

## Shielding Toxic Sensors from Electromagnetic Interference

Electrochemical toxic gas sensors typically have a large capacitance (between 50 and 200mF) which allows for easy electromagnetic pickup in a measuring circuit through the sensor. The internal resistance of toxic sensors is typically 1 to 3 ohms, so this, coupled with the large capacitance, makes them especially susceptible to noise pickup at 50 and 60 Hz.

A few design tips should be considered:

1. Since the resistance and impedance of the accompanying circuit is quite low around the sensor, although magnetic (H) fields are rare, if they are present, then they could easily couple into the circuit, creating noise. Therefore, although Mu Metal is the ideal material, nickel or mild steel screening could be used. Conductive polymer enclosures will screen electric fields, but use of low magnetic susceptibility materials will only screen for electrical susceptibility, not magnetic susceptibility.
2. If the noise source is external, then screen the entire instrument case. However, if the noise is coming from the on-board microprocessor then the sensor must be screened separately from the circuitry with good grounding. The best place to ground is the ground pin on your measuring op amp.
3. Design the circuit board as a multi-layer board and include a ground plane. This will at least minimise noise susceptibility along one axis.
4. For screening in difficult environments use a thin metal cylinder around the sensor body. This cylinder both screens the circumference of a sensor to the circuit board and acts as the grounding tag to the PCB.
5. There will still be a residual unscreened area where the gas is allowed access to the electrochemical cell. It is possible to add a metal mesh whose dimensions match the frequency of radiation to be screened, allowing gases to pass into the sensor and yet provide electromagnetic screening. Although the mesh size of the screen will affect the maximum attenuated frequency, screens with up to 2 mm spacing should be adequate to cover up to the 100 MHz region.

Beware of corrosive gases attacking the metal mesh. Consult Alphasense.