



okolab

CO2-UNIT-BL
Gas Controller

Manual

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CO2-UNIT-BL is a Digital CO2 Controller that mixes CO2 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 this 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 use the instrument.

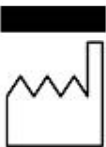
2.2 Symbols on the product label



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.

IP 30

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 Box.
- 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 ends are 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 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 the input pressure limit of 2.5 barg (36.3 psig). 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 is 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 the room.
- VENTILATION. Unit should be situated so that its location or position does not interfere with proper ventilation. Neither the gas controller 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-CB (x2)**. Silicon tube 20cm long 7mm OD with a PTFE filter in the middle. One to be installed on the rear of the Unit and one spare replacement.
3. **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 CO2) on the rear panel of the CO2 Controller.
4. **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.
5. **Pressure Gauge for CO2 + regulator + assembly stirrup (x1)**. Install pressure gauge between the pure CO2 tank pressure regulator and the CO2 Controller input port.
6. **24V-DC Power Adapter (x1)**.

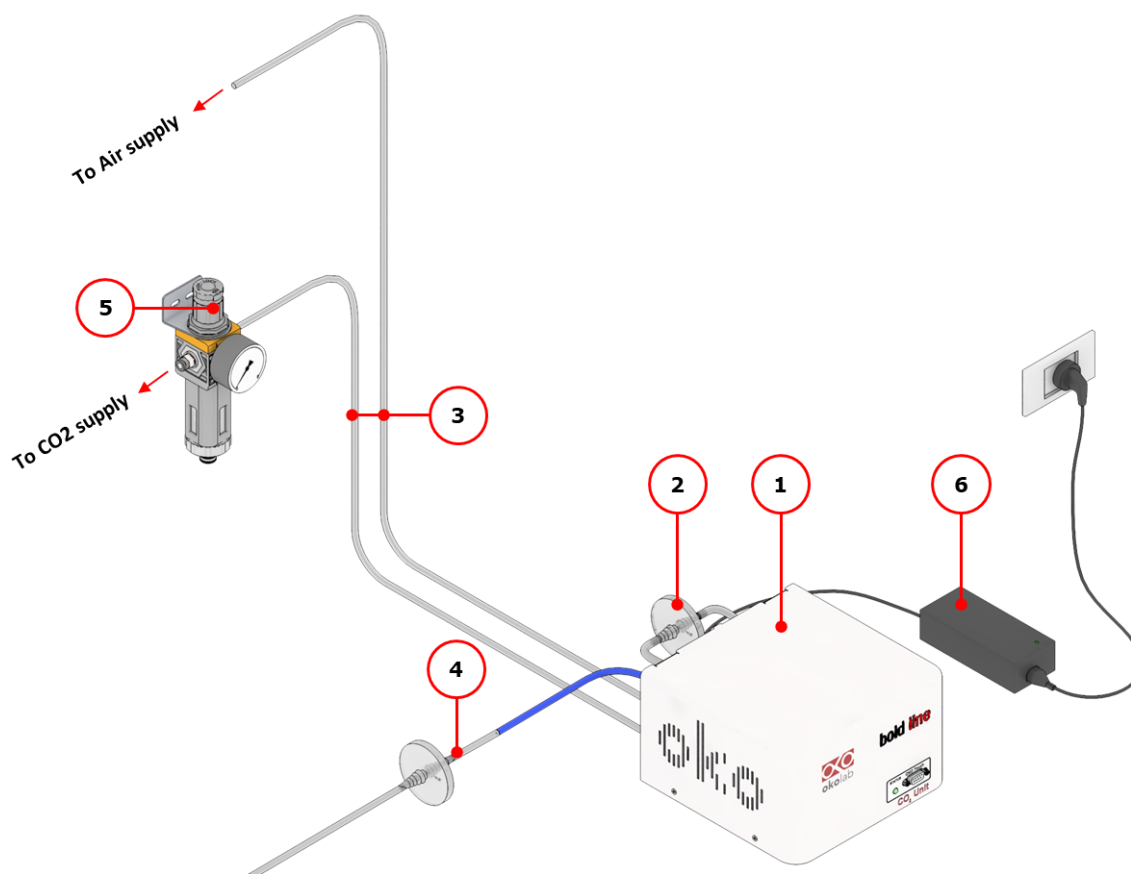


Figure 1. CO2-UNIT-BL – components.

5 GAS supplied requirements

- **CO2**. CO2 must be available at **1.4 barg (20.3 psig)**, with a connector for 6mm OD rigid silicon tube. Gas source must be Standard Purity CO2 (coded as 4.5 that means 99.995 % of CO2) and humidity-free gas.
- **Air**. Air must be available at **1.4 barg (20.3 psig)**, with a connector for 6mm OD rigid silicon tube.

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

6 Compatibility

CO2-UNIT-BL is compatible with:

- **OKO-TOUCH (required)**, including:
 - **Touch Screen Interface**
 - **#1 RS232 Serial cable**. To connect the Touch Screen to the unit.
 - **MINI-USB-OTG cable**. To connect a USB pen to the OKO-TOUCH for data download.
- **OKO-AIR-PUMP-BL**
- **H101-BASIC-BL**
- **H101-CRYO-BL**
- **H201-T-UNIT-BL**
- **H301-T-UNIT-BL-PLUS**
- **HM-ACTIVE**
- **H101-HM**
- **HM-VF**

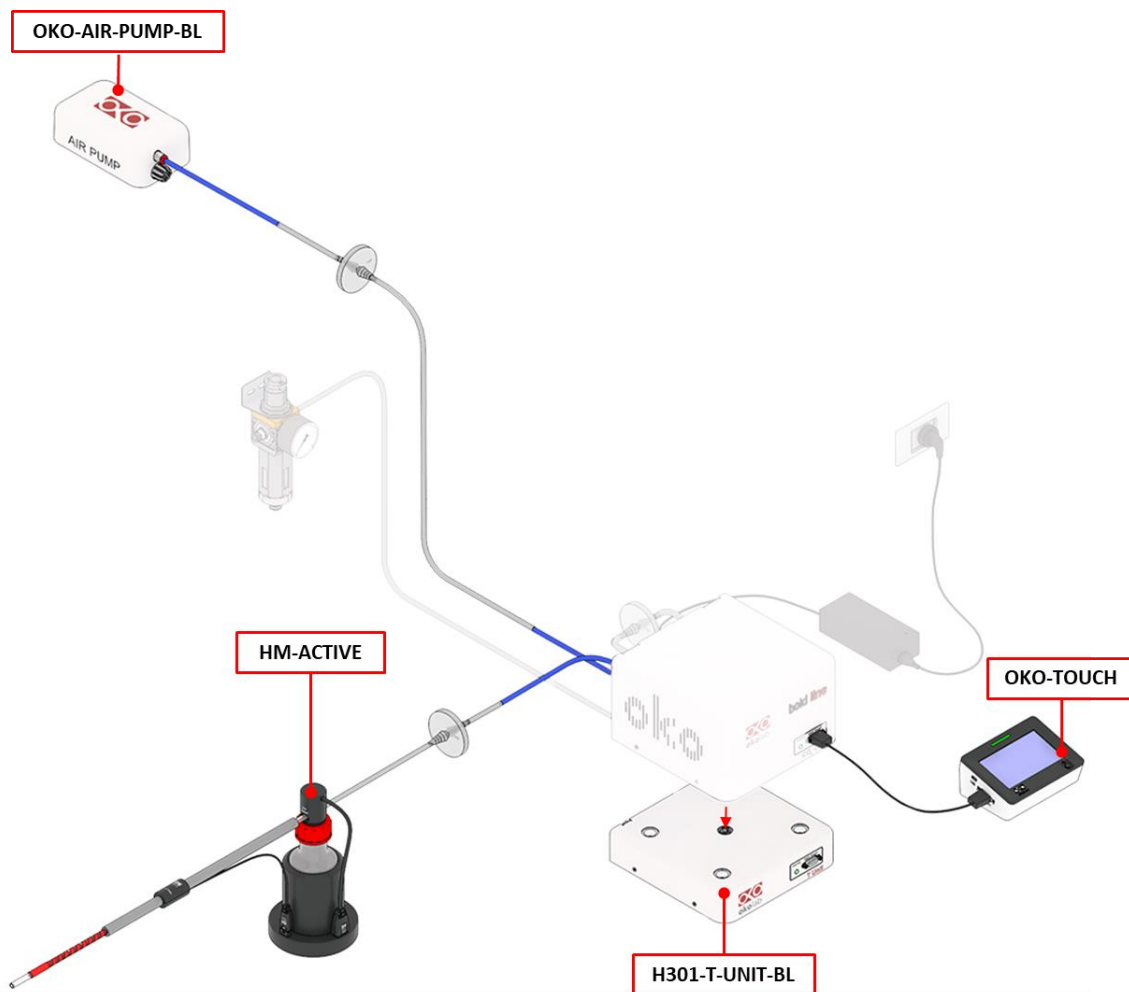


Figure 2. CO2-UNIT BL within a typical H301 configuration.

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

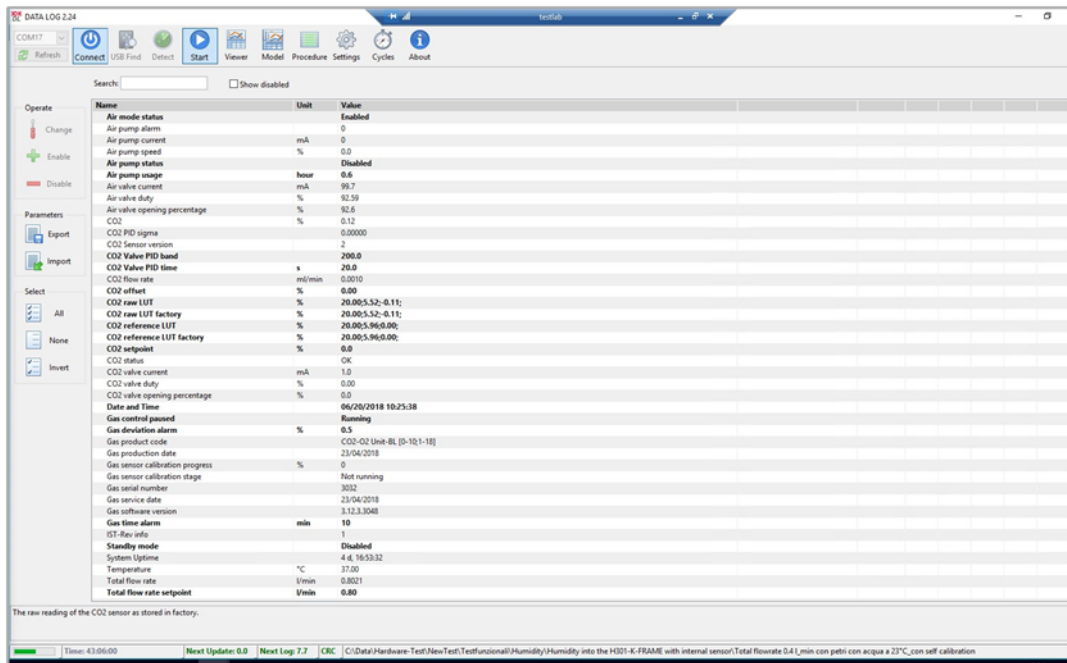


Figure 3. DATA LOG software.

- **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

Figure 4 illustrates CO2-UNIT-BL front panel:

1. **Status Led.**
2. **RS232 connector.** Connector for OKO-TOUCH.

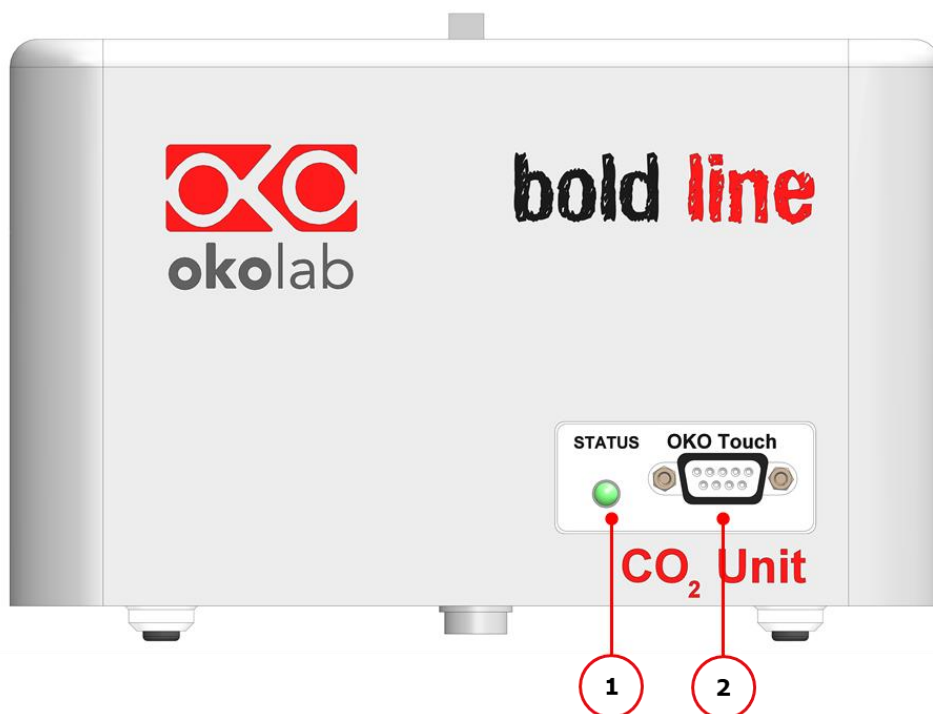


Figure 4. Gas Controller Front Panel Overview.

Figure 5 illustrated CO2-UNIT-BL rear panel:

3. **Filter Out.** Connector for the TUBE-CB.
4. **Filter In.** Connector for the TUBE-CB.
5. **Gas Output.**
6. **Power Input.**
7. **OKO-AIR-PUMP-BL connector.** Leave unplugged if CO2-UNIT-BL is not equipped with OKO-AIR-PUMP-BL.
8. **HM-ACTIVE connector.** Leave unplugged if CO2-UNIT-BL is not equipped with HM-ACTIVE.
9. **GPIO (General Purpose Input Output) connector.**
10. **USB connector.**
11. **Air Input.** Push to fit Input connector for 6 mm O.D. rigid tubing to supply air to the unit.
12. **CO2 Input.** Push to fit Input connector for 6 mm O.D. rigid tubing to supply CO2 to the unit.

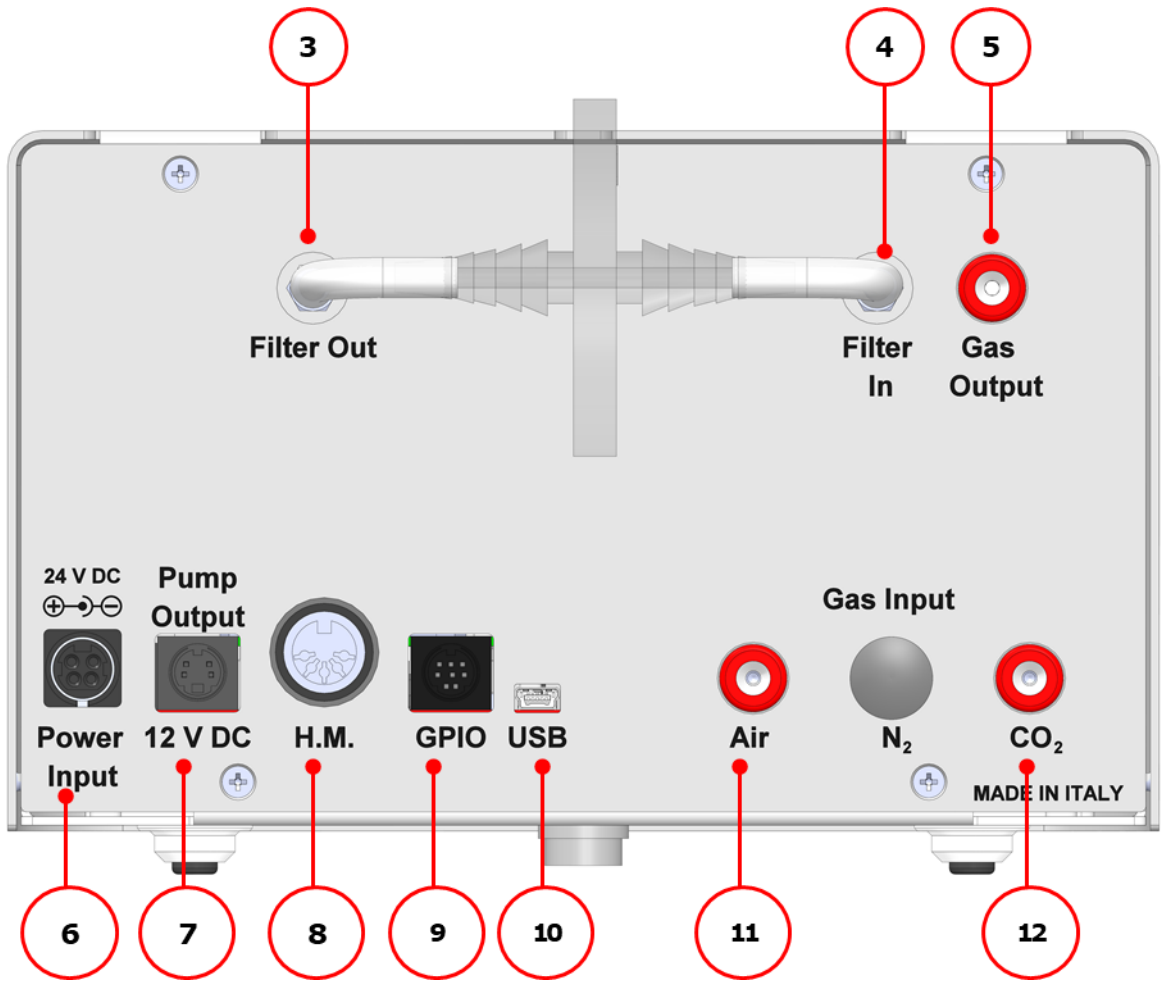


Figure 5. Gas Controller Rear Panel Overview.

8 Installation

The following paragraph illustrates how to install and to use CO2-UNIT-BL.

8.1 Setting up CO2-UNIT-BL



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 CO2-UNIT-BL. Follow the arrow on the rear of the Pressure Gauge for the correct Gas In-Out (see Figure 6).

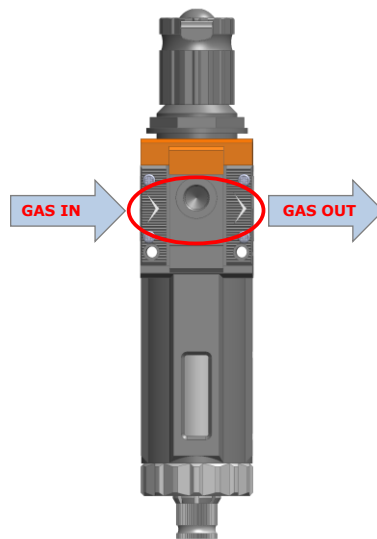


Figure 6. Input and Output gas ports. See symbol on the rear of Pressure Gauge.

On the bottom of the Pressure Gauge 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.

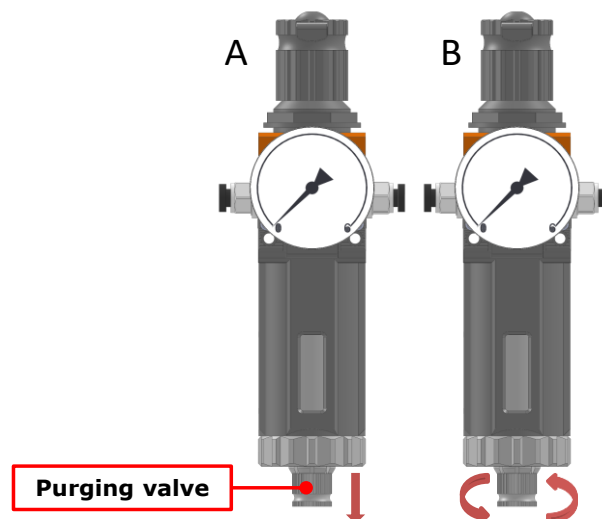


Figure 7. How to close the purging valve of the Pressure Gauge.

To close the gauge, pull the knob up and rotate it counterclockwise. Push the knob down to lock it. Open valve on the 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.

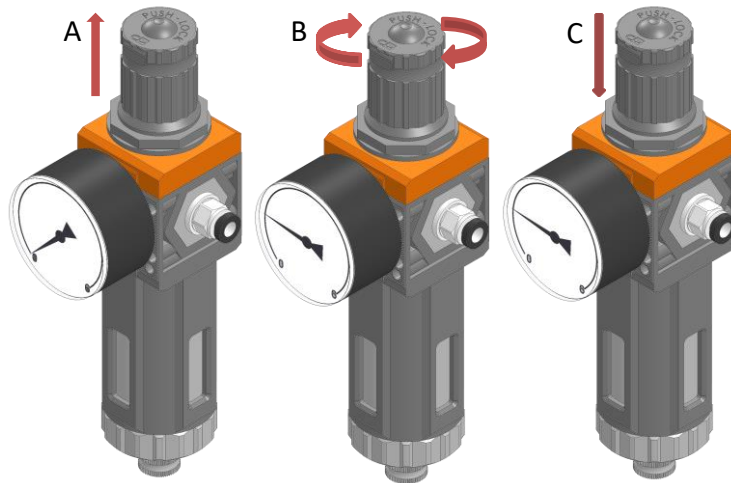


Figure 8. Pressure gauge using.

2. Install the **TUBE-CB** on the rear panel of CO2-UNIT-BL. It filters the Air/CO2 flow before it enters in contact with CO2-UNIT-BL gas sensors. Connect the TUBE-CB with the *Filter In* and *Filter Out* connectors on the rear panel of CO2-UNIT-BL (3, 4 in Figure 5). Make sure the *Filter In* label side of the filter is always connected to *Filter In* connector on the rear panel of CO2-UNIT-BL (see Figure 9).

Note ► CO2-UNIT-BL cannot operate if the TUBE-CB is not connected.

Note ► The improper installation of the TUBE-CB may cause gas sensors contamination.

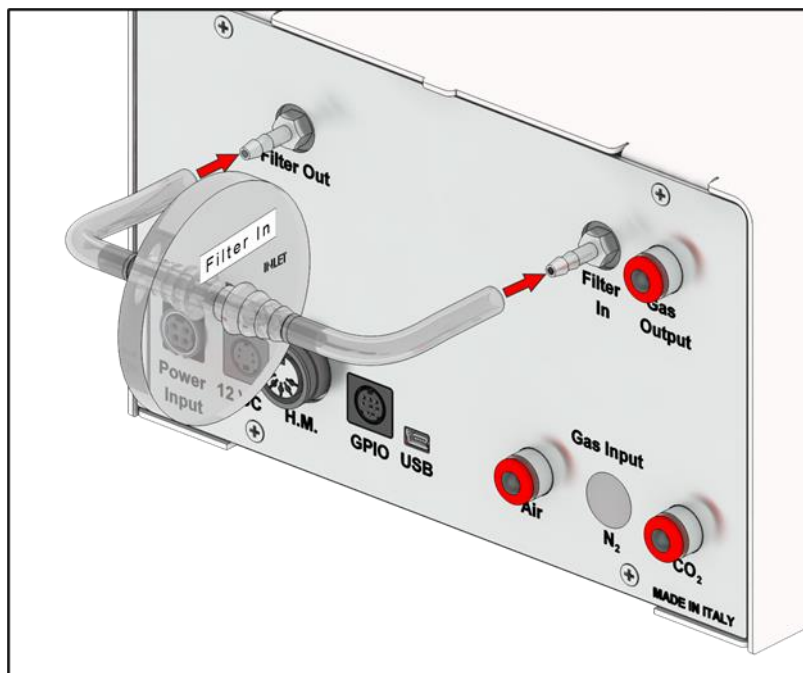


Figure 9. How to install TUBE-CB.

Tip ► Replace this filter each 2-3 months of continuous operation or if you see water in the inner part of the filter.



Do not remove the filter. This may damage the gas sensors.

3. Connect CO₂ and air supply to the corresponding push to fit connectors on the rear panel of CO₂-UNIT-BL by using TUBE-A (see Figure 10).

Tip ► Make sure to push the tubes all the way into the connectors thus avoiding any gas leak.

Note ► Do not 2.5 barg (36.3 psig) for CO₂ and Air supply.

To remove tubing from the connectors, push the red or black rubber ring while pulling the tubing.

Tip ► If the tubing does not come out easily, do not force it, simply make sure the rubber ring is properly pushed.

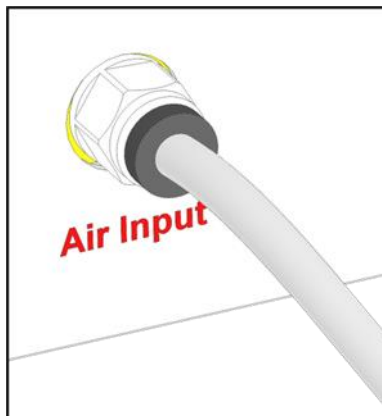


Figure 10. How to connect tubing to push to fit connector.



Before disconnecting any of tubing connected to CO₂-UNIT-BL, make sure there is no residual pressure by adjusting the pressure gauges upstream of the system and the tanks.

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

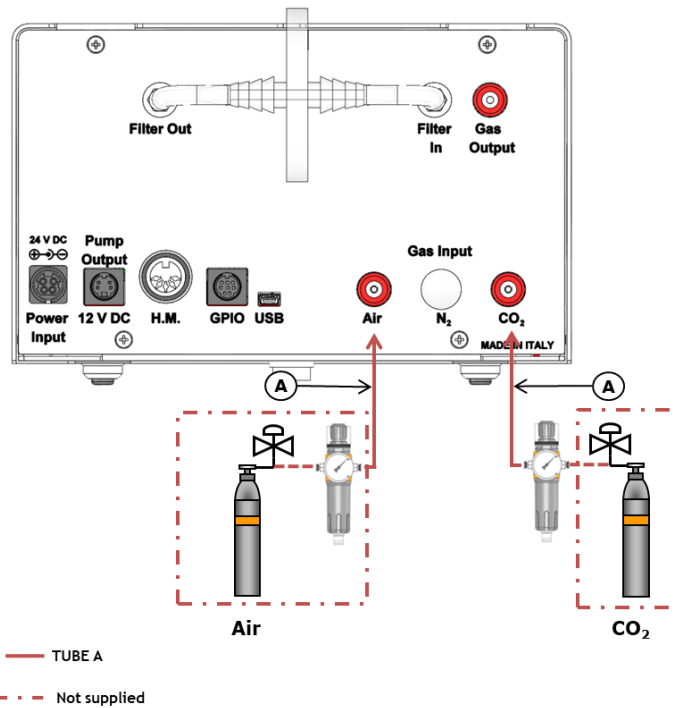


Figure 11. CO₂ and Air Tanks connections to the rear panel of the CO₂ Controller.

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

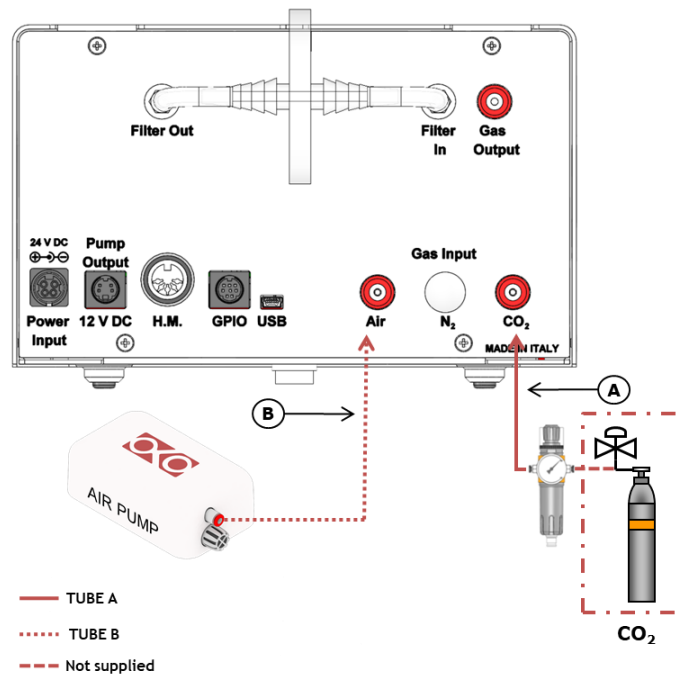


Figure 12. CO₂ Tank and Air Pump connections to the back panel of the CO₂ Controller.

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

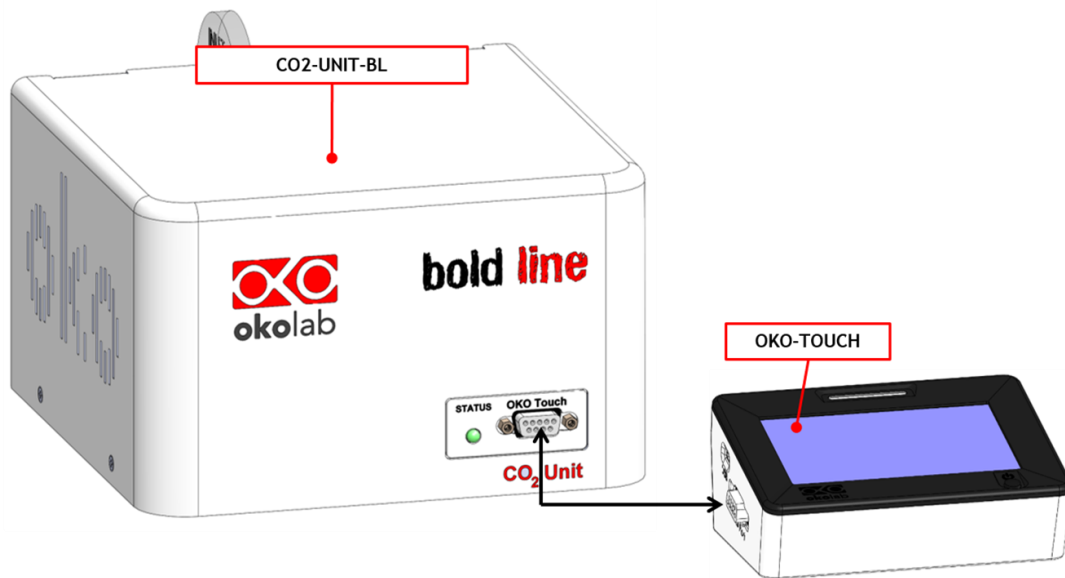


Figure 13. Oko Touch Connection.

6. Connect the power adapter to CO2-UNIT-BL (6 in Figure 1).
7. Regulate the pressure of each gas before the CO2 Controller at 1.4 barg (20.3 psig). Do not exceed 2.5 barg!
8. Check that all the cables are properly installed as described in the present paragraph.
9. To switch CO2-UNIT-BL on use the power button on OKO-TOUCH. The Status LED (1 in Figure 4) on the front of CO2-UNIT-BL will turn green.
10. Once the system has been initialized the Status LED on the front of CO2-UNIT-BL will stop blinking and will turn steadily on. The Homepage will appear on the touch screen, the color of the Status Indicator (see 1 in Figure 16 and Figure 18) on the gas tab will be yellow at the start.
11. Select the Setpoint gas composition from the touch screen Homepage (see Paragraph 9.1.1).
12. The light indicator on the Homepage becomes green when the Setpoint compositions are reached and are stable.

8.2 How to assemble CO2-UNIT-BL with a Bold Line T controller

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.

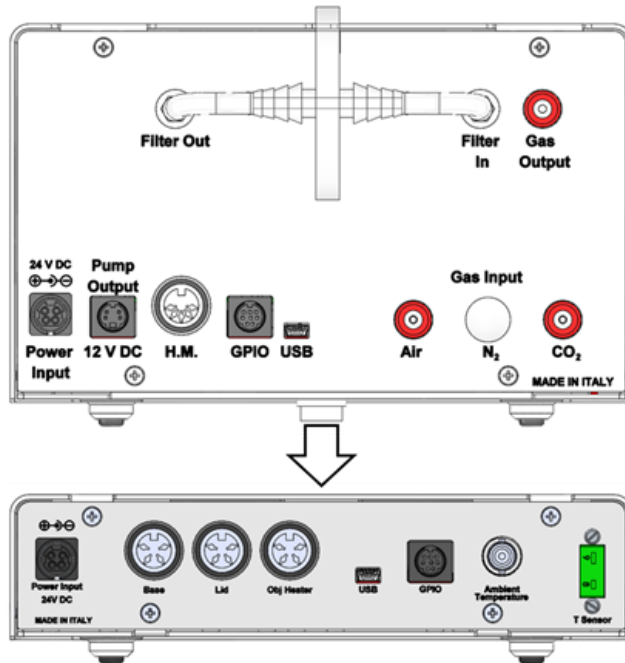


Figure 14. CO2-UNIT-BL and H301-T-UNIT-BL-PLUS.

CO2-UNIT-BL must stack on top of the Bold Line T controller by lining up the bus ports located on the top and bottom surface of each unit. When the units are properly connected the Temperature and CO2 parameters will appear on the OKO-TOUCH Touch Screen interface Homepage.

Tip ► If not all the parameters appear on OKO-TOUCH Homepage then the Control Units are not properly connected. Please check that the bus ports are properly aligned (see Figure 15).

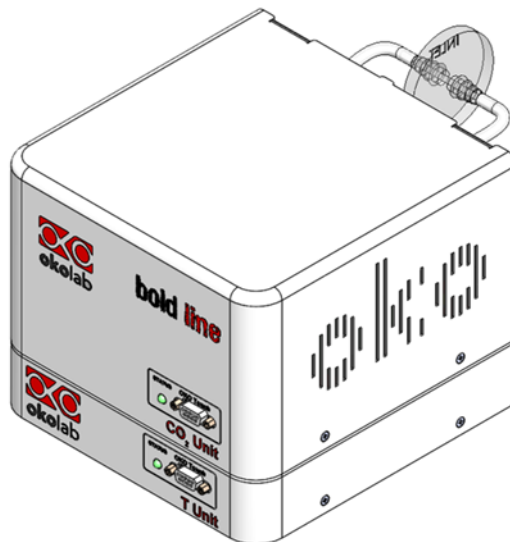


Figure 15. CO2-UNIT-BL and H301-T-UNIT-BL PLUS on stock.



If you have CO2-UNIT-BL and a Bold Line T controller, it is essential to read both this manual and the Bold Line T controller User 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 CO2-UNIT-BL.

9.1 Homepage

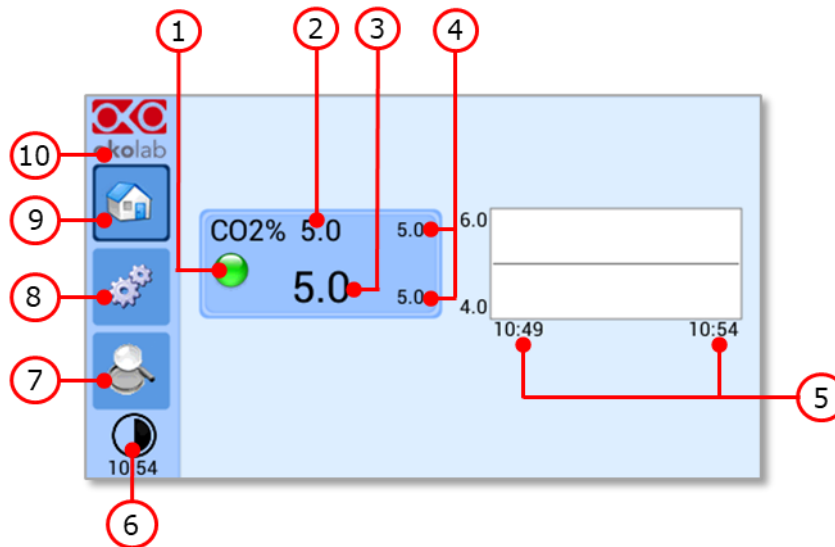


Figure 16. Homepage of CO2-UNIT-BL Touch Screen Display.

1. Status Indicator.
2. CO₂ Setpoint (see 9.1.1 to learn how to change the Setpoint value).
3. CO₂ current value.
4. Min/max CO₂ 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 CO2-UNIT-BL and running time.

Tip ► The OKO-TOUCH is pre-set at a 5% CO₂ concentration hence when you switch it on the system will start operating to reach this set-point value.

9.1.1 How to enter the Setpoint

To input a new CO₂ Setpoint, touch the corresponding tab, as indicated in Figure 17 a.

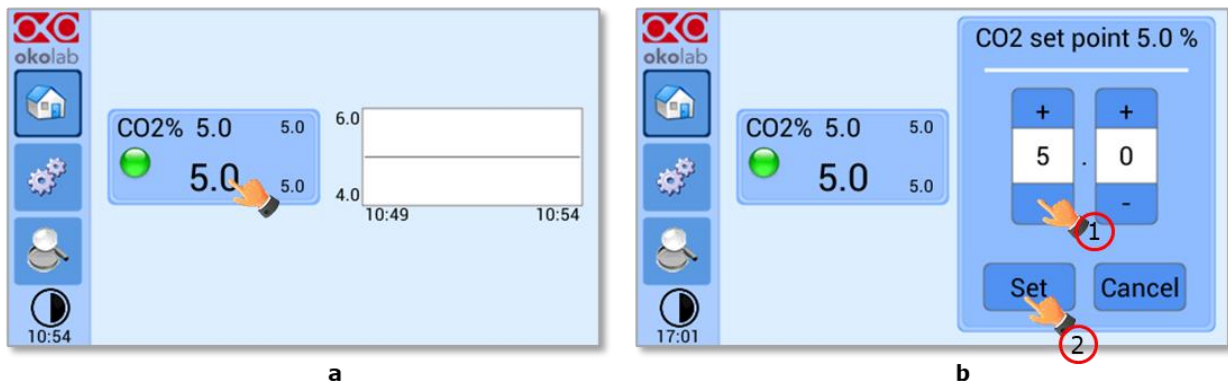






Figure 17. How to change the CO₂ Setpoint (a - b).

The Setpoint regulation page will appear as in the Figure 17 b. You can modify the Setpoint by clicking on + and -. Once you have input the new CO₂ Setpoint, press Set (2 in Figure 17 b) to save or Cancel to undo.

Tip ► After any change in the Setpoint value, CO₂-UNIT-BL enters into a transient regime, the Status Indicator and the TOP LED turn yellow (see paragraph 9.1.2). During the transient regime, CO₂-UNIT-BL will not trigger on alarm.

9.1.2 Controller Status: colors led and meaning

CO2-UNIT-BL can assume four different status, which are represented by the colors assumed by the Status Indicator and by the TOP LED (see Figure 18):

	<p>The GREEN color indicates that the Setpoint 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.</p> <p>Controller Status: NORMAL</p>
	<p>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 Setpoint change. The system is working properly, it is not in alarm and no action is needed. As soon as CO2-UNIT-BL reaches the CO₂ composition, CO2-UNIT-BL Status changes to NORMAL and the color turns GREEN. If 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 turns ORANGE.</p> <p>Controller Status: TRANSIENT</p>
	<p>The ORANGE color indicates 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.</p> <p>Controller Status: ALARM</p>
	<p>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.</p> <p>Controller Status: ALARM</p>

Tip ► The TOP LED follows the same color code as the Status Indicator (see Figure 18). To enable/disable the TOP LED follow the instruction reported in paragraph 9.2.2.3.

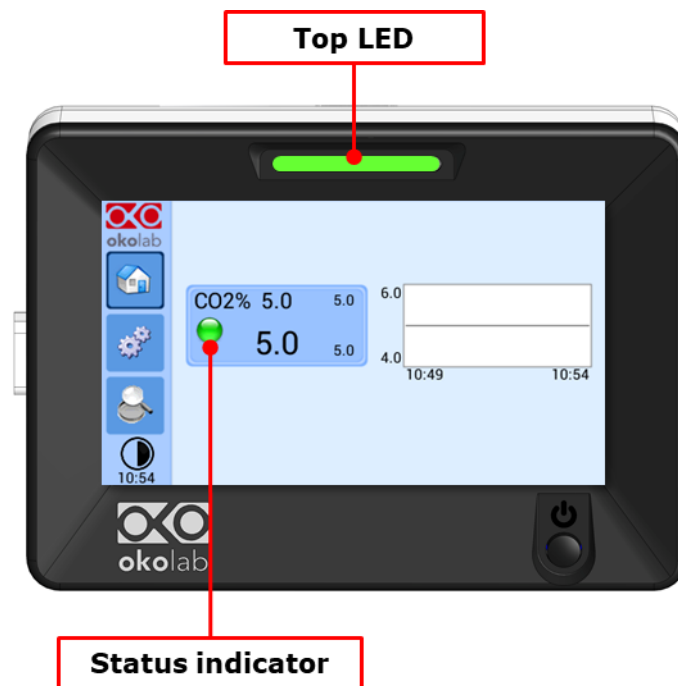


Figure 18. Status Indicator and TOP LED.

9.2 Settings

9.2.1 Gas

Press on *Settings* icon  to enter the *Settings* menu, as shown in the Figure 19 a.

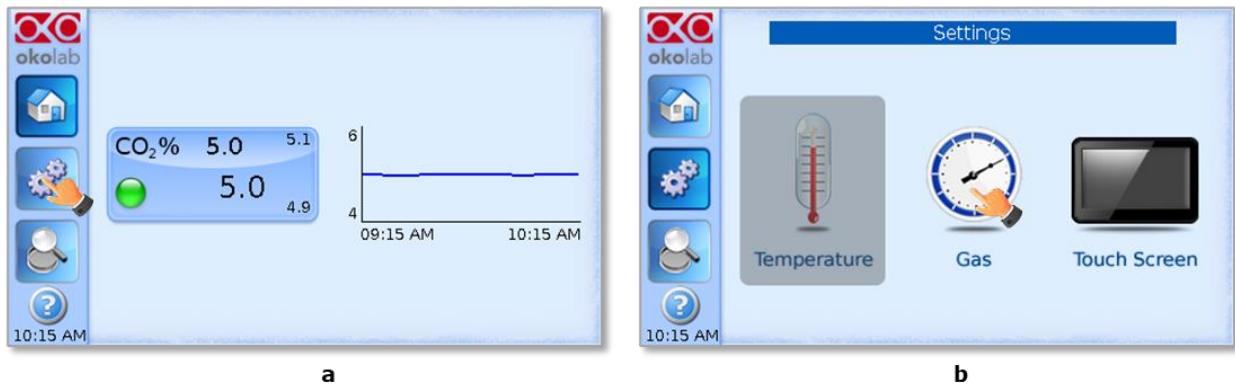



Figure 19. Gas Settings (a - b).

To enter the Gas Settings Submenu, press the Gas Icon  (see Figure 19 b). Then the page shown in Figure 20 appears.

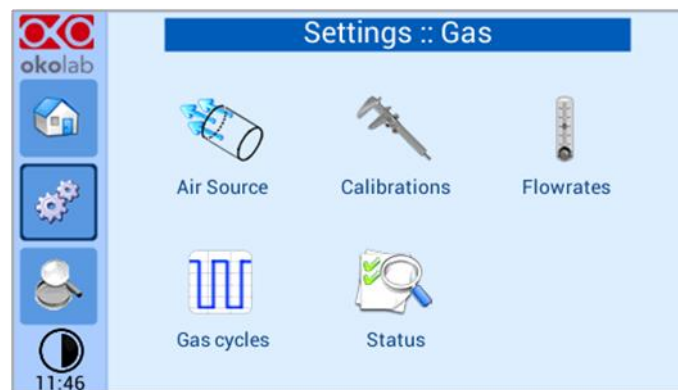



Figure 20. Gas Settings submenu.

9.2.1.1 Air Source

Press the icon  to set which Air source you are using (see Figure 21a). 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 21 b).

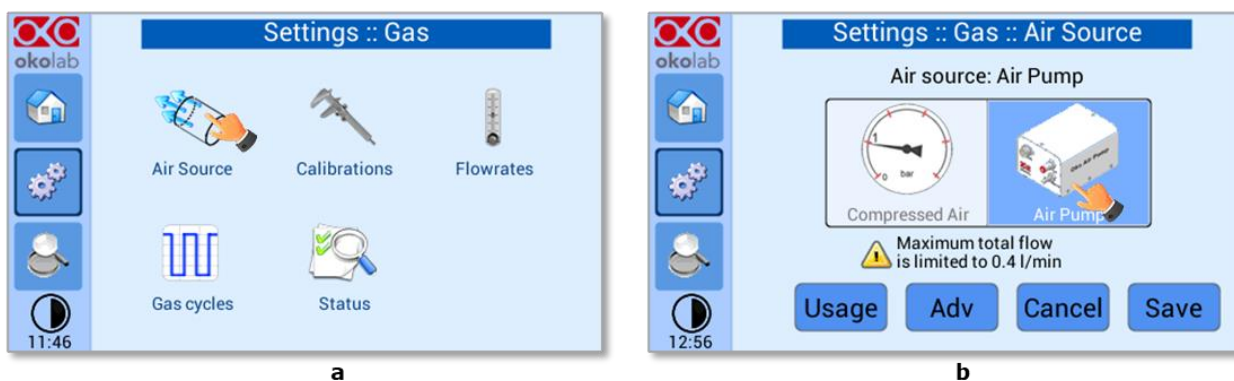


Figure 21. Air Source page (a – b).

If you want to use OKO-AIR-PUMP-BL (Air Pump), flag on *Air pump* checkbox (Figure 21 b), then press *Save* to confirm.

Tip ► To connect the Air Pump (OKO-AIR-PUMP-BL) to the CO2-UNIT-BL, 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.

Press on *Usage* button (see Figure 22 a) to check/reset the usage time of the Air Pump.

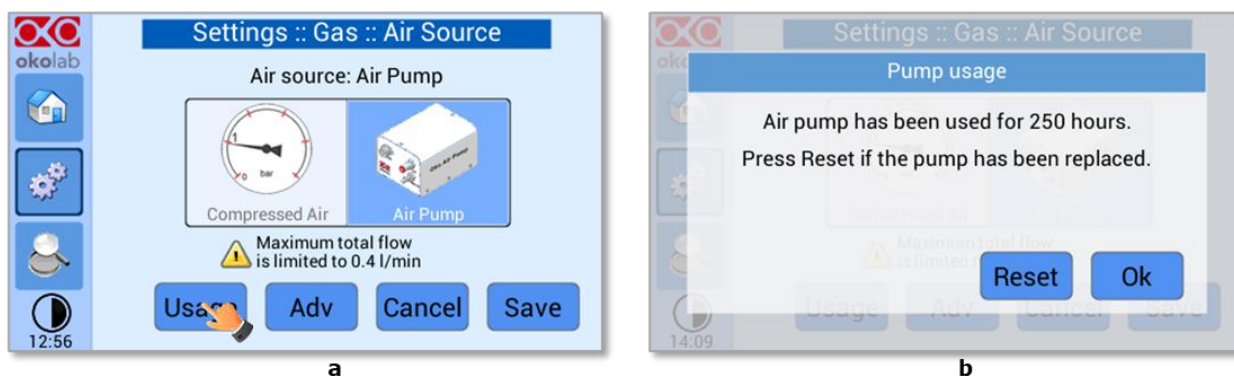


Figure 22. Air pump usage (a – b).

Tip ► Do not forget to reset the time counter after replacing the Air Pump.

Press on *Adv* button (see Figure 23 a) to change the Air pump speed. You can add an offset in the range [-10; +10] by using the + / - icons or scrolling the *Air pump speed offset* bar (see Figure 23 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 Setpoint.

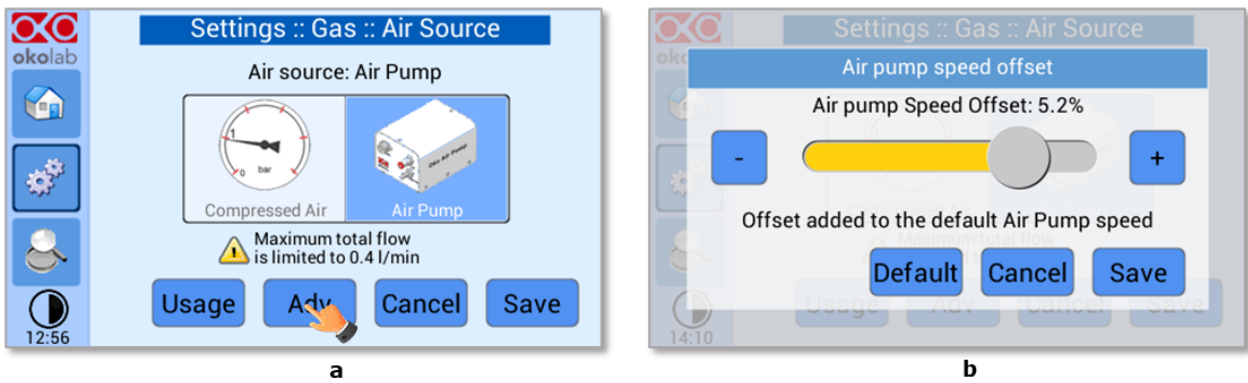



Figure 23. Air pump advanced settings (a – b).

9.2.1.2 Calibrations

Press on Calibration icon  to enter in the Calibration Menu, as shown in Figure 24.

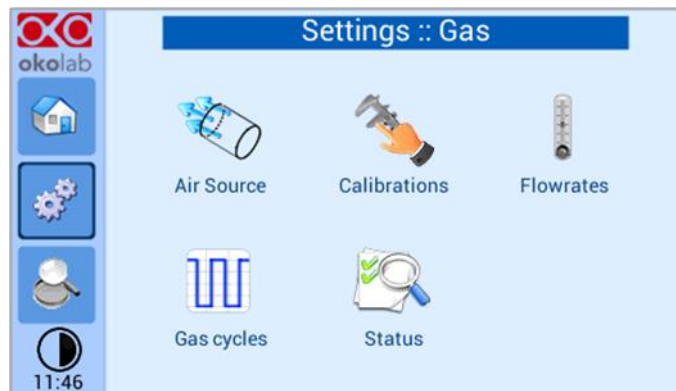


Figure 24. How to reach the Sensor Calibration Submenu.

9.2.1.2.1 Offset (with external meter)


Press on Offset icon  to calibrate the instrument by using an external CO₂ meter (NOT hereby provided).



Figure 25. How to enter a gas offset calibration.

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 rubber 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 rubber ring.

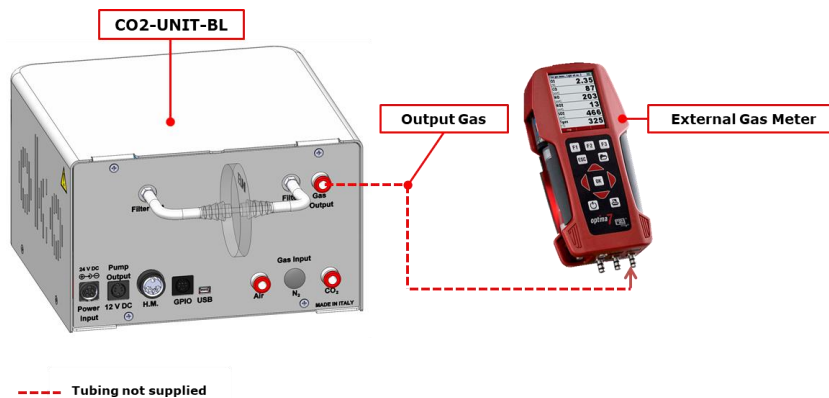


Figure 26. External Gas Meter Connection.

2. Connect the external Gas meter as shown above (see Figure 26). 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 CO₂ 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 27 b appears. Press on +/- icons to input the CO₂ level read by the external Gas meter (i.e. 5.5%), then press *Save*.



Figure 27. Manual Calibration (a - b).

Note ► The Touch Screen will go back to the previous screen. It will display on the left (“External Probe” tab) CO₂ 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*.

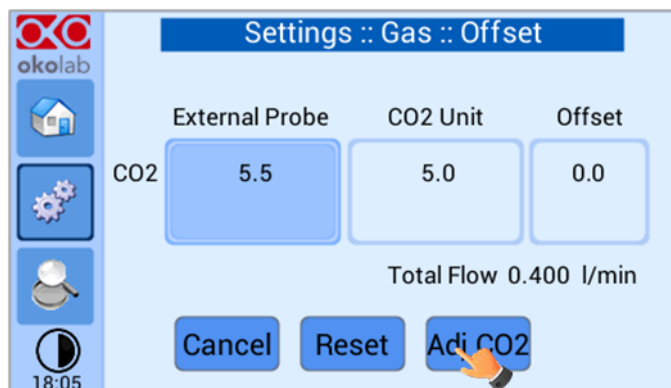


Figure 28. Manual Calibration Correction.

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.

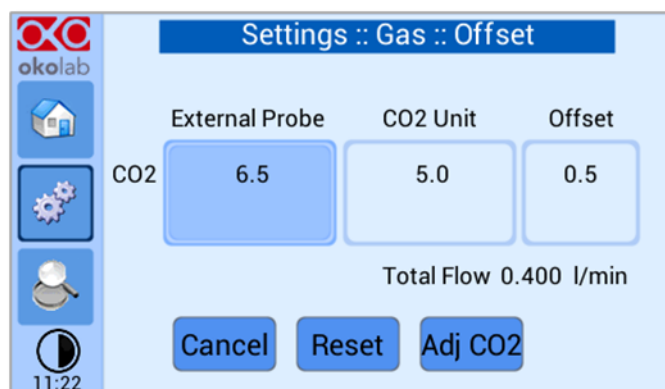



Figure 29. Manual Calibration End.



Please make sure that the external Gas meter used is accurate and calibrated.

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 25) 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 N₂ 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 30 b).

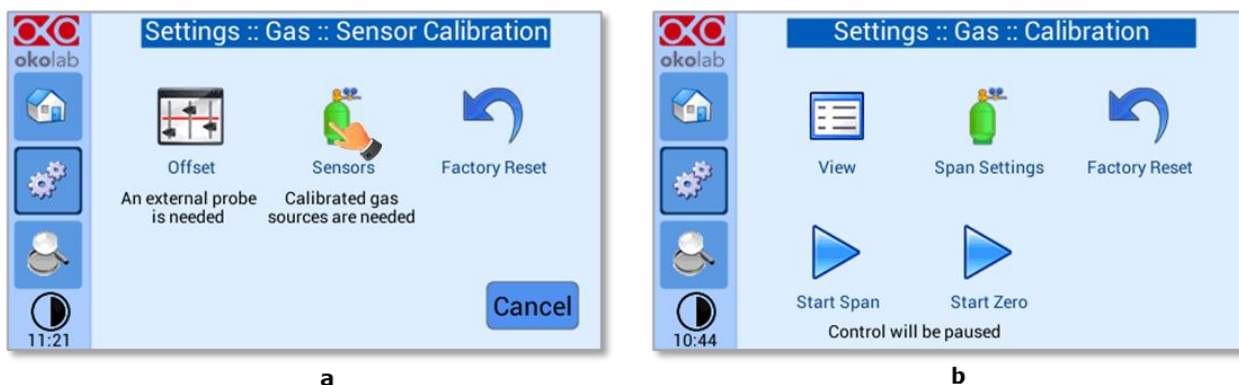



Figure 30. How to insert the Span Gas Calibration parameters (a – b).

9.2.1.2.2.1 **View**

Press on View icon  to visualize the latest calibration.

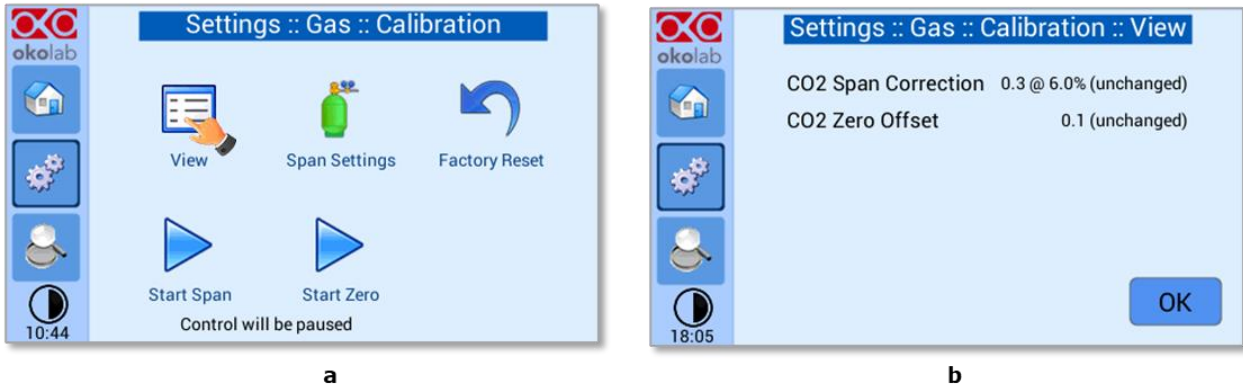



Figure 31. View Sensor calibration status.

9.2.1.2.2.2 **Span Settings**

Press on Span Settings icon  to access to the span gas settings (see Figure 32 a) and insert the exact gas composition of your span gas tank (see Figure 32 b).

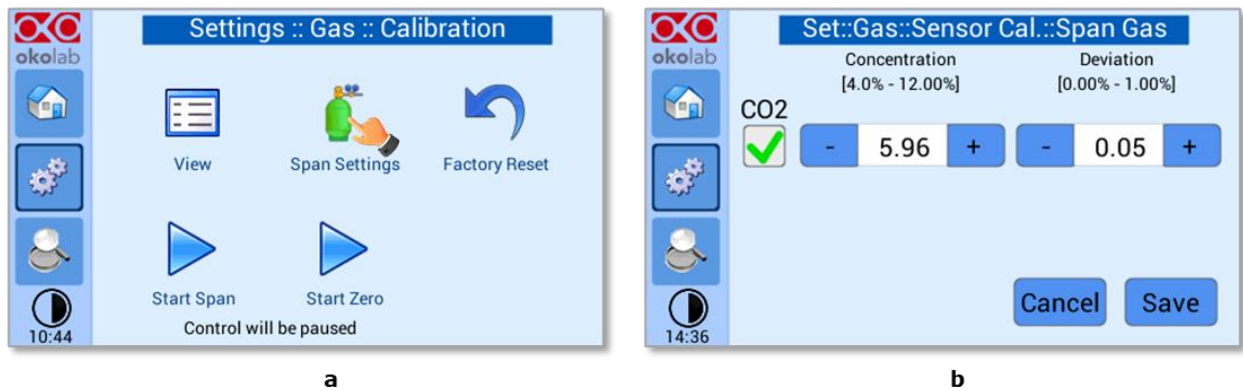



Figure 32. Span Settings Menu (a - b).

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 33 b.

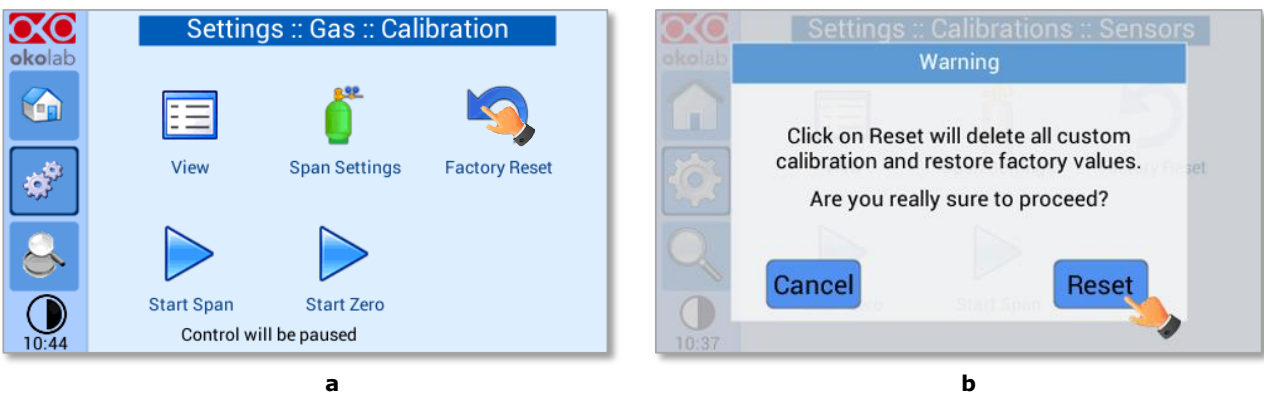



Figure 33. Factory Reset Menu (a - b)

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 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).

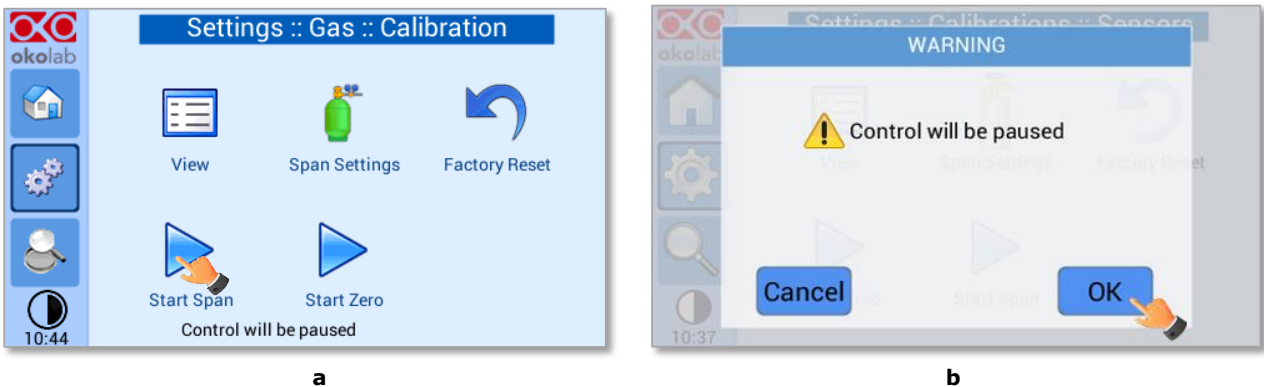


Figure 34. Start Span calibration (a - b)

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 35 a) and the progress bar will appear, as shown in Figure 35 b.

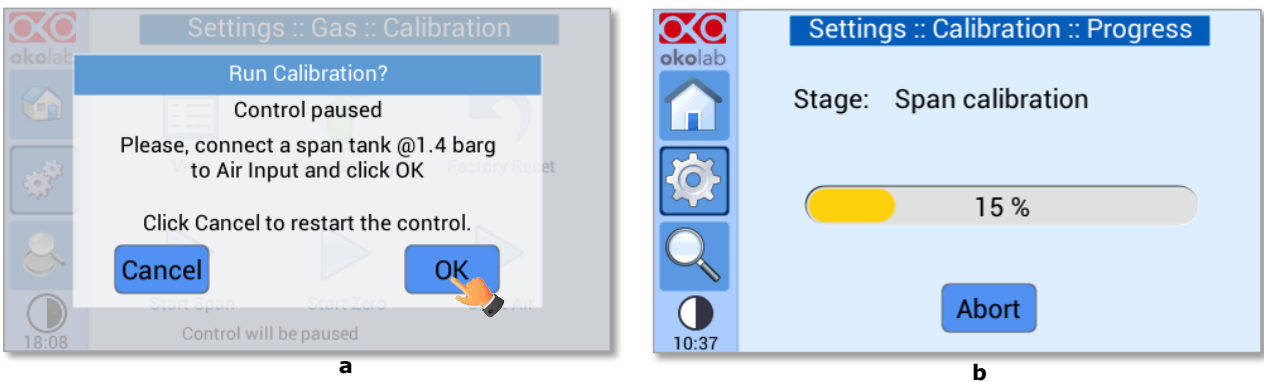



Figure 35. Span calibration running (a - b)

9.2.1.2.2.5 Start Zero

Press the Start Zero icon  to perform a new Zero Calibration (see Figure 36 a).

After clicking a pop-out message, will appear, warning about the pause of the control during the calibration routine (see Figure 36 b).

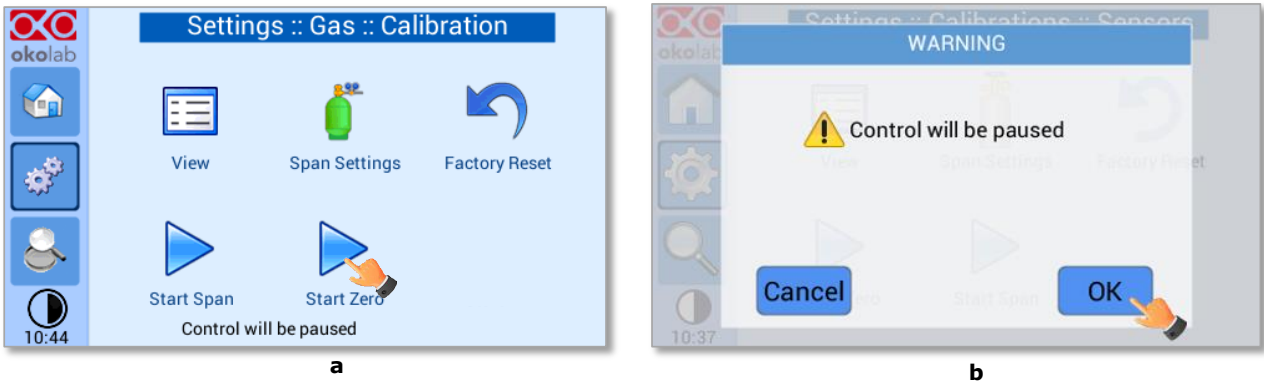


Figure 36. Start Zero calibration (a - b)

After clicking *OK* (see Figure 36 b), the controller will ask for connecting N2 at 1.4 barg to the Air Input, located on the rear panel of the CO2 CONTROLLER (see Figure 37 a), the Zero Calibration will start after pressing *OK* and the progress bar will appear (see Figure 37 b).

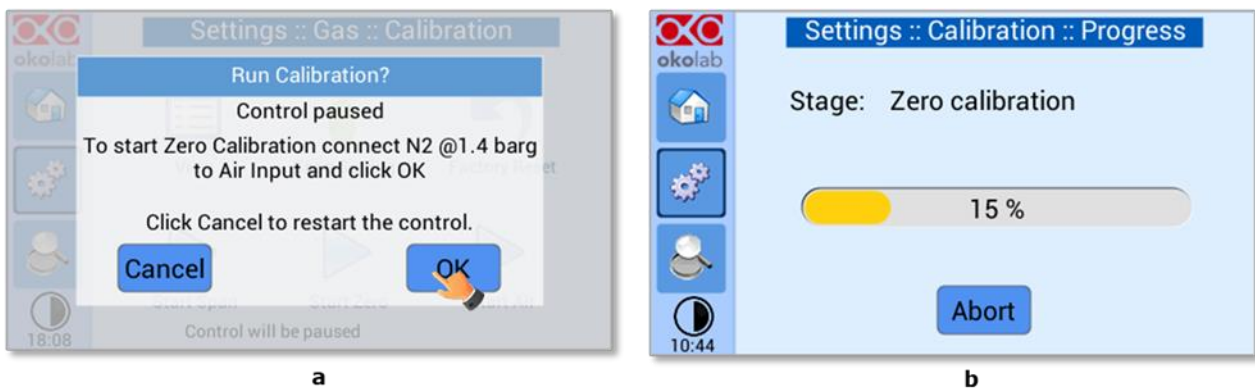



Figure 37. Flowrates view (a - b).

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 .

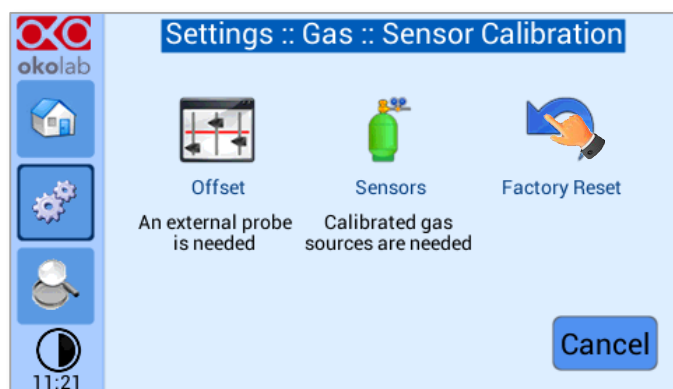



Figure 38. Sensor calibration factory reset.

9.2.1.3 Flowrates

Press the *Flowrates* icon  to check how many liters per minute of Air and CO₂ the system is consuming (see Figure 39 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 (see Figure 39 b) to set the gas flowrate in the range 0.0÷1 L/min by scrolling the *Total Flow* bar (1 in Figure 40) in the page that opens.

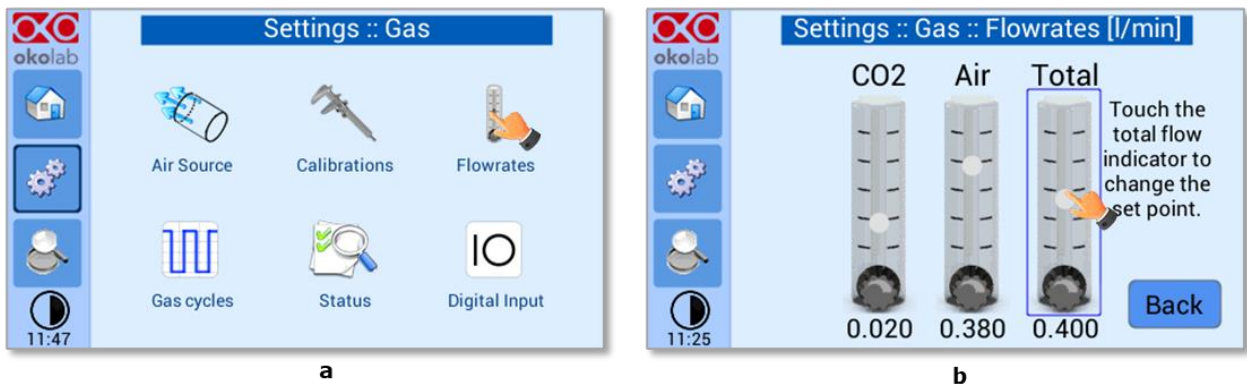


Figure 39. Flowrates View (a - b).

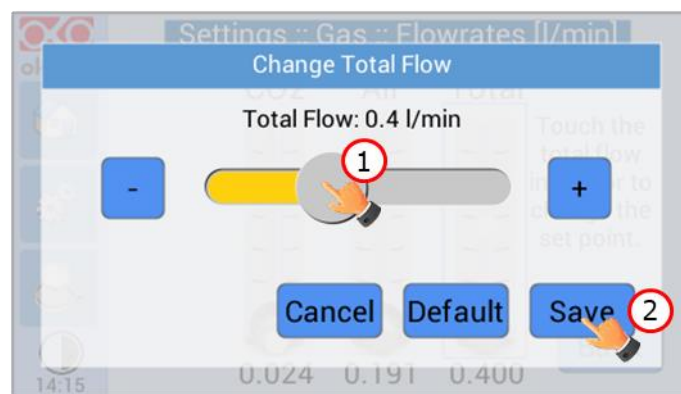



Figure 40. How to change the total flow rate.

Note ► You can set the flowrate at 0.0 l/min, in this case the gas flowrate will be paused and output flow will be interrupted (see **Error! Reference source not found.**). In this working mode three dots will appear in Homepage instead of CO₂% current value and the indicator will turn yellow.

Note ► 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 CO₂ concentrations. Press the *Gas cycle* icon  to set a gas concentration cycle (see Figure 41 a).

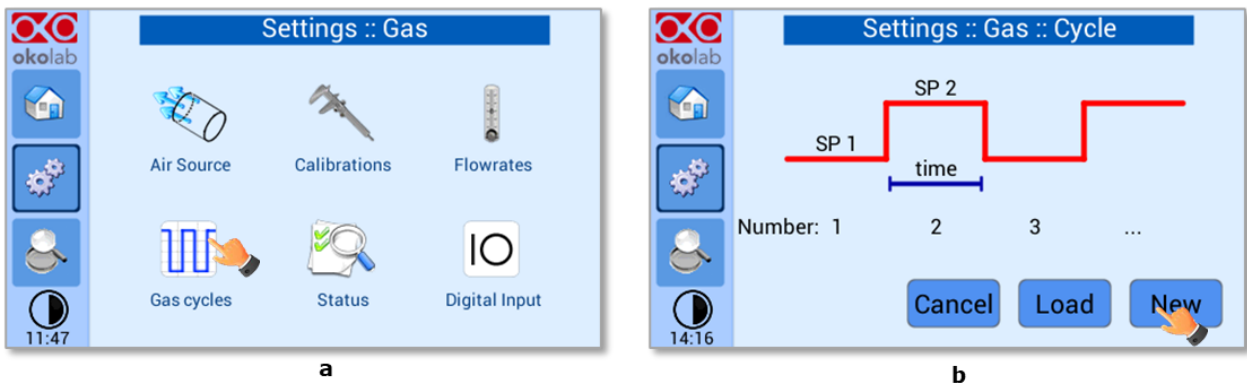


Figure 41. CO₂% Cycles Subpage (a – b).

You can decide whether setting a new gas cycle (*New*, as shown in Figure 41 b) or loading a previously saved one (*Load*). To set a new CO₂ concentration cycle, follow the indications below:

1. Choose the two CO₂ concentrations between which you want to switch (*SP1*: Setpoint 1 and *SP2*: Setpoint 2, as shown in Figure 42 a).
2. Set the duration in hours and minutes you want the system to dwell on each concentration (1, 2 in Figure 42 b).
3. Set the number of cycles (*Number*) you want the system performs (3 in Figure 42 b). Finally press *Next* (3 in Figure 42 b).

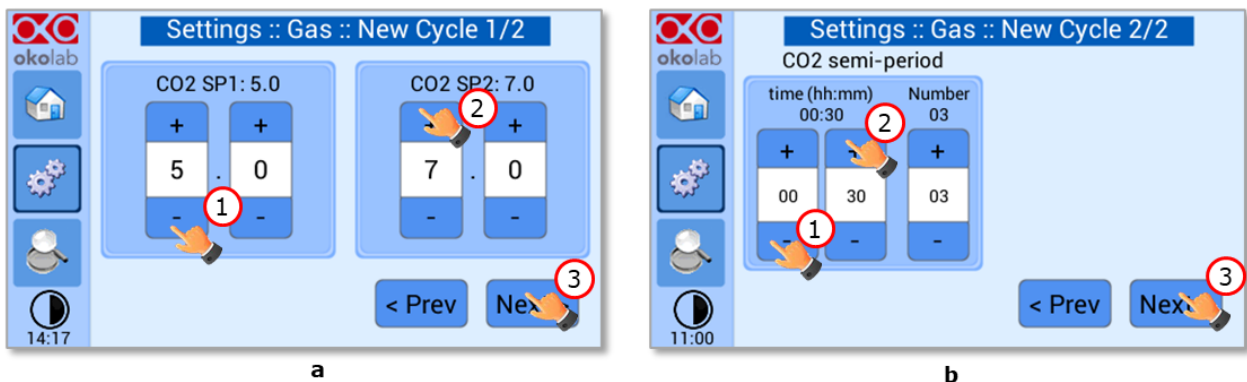


Figure 42. CO₂ Concentration cycles settings (a – b).

4. Once you have adjusted the settings, the *Cycle Summary* page will be displayed (see Figure 43 a). Press *Save* As if you want to save the CO₂ Cycle program to be recalled for future experiments.

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

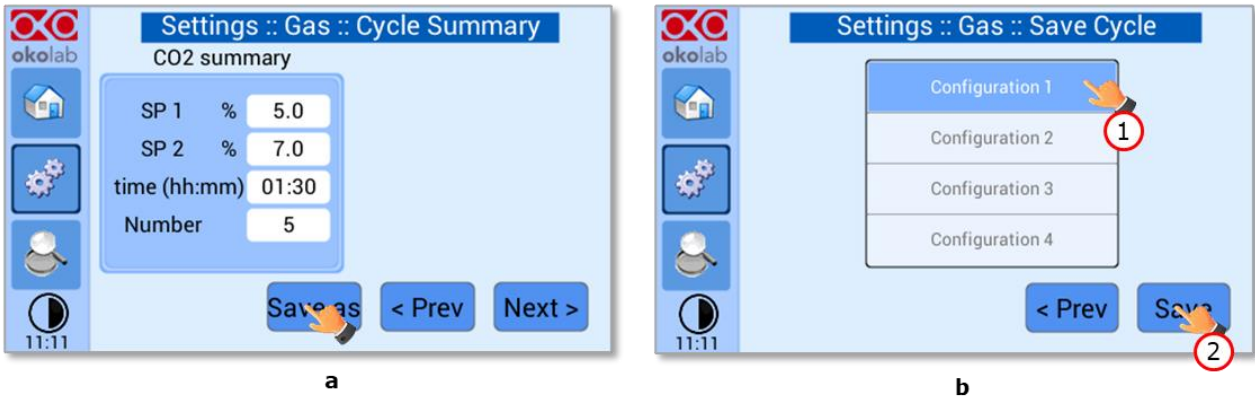


Figure 43. Cycle Summary and Configuration Saving (a - b).

- Schedule the time for the concentration cycle to start (see Figure 44).

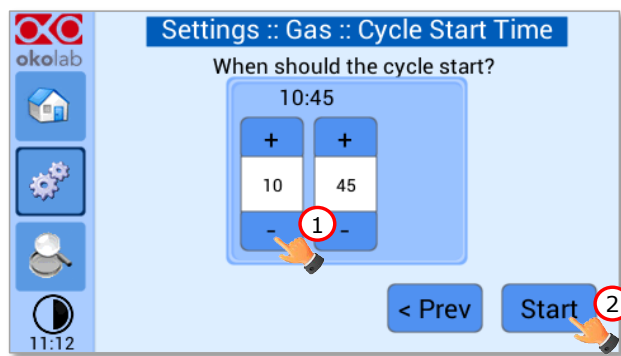



Figure 44. Cycle Start.

The cycle will start at the time set. A concentration cycling icon  will be displayed on the Homepage as a reminder (see Figure 45).

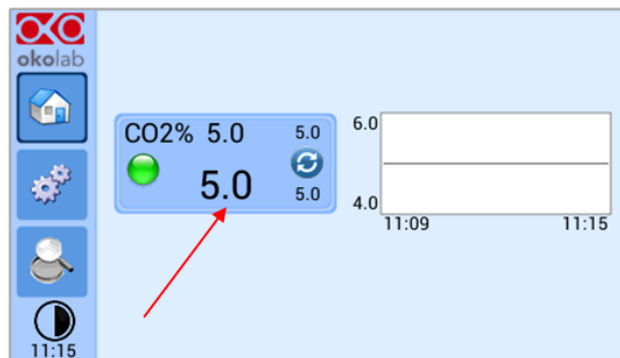


Figure 45. Icon in Homepage during a CO₂% cycle.

Note ► Trying to change Setpoint or starting a new cycle while a cycle is still running will open the window in Figure 46. You can press Abort to abort the cycle. Pressing "View" will open the current cycle settings. Press Home to undo.

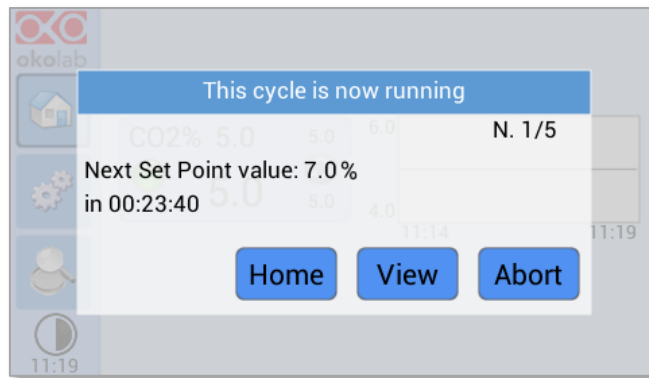



Figure 46. Warning shown if you try to change Setpoint during a gas cycle.

9.2.1.5 Status

Press the *Status* icon  (see Figure 47 a) to check CO2-UNIT-BL performance.

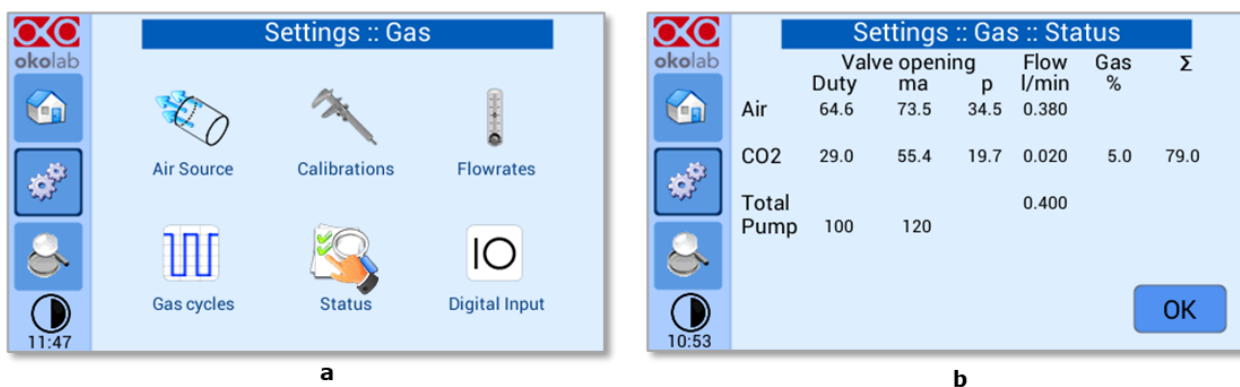


Figure 47. Status page (a – b).


Note ► The Status page contains advanced technical data. You may be asked to read these data in case of technical assistance with Okolab engineers.

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 48 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.

Press the *Digital Input* icon  to access to *Digital Input* page (see Figure 48 a).

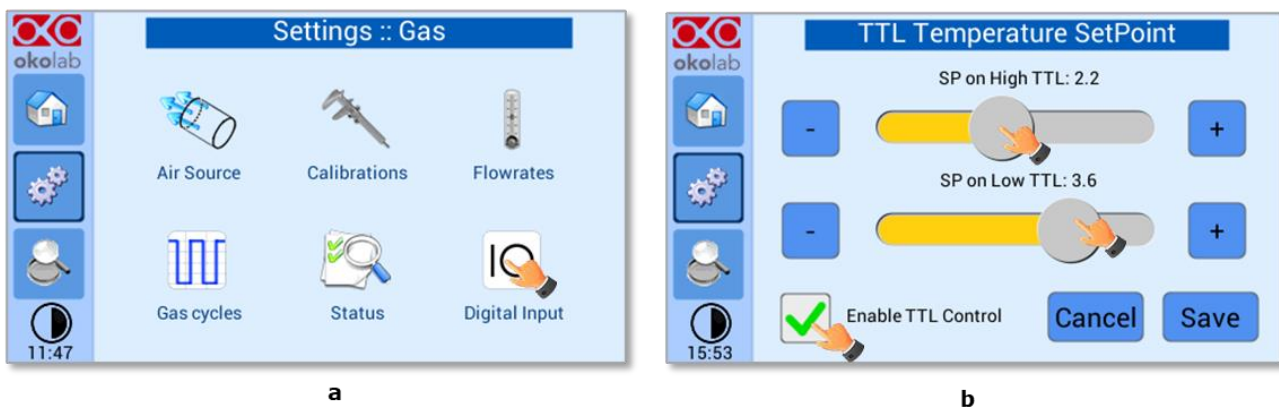




Figure 48. Digital input (a - b).

9.2.2 Touch Screen configuration

Press on *Settings* icon  to enter the *Settings* menu, as shown in the Figure 49 a. To enter the Touch Screen configuration menu, press on the icon , as shown in Figure 49 b.

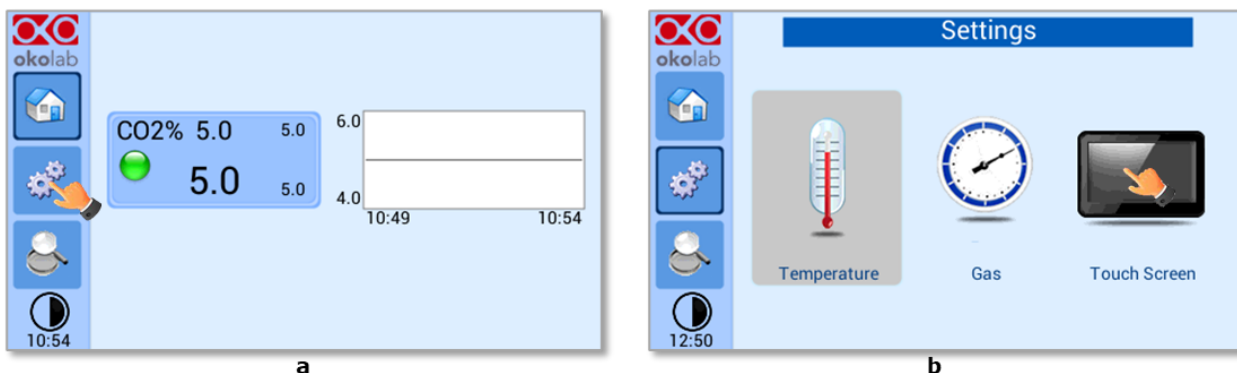



Figure 49. Touch screen settings (a - b).

9.2.2.1 Touch Screen Options

Press the *Options* icon  (see Figure 50 a) to enter the *Touch Screen Options* page. The Display Options menu allows to set the time frame in which the minimum and maximum CO₂ values are collected.

To insert the time frame, press the + / - icons or scroll the *Chart history length* bar (1 in Figure 50 b).

Note ► The chart history value length is pre-set at 5 minutes.

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

To change the sound frequency press the + / - icons or scroll the *Buzzer frequency* bar (2 in Figure 50 b), then press *Save* (4 in Figure 50 b) to confirm.

Note ► To activate a sound at each touch, flag the *Touch Buzzer* checkbox (3 in Figure 50 b).

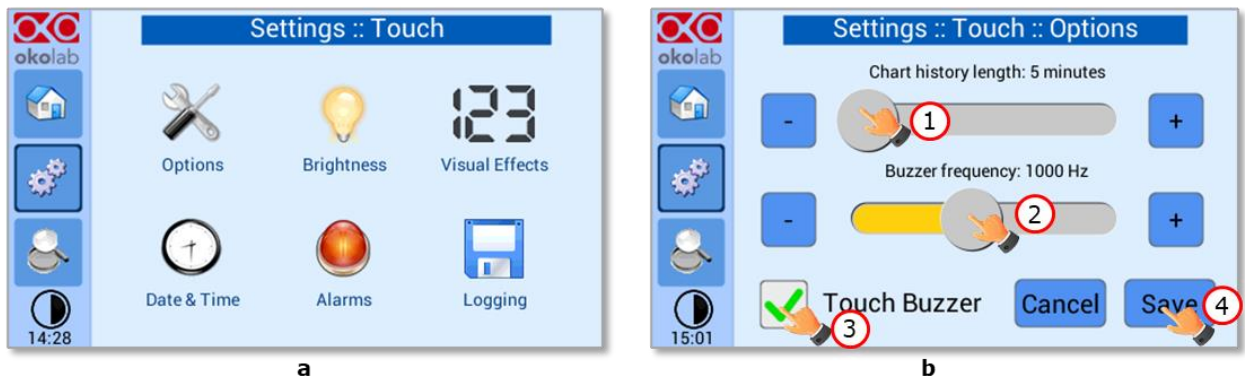



Figure 50. Touch Options (a - b).

9.2.2.2 Touch Screen Brightness

Press the icon  (see Figure 51 a) and scroll the bar (1 in Figure 51 b) or press the + / - icons in the page that opens to modify display *Brightness*. Set the required configuration and press *Save* (2 in Figure 51 b) to confirm.

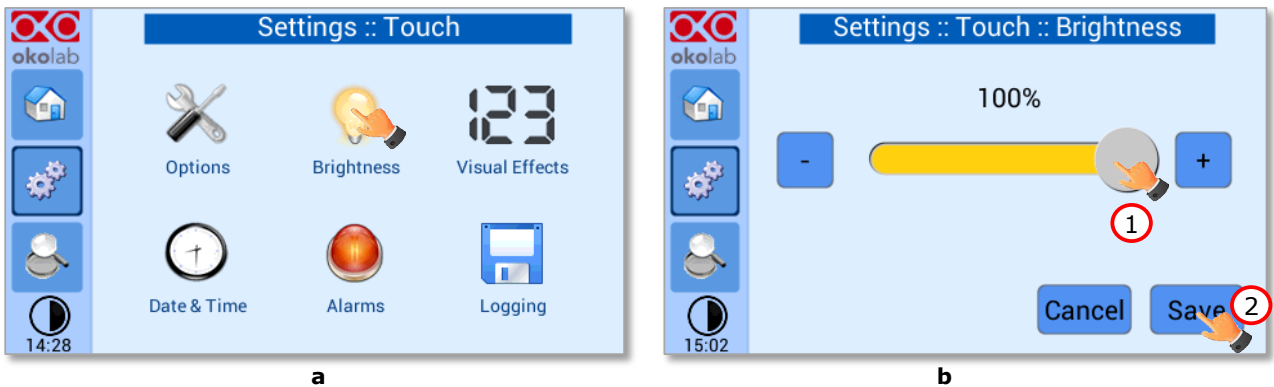


Figure 51. Brightness display page (a - b).

9.2.2.3 Touch Screen Visual Effects – icon and glance mode.

Press on the icon  to enter the Display visual effects menu, see Figure 52 a.

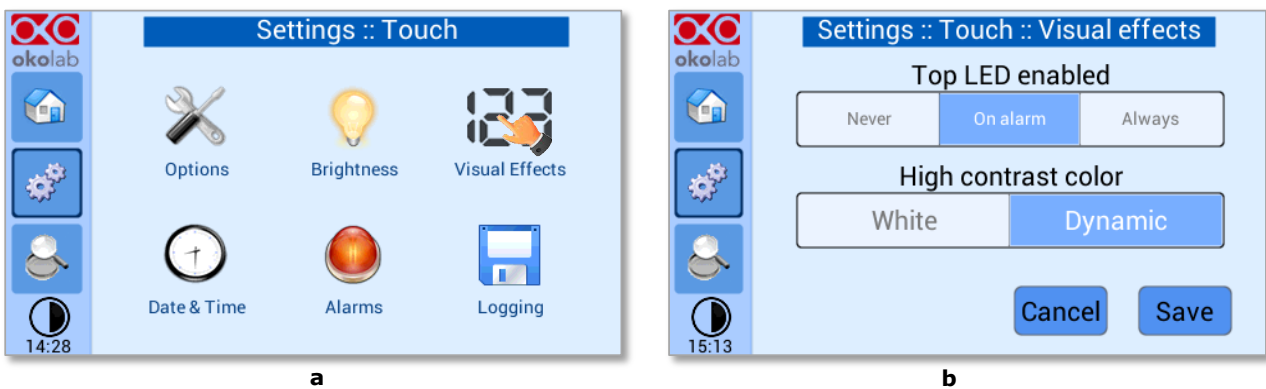




Figure 52. Visual Effects (a - b).

- **TOP LED Settings.** The TOP LED settings allows you to establish 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 CO2-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 color of the TOP LED and of the digits displayed in Glance Mode. If you select *White*, the TOP LED illuminates in white color (according to the criterion selected in TOP LED setting) and the digits displayed in Glance Mode are white. If you select *Dynamic* the color of the TOP LED and the color of the digits in Glance Mode follow the color coding reported in 9.1.2.

Tip ► To swap between Icon and Glance mode press on the icon  (see paragraph 9.4).

9.2.2.4 Date & Time

To set Date & Time, follow the instructions below:

1. Press the *Date & Time* icon  (see Figure 53 a).
2. Set the values by using the +/- icons (1 and 2 in Figure 53 b).

Tip ► Flag the 24 hours box, if you want to use the hour format based on 24 hours (3 in Figure 53 b).

3. Click on *Save* to confirm (4 in Figure 53 b) or *Cancel* to undo.

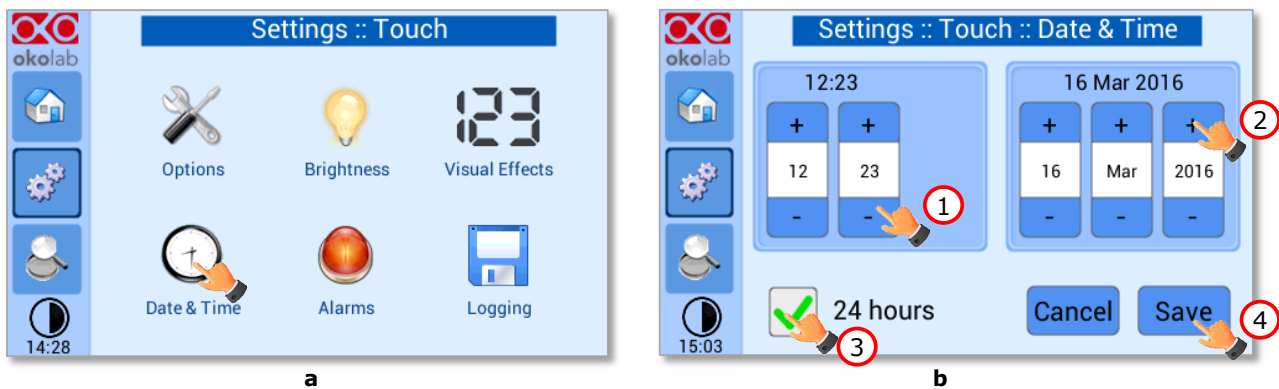




Figure 53. Touch screen settings. Date and Time (a - b).

9.2.2.5 Alarms

CO2-UNIT-BL also allows activating visual and audible alarms.

To set the alarms specifications, press the *Alarms* icon  (see Figure 54 a), then follow the indications below:

1. Click on the Gas icon  to set the gas deviation for a period of time then the system triggers on Alarms, as shown in the Figure 54 b.

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

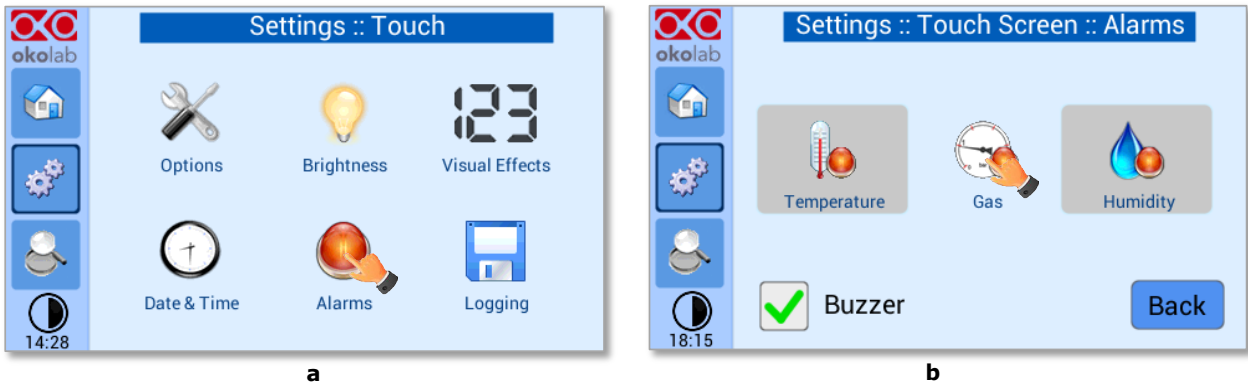


Figure 54. How to enter in Alarms page (a -b).

2. Insert the Gas Deviation by scrolling the bar (1 in Figure 55) or pressing the +/- icons.

Note ► The Gas Deviation value defines the tolerance from the Setpoint.

Note ► The gas deviation value range is 0.1-2.0 %.

3. Insert the Gas Time by scrolling the bar (2 in Figure 55) or pressing the +/- icons.

Note ► The Gas Time value defines the time for which the CO₂ composition may remain outside the allowed tolerance before CO₂-UNIT-BL triggers an alarm.

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

4. Press Save (3 in Figure 55) to confirm.

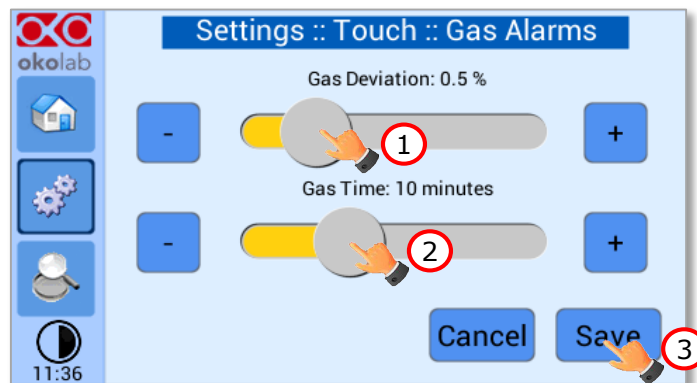


Figure 55. How to set the Deviation and Time Alarm.

Figure 55. In this example the following settings are displayed (valid only after the system has reached its stationary state): if the *Gas Deviation* from Setpoint is 0.5% or greater (i.e. if Setpoint 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 (*Gas Time* set in this example) then the system triggers an Alarm.

Tip ► After any change in the Setpoint value the device enters into a transient regime.

9.2.2.6 Data Logging

CO₂-UNIT-BL touch screen interface, OKO-TOUCH (see Figure 2), 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 56.

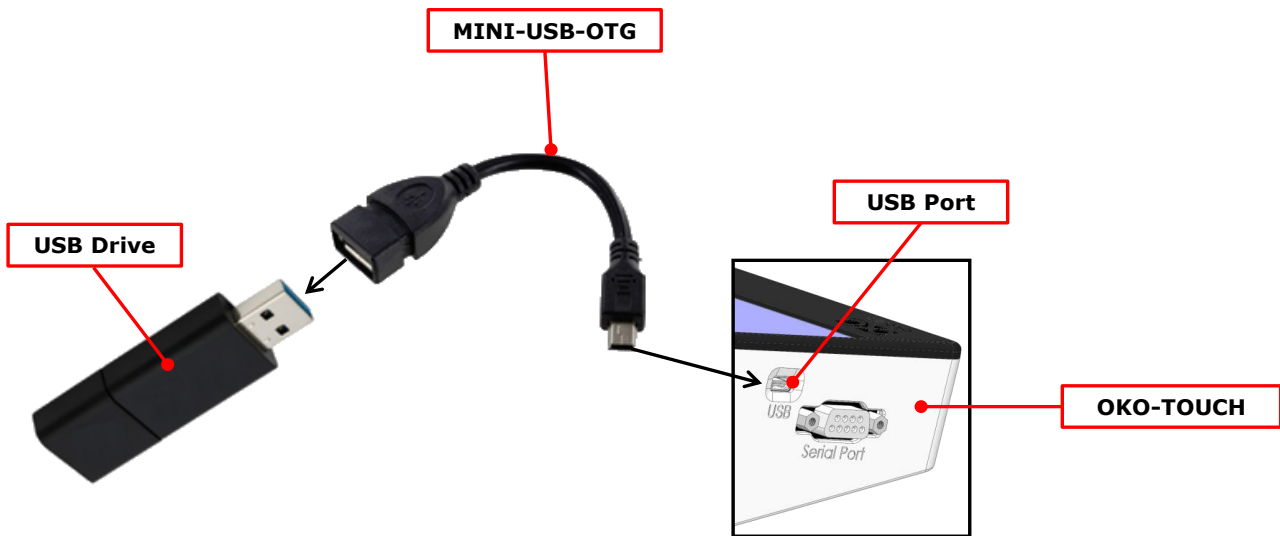


Figure 56. USB drive connection.

To activate the logging, follow the steps indicated below:





1. Press on *Settings* icon  (see Figure 57 a) and press on *Touch screen* icon  on the window that opens next (see Figure 57 b).



Figure 57 (a) How to enter the setting menu; (b) how to enter the Touch Screen menu.

2. Press on *Logging* icon  (see Figure 58 a) and flag *Internal memory* in the page that appears (see Figure 58 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 59.

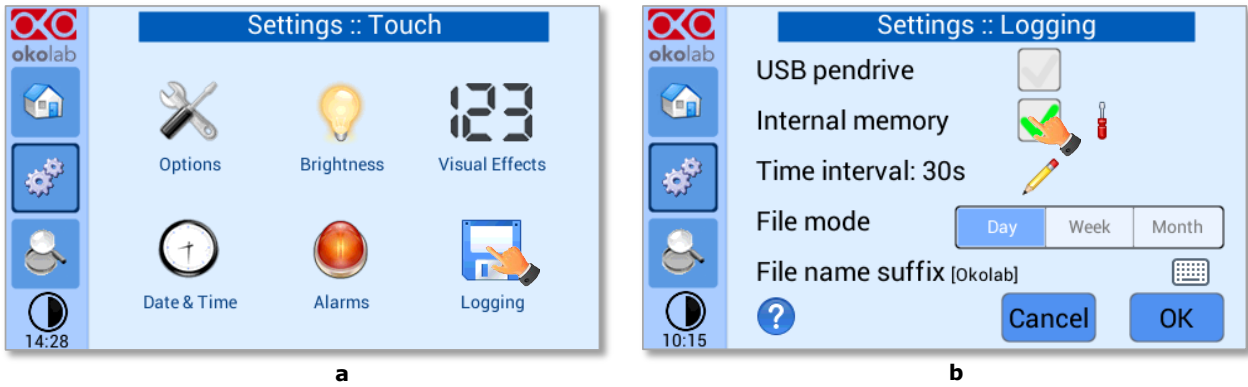


Figure 58. Logging. (a) How to enter in the logging menu; (b) logging in internal memory.

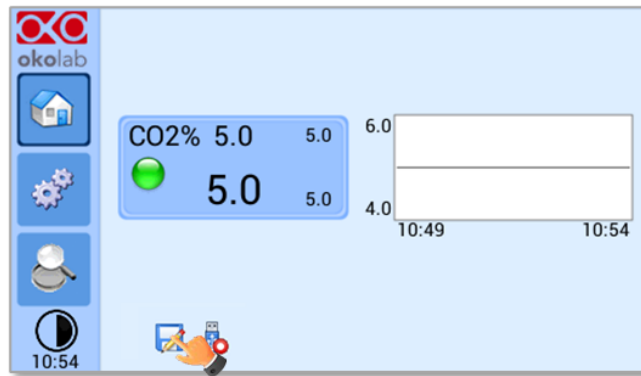



Figure 59. How to access the Logging page from the Homepage.

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 60. In this example a data point is logged every 30 seconds, you can change *Time Interval* in the range 1-60 seconds.

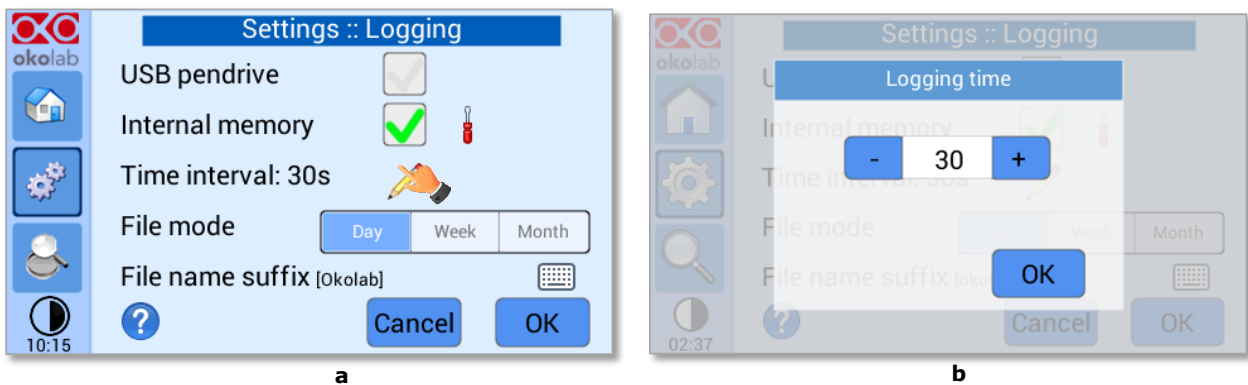



Figure 60. How to set the logging time (a – b).

4. Choose how you want to organize the data when downloaded, by pressing on Day, Week or Month (see Figure 60 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 61 a).
6. Press Save (see Figure 61 b).

Tip ► With the selections as in Figure 60 and in Figure 61, the data will be downloaded on the USB drive as shown in Figure 62.

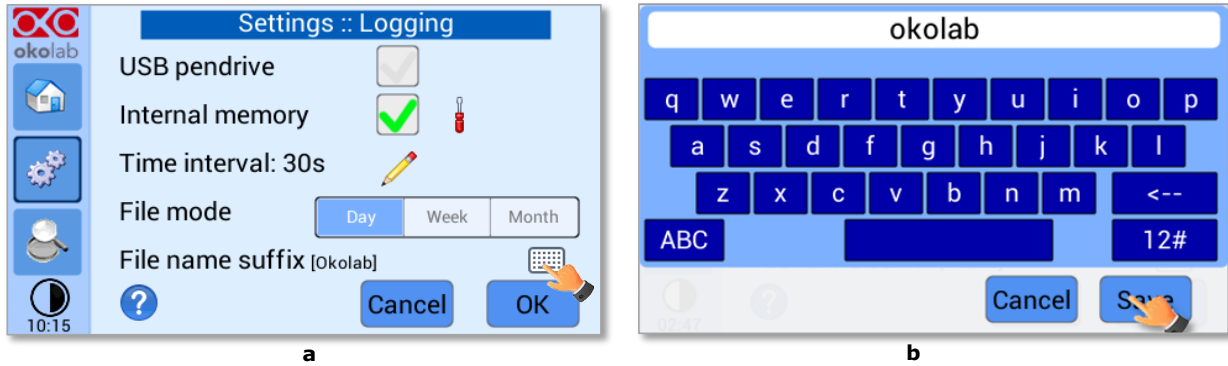


Figure 61. Data Logging. How to define the suffix for the downloaded files (a – b).

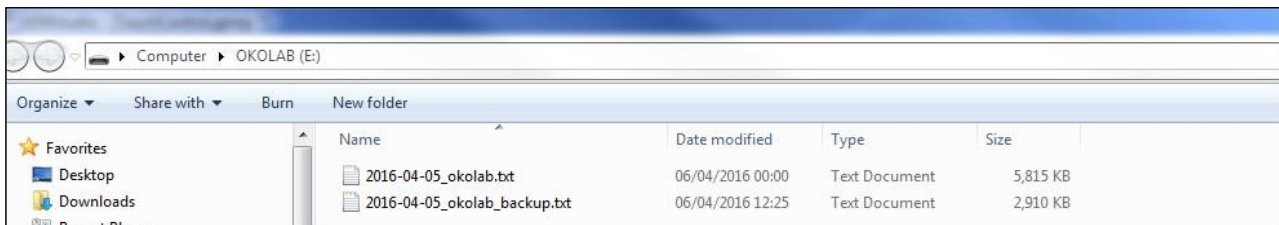



Figure 62. Downloaded files on the pen drive.

Note ► If you press on the screwdriver icon  (see Figure 63 a) you can view the logging starting date, the available memory and the latest download (see Figure 63 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.

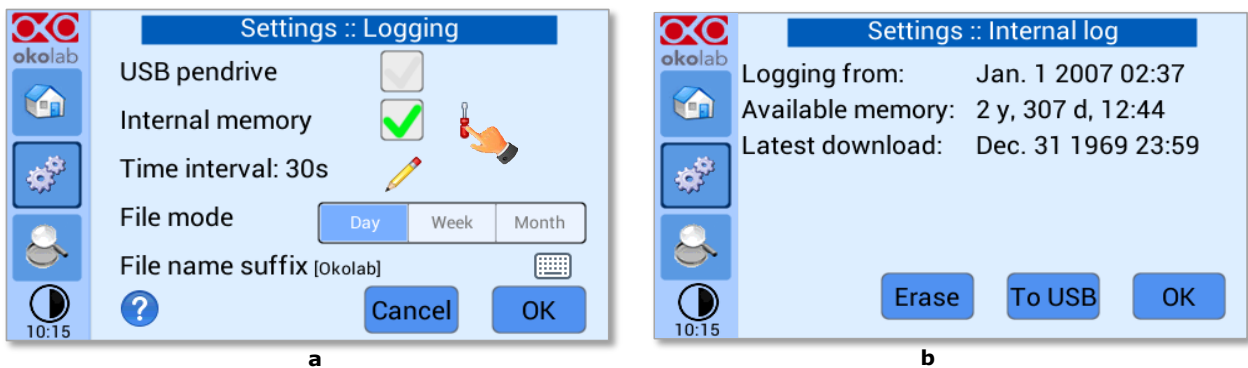
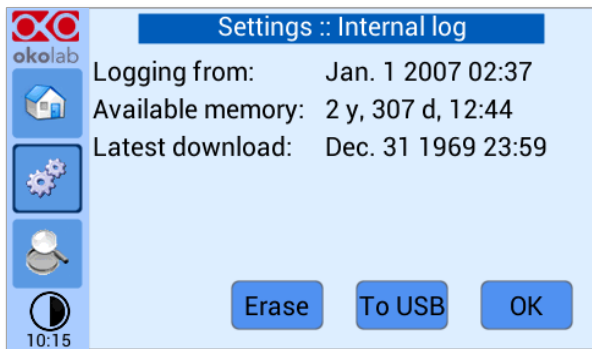
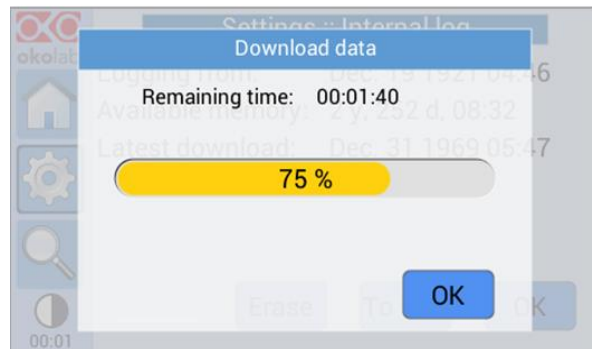


Figure 63. Internal memory status. (a) Logging page settings; (b) Internal log page settings.

To download the data, press on *To USB* or on *Erase* if you want to delete the data, see Figure 63 b.



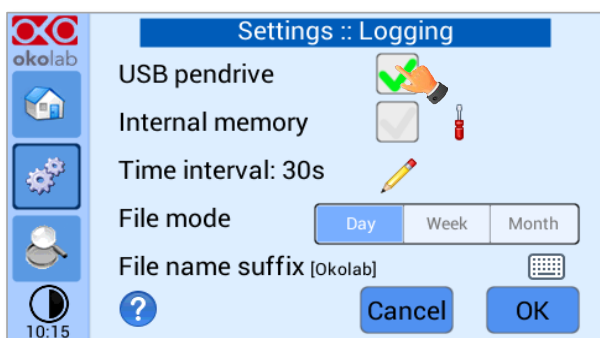
a



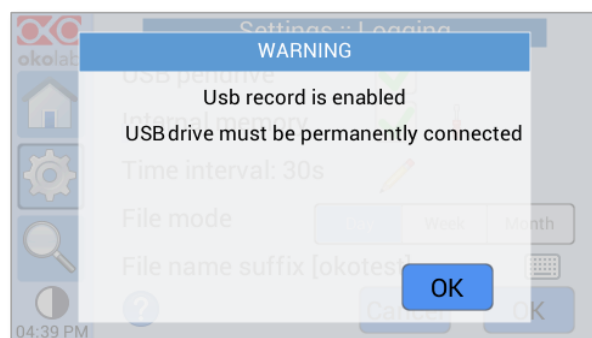
b

Figure 64. Download to USB.

You can activate the logging also on the *USB drive*, by flagging on *USB drive*, see Figure 65 a.



a



b

Figure 65. 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 65 b), and will store the data on the USB drive.

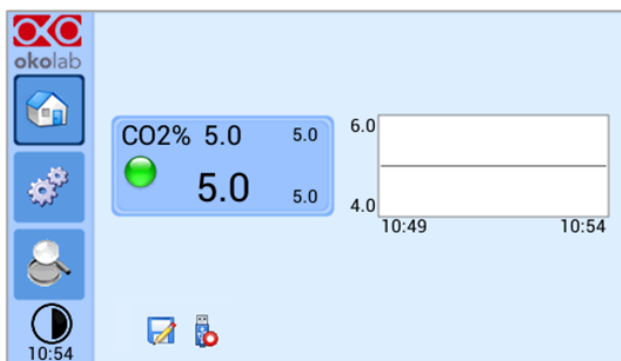




Figure 66. Logging to USB drive.

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 66).

9.3 Overview

Press on the icon  to open the *Overview* page as show in Figure 67 a.

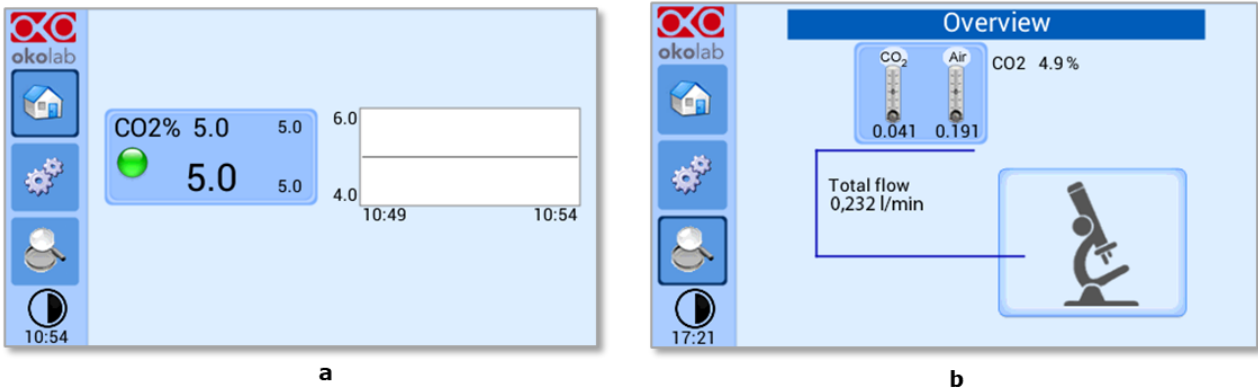



Figure 67. Overview Status page. (a) How to enter in the Overview Page (b) Overview Status Page.

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

CO2-UNIT-BL features two display modalities: *Icon mode* and *Glance Mode*, as shown in Figure 68 a and b.

You can swap between the two display modalities by pressing on icon .

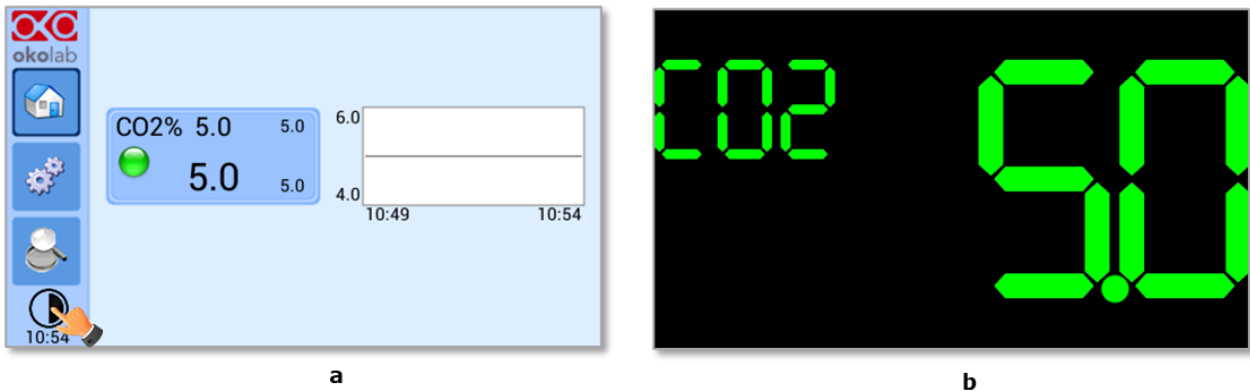



Figure 68. Display modalities. (a) Icon Mode; (b) Glance Mode.

9.5 Info page



Press the icon  to access the Info Page, as shown in Figure 69. This page contains the information related to the OKO-TOUCH (as shown in Figure 70 a) and to CO2-UNIT-BL version (as shown in Figure 70 b).

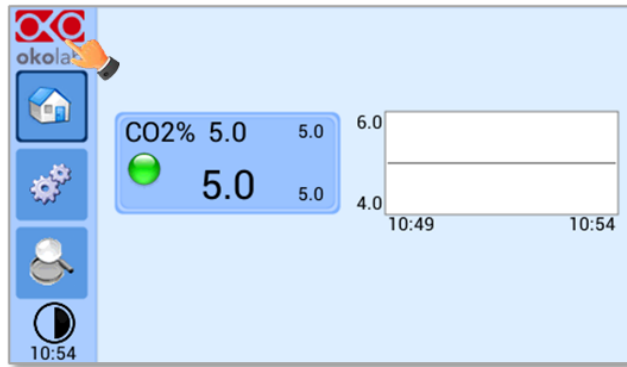


Figure 69. Info page selection.

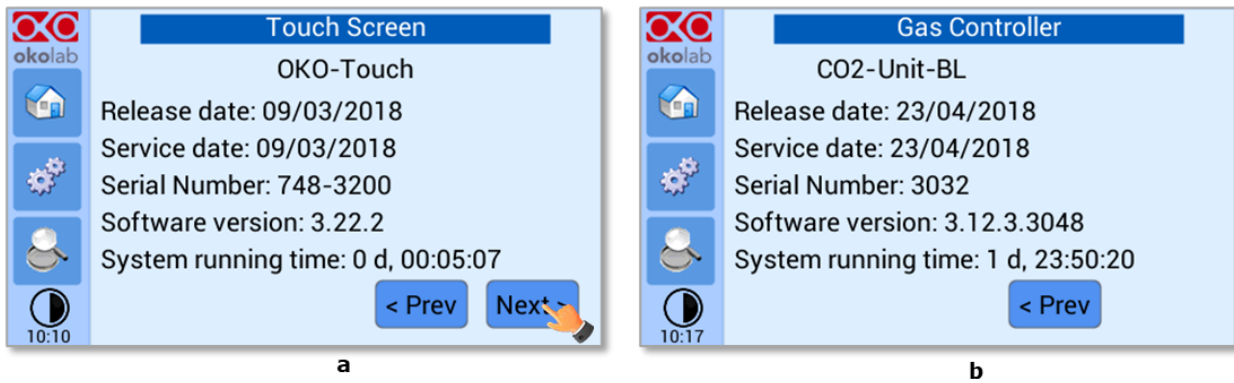


Figure 70. Info page OKO-Touch (a) and CO2-UNIT-BL (b).

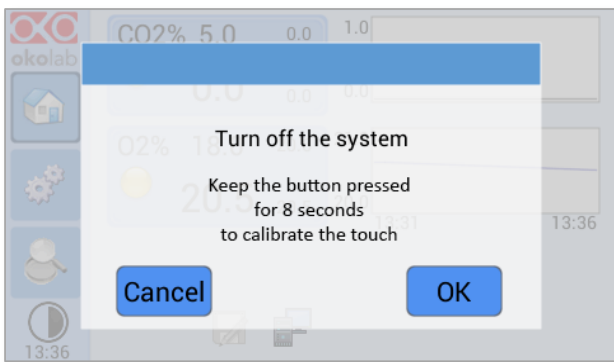
Tip ► Please have this information handy when contacting Okolab for support.

10 Touch Screen Calibration

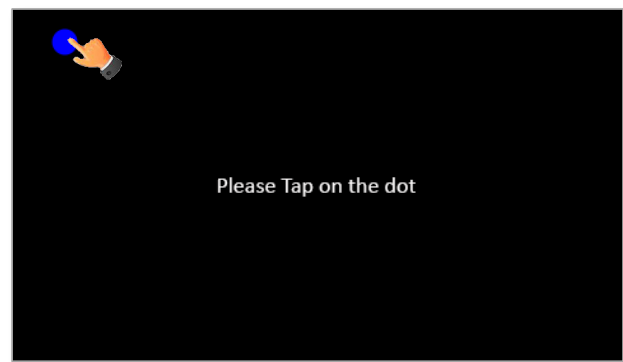
Keep pressed the *ON/OFF* button on OKO TOUCH for 7 seconds to start the Touch Screen Calibration (see Figure 71). While holding the button, the pop-up message shown in Figure 72 a appears. Then tap blue calibration dots until the calibration is complete (see Figure 72 b).



Figure 71. How to enter in Touch Screen Calibration.



a



b

Figure 72. Start Touch Screen Calibration (a – b).

11 Cleaning & Maintenance

Cleaning

Please, follow the instructions below to clean 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 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 filter (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.

12 Support

To contact one of our engineers please write to support@oko-lab.com or contact us through the live chat in www.oko-lab.com. You can request a remote support session anytime.

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

13 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.

14 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 CO ₂ -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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16 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
06	Edit new form factor User Manual	June 2021

WARRANTY

Okolab S.r.l. warrants "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. 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 damage that may results from improper use of its products in accordance with information provided by Okolab S.r.l. Okolab S.r.l. warrants only the parts manufactured by Okolab S.r.l to be 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.