A Primer: Indoor Air Quality and Combination CO_2 + VOC Sensors

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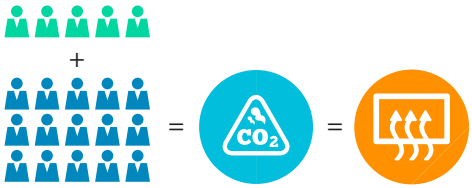
Demand Control Ventilation (DCV) strategies typically measure Carbon Dioxide (CO_2) levels to determine space ventilation requirements. At a very basic level, the calculation is simple:

More People = More CO_2 = More Fresh Air Required



Most CO_2 sensors used in HVAC applications have a measuring range of 0-2000 ppm. Generally speaking, acceptable indoor air quality is considered to have a maximum CO_2 concentration between 800 and 1000 parts per million (ppm). However, there is much more to indoor air quality than CO_2 concentration.

Volatile Organic Compounds, or VOCs, are not detected by CO_2 sensors, yet are major contributors to “stale air”. Common examples of VOCs include acetone, benzene and xylene. These sound very scary but VOCs are emitted by many common building materials, including carpeting, hardwood flooring, upholstery, and even marble surfaces. People of course, can also be VOC emitters.

In a typical office or school environment, it is possible to have CO_2 levels within the acceptable range yet still have poor air quality due to VOCs. This problem can be worse after lunch – depending on what the cafeteria was serving that day.

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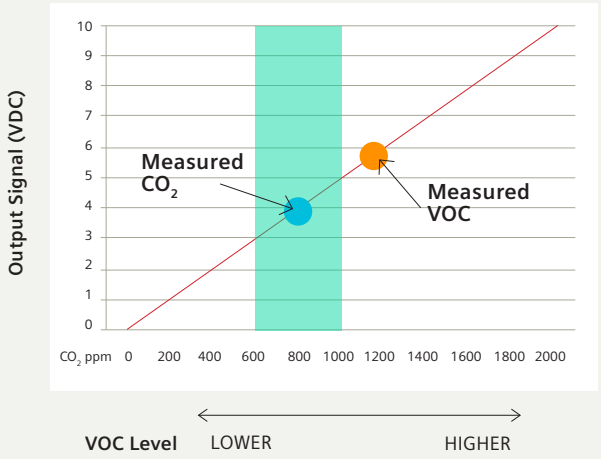
In a condition of acceptable CO_2 levels and high VOC levels, a DCV system using traditional CO_2 sensors will be of little value. Siemens combination CO_2/VOC sensors are the perfect way to help ensure optimum air quality at all times. These sensors have two separate sensing elements, one measures CO_2 and the other measures VOCs. The sensor algorithms then adjust the output signal to reflect the higher of the two values. In the scenario shown in the graph below, the CO_2 level is approximately 900 ppm which is acceptable in most situations. If the sensor output signal is reflecting only the CO_2 level, the DCV controller would see approximately 4.5V (900 ppm) and take no action. However, since the VOC concentration is relatively high, the Siemens combination CO_2 / VOC sensor will output a 6V signal, which would indicate to the controller that air quality is outside the desired range and the controller then initiates the appropriate DCV strategy.

Siemens Combination CO_2/VOC Sensors



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It is important to note that the CO_2 portion of the signal is the typical 0-2000 ppm, while the VOC portion is simply a general indicator of potentially unpleasant odors. From a comfort perspective, a lower VOC level is roughly equal to a lower CO_2 level.

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Combination CO_2 + VOC Sensors

Model Number	Orderable Number	Location	Output Signal	Display
QPA2002	QPA2002	Room	0-10V / 4-20mA	No
QPA2002D	QPA2002D	Room	0-10V / 4-20mA	Yes
QPM2102	QPM2102	Duct	0-10V / 4-20mA	No
QPM2102/MO	S55720-S469	Duct	Modbus RTU	No
QPM2102D	QPM2102D	Duct	0-10V / 4-20mA	Yes

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Siemens also offers a full range of standard CO_2 sensors for room and duct applications, including units with individual output signals for CO_2, temperature and relative humidity.

Standard CO_2 Sensors

Model Number	Orderable Number	Location	Output Signal	Display	Temp Output	Temp Output
QPA2000	QPA2000	Room	0-10V / 4-20mA	No	No	No
QPA2052/MO	S55720-S510	Room	0-10V / 4-20mA	No	Yes	Yes
QPA2060	QPA2060	Room	0-10V / 4-20mA	No	Yes	No
QPA2060D	QPA2060D	Room	Modbus RTU	Yes	Yes	No
QPA2062	QPA2062	Room	0-10V / 4-20mA	No	Yes	Yes
QPA2062D	QPA2062D	Room	0-10V / 4-20mA	Yes	Yes	Yes
QPM2100	QPM2100	Duct	0-10V / 4-20mA	No	No	No
QPM2150/MO	S55720-S470	Duct	Modbus RTU	No	Yes	No
QPM2152/MO	S55720-S471	Duct	Modbus RTU	No	Yes	Yes
QPM2160	QPM2160	Duct	0-10V / 4-20mA	No	Yes	No
QPM2160D	QPM2160D	Duct	0-10V / 4-20mA	Yes	Yes	No
QPM2162	QPM2162	Duct	0-10V / 4-20mA	No	Yes	Yes
QPM2162D	QPM2162D	Duct	0-10V / 4-20mA	Yes	Yes	Yes

Siemens also offers sensors that measure concentrations of particulate matter, which is increasingly recognized as a major contributor to unhealthy indoor air.

Particulate Matter Sensors

Model Number	Orderable Number	Location	Output Signal	Display	Temp Output	RH Output
QSA2700	S55720-S457	Room	0-10V / Modbus RTU	No	No	No
QSA2700D	S55720-S458	Room	0-10V / Modbus RTU	Yes	No	No
QSM2100	S55720-S491	Duct	0-10V	No	No	No
QSM2162	S55720-S492	Duct	0-10V	No	Yes	Yes

To learn more contact your local representative or visit:

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