Waterproof CO$_2$ Sensor for Continuous In-Situ Monitoring

- ACCURATE
- DURABLE
- COMPATIBLE
- WATERPROOF
- COMPACT

The eosGP gas probe offers continuous in-situ monitoring of CO$_2$ concentrations. Its robust design is ideal for harsh deployments—buried in soil, submerged in a stream or lake, or covered in snow.

Low power requirements, out-of-the-box submersibility, small size, and compatibility with standard dataloggers make the eosGP an easy addition to your field kit.

CONTINUOUS IN-SITU MONITORING
This is a hard working device—its continuous data stream lets you capture patterns, trends and variability in the field.

HARSH ENVIRONMENTS
The eosGP’s broad operating temperature range (0 C to 40 C / 32 F to 104 F) and built-in temperature correction means you can use this probe in most climates. Its strong, waterproof housing with optional anti-fouling copper mesh allows long-term fresh water deployment to depths of of 3 m / 10 ft.

COMPACT & LOW ENERGY
Small and light—fitting easily into your hand—this device can go anywhere. Its peak power consumption of less than 1 W can easily be handled by, for example, a modest solar panel. The device produces very little heat, so it has minimal thermal effect on its environment.

INTEGRATION & COMPATIBILITY
The eosGP likely connects conveniently with your current field infrastructure. Its standard 0 V to 5 V analog outputs are compatible with most dataloggers, and it can be powered by commonly available 5 V DC to 24 V DC sources, just like your other equipment.

Data from GP sensors buried in alfalfa fields at 2, 8, and 16 cm depths showing diurnal and weather related variation in CO$_2$ concentrations.
eosGP IN WATER
The monitoring of fresh water CO₂ concentrations is critical for applications ranging from carbon balance research to public safety. The eosGP is sealed and ready for action in fresh water to depths of 3 m / 10 ft. Equilibration time is kept short by minimizing the interior volume of the eosGP and maximizing the CO₂ transfer rate across the hydrophobic membrane.

EXAMPLE
Several eosGPs were attached to a submersible stringer chain along with O₂ and environmental sensors to study the relationships between gas production and consumption in the water column.

eosGP IN SOIL
Soil CO₂ concentrations are highly variable and can sometimes span many orders of magnitude in a short time. This high variability can result in missed measurements when the calibration range of a sensor is exceeded. Eosense’s optional dual-range calibration allows for measurement of large variations in soil CO₂ concentration while also maximizing sensor accuracy. Additionally, the combination of a strong acetal housing and water-tight sealing makes eosGP sensors the ideal choice for in-situ soil CO₂ monitoring.

EXAMPLE
eosGP sensors were buried at 2, 8 and 16 cm depths in an alfalfa field. On the chart overleaf you can see the strong diurnal changes in CO₂ concentration, driven by temperature changes in the upper soil layers, as well as the synoptic variation due to rainfall events shown in the upper plot.

eosGPs in alfalfa field

ACKNOWLEDGEMENT
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SPECIFICATION HIGHLIGHTS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Dimensions (⌀ x L)</td>
<td>5.1 x 10.7 cm / 2 x 4.2 in</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 to 40 C / 32 to 104 F</td>
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<tr>
<td>Operating power - avg / peak</td>
<td>&lt; 0.5 / &lt; 1 W</td>
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<tr>
<td>Operating voltage</td>
<td>5 to 24 V DC</td>
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<tr>
<td>Time to equilibrium</td>
<td>&lt; 90 s (in air)</td>
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<td>Mass (approx)</td>
<td>200 g / 0.44 lb</td>
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<tr>
<td>Output voltage</td>
<td>0 to 5 V DC</td>
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<tr>
<td>Concentration accuracy</td>
<td>1% range + 1% reading</td>
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<tr>
<td>Calibration ranges (ppm)</td>
<td>0-20,000, 0-50,000, 0-125,000</td>
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<tr>
<td></td>
<td>Dual 0-5000 and 0-20,000</td>
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