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Extend your measurement range

The upgraded CO₂ probe goes “underground”

Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 has recently been upgraded with improved features especially for ecological measurement applications: in addition to the slightly new appearance of the probe, the most noticeable new feature is the extended measurement range, up to 2% CO₂. The low end of the measurement range, the 0–1000 ppm range, also has improved linearity and temperature dependency. Both changes enable increasingly reliable and accurate ecological measurements.

The GMP343 was launched three years ago. The probe was designed for the ecological CO₂ measurement segment. It is successful in a variety of research applications, such as soil respiration measurements, plant growth chamber control,

and measurements in lakes and even oceans. The probe has also been used in boundary layer measurements with a tethered sonde as well as in an ecological measurement station application in the Helsinki Testbed. Furthermore, OEM customers manufacturing total organic carbon (TOC) analyzers have found the GMP343 suitable for integration with their measurement equipment.

Below-ground soil respiration measurements

One of the most successful applications for the GMP343 in the ecological segment has been a particular niche of soil respiration measurements, where soil CO₂ is measured below ground in a vertical profile. However, the measurement range

of the probe has not been wide enough for all below-ground CO₂ measurements since in some soil types and conditions the CO₂ concentration can rise multi-fold from the ambient CO₂ background concentration of 370 ppm.

The growing need for the below-ground soil respiration measurements has called for an extension of the measurement range, whereas the growing interest in atmospheric CO₂ concentration measurements, such as urban air CO₂ measurements, encouraged us to improve the probe's performance in the ambient CO₂ concentration measurement range.

The upgraded GMP343 is calibrated at the factory at three new CO₂ concentration points, which adds up to a total



Figure 1. The open path, diffusion aspirated model (left) and the flow through model (right) of the upgraded GMP343.

of seven gas calibration points (0, 200, 370, 600, 1000, 4000 ppm and 2%). The new temperature compensation is applied to each probe individually, and each upgraded probe is calibrated at four temperature points (-30, 0, 25, and 50°C).

We know how to make reliable sensors

The GMP343 uses the renowned Vaisala CARBOCAP® measurement technology. The absorption of infrared (IR) light is measured in this technology by using small silicon-based, electrically tunable Fabry-Perot Interferometer (FPI) acting as a tunable bandpass filter. The FPI is continuously measuring not only the CO₂ absorption band but also a reference band. Because of this, a true reference measurement, and, therefore, a stable CO₂ measurement can be obtained. Only a single IR detector is used for measuring

both the absorption and the reference bandwidths, which eliminates the errors commonly present in NDIR sensors with two IR detectors. The true reference measurement enables good stability of the sensor both in terms of time and temperature. It is worth emphasizing that the temperature stability also results in a good stability with flow, which is an important feature, especially in diffusion-based sensors.

The upgraded GMP343 comes as a diffusion-based or a flow through-based model (Figure 1) and features low power consumption and small size compared to traditional CO₂ equipment designed for the ecological segment. The probe also sustains harsh environments and can be installed outdoors without complicated protection or shelters. ■

The GMP343 uses the renowned Vaisala CARBOCAP® measurement technology.