Clean Air Control

How does it work?

QUICK FACTS

- Reacts to unhealthy substances in the air
- Reacts equivalent to a CO2 sensor
- Lower cost than a CO2 sensor
- Integrated in the damper or the air handling unit, pre-assembled from the factory

Swegon

How clean is the air that we breathe?

Most people spend more than 20 hours a day indoors. During this time, an average person drinks around 3 l of water and eats 1-2 kg of food. Considerable attention is given to what kind of food we eat, but the fact that each person breathes 15 kg of air each day is something that not so many of us concern ourselves about.

Clean Air Control sensor

The Clean Air Control function is used in ventilation systems where the aim is to regulate the airflow according to the content of emission/impurities in the room air.

Swegons WISE-damper, ADAPT Damper, is available in a special variant with integrated VOC sensor. See the specification below.

The VOC sensor measures the content of emissions/impurities in % VOC.

When an occupant emits CO_2, this creates a proportional amount of emissions/impurities which are measurable by the VOC sensor. For an approximate translation of the % VOC to CO_2 content, see the diagram.

When the VOC sensor measures contents of emissions/impurities that are lower than the preset value; the air handling unit's supply air and extract air flows are then equivalent to the preset min. flows.

When the VOC sensor instead measures contents of emissions/impurities that are higher than the preset limit value, the supply air and extract air flows are variably increased until the preset value or max. flow is reached.

References

The diagram to the right shows the results from a measurement of two different buildings.

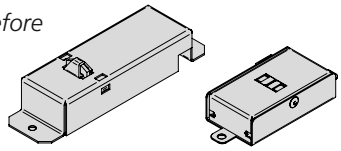


Figure 1. CAC sensor.

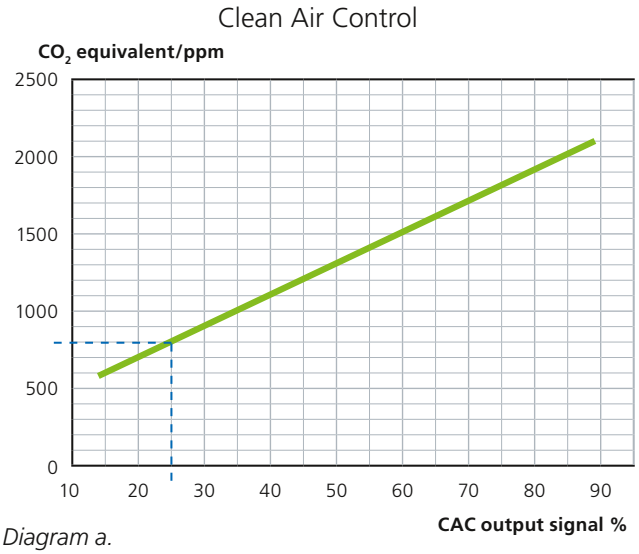


Diagram a.
Example: 25% CAC output signal is equivalent to CO_2 800 ppm.
NOTE! The diagram applies only to versions of the sensor before 170501, see figure 1

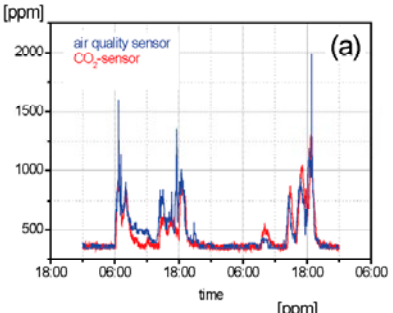


Diagram b. Training premises.

The CAC sensor correlates very well with the CO_2 sensor.

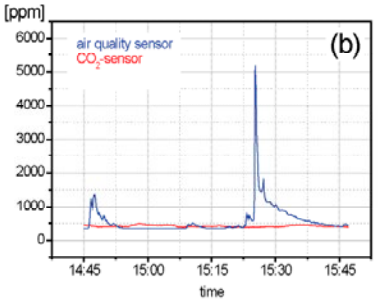


Diagram c. Bathroom.

The CAC sensor reacts on odours or parfume contrary to the CO_2 sensor.

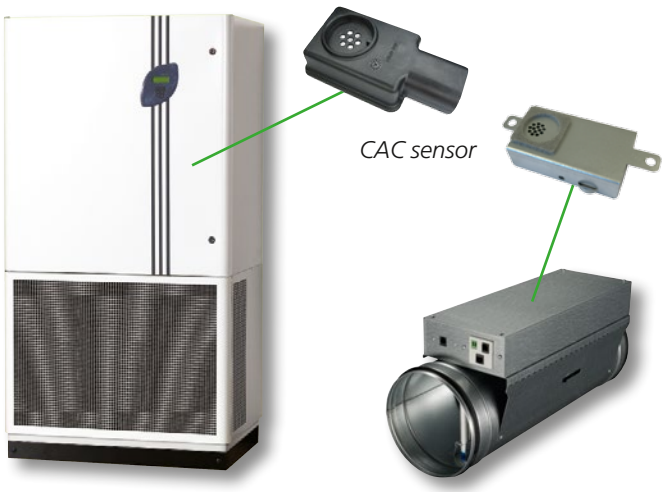
Products

ADAPT Damper

The CAC sensor is available in ADAPT Damper in a master version (extract air). The damper must be ordered with the CAC sensor preassembled; the sensor cannot be ordered afterwards.
The SchoolWISE package will also include the ADAPT Damper with CAC sensor.

COMPACT

All COMPACT Air and Heat air handling units have the CAC sensor installed. For the COMPACT Unit and TOP air handling unit it can be ordered as an accessory.



COMPACT Air & Heat

ADAPT Damper

FAQ for Clean Air Control

Q: Is there a complete specification of all the gases (emissions) CAC reacts to?
A: Yes and no; There are approximately 5 000 - 10 000 different Volatile Organic Compounds (odours, etc.) out of which the sensor detects almost all or at least typical representatives from each group, plus typical gases like carbon monoxide and hydrogen (both from combustion) as well as methane. So far we and many institutes involved have not encountered any particular VOC or at least no group of substances it does not detect.

The table below gives some insight into the main substances, groups and, in particular, their sources. Furthermore it provides recommendations for the appropriate ventilation model.

Indoor air Contamination source	Emission source	Typical substances		CAC reacts	Cure
		VOCs	Others		
Human Being	Breath	Acetone, Ethanol, Isoprene		X	Demand Controlled Ventilation
		CO_2			
		Humidity		X	
	Skin respiration and transpiration	Nonanal, Decanal, α-Pinene		X	
		Humidity		X	
	Flatus	Methane, Hydrogen		X	
	Cosmetics	Limonene, Eucalyptol		X	
	Household Supplies	Alcohols, Esters, Limonene		X	
		Unburnt Hydrocarbons		X	
	Combustion (Engines, Appliances, Tobacco Smoke)	CO		X	
		CO_2			
		Humidity		X	
Building Material Furniture Office Equipment Consumer Products	Paints Adhesives, solvents Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes		X X X	5-10 % permanent ventilation
	PVC	Toluene, Xylene, Decane		X	
	Printers/Copiers, Computers	Benzene, Styrene, Phenole		X	

Q: Can the airflow be controlled by a specific individual VOC or substance, such as moisture?
A: No, the total volume of emissions and impurities is the controlling factor for the airflow. .

Q: How is calibration performed?
A: The CAC sensor has a built-in operation compensation and prediction algorithm that re-calibrates itself every second, based on pattern recognition and advanced signal analysis.

Q: Does it calibrate based on background level?
A: It calibrates based on an algorithm with pattern recognition (see question above). A constantly existent low level of VOCs (which can also be the called "background") could be recognized as the baseline and adopted to by the sensor.

Q: There has been some bad publicity regarding the use of a VOC sensor in a ventilation system, why is that?
A: First reason is that they do not fit the current standard by sending a 0-10 V signal. The Swegon CAC sensor takes care of this by correlating the signal to CO_2-equivalent values.

Second reason is that the typical VOC sensor needs to recalibrate every 3 months, otherwise you cannot rely on them. The Swegon CAC sensor does not make absolute measurements (as done by plain VOC sensors). It has an automotive industry-approved operation compensation algorithm to provide reliable signals over many years.

Q: What happens if you mount the Swegon ADAPT Damper in a newly built building with a lot of emissions present. The sensor is active, but the ventilation system is yet not. Has the sensor then "accepted" the high emission level as a standard level or will it increase the airflow?
A: If the sensor is active for some days or more without any ventilation running, and with a serious amount of VOCs present, it will adopt its baseline over time to higher values. Depending on the present VOC concentration and the preset ventilation values, it will either boost the airflow or not when the ventilation system is started.

If ventilation in the above example will not increase, the sensor needs to be re-powered (On/off) once the ventilation system is started for the first time. The on/off acts as a general reset and deletes "old" background memory. After a restart it goes into a general start-up mode for 15 minutes fixed to 50% PPM output value.

However, there is no need to worry about a sensor having slightly adopted its baseline in the beginning, since it will always gradually re-adjust to lower values when the ventilation system starts.