

Outdoor Carbon Dioxide Measurements for Demand Controlled Ventilation



The outdoor CO₂ level serves as a baseline for comparison to indoor CO₂ concentration. If the outdoor CO₂ concentration level is 475 ppm, it is rarely lower indoors. Selecting a stable outdoor CO₂ instrument is crucial for monitoring outdoor levels.

Demand controlled ventilation (DCV) helps to maintain good indoor air quality while optimizing energy consumption. In a typical set-up only indoor CO₂ levels are measured. Ventilation controls are operated based on the assumed outdoor CO₂ level of 400 ppm. However, locally elevated CO₂ levels occur due to CO₂ emissions from transportation, energy production and industrial manufacturing.

Ventilation guidelines, such as ASHRAE, recommend indoor CO₂ levels not to exceed the

surrounding outdoor concentration by 700 ppm. Also, LEED guidelines suggest providing an alarm when the indoor CO₂ level exceeds the outdoor level by 530 ppm, or 1,000 ppm absolute. Reliable correlation between indoor and outdoor CO₂ levels can only be achieved by measuring both.

Measuring CO₂ Outdoors

Knowing outdoor CO₂ levels helps when assessing indoor conditions. During periods when the outdoor CO₂ level exceeds 412 ppm the

space may be over-ventilated. In order to truly optimize energy consumption, outdoor CO₂ concentration should be measured. The real time differential between indoor and outdoor CO₂ concentration can be used as a control parameter.

As there are large diurnal and seasonal variations in outdoor temperature, the outdoor CO₂ instrument should automatically compensate for temperature variations.

Outdoor CO₂ sensors need to operate in varying conditions. They have to tolerate rain, hail, snow, solar radiation, dirt and dust, as well as temperature extremes between -40 and +60 °C (-40 ... +140 °F).

GMP252 inside the DTR250 radiation shield is an ideal solution for dynamically measuring outdoor CO₂ levels. This combination meets the specifications of Section 6.2.7 of ASHRAE Ventilation Standard 62.1.



Radiation shield DTR250A (right) with GMP252 probe

Vaisala Radiation Shield DTR250 Series:

- Naturally ventilated, maintenance-free shield protects the probe from both scattered and direct solar radiation, and precipitation
- Two options: DTR250 for direct mount to existing support bars and DTR250A for mounting to a pole, mast, or vertical surface.

GMP252 probe features:

- Wide operating temperature range of -40 ... +60 °C (-40 ... +140 °F)
- Integrated temperature sensor for continuous compensation
- Sensor head heated to prevent condensation
- Traceable calibration (certificate included)
- Possibility to compensate for pressure (site elevation)

In addition to outdoor CO₂ measurement Vaisala offers complimentary instruments for outdoor relative humidity and temperature measurements that also use integrated solar radiation and precipitation shield



HMS110 Series for Outdoor Relative Humidity and Temperature measurements

Vaisala HMS110 Series HUMICAP Humidity and Temperature Transmitters

- Measurement range of 0 to 100% RH & -40 to +60°C (-40 to +140°F)
- Traceable calibration certificate included
- 2 Loop powered, 4...20mA analog outputs
- Modbus RTU digital output
- Selectable humidity parameter outputs (dewpoint, enthalpy, etc.)
- Service port for on-site calibration, adjustment, and setting changes
- Integrated radiation shield for solar and precipitation protection
- Mounts directly onto a wall or pole without any extra accessories.

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