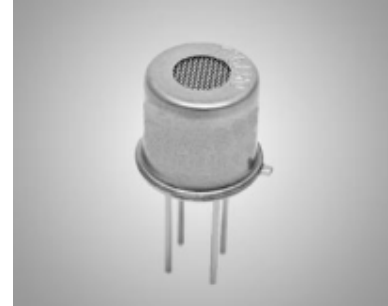


Understanding Air quality / VOC sensor

This document will show that:

- VOC sensor is as good indicator of space occupancy
- VOC acts as a good CO2 sensor
- VOC is able to measure other air contaminants which affect human comfort and health
- will describe how the VOC sensor output corresponds to the CO2 level in the space so that system designers can use their existing CO2-based DCV (demand-controlled ventilation) occupancy algorithms
- proper ventilation from the VOC sensor improves occupant comfort, health and productivity, and saves money for building owners



Up to now proper air quality has been defined as:

- proper temperature
- proper humidity level
- proper CO2 level

The main drawback for this demand-controlled ventilation (DCV) is that it ignores the offensive odors, air contaminants and VOCs that may be present even when the CO2 levels are low. The mentioned gases have just as much or even more impact on human comfort, productivity and health.

What are VOCs and Where Do They Come From?

VOCs are chemicals that contain carbon and can be emitted as gases at room temperature. Table below shows some typical indoor contaminants and their sources. VOCs evaporate from substances, such as cleaning products, adhesives, paints, dry-cleaning fluids and wood preservatives. VOCs are also emitted from humans and animals in their breath, sweat and directly from their skin. In fact, the majority of VOCs in an indoor space are generated by humans. LogicMachine Wall is able to measure these VOCs, and that is why the VOC sensor is as good an indicator of occupancy as a CO2 sensor.

Contamination Source	Emission Source	VOC
Human Being	Breath	Acetone, Ethanol, Isoprene, CO ₂
	Skin Respiration & Perspiration	Nonanal, Decanal, alpha-Pinene
	Flatulence	Methane, Hydrogen
	Cosmetics	Limonene, Eucalyptol
Consumer Products	Household Supplies	Alcohols, Esters, Limonene
Office Equipment	Printers, Copiers, Computers	Benzene, Styrene, Phonole
Combustion	Engines, Appliances, Smoke	Unburnt Hydrocarbons, CO, CO ₂
Building Materials	Paints, Adhesives, Solvents, Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes
Furniture	Poly Vinyl Chloride (PVC)	Toluene, Xylene, Decane

The true meaning of air quality

VOCs are known to cause eye, nose and throat irritations, headache, drowsiness, dizziness, nausea, difficulty concentrating and fatigue. The importance of detecting the presence of VOCs in indoor air goes beyond these immediate health concerns. People judge the quality of the air not just by how it feels (temperature and humidity), but also by how it smells. Unfortunately, offensive odors in offices, kitchens, gymnasiums and restrooms have no impact on CO₂ levels. A fish sandwich left in a desk drawer over a weekend may not be life threatening, but may smell like it by Monday. These obnoxious odors reduce everyone's productivity until the odor is eliminated. A single person entering or passing through a space may deteriorate the air quality due to heavy amounts of aftershave lotion, cologne, perfume, hand soap, laundry detergent residue, fabric softeners or residual cigarette smoke. In these cases a CO₂ sensor will not correct the problem.