CO2-UNIT-BL

Gas Controller

Manual

IST1140_REV02
SV 2.3.8.2

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1 Preface

The **CO2-UNIT-BL** is a Digital CO_2 Controller that mixes CO_2 and Air to the desired concentration in the range 0-18%. It connects to any Bold Line T controller and can be operated through the same intuitive touch screen interface, OKO-TOUCH.

The **CO2-UNIT-BL** features a long life Non Dispersive InfraRed (NDIR) dual wave length detector to ensure a high accuracy on CO2 concentration and a flow rate sensor to regulate output flow rate.

The **CO2-UNIT-BL** is compatible with Okolab Active Humidity Controller to control output gas Relative Humidity and with Okolab air pump OKO-PUMP-BL, which enables to use background air as a convenient alternative to compressed air.

The **CO2-UNIT-BL** is operated via the OKO-TOUCH touch screen control panel (to be ordered separately). OKO-TOUCH features on-board memory for data logging and mini-USB port for data download.

In addition data logging is possible via SMART-BOX, via DATA-LOG Okolab software and via following third-party Imaging software: LASX 2.0, NIS-Elements, SlideBook, MetaMorph and MicroManager. Macro for ZEN Black software is available upon request.

Okolab Bold Line controllers are also capable to receive TTL input (requires to order separately TTL-CABLE).

2 Symbol description

This paragraph describes the symbols used in the manual and on the product label.

2.1 Symbols used in this manual

The following symbols identify important information to note:

CAUTION or WARNING: this symbol warns you about the risk of electrical shock.

CAUTION or WARNING or IMPORTANT: this symbol warns you of circumstances or practices that can affect the functionality of the instrument.

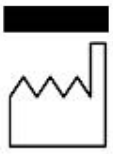
Tip ► *Supplies you with helpful suggestions.*

Note ► *Supplies you with important information to successfully setup and use the instrument.*

2.2 Symbols on the product label

CE MARKING: this symbol indicates product compliance with EU legislation.

PRODUCT DISPOSAL: this symbol indicates that this product must not be disposed as urban solid waste.



This symbol indicates the product production date.

This symbol indicates the manufacturer data.

This symbol warns you to read the user manual before starting the device.

This symbol indicates the protection degree against ingress of solids or liquids inside the product.

3 Safety Notes

In order to achieve maximum performance and to ensure proper operation of your new equipment, please read carefully the following safety notes and the instructions. If you have any question, please contact Okolab.

- The equipment must only be used as intended and as described in this Manual.
- Equipment should be operated only by technically qualified personnel.
- Do not start up the equipment if some of its parts are damaged.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Transport the equipment with care.
- Equipment and its internal parts can be damaged by dropping and by shock.
- Not following these instructions can result in damage or breakdown of the device and its accessories.
- The products labels can be found on the bottom panel of the Main Unit.
- Do not disassemble any part of the system.
- Do not disconnect cables while in operation.

- Do not use a volatile solvent such as paint thinner to clean the instrument because deformation or discoloration may occur.
- Use a soft, dry cloth to remove stains from the instrument.
- Do not exceed voltage indicated in this manual and on the product label.
- Avoid excessive induction noise, static electricity and magnetic fields.
- Do not expose this instrument to rain or moisture.
- Do NOT go in close contact with or breathe any gas stream whose composition is different from that of ambient air.
- Prevent throttling and kinking of tubing.
- Check tubing time to time for possible material usage.
- Check that all tubing is well inserted into the connectors so they cannot slip off
- This device is not designed for use for medical applications.
- Install safety valves and adequate pressure regulators on gas lines before the CO2 Controller input connectors.
- Power cord of unit should be unplugged from electrical outlet when left unused for a long period of time.

- PRESSURIZED GAS, secure all connections with hose clamps. Never exceed pressure limits, 1.5 Bar. Bleed all lines before disconnecting. Wear safety goggles if needed. If pressure regulators are not within sight and reach make sure at least one shut off valve within reach.

- LOW OXYGEN ATMOSPHERES, never enter a room or enclosure which has a low oxygen atmosphere because of severe danger of suffocation. Only operate in well- ventilated room. A small amount for carbon dioxide gas leaks continuously out of the instrument and should never be allowed to build up in room.

- VENTILATION, unit should be situated so that its location or position does not interfere with proper ventilation. Neither the gas mixer nor stream destinations should be in poorly ventilated areas.
- Unit should be situated away from heat sources such as open flames, radiators, heat registers, stoves, or other appliances or processes that produce heat.

- Do not start up the equipment if the supply cable is damaged.
- Connect the equipment only to grounded mains power socket.

- Do not disconnect cables while in operation.
- Do not open the unit. Do not remove cover or back.
- Prevent metal fragments or lead wire scraps from falling inside instrument to avoid electric shock, fire or malfunction.
- No user serviceable parts inside.
- Before starting, assemble the equipment far from electric device.
- Unit should never be used where it can fall or be pushed into water.

International caution symbol marks this device. It is important to read the “Safety Notes” before installing, using and commissioning this device, as the notes contain important information relating to safety and EMC. Not following these instructions can result in damage or breakdown of the device and its accessories.

We reserve the right to make technical variations.

IN NO EVENT SHALL OKOLAB S.R.L. BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.

4 Supplied equipment

1. **CO2 Controller**, main box.
2. **TUBE A (x2). Rigid tubes**, 3m long 6mm OD each. Use TUBE A to connect the output ports of Air and Carbon Dioxide tanks to the corresponding input ports (Air and CO_2) on the rear panel of the CO2 Controller.
3. **TUBE C (x1).** 2m long blue rigid tube 6mm OD with attached a 4mm ID silicon transparent tube 1 m long plus PTFE filter in the middle. Use TUBE C to connect the CO2 Controller to your device or to the humidifier, if it is present.
4. **Pressure Gauge for CO2 + regulator + assembly stirrup (x1)**. Install pressure gauge between the pure CO_2 tank pressure regulator and the CO2 Controller input port.
5. **PTFE filter (x2)**. One to be installed on the rear of the Unit and one spare replacement.
6. **RS232 Serial cable (x1)**. To connect the touch screen interface (OKO-TOUCH) to the CO2-UNIT-BL.
7. **24V-DC Power Adapter (x1)**.

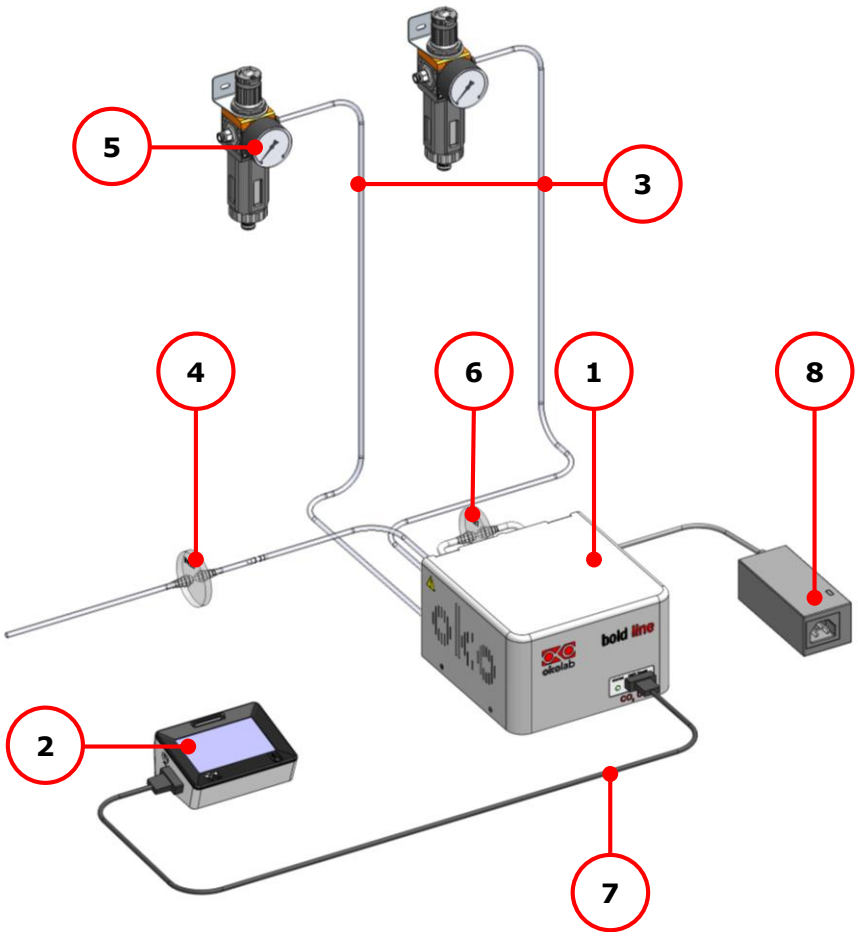


Figure 1. CO2 UNIT BL and OKO TOUCH - components

5 NOT supplied equipment

– **OKO-TOUCH (to be ordered separately)**, including:

1. **Touch Screen Interface**
2. **#1 RS232 Serial cable**. To connect the Touch Screen to the T-Unit

3. **MINI-USB-OTG** cable. To connect a USB pen to the OKO-TOUCH for data download.

- CO_2 tank with safety valve/pressure gauge regulator to accept rigid tubing 6 mm OD. Gas source must be Standard Purity CO2 (coded as 4.5 that means 99.995 % of CO2) and humidity-free gas.
- Air tank or compressed air line with safety valve/pressure gauge regulator (degree of filtration 20 µm and condensate drain) to accept rigid tubing 6 mm OD.

Note ► *An alternative solution for Air supply is the OKO-AIR-PUMP-BL.*

6 Optional Equipment

It can be equipped with:

- **OKO-AIR-PUMP-BL** *(optional)* that includes*:*
  - **TUBE B**. 2 m long tube composed of 6 mm OD rigid tube (0.5 m long) connected to 4 mm ID silicon transparent tube (0.5 m long) then connected to an hydrophobic filter 0.2 micron porous, connected to 4mm ID silicon transparent tube 0.5 m long and then connected to 6 mm OD rigid tube (0.5 m long). Use the TUBE B to connect the OKO-AIR-PUMP-BL to the port labeled "Air In" on the rear panel of the CO2 Controller.

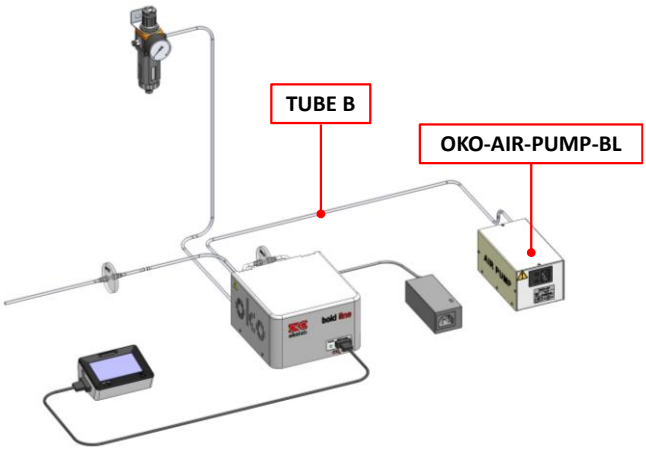


Figure 2. CO2 UNIT BL with OKO AIR PUMP BL

- **HM-ACTIVE** *(optional)* that includes:
  - **Humidity Sensor Lid** with Temperature control.
  - **Humidity bottle** and its Humidifier (**Heated Base**)
  - **Heated and Insulated Tube**

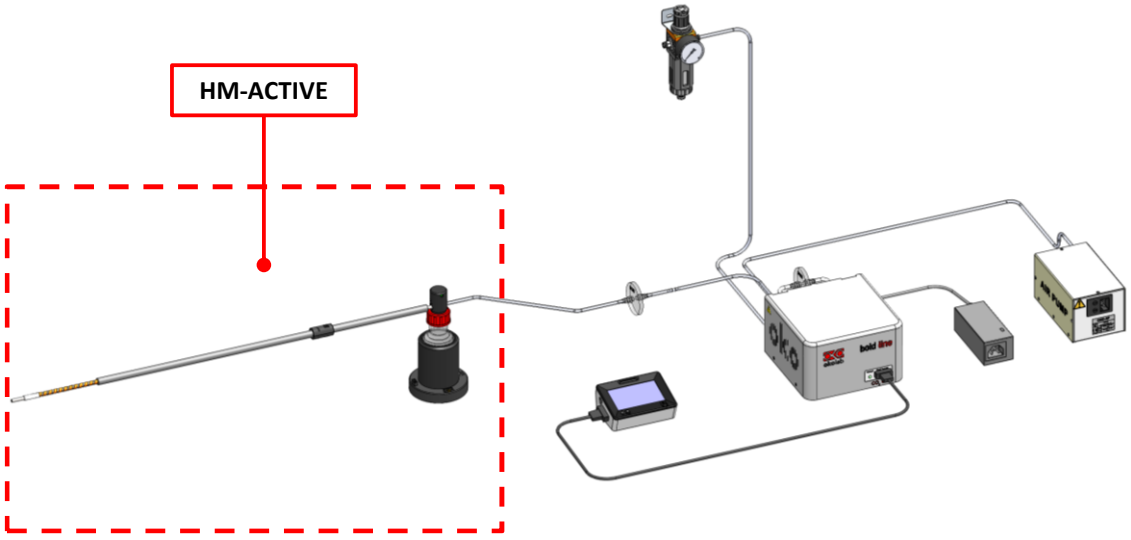


Figure 3. CO2 UNIT BL, OKO AIR PUMP and HM ACTIVE

- **DATA LOG *(Optional-to be purchased separately)*.** Software used to log, view, and store data from PC. It may be used to change parameters of the controllers via PC. Data can be exported in .xlsx format.

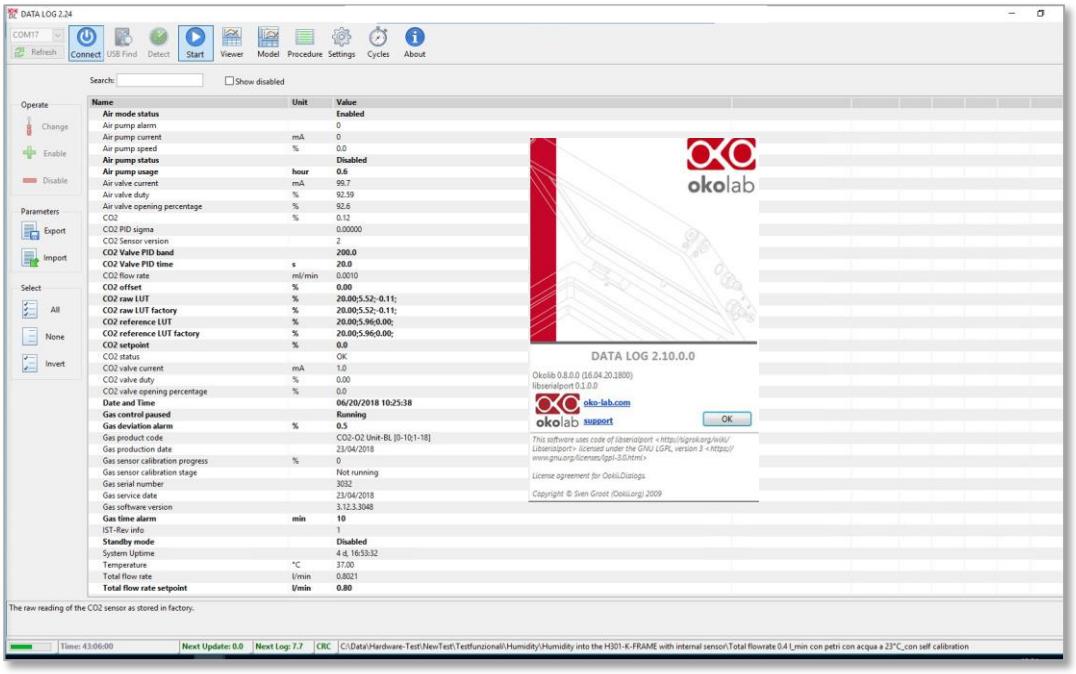


Figure 4. DATA LOG software.

- **SM-BL Smart Box.** To store data, to operate the controllers via web/smartphone/tablet and to allow remote assistance for service.

7 Equipment Description

A detailed description of the CO2 UNIT BL rear is provided in the following list, which refers to the pointers in Figure 5:

4. **Filter Out. To connect the PTFE filter**
5. **Filter In. To connect the PTFE filter**
6. **Gas Output**
7. **Power Input**

8. **OKO-AIR-PUMP-BL connector**. Leave unplugged if the system is not equipped with OKO-AIR-PUMP-BL
9. **HM-ACTIVE connector**. To connect the HM-ACTIVE active humidity controller
10. **GPIO (General Purpose Input Output) connector**
11. **USB connector**
12. **Air** Push to fit Input Connector for 6 mm O.D. rigid tubing carrying air from air source
13. **Pure CO2** Push to fit Input Connector for 6 mm O.D. rigid tubing

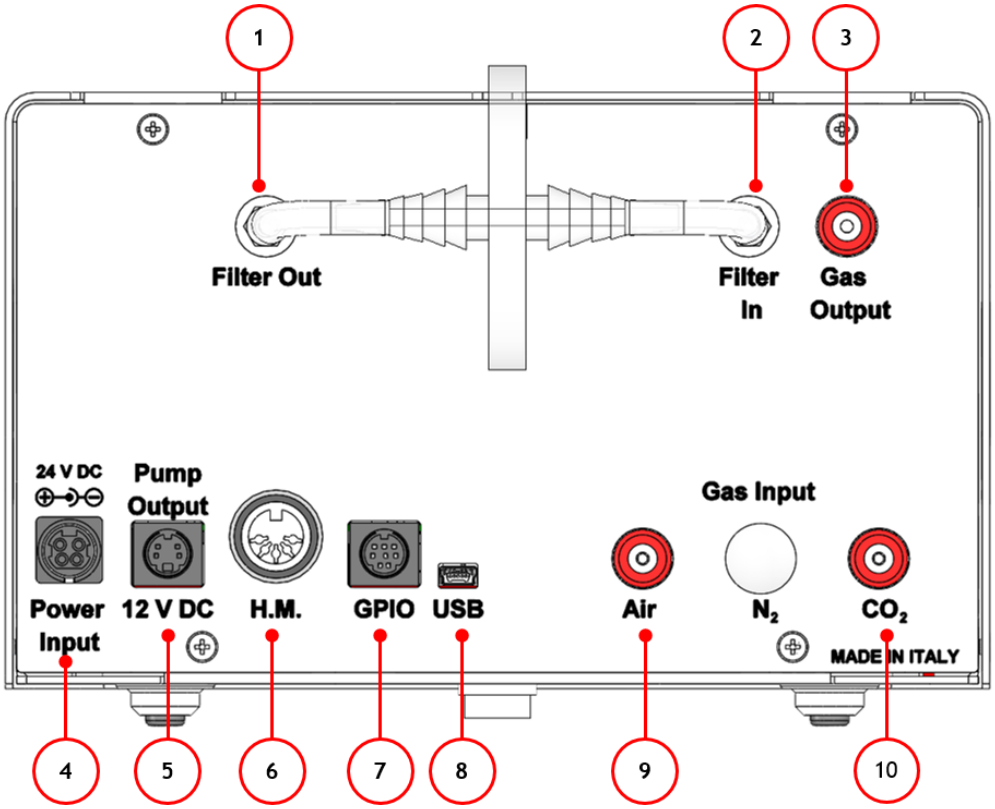


Figure 5. Gas Controller Rear Panel Overview

8 Installation

The following paragraphs will illustrate how to install and to use the CO2 Controller.

8.1 CO2-UNIT-BL. Installation guide

The following instructions shall give you the possibility to install the unit quickly. For safe operation of the unit it is absolutely necessary to read carefully all the instructions and safety notes.

1. Install the **pressure Gauge for the CO2 line** between the CO2 tank and the CO2-UNIT-BL. Follow the arrow on the rear of the Pressure Gauge for the correct Gas In-Out (See Figure 6).

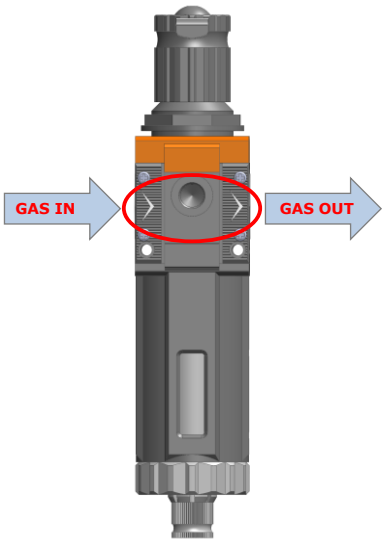


Figure 6. Input and Output gas ports. See symbol on the rear of Pressure Gauge

On the bottom of the unit there is an automatic purging valve. Close it before operating the Pressure Gauge. To close the purging valve, looking at the regulator vertically from the top knob, pull it down and rotate it counterclockwise. (See A and B in Figure 7). Now you can operate the Pressure Gauge.

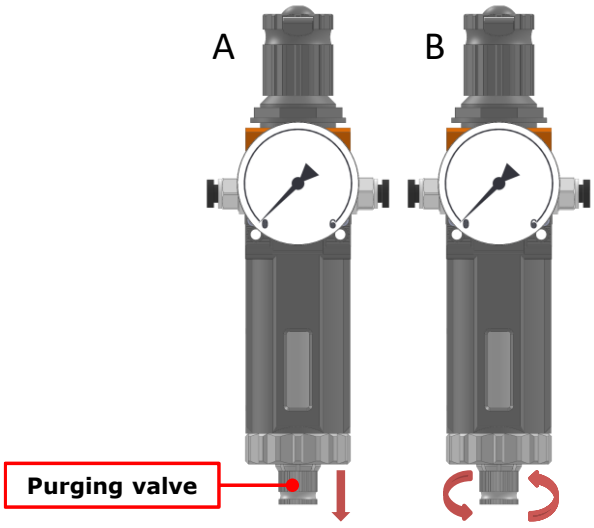


Figure 7. How to close the purging valve of the Pressure Gauge

To close the gauge, pull the knob up and rotate it counterclockwise. Push the knob down to lock it. Open valve on gas supply tank. Adjust Pressure Gauge by pulling the top knob up and rotating it clockwise until the pressure reaches the desired value (See Figure 8), then push the top knob down to lock it.

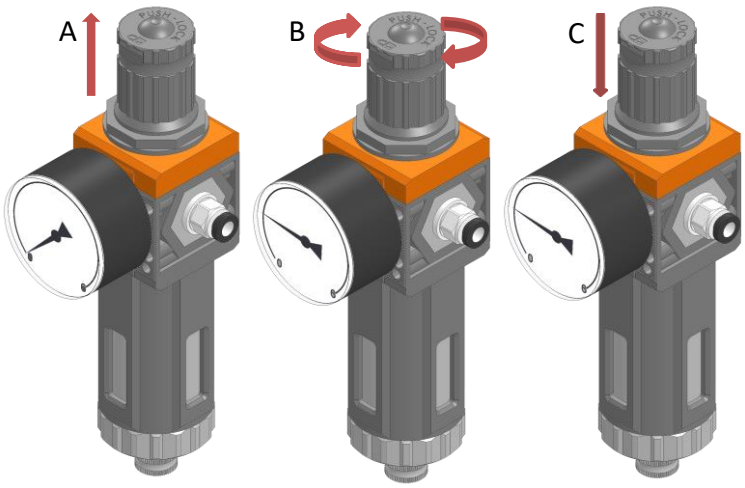


Figure 8. Pressure gauge using

2. Install the **PTFE filter** on the rear panel of the CO2-UNIT-BL. It filters the Air/CO_2 flow coming from their tanks before entering in contact with sensing cells. It prevents sample contamination from bacteria and gas sensors from damages caused by dirty gas streams. It is connected with two 4 I.D. mm silicon tubes with the "Filter In" and "Filter Out" connectors on the rear panel of the CO2-UNIT-BL (see Figure 9 and pointer 1 and 2 in Figure 5).

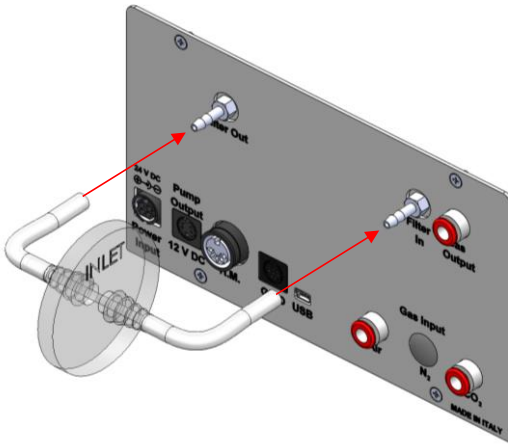


Figure 9. Filter tubing

Tip ► *Replace this filter each 2-3 months of continuous use or when it is present water in the inner part of the filter.*

Do not remove the filters. This may cause damages to the gas sensor and sample contaminations.

---

3. Tubing for CO_2 and Air lines are rigid tubing, 6 mm O.D. (TUBE A in par. 4), and they connect to the CO2-UNIT-BL through Push-in connectors (see Figure 10 and pointer 3 in Figure 1). Make sure to push tubes securely all the way into connectors avoiding any gas leak. To remove tubing from push-in connectors push

the black or red rubber ring while pulling the tubing. If tubing does not easily come out, do not force it, simply make sure the black ring is properly pushed.

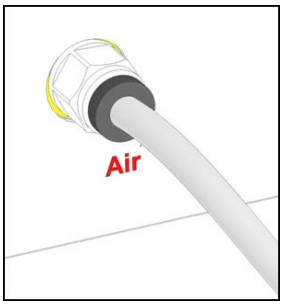


Figure 10. Avoid gas leak: strongly push the tube into the Push-in to-Fit connector

Before disconnecting any of the polyurethane tubing connected to tanks or to the CO2 Controller, make sure there is no residual pressure by adjusting the pressure gauges upstream of the system and the tank manometer.

4. Figure 11 shows the connections between the CO_2 and Air tanks and the respective connectors on the rear panel of the CO2-UNIT-BL (see pointer 3 in Figure 1).

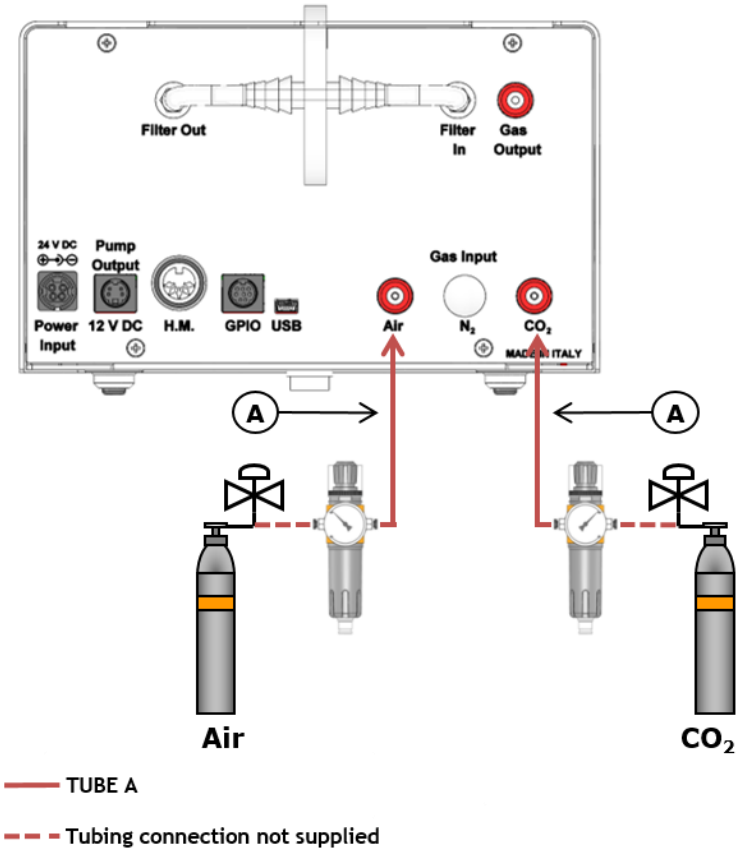


Figure 11. CO_2 and Air Tanks connections to the back panel of the CO2 Controller

Tip ► *If you have ordered OKO-AIR-PUMP-BL, you have to connect TUBE B (see par.6 Figure 2) between the Air Pump and the connector labeled "Air" on the rear panel of the CO2 Controller (see Figure 12).*

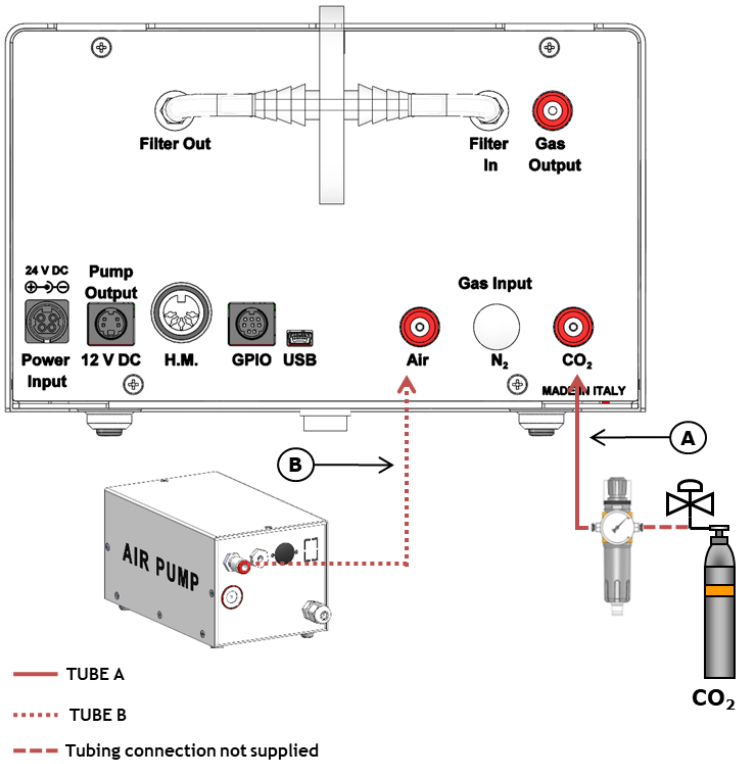


Figure 12. CO_2 Tank and Air Pump connections to the back panel of the CO2 Controller

5. Connect the touch screen interface OKO-TOUCH to the CO2 Controller with the RS232 serial cable as illustrated in Figure 13.

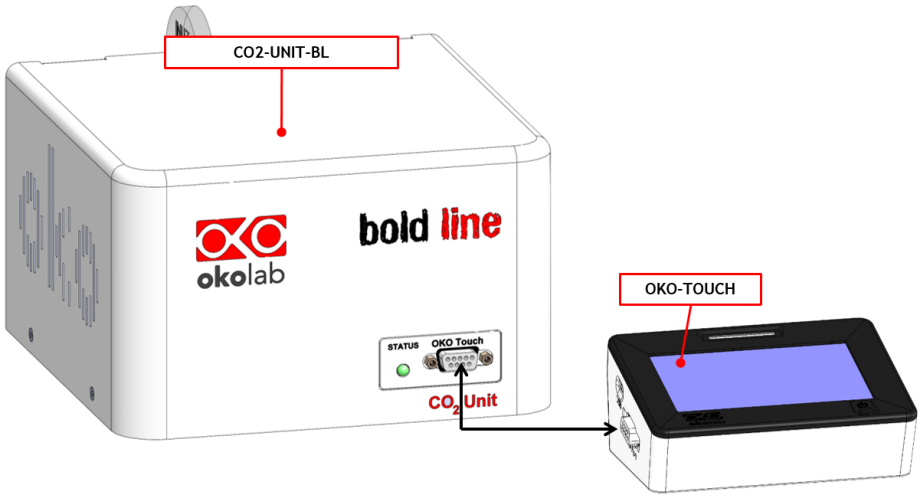


Figure 13. Oko Touch Connection

6. Connect the power adapter to the CO2 Controller (see pointer8 in Figure 2Figure 1).

8.2 CO2-UNIT-BL. Set up the system and Turn the Unit On

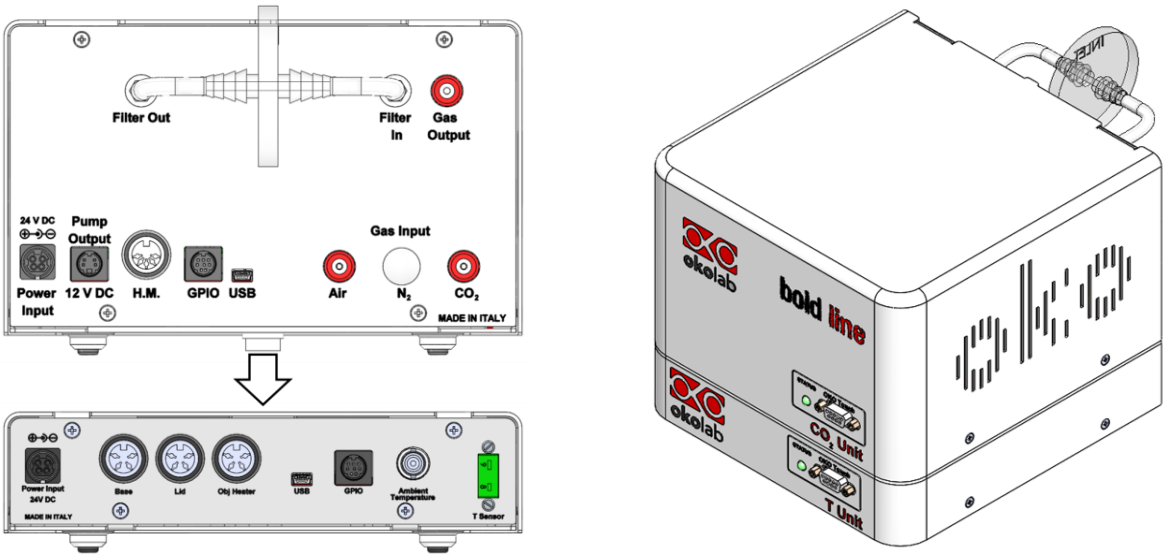
Brief instruction to set up and turn on the unit.

1. Regulate the pressure of each gas before the CO2 Controller at 1.4 barg (20.3 PSI). **Do not exceed 1.5 barg!**
2. Check that all the cables are properly installed as described in the previous paragraph.
3. To switch the CO2 Controller on use the power button on OKO-TOUCH. The led on the front of the CO2 Controller will turn green.

4. Once the system has been initialized the led on the CO2 Controller will stop blinking and will turn steadily on. The Homepage will appear on the touch screen, the color of the light indicator on the gas tab will be yellow at the start.
5. Select the set point gas composition from the touch screen Home page (see Paragraph 9.1.1.).
6. Wait until the light indicator on the Home page becomes green.

8.3 How to assemble CO2-UNIT-BL with a Temperature Unit

CO2-UNIT-BL can be used as a stand-alone device or in combination with any one of the Bold Line Microscope Incubator. Figure 14 shows how to assemble CO2-UNIT-BL, for example, with a H301-T UNIT-BL-PLUS.



a. CO2-O2 UNIT-BL [0-10; 1-18] and H301-T-UNIT-BL-PLUS. Units rear panels.

b. CO2-O2 UNIT-BL [0-10; 1-18] and H301-T-UNIT-BL-PLUS. 3D view.

Figure 14. CO2 UNIT-BL and H301-T-UNIT-BL-PLUS

The T-Unit and the CO2 Controller must stack on top of each other by lining up the bus ports located on the top and bottom surface of each. When the units are properly connected the Temperature and CO_2 parameters will appear on the OKO-TOUCH Touch Screen interface Home page. If not all the parameters appear on OKO-TOUCH Home Page then the Control Units are not properly connected. Please check that the bus ports are properly aligned with each other.

If you have the CO2 Controller and a Temperature Control Unit, it is essential to read both this manual and the Temperature Control Unit Manual to familiarize yourself with the functions and the operation of the devices before use.

9 User Interface

This chapter describes the user interface of the CO2 UNIT BL.

9.1 Home page

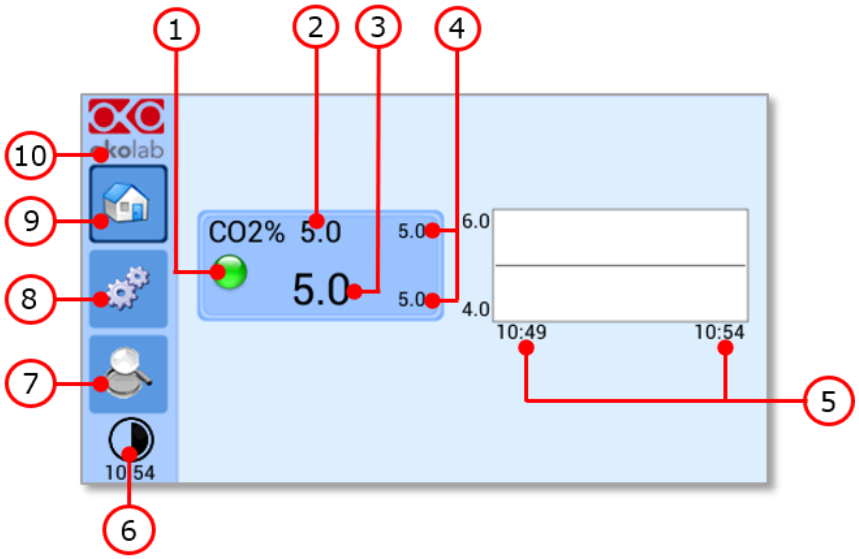


Figure 15. Homepage of the CO2 Controller Touch Screen Display

1. Status LED
2. CO_2 set point (see 9.1.1 to learn how to change the set point value)
3. CO_2 current value
4. Min/max CO_2 values within the time-frame set in the *Options subpage (see paragraph 9.2.2.1)*
5. Chart history length set at 5 minutes
6. Display mode. Touch here to switch display mode
7. Overview page
8. Settings. Press here to access system options and settings
9. Home. To open the homepage
10. Product info. Press here to know generic info about CO_2 UNIT BL and running time

Tip ► *The OKO-TOUCH is pre-set at a 5% CO_2 concentration hence when you witch it on the system will start operating to reach this set-point value.*

9.1.1 How to enter the set point

To input a new set-CO_2 set point, touch the corresponding tab, as indicated in Figure 16 (a).

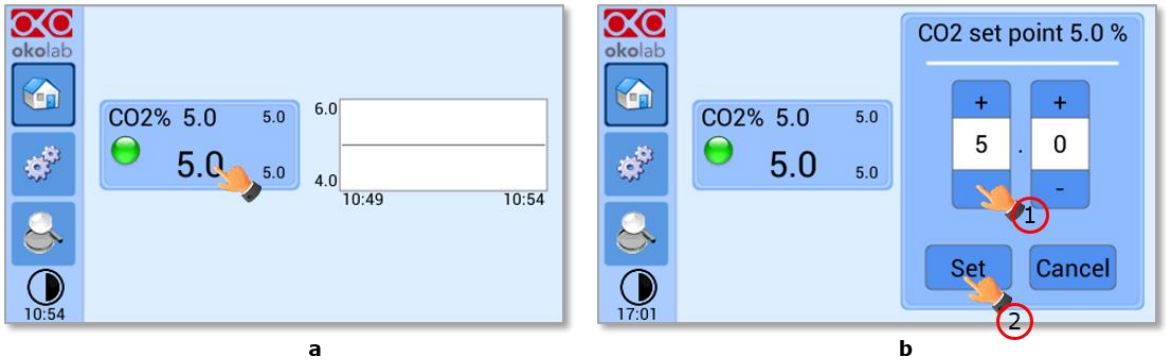


Figure 16. How to change the CO_2 set point

The set point regulation page will appear as in the Figure 16(b). You can modify the set point by clicking on + and –. Once you have input the new CO_2 set point, press *Set* to save or *Cancel* to undo.

Tip ►*After any change in the set point value the controller enters into a transient regime, the Status Indicator and the Top LED turn yellow (see paragraph 9.1.2). During the transient regime, the controller will not trigger on alarm.*

9.1.2 Controller Status: colours led and meaning

The C02 UNIT BL can assume four different status, which are represented by the colors assumed by the Status Indicator (pointer 1 in Figure 15) and by the TOP LED (if enabled, as indicated in paragraph 9.2.2.3):

The GREEN color indicates that the set-point value has been reached (within the tolerance defined in the alarm subpage, see paragraph 9.2.2.5) and that the system is working properly.

Controller Status: NORMAL

The YELLOW color indicates that the controller is in transient regime. The Yellow light will appear after the controller is turned on and after any set point chance. The system is working properly, it is not in alarm and no action is needed. As soon as the CO2 UNIT BL reaches the CO_2 composition, the CO2 Controller Status changes to NORMAL and the color turn GREEN. If the CO2 UNIT BL cannot reach the set composition values within the maximum time defined by the operator (see paragraph 9.2.2.5), the Gas Controller Status changes to ALARM and the color turn ORANGE.

Controller Status: TRANSIENT

The ORANGE color indicates that that the current gas concentration is not correct and its value is out of the set tolerance (see section “ALARMS” in paragraph 9.2.2.5). Most commonly this is related to gas leaks or gas source(s) running low. Verify that all cables are correctly connected. Check all tubing for gas leaks and pressure in gas supply tanks.

Controller Status: ALARM

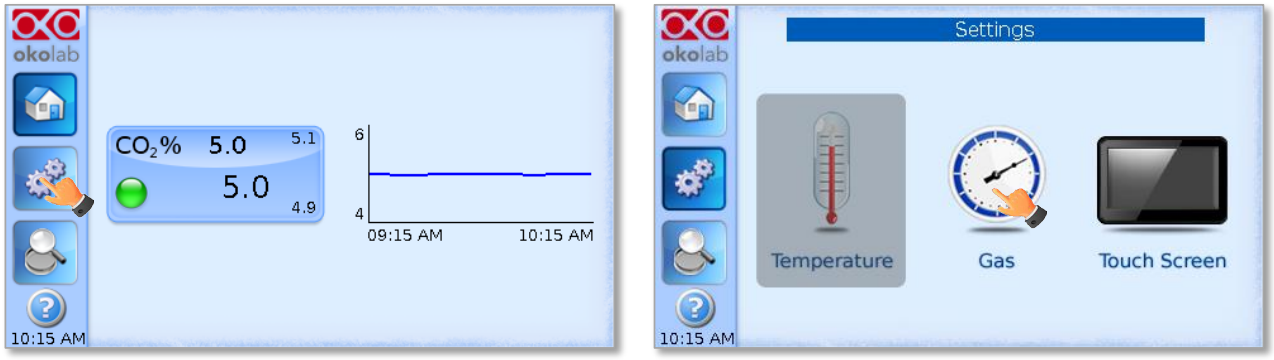
The RED color indicates that there is a problem with the unit itself (for example the sensor is broken). The system is on alarm. Turn the system off, wait for 5 minutes, and turn it back on. If the color is still red, contact Okolab at www.oko-lab.com for support.

Controller Status: ALARM

9.2 Settings

9.2.1 Gas

Press on the Settings Icon to adjust gas settings, as shown in the Figure 17 (a and b).



a **b**

Figure 17. Gas Settings (a – b)

When you press the Gas Icon , the Gas Settings Submenu will open. See Figure 18.

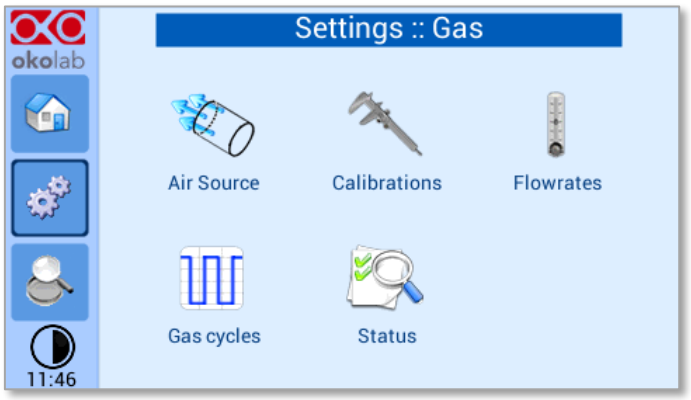
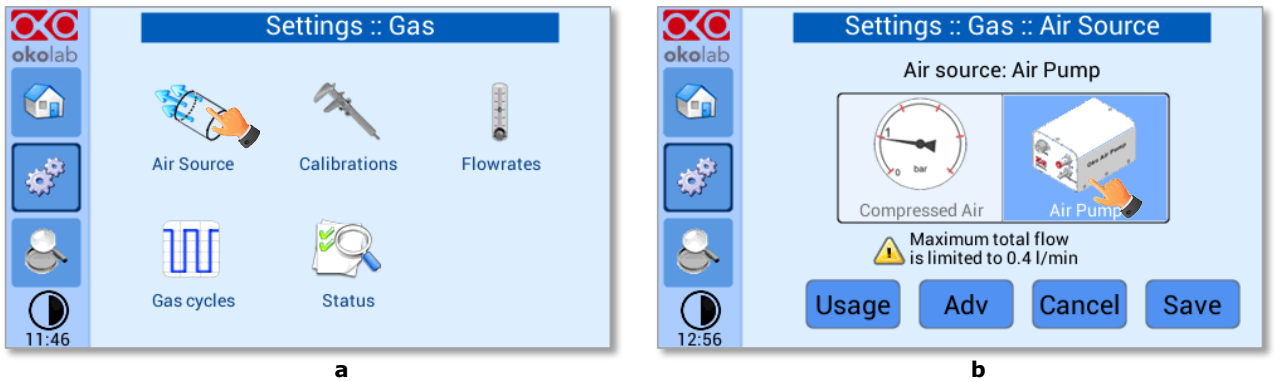


Figure 18. Gas Settings submenu

9.2.1.1 Air Source

Press the icon to set which Air source you are using (see Figure 19 a). If this is an external Air tank or compressed Air line (Compressed Air) or if you are instead using the OKO-AIR-PUMP-BL (Air Pump) (See Figure 19 b).



a **b**

Figure 19. Air Source page (a - b)

To connect the air pump (OKO-AIR-PUMP-BL) to the CO2 Controller, see Figure 12. In the case you are using OKO-AIR-PUMP-BL please note that it can be turned on/off only via the Touch Screen interface (OKO-TOUCH). Thus, it is essential that you hereby set the correct Air source.

By pressing on "Usage" button (see Figure 20 a), it is possible to check/reset the usage time of the air pump:

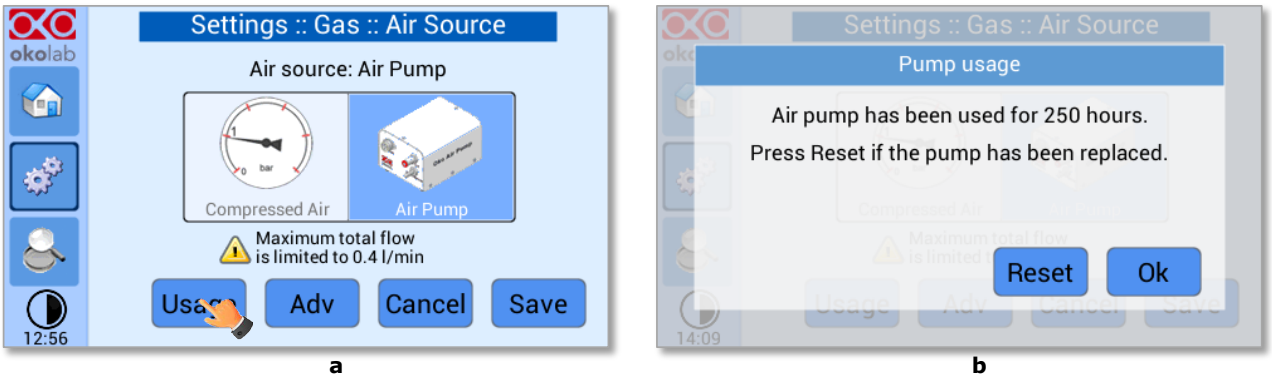


Figure 20. Air pump usage (a – b)

Tip ► Do not forget to reset the time counter after replacing the air pump.

Press on "Adv" button (see Figure 21 a) to change the air pump speed in a range [-10; +10] %: (see Figure 21 b).

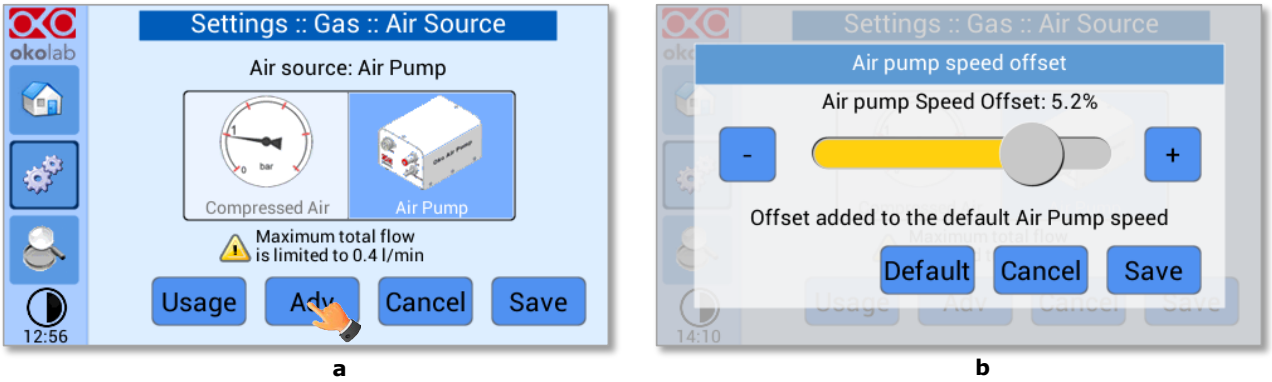


Figure 21. Air pump advanced settings (a – b)

Tip ►*Reducing the air pump speed will lead to a lower emitted noise from the air pump, while rising the air pump speed will help if you cannot reach your desired flow rate set-point.*

9.2.1.2 Calibrations

Press on Calibration icon to enter in the Calibration Menu, as shown in Figure 22

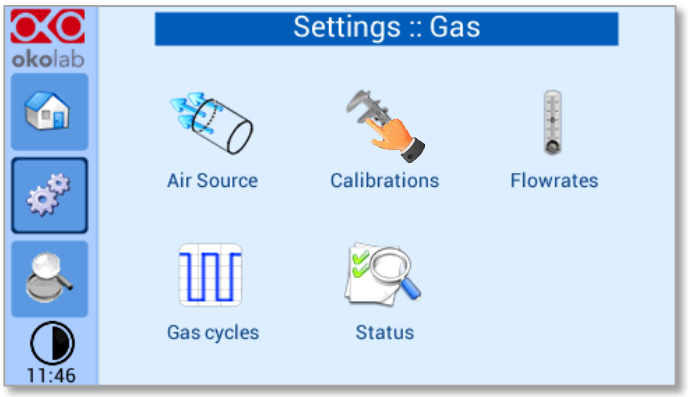


Figure 22. How to reach the Sensor Calibration Submenu

9.2.1.2.1 Offset (with exthernal meter)

Press on Offset icon to calibrate the instrument by using an external CO_2 meter (NOT hereby provided).

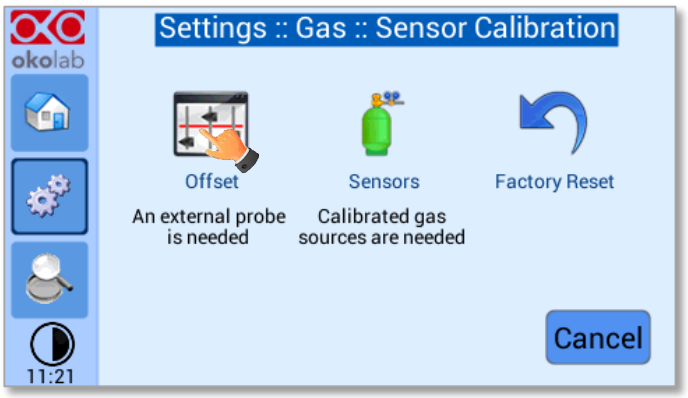


Figure 23. Sensor Calibration Submenu

To run the gas sensor calibration through an external gas meter follow the indications below:

1. Disconnect the blue tubing inserted into the "Gas Output" port. Remove it by keeping the black ring of this connector pushed in; you should feel no resistance in pulling this tubing out. If you do make sure you are properly pushing in the black ring.

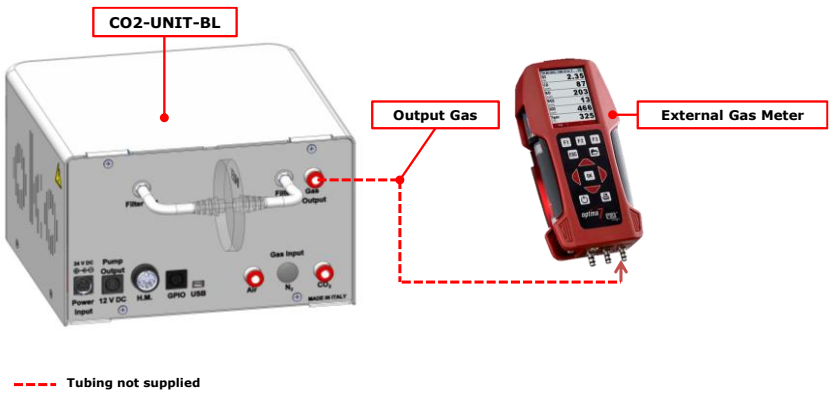


Figure 24. External Gas Meter Connection

2. Connect the external Gas meter as shown above (see Figure 24). The Gas Meter will read same gas levels that are going into the Top Stage Incubator.
3. Wait until the external Gas meter steadily reads CO_2 value; this may take 10-15 minutes.
4. When you are sure that the value being read is at steady state press on the "External Probe" Tab.
5. The Figure 25 b appears. Press on "+/-" to input the CO2 level read by the external Gas meter (i.e. 5.5%), then press "Save".

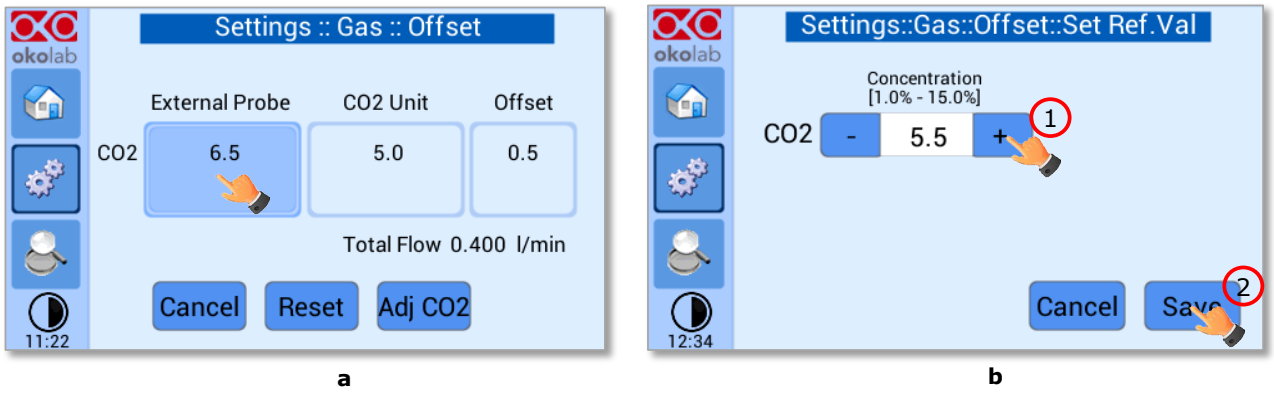


Figure 25. Manual Calibration (a – b)

Note ► *The Touch Screen will go back to the previous screen. It will display on the left ("External Probe" tab) CO_2 level read by the external Gas meter as you have just input. The value in the "CO2 Unit" tab is the value that the device (CO2 UNITL BL) was reading before connecting it to the external Gas meter.*

6. Now press "Adj CO2"

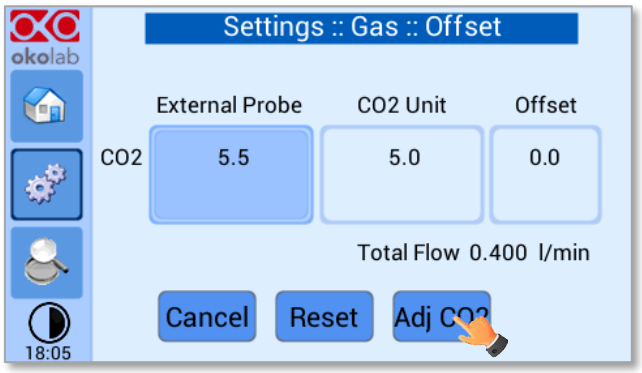


Figure 26. Manual Calibration Correction

Note ► *Once you have pressed "Adj CO2", the system will perform a self-calibration using the input value from the external meter as a reference. After pressing "Adj CO2" an offset resulting from the calibration will be displayed on the "Offset" tab (last tab on the right). Now you can press the "Home" icon to go back to the Main page.*

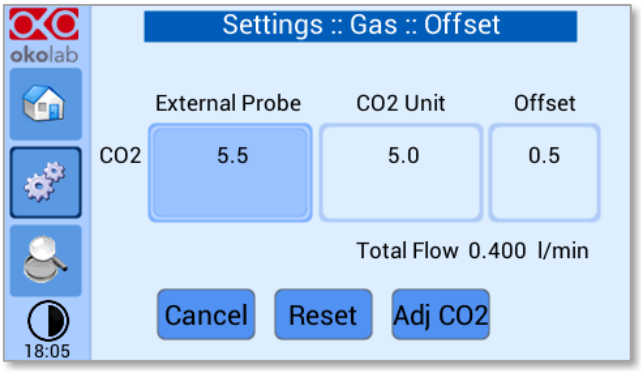


Figure 27. Manual Calibration End

Please make sure that the external Gas meter you use has been recently calibrated and that it has sufficient accuracy. It often happens that external Gas meters are less accurate than our CO2 UNIT BL, and are not suitable to perform the calibration described above.

Finally, if you are unsure on the calibration you have just performed or if for any reason you want to reset to the factory calibration simply go to the "Sensor Calibration" page (Figure 23) and press "Factory Reset".

9.2.1.2.2 Sensors (with calibration gas)

This function allows performing a calibration using a Span Gas or pure Air or pure N_2 Tank. Before starting the instrument calibration, make sure you have the Gas Tank connected to the port labeled "Air Input" on the rear panel of the CO2-UNIT-BL, then press the Sensors icon . At this point several options are available (see Figure 28 b).

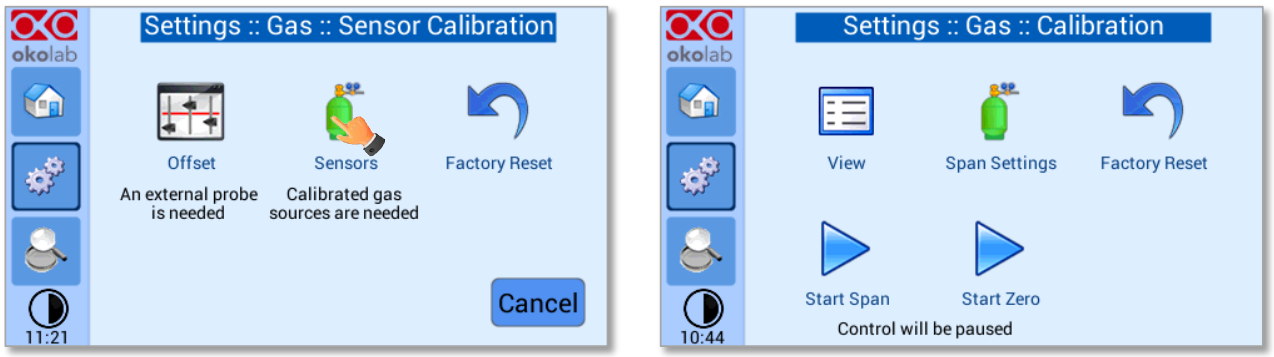
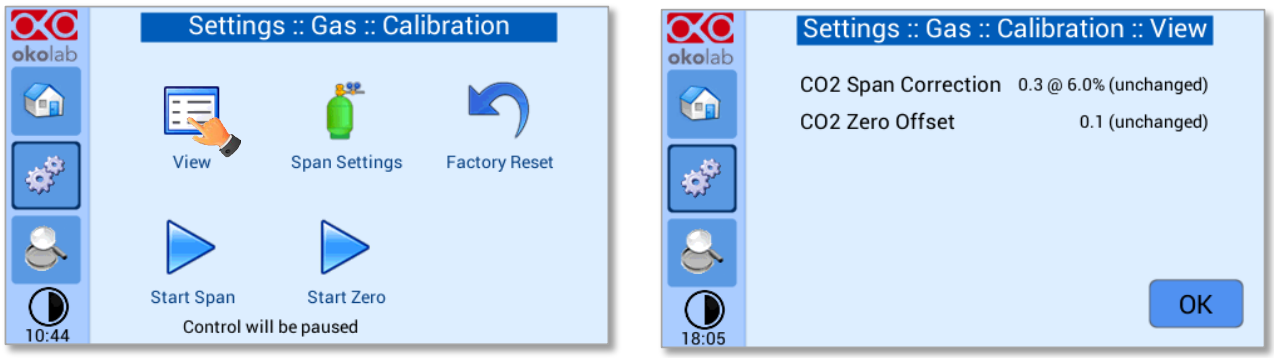


Figure 28. How to insert the Span Gas Calibration parameters (a – b)

9.2.1.2.2.1 View

Press on View icon to visualize the latest calibration.

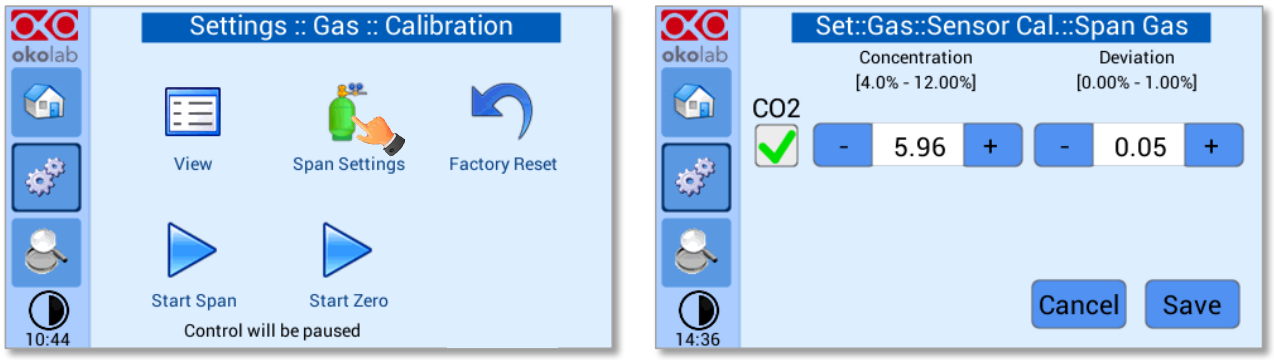


a **b**

Figure 29.View Sensor calibration status

9.2.1.2.2.2 Span Settings

Press on Span Settings icon to access to the span gas settings (see Figure 30 a) and insert the exact gas composition of your span gas tank (see Figure 30 b).

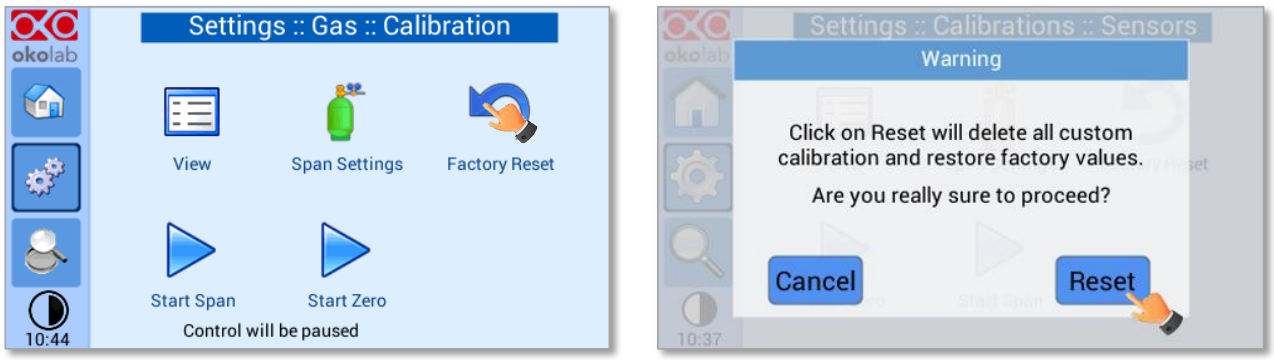


a **b**

Figure 30. Span Settings Menu (a – b)

9.2.1.2.2.3 Factory Reset

Press on Factory Reset icon to reset Gas Calibration to factory. After clicking, a pop-out message will appear. If you are sure to proceed and restore factory values, press "Reset", as shown in the Figure 31 b.



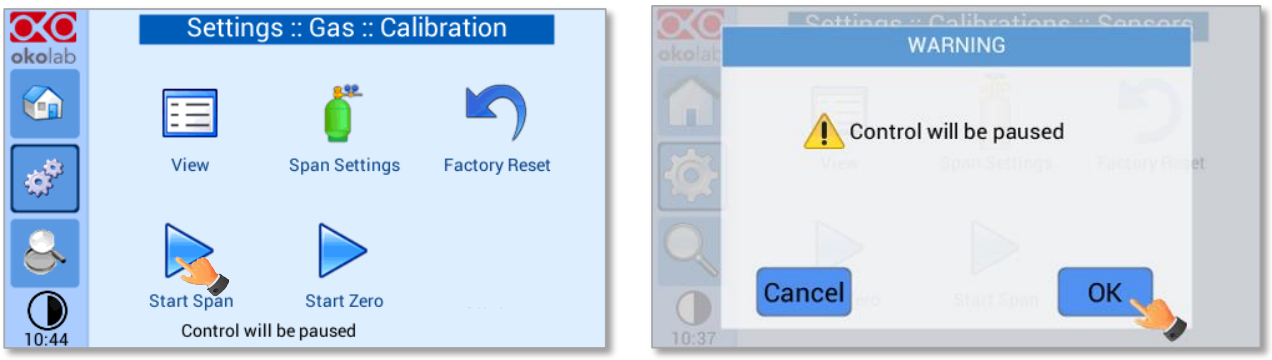
a **b**

Figure 31. Factory Reset Menu (a – b)

9.2.1.2.2.4 Start Span

Press the Start Span icon and the controller will perform a new Gas Calibration for the CO2 using a span gas (see Figure 32 a).

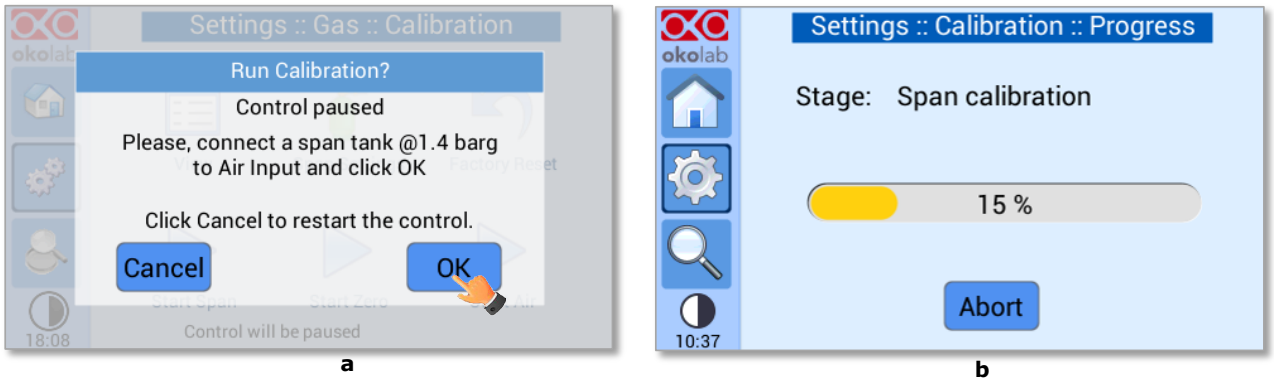
After clicking, a pop-out message will appear, warning about the pause of the control during the calibration routine (see Figure 32 b).



a b

Figure 32. Start Span calibration (a – b)

Click "OK" and the controller will ask for connecting the span tank at 1.4 barg to the Air Input, located on the rear panel of the CONTROLLER, the Span Gas Calibration will start after pressing "OK" (see Figure 33 a) and the progress bar will appear, as shown in Figure 33 b.



a b

Figure 33. Span calibration running (a – b)

9.2.1.2.2.5 Start Zero

Press the Start Zero icon to perform a new Zero Calibration (see Figure 34 a).

After clicking a pop-out message, will appear, warning about the pause of the control during the calibration routine (see Figure 34 b).

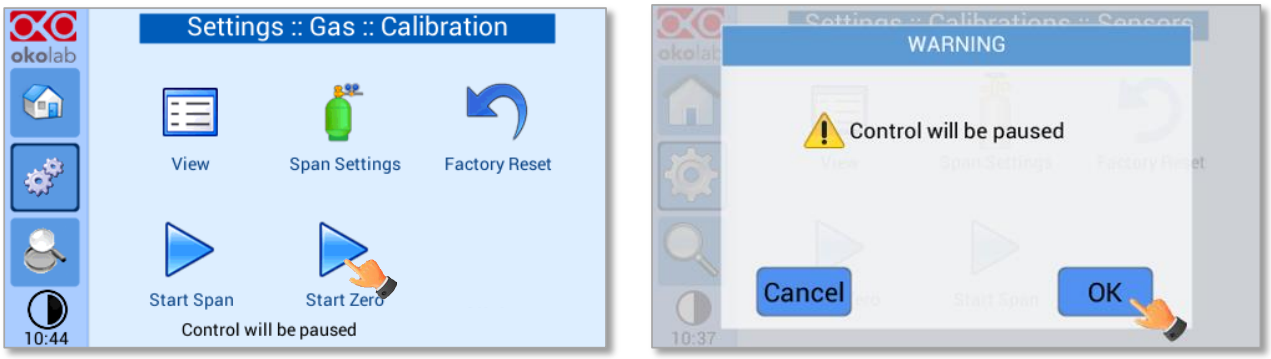


Figure 34. Start Zero calibration (a – b)

After clicking "OK" (see

Figure 35

Figure 34 b), the controller will ask for connecting N2 at 1.4 barg to the Air Input, located on the rear panel of the CO_2 CONTROLLER (see

Figure 35 a), the Zero Calibration will start after pressing "OK" and the progress bar will appear (see Figure 35 b).

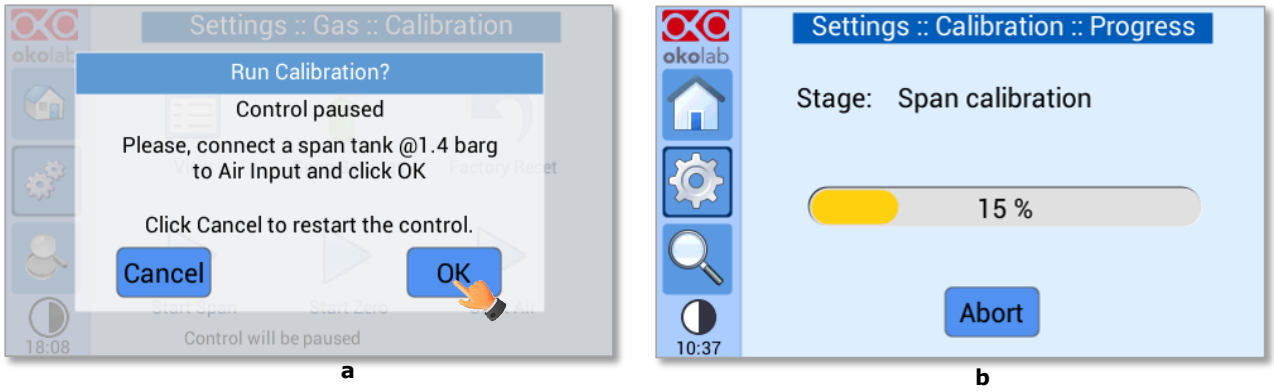


Figure 35. Zero calibration running (a – b)

9.2.1.2.3 Factory Reset

If you are unsure about the calibration you have just performed or if for any reason you want to reset to the factory calibration go to the "Sensor Calibration" page and press on Factory Reset icon .

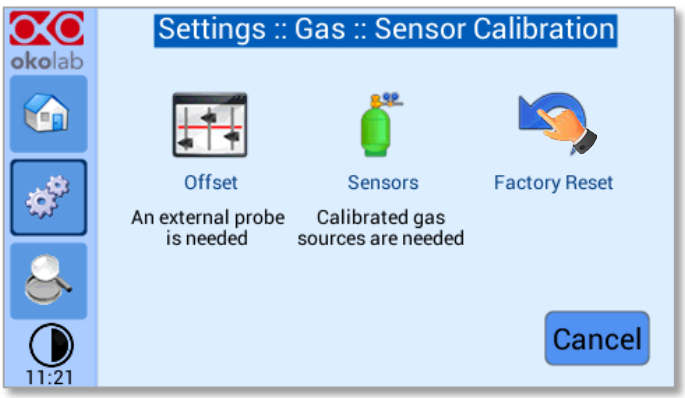


Figure 36. Sensor calibration factory reset.

9.2.1.3 Flowrates

Press the Flowrates icon to check how many liters per minute of Air and CO_2 the system is consuming (see Figure 37 a). Additionally, this panel allows you to select the flowrate of the gas mixture you want to send to your incubator/device. Press the "Total" flowmeter to set the gas flowrate in the range 0.0÷1.0 L/min using the slider, as shown in Figure 38.

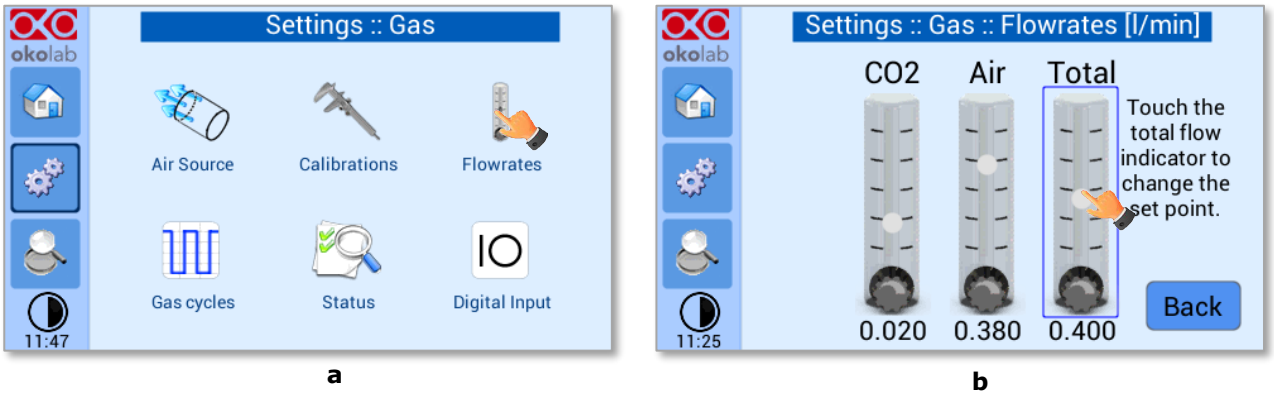


Figure 37. Flowrates View (a – b).

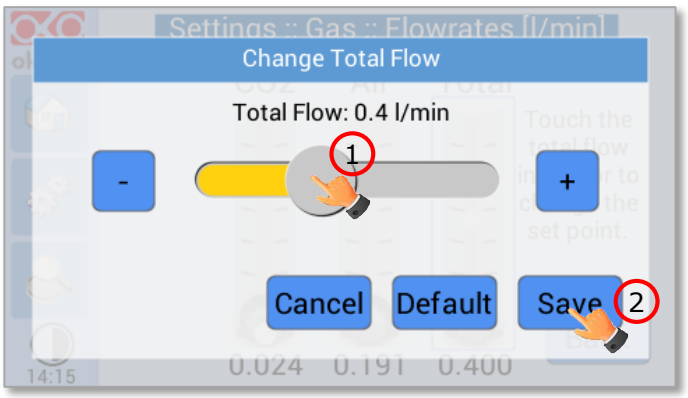


Figure 38. How to change the total flow rate.

When setting the flowrate at 0.0 l/min the gas flowrate will be paused and output flow will be interrupted. In this working mode three dots will appear in Homepage instead of CO_2% current value and the indicator will turn yellow.

When using the OKO-AIR-PUMP-BL as Air Source, the maximum flowrate value you can set is 0.4 l/min.

9.2.1.4 Gas cycles

This function allows switching between two different CO_2 concentrations. Press the Gas cycle icon to set a gas concentration cycle (see Figure 39 a).

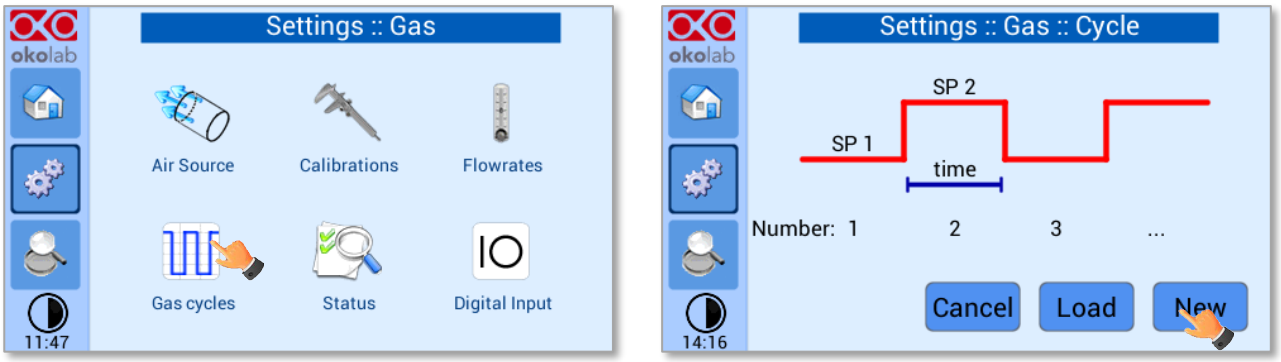


Figure 39. CO_2 % Cycles Subpage (a – b)

You can decide whether setting a new gas cycle ("New", as shown in Figure 39 b) or load a previously saved one ("Load"). To set a new CO_2% concentration cycle, follow the indications below:

1. Choose the two CO2% concentrations between which you want to switch (SP1: Set Point 1 and SP2: Set Point 2, as shown in Figure 40 a).
2. Set the duration in hours and minutes you want the system to dwell on each concentration.
3. Set the number of cycles ("Number") you want the system to perform (see Figure 40 b).

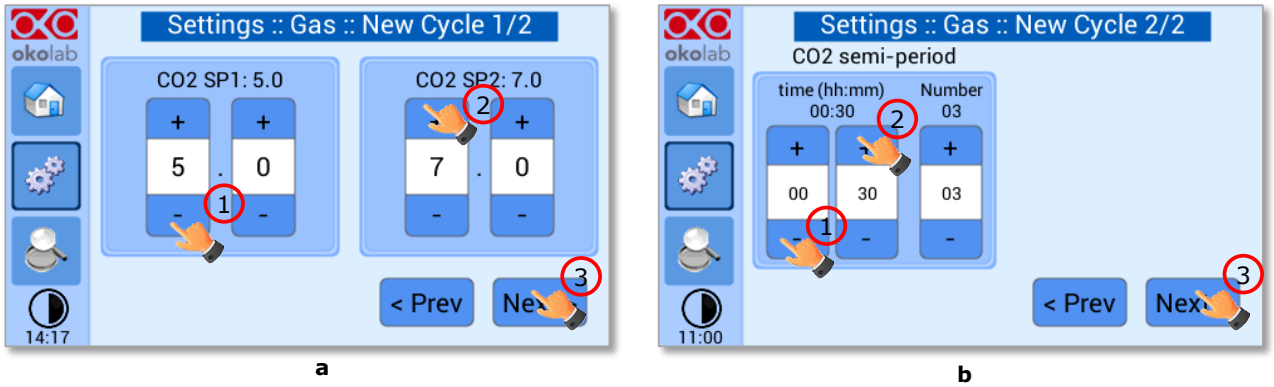


Figure 40. CO_2 Concentrations cycles settings (a – b).

Once you have adjusted the settings, a "Cycle Summary" page will be displayed.

4. Press "Save As" if you want to save the CO_2 Cycle program to be recalled for future experiments (see Figure 41 a).

Note ► You can save up to 4 different CO2 cycles programs. Saving a 5th one will overwrite the first saved one.

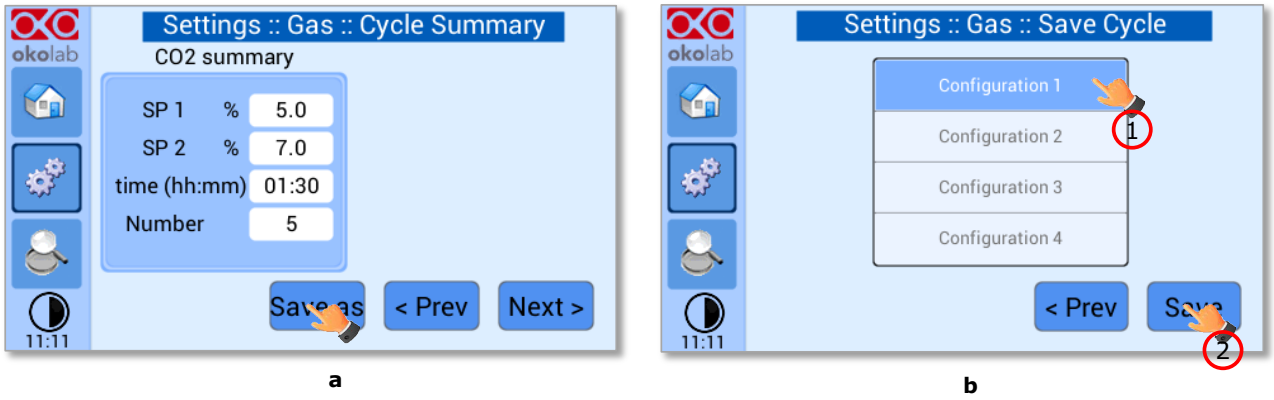


Figure 41. Cycle Summary and Configuration Saving (a – b)

5. Schedule the time for the gas cycle to start (see Figure 42).

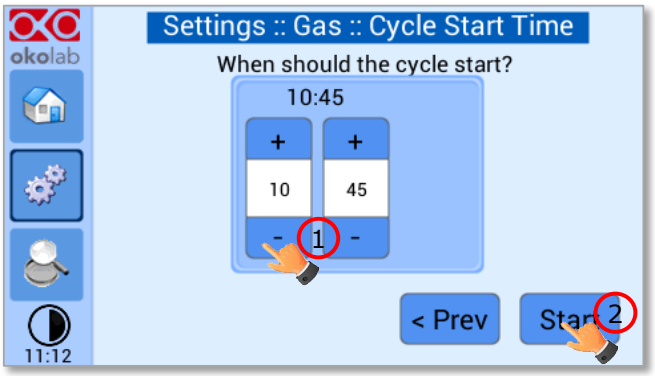


Figure 42. Cycle Start.

The cycle will start at the time set. A concentration cycling icon will be displayed on the Homepage as a reminder (Figure 43).

Note ► *Trying to change set points or starting a new cycle while a different one is still running will open the window in Figure 44. You can press Abort Cycle to modify it or start a new one. Pressing "View" will open the current cycle settings.*

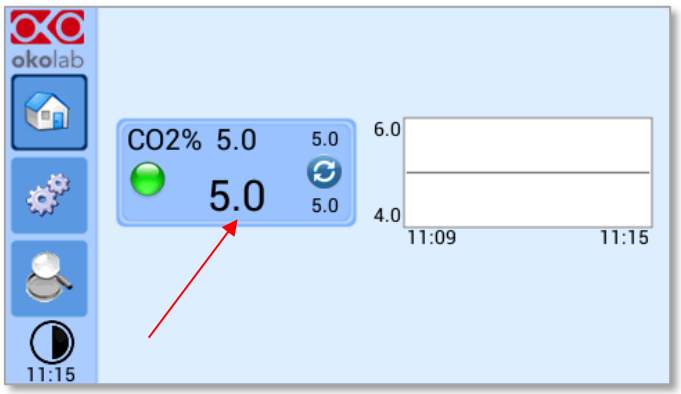


Figure 43. Icon in Homepage during a CO_2% cycle

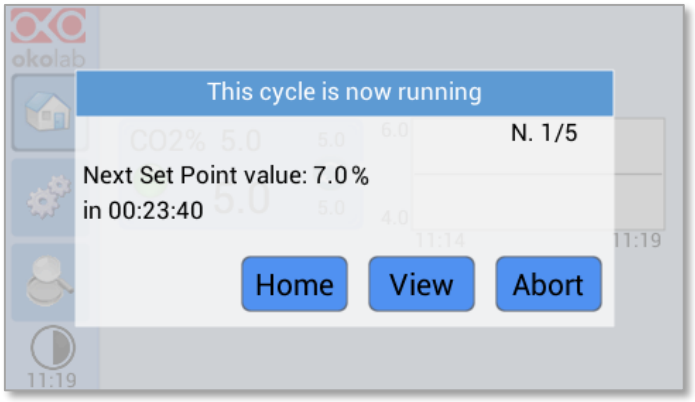


Figure 44. Warning shown if you try to change set point during a gas cycle

9.2.1.5 Status

Press the Status icon to check the CO2-UNIT-BL performance (see Figure 45 a). Most of the parameters displayed are technical/control parameters that you may be asked to share in case you have requested for Okolab support (see Figure 45 b).

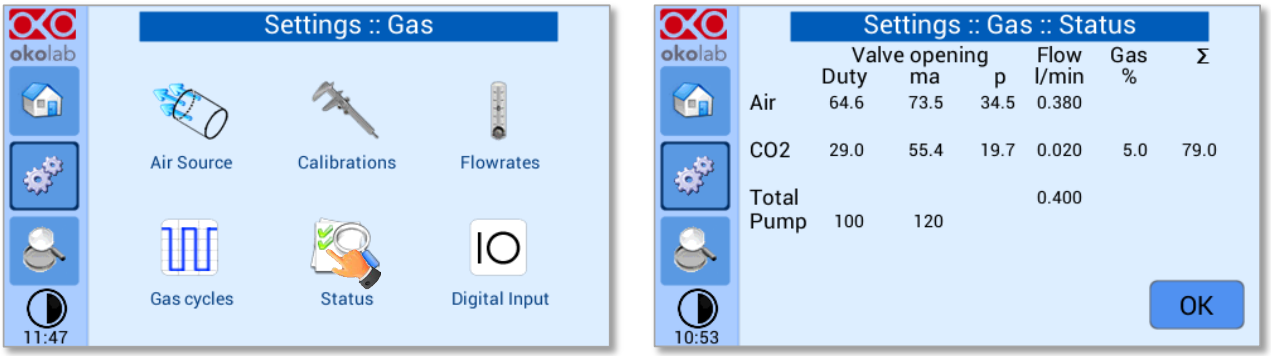


Figure 45. Status page (a – b).

The values that may be of interest to users are “Flow” and “Gas %”. All other parameters are just to be communicated to our technicians in case you may need Okolab support.

9.2.1.6 Digital Input

Digital Input feature is available only for TTL ready (optional) controller.

TTL feature allows to change setpoint between two specified values using a TTL signal (see Figure 46 b). The TTL is a digital input for our Units and has only two values: High and Low. The setpoint values for High TTL value and for Low TTL value can be set using OKO-TOUCH, via GPIO connector.

When TTL Control is enabled, the user cannot change the setpoint using the dialog in the main page. In this case, the setpoint value is read by the external TTL signal.

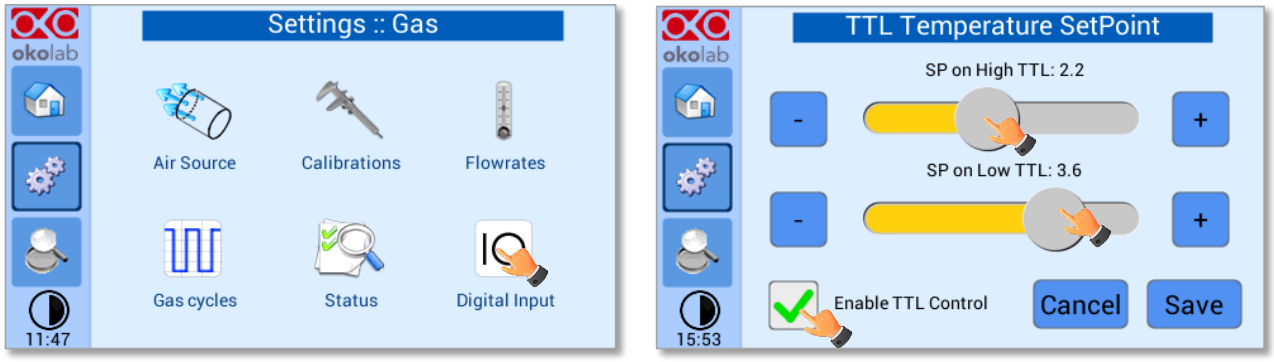


Figure 46. Digital input (a – b)

9.2.2 Touch Screen configuration

Press on *Settings* icon to enter the *Settings* menu, as shown in the Figure 47(a). To enter in the Touch Screen configuration menu, press on the icon , as shown in Figure 47(b).

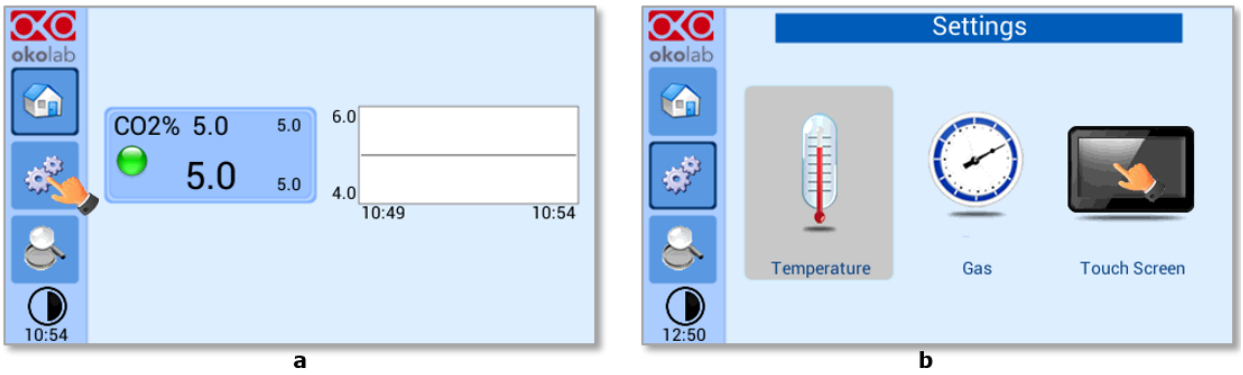


Figure 47.Touch screen settings (a – b)

9.2.2.1 Touch Screen Options

The Display Options menu allows to set the time frame in which the minimum and maximum CO_2 values are collected. To insert the time frame, press on the icon and slide your finger along the *Chart history length* bar or click the +/- icons, then press *Save*, see Figure 48 b.

In this window you can set the scale of the X axis (time duration) of the graphs displayed in the main page and the buzzer sound frequency.

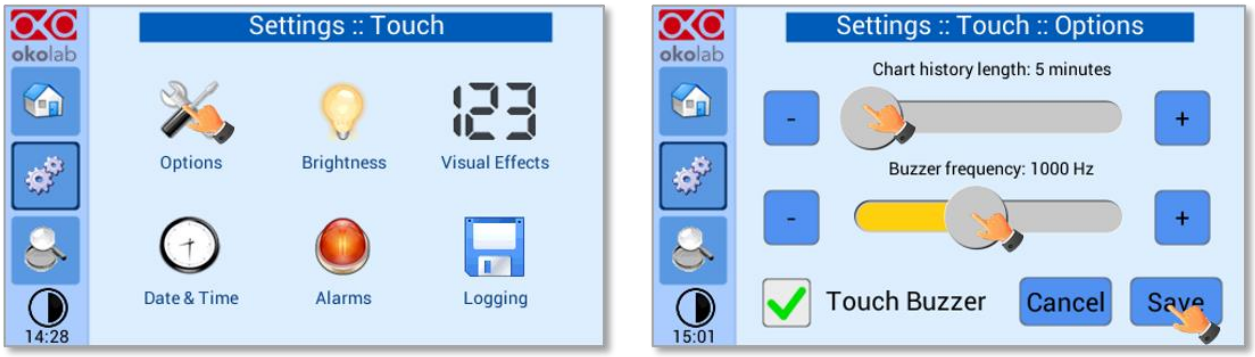


Figure 48. Touch Options (a – b)

Tip ► *Recommended value for the chart history length is 60 or 120 minutes.*

To change the touch sound frequency press and slide your finger along the setting bar indicated with *Sound frequency*, then press *Save*, see Figure 48 b.

Note ► *To activate a sound at each touch, flag the tab labeled Touch Sound*

9.2.2.2 Touch Screen Brightness

To modify display *Brightness,* press the icon and scroll the bar or press the +/- icons in the page that opens, as shown in Figure 49 a.

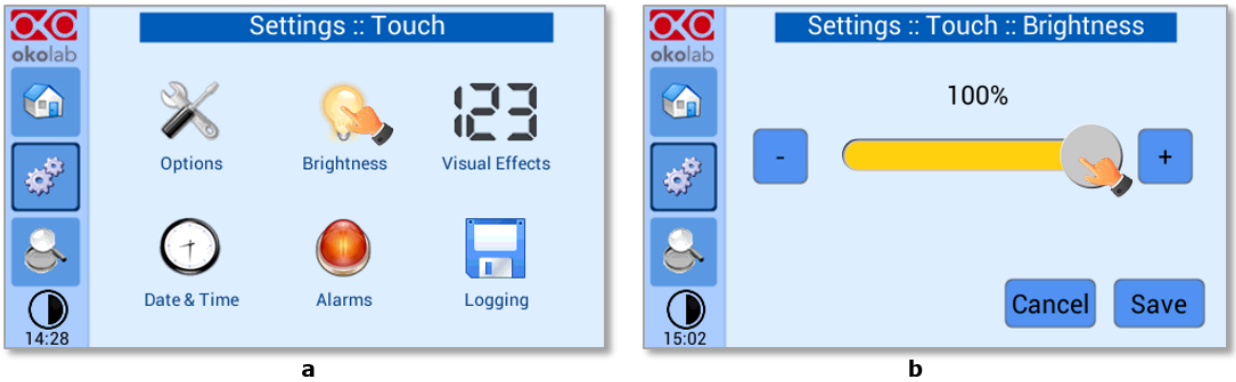


Figure 49. Brightness display page (a – b)

Set the required configuration and then press on *Save* to obtain the right configuration of *Brightness,* see Figure 49 b.

9.2.2.3 Touch Screen Visual Effects – icon and glance mode.

To enter in the Display visual effects menu, press on the icon , see Figure 50 a.

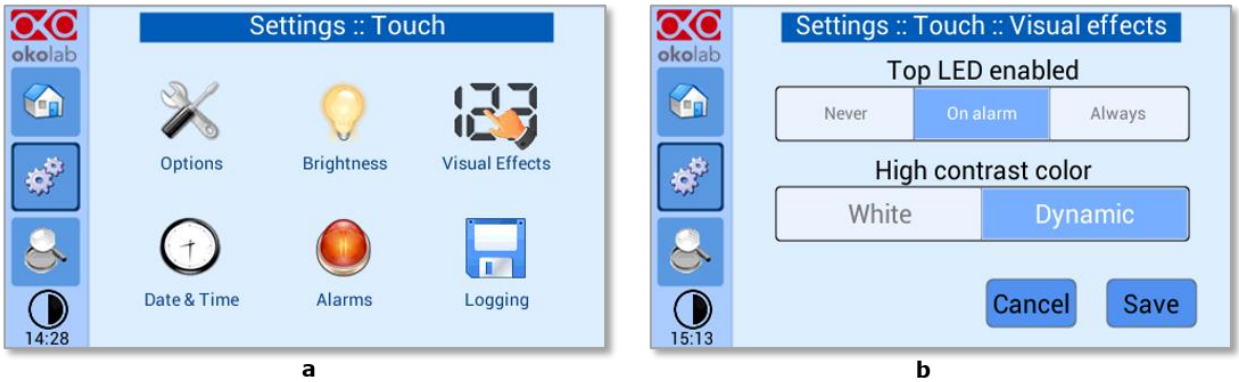


Figure 50. Visual Effects (a – b)

Top LED Settings

The Top LED settings allows you to when the Top LED should be illuminated: if you select *Never*, the Top LED will never illuminate, if you select On Alarm, the Top LED will illuminate only when the CO_2 UNIT BL is in Alarm Status (see paragraph 9.1.2), if you select Always, the Top LED will always illuminate.

Glance Mode Setting (see also paragraph 9.4)

The Glance mode setting defines the colour of the Top LED and of the digits displayed in Glance Mode. If you select *White*, the Top LED illuminates in white colour (according to the criterion selected in Top LED setting) and the digits displayed in Glance Mode are white. If you select *Dynamic* the colour of the Top LED and the colour of the digits in Glance Mode follow the colour coding reported in 9.4.

Tip ► *To swap between Icon and Glance mode press on the icon* .

9.2.2.4 Date & Time

To set Date & Time, follow the instructions below:

1. Press the *Date & Time* icon , see Figure 51 a
2. Set the values, as shown in Figure 51 b
3. Click on *Save* to save or *Cancel* to undo

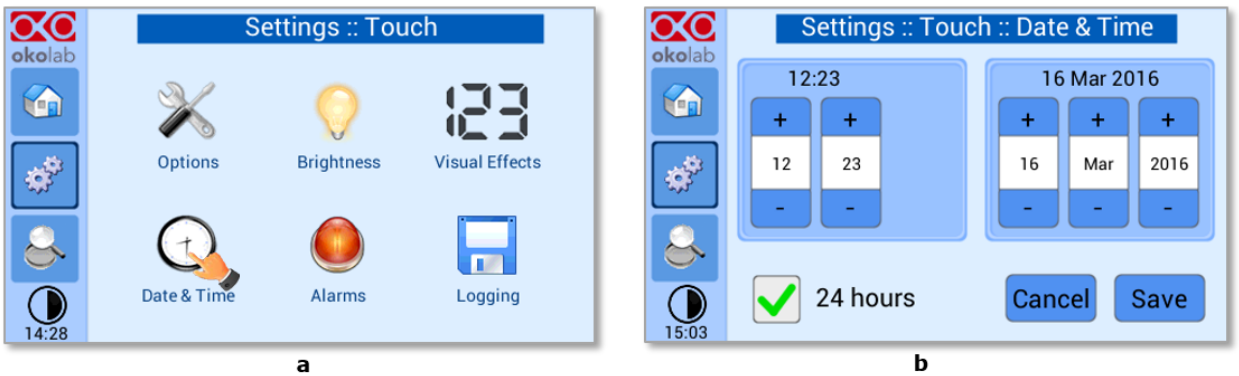


Figure 51. Touch screen settings. Date and Time (a – b)

Tip ► *Flag the 24 hours box, if you want to use the hour format based on 24 hours.*

4. Press "Home" (first one on the left menu) to go back to the main page.

9.2.2.5 Alarms

CO_2 UNIT BL also allows activating visual and audible alarms.

To set the alarms specifications, press on the Alarms icon ; see Figure 52(a) then follow the indications below:

1. Click on the Gas icon to set the gas deviations for a period of time then the system triggers on Alarms, as you see in the Figure 52 b.
2. Insert the Gas Deviation, see Figure 53. This value defines the allowed tolerance form the set point.

Note ►*The gas deviation value range is 0.1-2.0 °C*

3. Insert the Gas Time; i.e. the time for which the CO_2 composition may remain outside the allowed tolerance before the controller triggers in alarm, see in Figure 53

Note ►*The alarm time range is 5-20 minutes.*

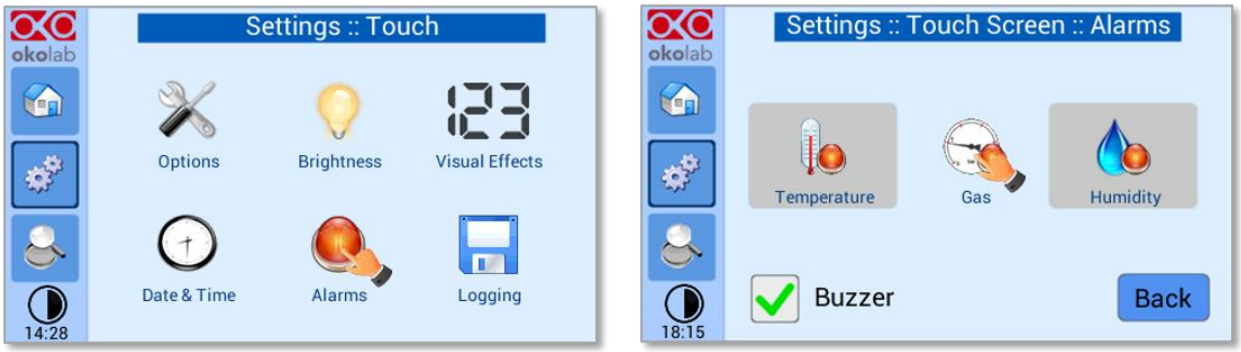


Figure 52. How to enter in Alarms page (a -b)

Tip ►*Flag "Buzzer" if you want the Alarm to be acoustical as well rather than just being displayed.*

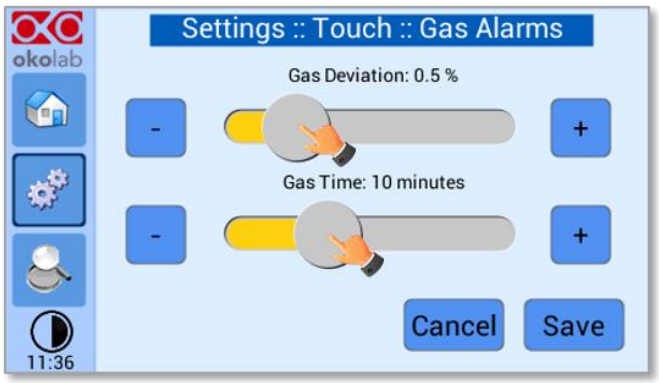


Figure 53. How to set the Deviation and Time Alarm

Figure 53. In this example the following settings are displayed (valid only after the system has reached its stationary state): if the Gas Deviation from set point is 0.5% or greater (i.e. if set point gas is 5.0% and the composition reaches a value equal or less than 4.5% or equal or more than 5.5%) for a period of time equal or longer than 10 minutes ("Temp time" set in this example) then the system triggers an Alarm.

Tip ►*After any change in the set point value the device enters into a transient regime.*

9.2.2.6 Data Logging

CO2 UNIT BL touch screen interface, OKO-TOUCH (see pointer 2 in Figure 1), is equipped with on-board memory for data logging and storage. A simple routine allows downloading data to USB drive or to PC.

In order to log and then download the logged data, connect a USB drive (not supplied) to OKO-TOUCH, using MINI-USB-OTG cable (provided), as shown in Figure 54.

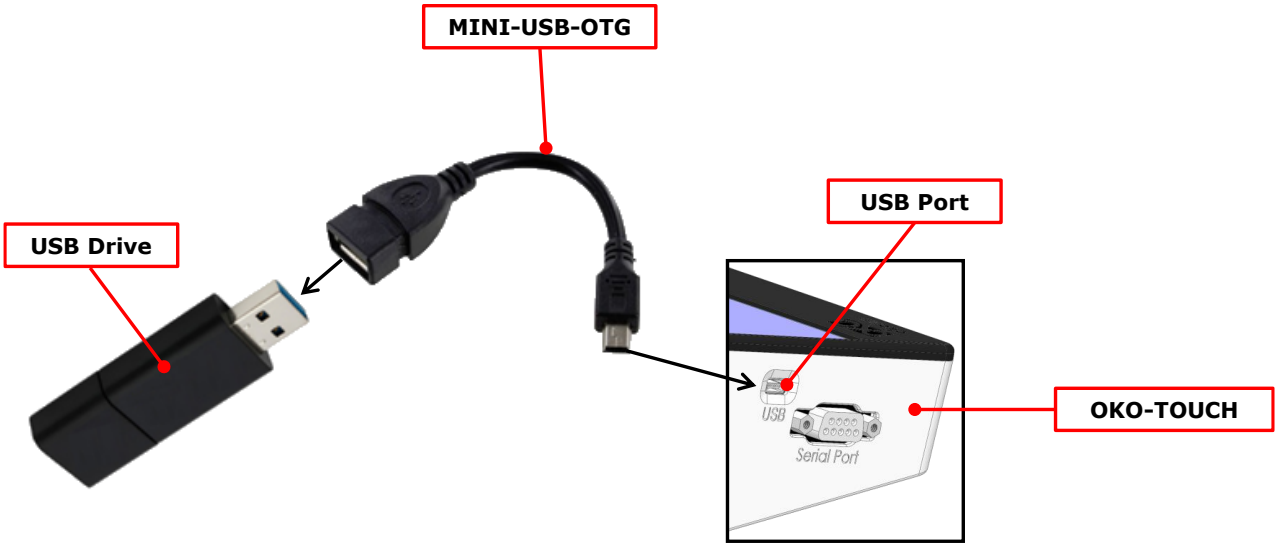


Figure 54. USB drive connection

To activate the logging, follow the steps indicated below:

1. Press on *Settings* icon (Figure 55, a) and press on *Touch screen* icon on the window that opens next (Figure 55, b).

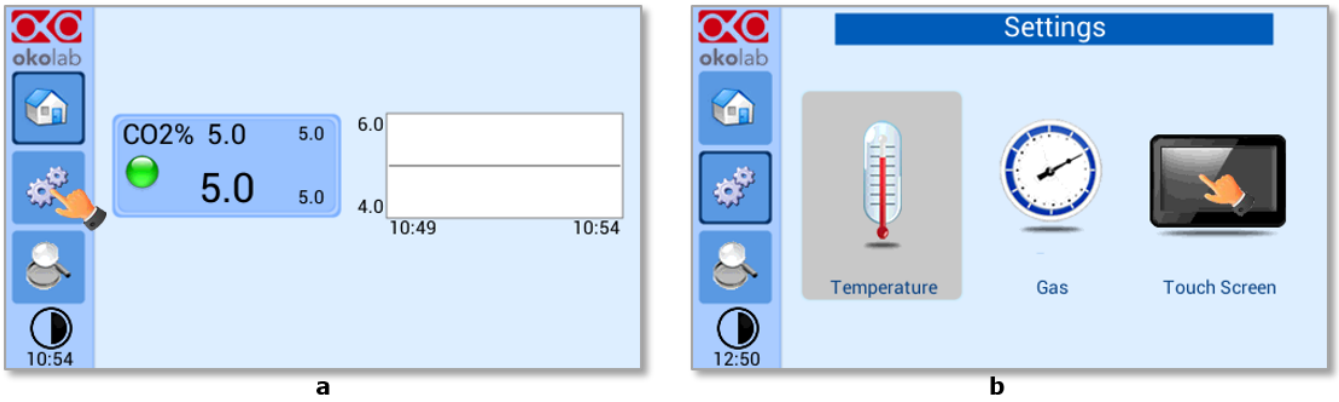
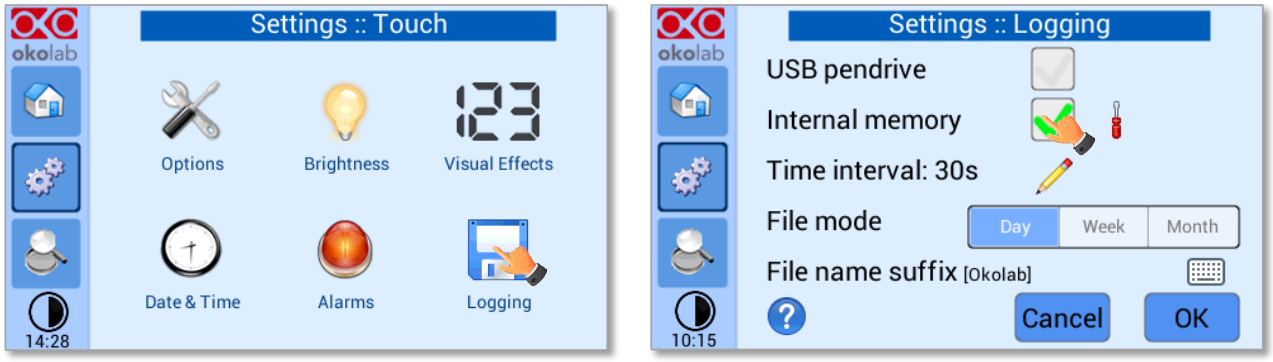


Figure 55 (a) How to enter the setting menu; (b) how to enter the Touch Screen menu

2. Press on *Logging* icon and flag *Internal memory* in the page that appears, see Figure 56 a and b.

Tip ► When activating the logging on the internal memory, you can access the Logging page also by pressing the activated logging icon on the Homepage, as shown in Figure 57



a b

Figure 56. Logging. (a) How to enter in the logging menu; (b) logging in internal memory

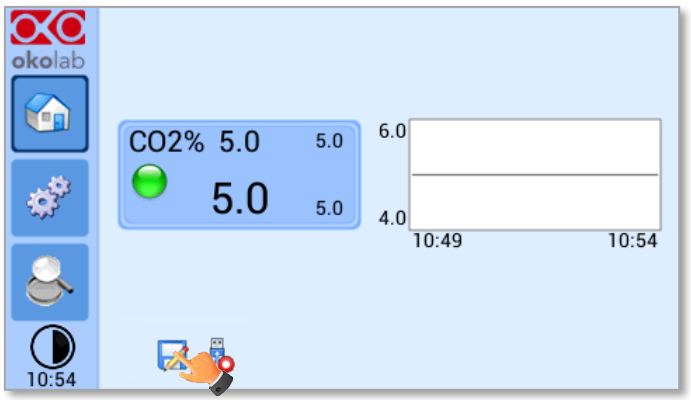
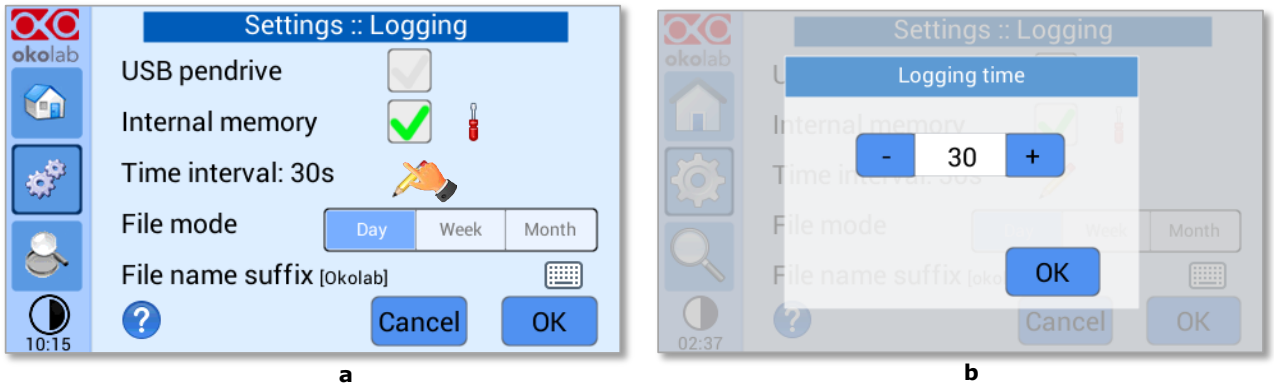


Figure 57. How to access the Logging page from the Homepage

3. Press on the icon to insert the *Time Interval* i.e. the frequency with which you want to record a data point, as shown in Figure 58. In this example a data point is logged every 30 seconds, you can change *Time Interval* in the range 1-60 seconds.



a b

Figure 58. How to set the logging time (a – b)

4. Choose how you want to organize the data when downloaded, by pressing on Day, Week or Month, see Figure 58 (a).

Tip ►*If you select Day, the data will be split in files, each one containing the data of one day. If you select Week, the data will be split in files, each one containing the data of one week.*

5. Write the file name suffix to be reported in the downloaded files by pressing on the keyboard icon , see Figure 59(a).

6. Then press *Save*, see Figure 59(b).

Tip ► *With the selections as in Figure 58 and in Figure 59, the data will be downloaded on the USB drive as shown in Figure 60.*

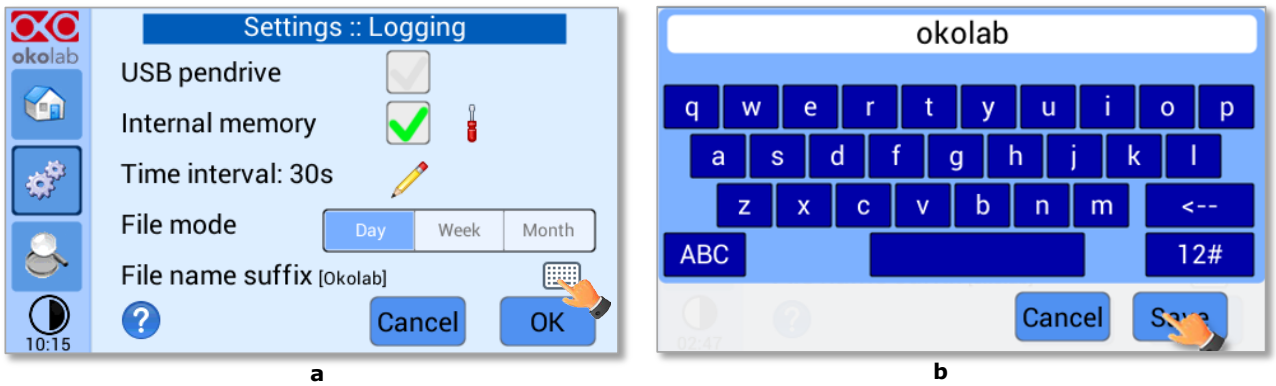


Figure 59. Data Logging. How to define the suffix for the downloaded files (a – b)

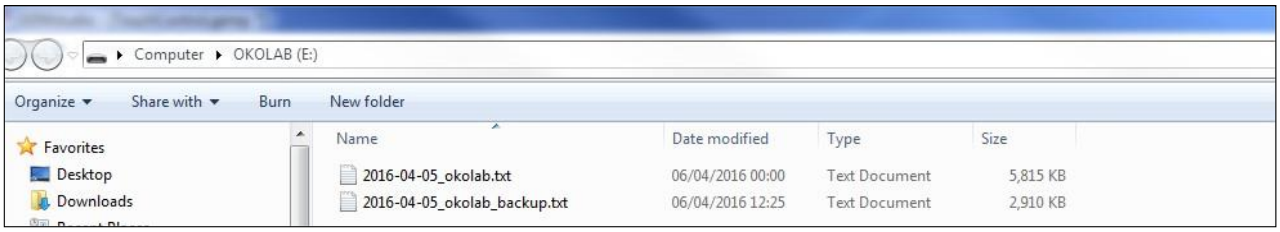


Figure 60. Downloaded files on the pen drive

Note ► *If you press on the screwdriver* *, see Figure 61(a) you can view the logging starting date, the available memory and the latest download, see Figure 61(b).*

Note ►*The available memory depends on the time interval you have inserted in the Logging page. The default logging Time Interval is 30 seconds.*

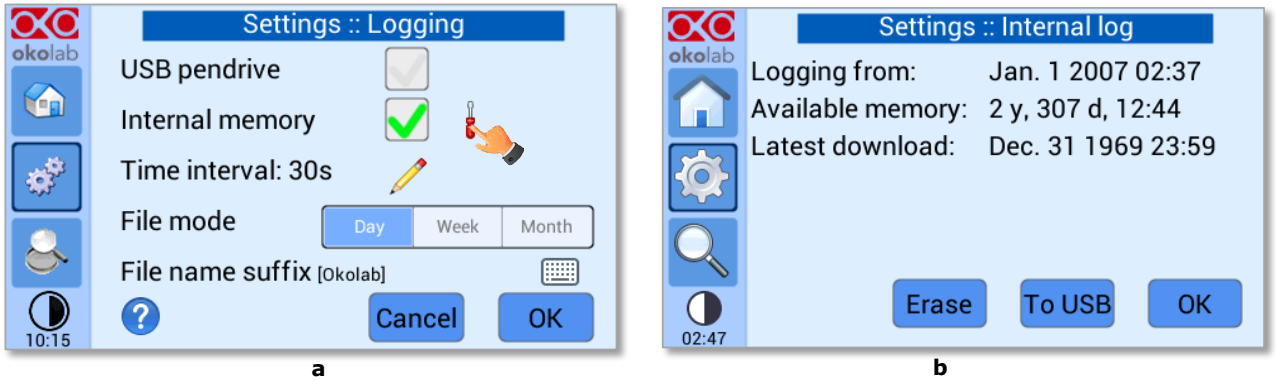
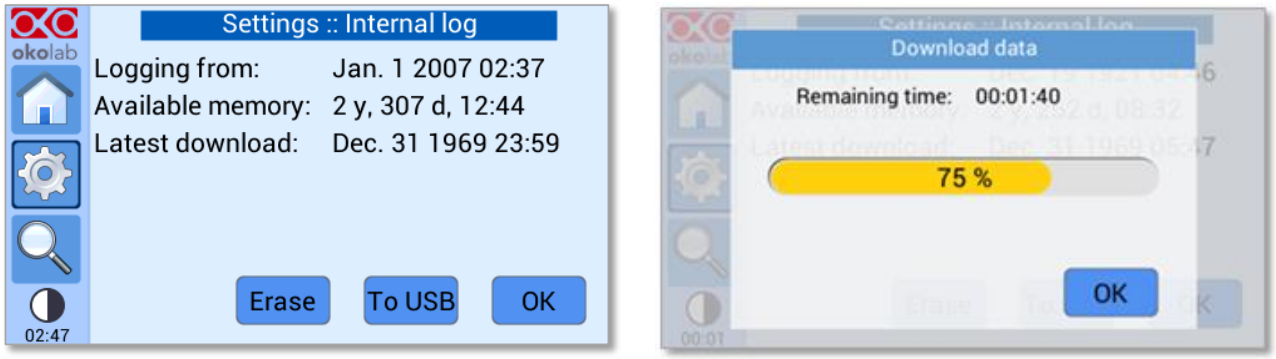


Figure 61. Internal memory status. (a) Logging page settings; (b) Internal log page settings

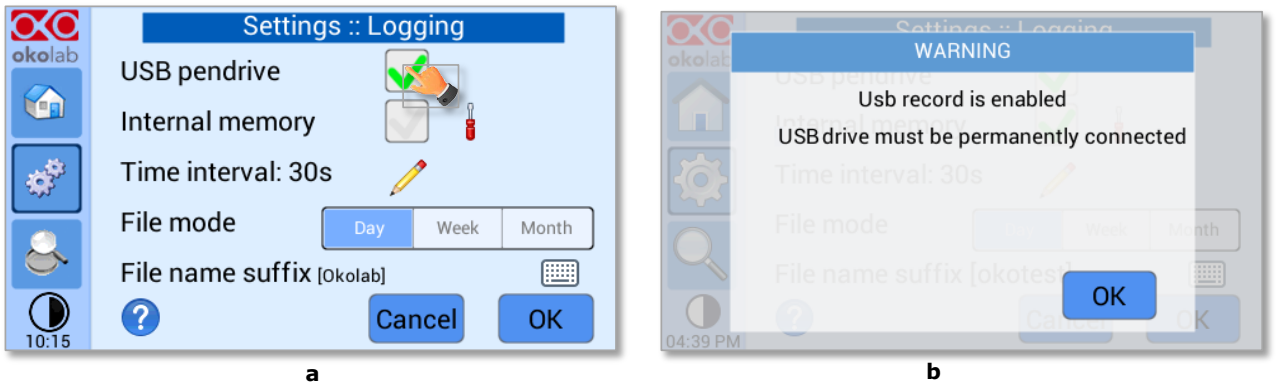
To download the data, press on *To USB* or on *Erase* if you want to delete the data, see Figure 61(a).



a b

Figure 62. Download to USB

You can activate the logging also on the *USB drive*, by flagging on *USB drive*, see Figure 63(a).



a b

Figure 63. Logging on USB flash drive. (a) USB drive selection; (b) Reminder to connect the USB drive

In this case, OKO-TOUCH warns you that a USB drive must be connected to the USB port, see Figure 63(b), and will store the data on the USB drive.

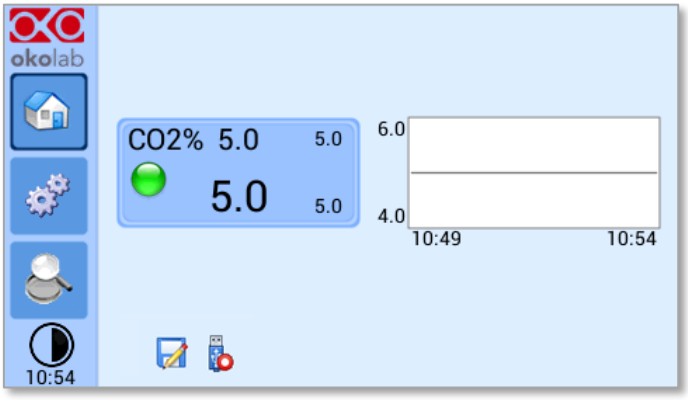


Figure 64. Logging to USB drive

Note ► *When connecting the USB drive to OKO-TOUCH, a USB drive icon* *appears on the Homepage. If you activate the logging on USB drive, a red dot appears on the USB drive, to remind that the USB drive should not be disconnected while data logging is ongoing see Figure 64.*

9.3 Overview

Press on the icon to open the status page as show in Figure 65(a).

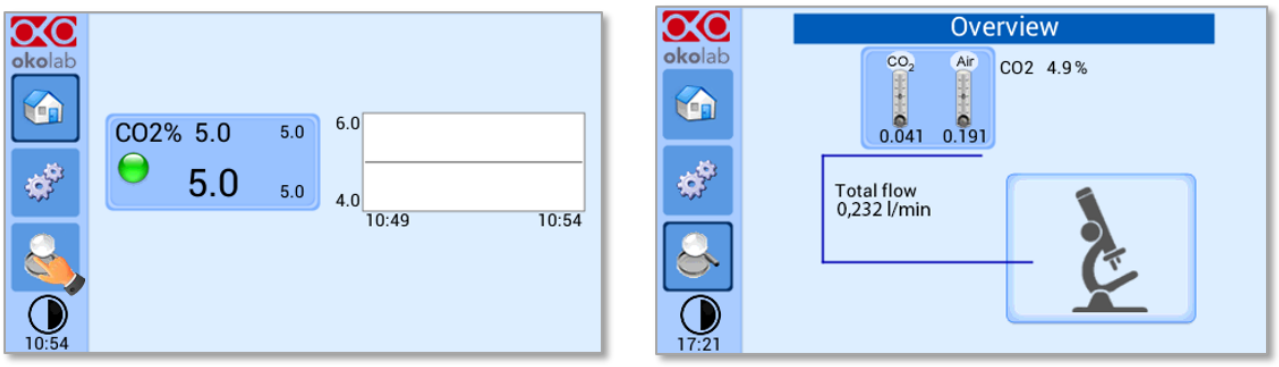


Figure 65. Overview Status page. (a) How to enter in the Overview Page (b) Overview Status Page

Note ► *This page contains data useful for technical/control reasons. In case you requested support from one of Okolab engineers you may be asked for some of these data*

9.4 Icon and Glance Mode View

The CO2 UNIT BL features two display modalities: Icon mode and Glance Mode, as shown in Figure 66(a) and (b). You can swap between the two display modalities by pressing on icon .

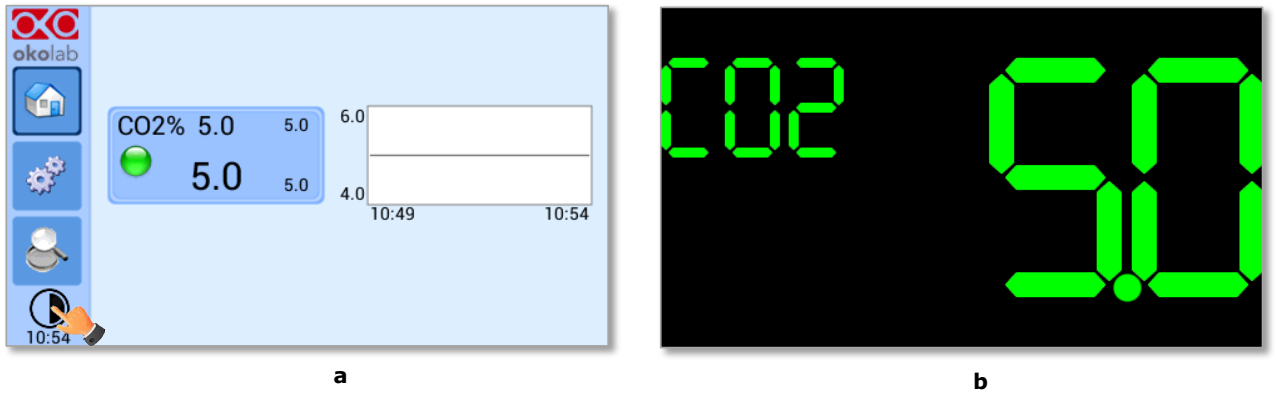


Figure 66. Display modalities. (a) Icon Mode; (b) Glance Mode

9.5 Info page

Press the icon okolab to access the Info Page, as shown in Figure 67. This page contains the information related to the OKO-TOUCH (as shown in Figure 68 a) and to the CO2 UNIT BL version (as shown in Figure 68 b).

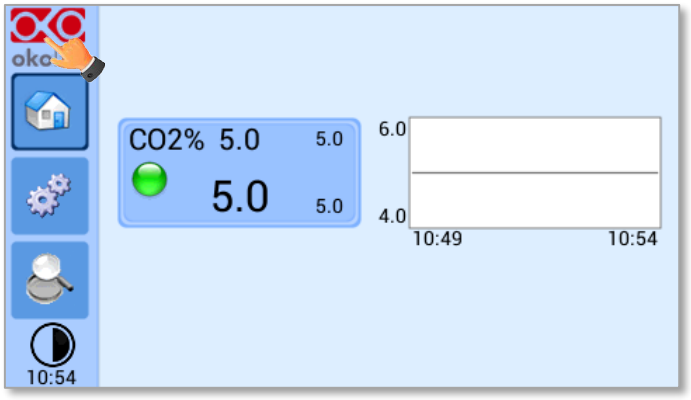
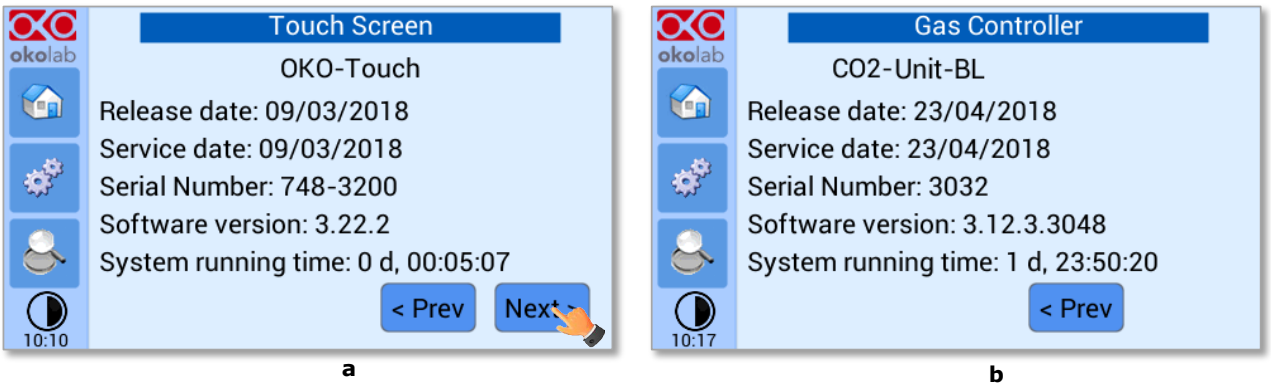


Figure 67. Info page selection



a **b**

Figure 68. Info page OKO-Touch and CO2 UNIT BL (a – b).

Tip ►*Please have this information handy when contacting Okolab for support*

10 Cleaning & Maintenance

Cleaning

Please, follow the instructions below to clean the CO2 UNIT BL:

- Use a polishing cloth or dry cloth to wipe off dust and dirt.
- Before cleaning the unit, pull out the main plug.
- Liquids should not be entered inside the CO2 UNIT BL.

Maintenance

- Verify periodically the status of all hoses/ tubing. If some hoses/ tubing is damaged, contact Okolab to receive assistance.
- After 2 years, disconnect all polyurethane tubing, cut the last 1 cm of the tubing and reconnect them.
- Replace the PTFE filters (on the rear panel of the unit and along the tubes) each 2-3 months of continuous use or when it is present water in the inner part of the filter.
- Okolab Air pumps have to be replaced every 18-24 months

11 Support

In order to send directly an email to the Okolab staff, you can use the QR codes shown in the following images:

- For commercial info:

Figure 69. QR code for commercial info contact

- For technical info:

Figure 70.QR code for technical info contact

To contact one of our engineers please see below, write to support@oko-lab.com or contact us through the live chat on www.oko-lab.com. You can request a remote support session anytime, also via video chat.

– Contact our technical support (sibillo@oko-lab.com) by e-mail to take an appointment for the web assistance.

Technical Support.

Please, do not hesitate to contact Okolab should you need any further commercial information or technical support.

For HARDWARE SUPPORT: sibillo@oko-lab.com
Phone +39 081 806 3470
Fax: +39 081 876 4410
Mobile: +39 348 96807 18

For COMMERCIAL SUPPORT WORLDWIDE: lanzaro@oko-lab.com
Phone +39 081 806 2624
Fax: +39 081 876 4410
Mobile: +39 348 96807 17

For COMMERCIAL SUPPORT US&CANADA: foppiano@oko-lab.com

For COMMERCIAL SUPPORT CHINA: tong@oko-lab.cn

12 Technical Specifications

CO2 UNIT-BL – Technical Specifications	
CO_2	Range: 0-18% Step size: 0.1% Accuracy:± 0.1%@ 5.0% Sensor: 10 year-life, Non Dispersive InfraRed (NDIR) dual wave length detector Recommended Calibration Interval: 1 year
Input Gas	CO_2, Air
Total Flow rate	0.0-1.0 L/min (0.4 L/min max with OKO-AIR-PUMP-BL)
Operating Temperature	0°C ~ +55°C (23°C suggested)
Storage Temperature	-5°C ~ +60°C
Operating Humidity	0-70%
Power Consumption	Input 24 V DC 85 W max
Weight	3 Kg

Table 1. Technical specifications.

13 Troubleshooting

We have collected in the table below some frequently asked questions, please contact Okolab if you need support.

Symptom	Probable cause	Remedy
The little led on the front of the Control Unit is off	Power plug is disconnected from outlet	Insert plug securely into outlet
	Blown fuse	Replace the fuse, 1A-Time Lag Fuses
No CO_2 or Air flow rate stability	Pressure drop	Check reservoirs and/or compressed line. Check Air/CO_2 tanks; make sure they're not close to finish.
No CO_2 and/or Air flow streams	Regulators closed	Open regulators
No CO_2/Air arrives to the incubating chamber	Missing connection	Make sure you've attached the PTFE filter on the back of the CO2-UNIT-BL. Pinter 1 and 2 in paragraph 7.
Acoustic alarm sounds	The current CO_2 value is far from CO_2 set point	Check the CO_2 and Air supplies
The little led on the front of the Control Unit is green but the Oko-Touch is off	Serial cable is disconnected	Check the connection between Control Unit and the Oko-Touch
Gas leak on the rear of the control box	Not properly inserted tubes	Strongly push the tube into the Swift-Fit connector
I checked the previous troubleshooting but I cannot solve the problem	Contact Okolab to receive assistance	

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15 Manual Revision Table

Revision Number	Additions or changes	Date
01	Edited	March 2017
02	Replaced some images	May 2018
03	Review layout	June 2018
04	Equipment correction	May 2019
05	Cleaning & Maintenance	January 2020

WARRANTY

Okolab S.r.l. warrants the “CO2-UNIT-BL” to be free of defects in materials and workmanship for a period of one year starting from invoice date. If the unit malfunctions, it must be returned to the factory for evaluation. If the equipment has to be returned to the factory, please ensure that is carefully and properly packed. Okolab S.r.l. accepts no responsibility for damage due to unsatisfactory packing. Upon examination of Okolab S.r.l., if the unit is found to be defective, it will be repaired or replaced at no charge. This warranty does not apply to defects resulting from any actions of the purchaser. Components which wear are not warranted. Okolab S.r.l. neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by Okolab S.r.l. Okolab S.r.l. warrants only the parts manufactured by it will as specified and free of defects. Okolab S.r.l. makes no other warranties or representations of any kind whatsoever, express or implied, except that of title, and all implied warranties including any warranty of merchantability and fitness for a particular purpose are hereby disclaimed. LIMITATION OF LIABILITY: the total liability of Okolab S.r.l. shall not exceed the purchase price of the component upon which liability is based. In NO event shall Okolab S.r.l. be liable for consequential, incidental or special damage.