SwemaCO$_2$
Operating instructions
vers 1.01 AÖ202002

NOTE! Before you start measuring please read chapter 2. "Start of instrument", warm up time of the measurement sensor.
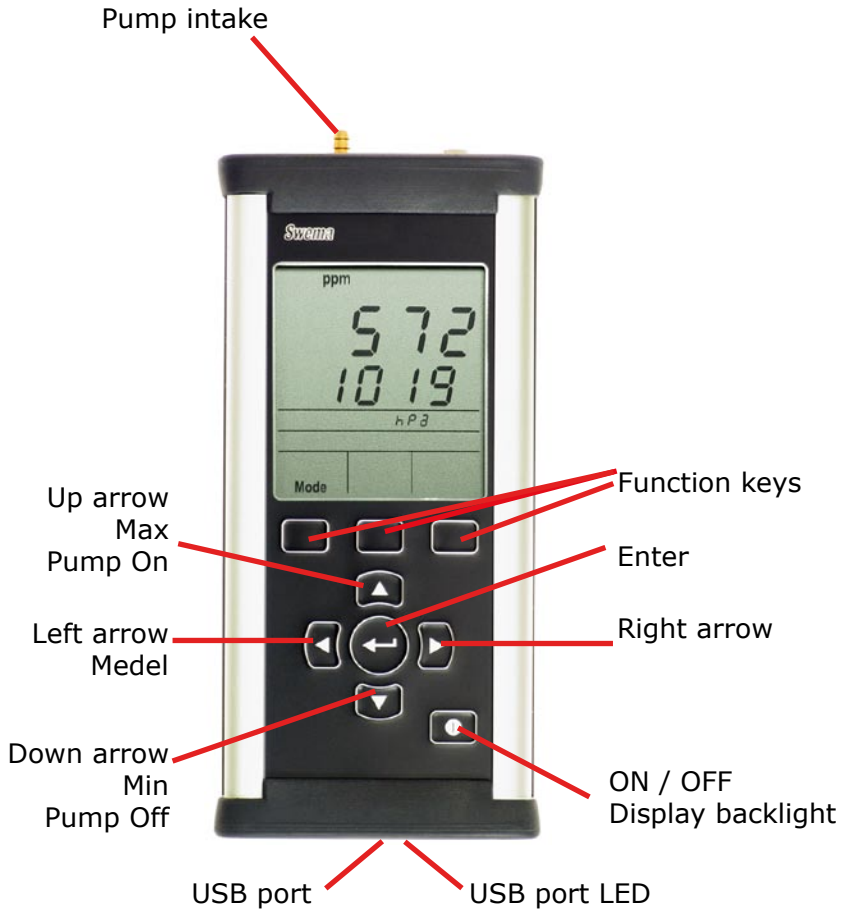
SWEMA AB
Pepparv. 27
SE-123 56 FARSTA
Tel: +46 8 94 00 90
E-mail: swema@swema.se
Web page: www.swema.com

Contents:

1. Introduction

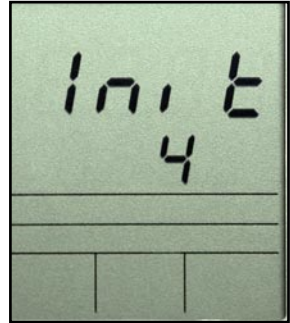Swema CO_2 is a handheld instrument that measures and logs CO_2-levels (ppm) and air pressure (hPa). A built-in pump allow measurements to be made exactly where you wish, whilst also ensuring the fastest possible response time. The instrument can display the average value, as well as saving and logging values. Measurement series can also be transferred to a PC using the included USB cable.

Pump intake

Function keys

Up arrow
Max
Pump On

Enter

Left arrow
Medel

Right arrow

Down arrow
Min
Pump Off

ON / OFF
Display backlight

USB port

USB port LED

2. Start of instrument

NOTE! Warm up of the instrument takes around one minute, please wait to ensure the sensor is fully functional.

A star on the left side of the display will blink until the sensor has warmed up. When booting up the instrument (**ON/OFF – button**), the display shows **Init** along with a 5 second countdown. This is followed by the software version, battery voltage, and calibration date. The instrument then proceeds to enter measuring mode, and can be used even during the sensor warm up. The display now shows the CO_2 level (ppm) and air pressure (hPa). A battery warning symbol is shown when it's time to connect the USB power adapter for external power suppliance and charging.
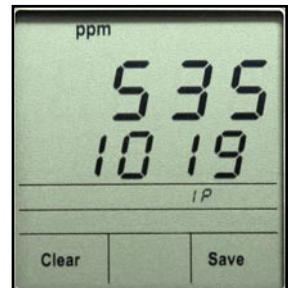
3. Measurement

The instrument updates the measurements according to **9. Technical data**. *NOTE!* Refrain from breathing directly on the sensor as this may affect the *CO_2-measurement.*

Collect measurements: Save a point of measurement in the temporary memory by pressing **Enter**. The amount of measurement points saved in the measurement series will then show below the measured values on the display. "1P" indicates that a point of measurement has been saved in the temporary memory. The average value of the measurement points is shown for a second upon pressing **Enter**. The instrument then shows the current measurement in real-time.

Average, Max & Min: The **Left arrow** (average), **Up arrow** (max) or **Down arrow** (min) can be held down respectively to check the average, max or min-value of a measurement series.

Save Measurement: Measurement series can be saved by pressing **Save** after a point of measurement has been taken. The display will show which memory position the saved measurement has (e.g. n3 = position 3). To wipe the temporary memory and remove the saved series, press **Clear**.

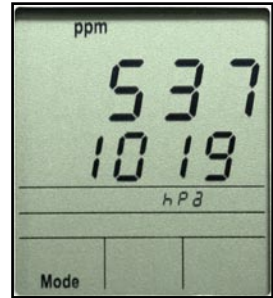**Pump:** Press **up arrow** to start the pump, **down arrow** to shut off.

Display backlight: Quickly press the **ON/OFF-button**.

Shut off: Hold the **ON/OFF-button** for more than 2 seconds.

4. Function keys

The bottom section of the display is divided into three sections, and three function keys are situated directly below these. The function of these keys vary, and is described in the three sections above. Mode is the only possible choice while the instrument is measuring.

Mode allows you to change **Settings**, **Log** or view saved measurements and logs (**Notebook**). To access **Settings** for example, press **Mode**, move with the **arrow keys** until **Settings** starts blinking. Press **Enter**.

Choose Mode to access Settings, Log and Notebook.

5. Settings (SEtt InGS)

Use the **Left & Right arrow keys** to navigate the settings. Use the **Up & Down arrow keys** to change a setting.

Press Esc or Enter after a change has been made to apply it, SwemaCO$_2$ then returns to its measuring mode. The following settings can be changed:

● Unlt SySt
Unit system: Système international (SI) United States customary (US)
change of international measurement (SI) or american measurement (US) **Arrow Up** and **Arrow Down**.

SEtt InGS - Settings

● bAC. LIGH (Display backlight)
Backlight: Via settings, use the **Up** or **Down** arrows**.** The **ON/OFF** button also fills this function with a short press.

● Auto Shut
Auto Shut: Time before automatic shut off, (after the last button press) 60min, 30min, 10min, 5min and 1min (**OFF** disables the auto shut off completely.)
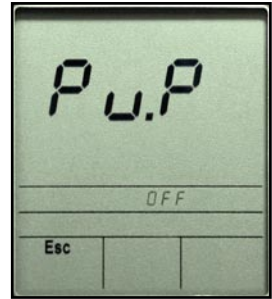

"Up" or "Down" arrows, for **On/Off**.

- **PuP.**

Pump: Use the **Up** and **Down arrows**, to switch between **ON/OFF.** It is also possible to switch the pump on and off during a measurement. The pump absorbs air and blows it into the Carbon dioxide sensor. Refrain from breathing on the instrument as this may affect the CO_2-measurement even when the pump is switched on.

- **LOG Int.S**

Log interval: Adjust the log interval in seconds. Choose between **16**, 30, 60, 120, **240**, 600, 900, **1200**, 1800, **3600**, **7200** second intervals. Use the **Up** and **Down arrows**. The **bold** second intervals are in phase with the CO_2-sensors measuring frequency. If a logging is initiated without *, the logged measurements with these time constants will be measured values (non predicted - *).

- **Battery symbol - initiate logging**

The display to the right shows the battery voltage (V) and how long the instrument can log with the set log interval (hours until the memory is full). The battery life may be shorter. By pressing Enter a logging is initiated. Start once the star disappears to collect a measured value. Longer log intervals can be chosen for longtime logging, see (LOG Int.S). Use a USB power supply to prevent power loss. See also **6. Logging**.

Pump OFF

Log interval

4,11V, 50,4 hours of logging with chosen interval.

- **noti Fy**

Notify: ON or **OFF**. The instrument will beep once for every thousandth PPM. E.g. at 5300 ppm the instrument shall beep five times. If the ppm rises, the beeps will sound in higher pitched tones, and the backlight will turn on for five seconds. If the PPM is stable on the same thousandth, the beeps will sound in the same pitch. If the PPM drops, the beeps will also drop in pitch. The instrument waits for a few minutes between every beep-sequence.

- **AdJ. 410**

Adjust: Adjust the CO_2-sensor to show 410 ppm. Enable the pump and absorb some fresh air. This is assumed to have 410 ppm CO_2. This adjustment is done to prevent drift (offset) of the sensor.

6. Logging

Logging can be initiated in two different ways. The first method is to select **Mode** and thereafter **LOG** and **Enter**. This leads to the battery setting (battery symbol). This can also be accessed by selecting **Mode** followed by **Settings** and then by navigating to this setting. To initiate a logging see **Battery symbol - initiate logging** in **5. Settings (SEtt InGS)**.

NOTE! If the battery runs out during the logging, the instrument will shut off after the logging has been saved. If the pump is turned on during the start of the logging, the pump will work for 30 seconds before the measurement is taken. At other times the pump is shut off, meaning the pump is always on if the interval is set to 30 seconds or less.

To stop and save a log, press **All**.
For a brief moment the display will read Notebook with "n3" blinking, which in this case means that the log was saved as measurement series 3 in notebook. The instrument then switches back to measuring mode without logging.

7. PC transfer

Install the following program **Swema Terminal 3** which can be found on Swema's website. After the installation is complete, connect the instrument with its included **USB-ADAPTER**, make sure this is done before starting the program. The **USB port LED** should be lit green. Start the program**.** Click on **Ter..** "Terminal COM22" and then press "Enter" to access the menu.

  SwemaCO2 410 S/N: 671099
  Firmware: 1.30 Hardware: 1.00

[O] Decimal delimiter: Point
[U] Unit system: SI
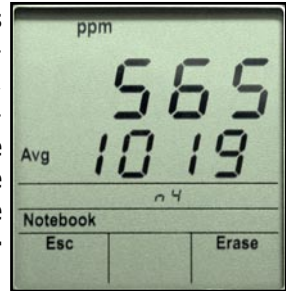[S] Auto shutoff after: 60.0 passive minutes

[P] Print calibration certificate
[L] Print note (all measurements)
[N] Print notes

[ ] Space - Print measurement values
[,] Comma - Print measurement values with units

8. Saved data (Notebook)

To print or control saved measurement series, go to Notebook, see **4. Function keys.**

Navigate between saved measurement series with the **Left & Right arrow keys**, which memory position being shown is indicated with n1, n2, n3 etc. directly below the lower measurement (the number is the memory position). The measurment shown in "Notebook" is the average value of the saved measurement series. To see the Max & Min values, press **Arrow Up & Arrow down**.

Notebook display

Erase saved data
Erase makes it possible to delete saved measurement values. Upon pressing **Erase** the text "Erase" is shown on the display, to erase the entire memory, press **All.** Press **Esc** to cancel.

It is also possible to erase the last saved measurement value. This is done by navigating to the last memory position and pressing **Erase**, in this case three alternatives will show. Press **Note** to erase the last note or **All** to erase the entire memory.

Should the last note or the entire memory be erased?

*WARNING! Only **All** can be chosen if the last measurement series isn't selected, which means all notes will be erased.*

NOTE!
Note = Selects the last log.
ALL = Selects all logs.

9. Technical data

Measurement Range:
CO2:   0...5000 ppm
Barometer: 600...1200 hPa

Measurement Uncertainty:
(1 minute after start)
CO2:   ±35 ppm ± 3,7 % read value
Barometer: ± 3,5 hPa

Measurement uncertainty with 95% coverage probability in non con-densating air.
In relative humidity below 80 %, at 0...35°C,
In relative humidity below 70 %, at 35...50°C, non aggressive gases

Sampling Interval:
CO2:   16 seconds
Barometer: Twice per second

Display Interval:
CO2:   16 seconds for the measured value.
            Two prognostications in between, indicated by a * on display. In stable conditions prognostications equal measured value.
Barometer: Twice per second

Log Interval:
            16 seconds - 2 hours. Pump can be set on or off. Setting pump on turns it on 30 seconds before measure ment is made.

General:
Memory: 50 series of measurements, max 15700 measurement pairs all series combined. (CO2 and air pressure is a measurement pair)

PC Communi-
cation: Mini USB

Lithium-Ion
Battery: Almost one week up time without pump and backlight (150 hours, 24 hours with backlight)

            USB charger and USB cable included