-in oxidizing chemical filter that is designed to remove ppm level H₂S for 2 years. The table above shows that a new sensor also shows no or low response to isobutylene. However, the built-in filter can be burned out by high doses of H₂S or organic vapors. After that time, the cross-sensitivity to VOCs increases. When using 100 ppm isobutylene to calibrate a Multi-gas meter having both PID and CO sensors, a response of 30 to 65 ppm is commonly observed on a used CO sensor. A good charcoal (carbon) filter should eliminate most of that cross-sensitivity.

Maintenance of Carbon Filter for CO Sensors

The carbon filter is 0.35" in diameter. When a CO sensor is installed in the MultiRAE monitor, the carbon filter should be inserted into the corresponding opening on the gas distribution plate for the CO sensor (see figure). This carbon filter lasts for about 4 to 6 weeks under normal operation conditions before needing replacement. However, if the monitor is exposed to high VOC concentrations, the carbon filter should be replaced more frequently. To check the carbon filter, apply a known

VOC gas, such as 100 ppm isobutylene, to the monitor. If the CO sensor exhibits readings above 5 ppm, it is time to replace the carbon filter. To replace the filter, simply open the gas distribution plate, use a tweezers to remove the old filter, and insert a new one into the opening. On an old, used sensor, some response with isobutylene is expected even with the carbon filter in place.

Warning: The carbon filter used for CO sensors may lower the reading if used on other sensors such as H₂S, NH₃, or Cl₂. Remove the filter if another sensor replaces a CO sensor in the multi-gas meter.

