



CO₂Vking is designed for Cavers !



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<http://co2.vking.earth/project-fra.php>

v4.2.28

CO₂Vking Features

CO₂Vking was designed for speleologists, as no other commercially available device is adapted to the harsh environment of dust, humidity and mud in caves.

The solid, thick 3d-printed housing is protecting sensors and electronics during exploration or research.

CO₂Vking is marking the end of complications by uncompensated metering, energy greedy electrochemical or IR-cells and imperfections due to warm-up.

This new generation of CO₂-measurement is temperature, pressure and humidity compensated, thanks to a factory calibrated 0-5% or 0-20% gold plated tuned NDIR CO₂-sensor with PTFE filter membrane, which is a long-life, maintenance-free, fast, ultra-low energy and low budget sensor.

The sensor LED and photodiode are tuned to a narrow bandwidth, further reducing cost and simplifying design. Narrowband photonics technology is operating at mid-infrared tuned wavelengths for specific gas detection. The 4.26 μm narrow-bandgap wavelength absorption avoids spectral influence by other gases as water vapour, methane, NO_2 , N_2O , CO or NO . The measurement is particularly independent from any relative humidity for operation between 0 and 50°C and is offering advantages in lifetime and stability, compared to traditional optical structures. This is permitting an accuracy of 70 ppm, with a non-linearity of less than 3% full scale. The sensor manufacturer claims a calibration free minimum 15 years lifespan, as long as no physical sensor deformation takes place. It only needs periodical zero point calibration like ABC (automatic baseline calibration) in outside fresh air. At startup, the user can perform this calibration by holding down the plus(+)button.

Bosch high-definition BME Climatology sensors are measuring temperature, barometric pressure and relative humidity at positive and negative temperatures.

After switching on the power by a protected slider-switch, the instrument is operating in foolproof mode and can be controlled by a membrane push button.

No need to touch any button at all, as the unit's large display is alternatively showing battery voltage, temperature, pressure, humidity, gas level and the depth at which the maximum concentration has been found. The maximum concentration @depth is reset at startup.

At startup and on reset, a full self-test cycle will be performed automatically.

Buzzer alarm beeps on startup and to indicate presence of CO_2 gas concentrations higher than 0.5%. As the buzzer can be annoying in caves and may be stressing team mates, it can be switched off.

The BMS battery management system takes care of energy by following up the internal lithium-polymer battery voltage, warning the user to charge or switch the pack.

CO₂Vking Specifications

Narrowband IR CO₂ –sensor, factory calibrated, temperature and pressure compensated. Operating range 0-5% (400-50.000 ppm) or 0-20% (400-200.000 ppm) CO₂, see 5 or 20 in serial number respectively.

Resolution: 10 ppm. Precision: +-70 ppm. Linearity: better than 3% full scale.

Anti-vapour screen PTFE membrane.

Bosch clima-module Temp: -15...+40°C (resolution 0.1°C, precision 0.5°C@25°C). Relative humidity 0...100% (resolution 0.1%, precision 3%). Barometric pressure: 850-1200 hPa (precision 0.12 hPa, compensation 1.5 Pa/°K).

Ultra Low Power 32-bits Espressif ESP32 microcontroller @128MHz.

3D printed protective case in full density ABS (Acrylonitrile butadiene styrene), a light and durable tough impact-resistant polymer. Specific gravity: 1.03 g/cc. Impact strength: 36 kJ/m².

Housing joints reinforced with ABS resin and painted base plate.

Slide switch for battery cut-off during transport and when unit is not in use.

Membrane switch keypad for foolproof operation.

Bright 1.3" 128x64 monochrome OLED display for:

CO ₂ %	carbon dioxide percentage (1% = 10.000 ppm)
Prof	depth in meters below starting point 0m, at moment of measure
Tmp*°C	temperature in °C (after 60 mn equilibration time with cave atmosphere)
Pres-hPa	barometric pressure in millibars or hectoPascal
RH%	relative humidity percentage
MaxCO ₂	maximum gaz concentration measured at a certain depth in relation to point 0m
MProf	dept in m at which a maximum gaz concentration has been detected
VBat	battery voltage

Fresh air calibration check on reset and startup, assuming operator is outside cave entrance in clean air @410ppm CO₂ (as of 06/2018) and ABC (Automatic Baseline Calibration) option to perform once per month.

LiPo battery voltage test on startup, wakeup and reset.

Buzzer indicating presence of more than 0.5% carbon dioxide.

Buzzer can be deactivated through slider switch.

Low V warning <3.4 V

Spécifications - Résolution, précision (capteurs en équilibre avec avec le milieu ambiant):

CO₂ vol%: plage de 400... 50.000 ppm (0-5%) ou 200.000 ppm (0-20%). Résolution 10 ppm; précision +-70 ppm, linéarité <3% pleine échelle, compensé en température et pression, T₉₀ <10 sec.

Pression atmosphérique: 850-1200 hPa (précision 0,12 hPa, compensé en température° 1.5 Pa/°K).

Humidité relative: 0...100% (résolution 0.1%, précision 3%).

DP*°C Point de rosée : calcul approximatif selon la formule de Magnus (Sonntag90).

Temp*°C: 0...+40°C (résolution 0.01°C, précision 0.5°@25°C, après équilibrage de 60 min).

Option: thermomètre infrarouge: affichage instantané.

Option multigaz: O₂ vol%: 0...25% oxygène (résolution 0,01%, précision <2% pleine échelle, compensé en compensé en température et pression) ou gaz de combustion en ppm.

Option: datalogging et paramétrage sans fil sur smartphone.