

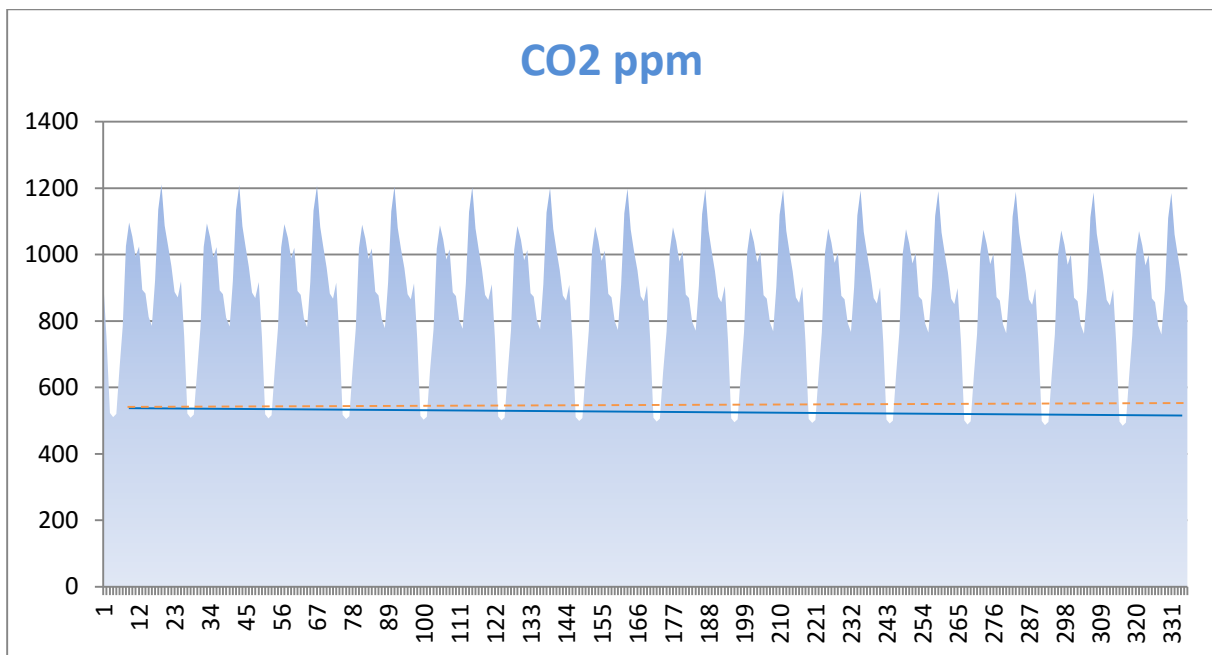
Auto-calibration function description of CO₂ sensor AS-CO₂-G(R)

CO₂ sensor ADS and NL are based on principle of NDIR¹⁾ method. So the sensor drift is the normal and unavoidable aging mainly of the infrared light source within the sensor. This natural drift can be up or down. Self-calibration feature is designed to correct all sensor drifts including aging of the light source. The sensor drift is about a few ppm/ month.

Outside levels of CO₂ are generally very low at around 400 ppm. Inside buildings people are the major source of CO₂. When a building is unoccupied for a few hours, four or more CO₂ levels will tend to drop to outside background levels. This is especially the case if the building operational schedule includes a pre-occupancy purge of fresh air into the building prior to the start of the day.

Auto-calibration which stands for "Automatic Background Calibration" utilizes the computing power in the sensor's on-board microprocessor to remember the lowest CO₂ concentration that takes place every 24 hours. The sensor assumes this low point is at outside levels. The sensor is also smart enough to discount periodic elevated readings that might occur if for example a space was used 24 hours per day over a few days even weeks. Once the sensor has collected three weeks worth of low concentration points it performs a statistical analysis to see if there has been any small changes in the sensor reading over background levels that could be attributable to sensor drift. If the analysis concludes there is drift, a small correction factor is made to the sensor calibration to adjust for this change. The figure below shows CO₂ concentrations as they might occur in time in an office space with peak concentration occurring in the morning and afternoon of each day. If a statistically relevant change in the data shows a shift above or below background, a slight adjustment is made to sensor calibration as shown by the solid level line. Every day the sensor looks at the past three weeks data and determines if a calibration adjustment is necessary. A similar type of approach of nightly calibrations is often used for other HVAC equipment such as VAV boxes.





- Long term slight zero level drift of the sensor
- Zero level correction of Autocalibration function

Thanks to the auto-calibration function it is not needed service recalibration of the sensor during its lifetime (typical lifetime of the sensor is at least 10 years).

Measuring Inside-Outside Differential

When using CO₂ to measure and control for ventilation it is most important to consider not the absolute ppm levels but the differential concentration between inside and outside concentrations. In general terms the higher the differential the lower the ventilation rate. One of the additional benefits of auto-calibration function is that the sensor is calibrated to outside levels without having the expense and trouble of placing a sensor in the outside air. The sensor assumes that the lowest level is 400 ppm. Any readings above this level are related to the differential.

It is important to note that auto-calibration function is designed for use in applications where spaces are periodically unoccupied for some time, so that indoor concentrations can drop down to typical outside levels.



Use of a pre or post occupancy ventilation purge is recommended as a good engineering practice to deliver proper air quality and can help ensure that the space regularly reaches background conditions. If a purge is not used it is recommended that the occupancy schedule for the building operate the HVAC system for an hour or so after normal occupancy ends to allow for CO₂ levels to be reduced to background. Some building operators may also want to use CO₂ as the control parameter for activating the system. When first installed CO₂ sensors with Auto-calibration function, the sensors will use the first three weeks of operation to calibrate themselves to local background levels. Installers or building operators should not be concerned if readings on the sensors appear slightly unusually high or low or if a lack of agreement between sensors is found. The sensor you receive has gone through a complete quality check and has received a factory calibration that has verified the sensor is working properly. Each sensor will calibrate itself to its environment over the first three weeks of operation.

Reasons that sensors in the same building may read differently immediately after installation include:

- Concentrations in each space may be different
- The installer may be blowing into the sensor while working with it
- If a sensor is dropped or jarred in shipment a slight shift in the original factory calibration may occur.

Auto-calibration function will correct this shift in three weeks.

If a space does not experience a periodic drop to outside levels (e.g. where occupancy is 24 hours, 7 days/week), Auto-calibration function should be deactivated off. With Auto-calibration function turned deactivated, calibration may be required every 2 to 3 years.

¹⁾ NDIR – acronym derived from words Non Dispersive Infra Red – means CO₂ measurement is based on following strength of infra-red signal (with exact wave length) in dependency on number of molecules of CO₂ in the air.

