



okolab

CO2-02-UNIT-BL [0-20; 1-95]

Gas Controller

Manual

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CO2-O2-UNIT-BL [0-20; 1-95] is a Digital CO₂/O₂ Controller that mixes CO₂, O₂ and N₂ to the desired concentration in the CO₂ range 0-20% and O₂ range 1-95%. If operated without N₂, it mixes CO₂ and Air to the desired CO₂ concentration in the range 0-20% and you don't need to regulate O₂.

It features a long life Non Dispersive Infrared (NDIR) dual wave length CO₂ detector and a long life O₂ optical sensor to ensure a high accuracy on the gas composition and a flow rate sensor to regulate output flow rate.

CO₂-O₂-UNIT-BL [0-20; 1-95] 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).

CO₂-O₂-UNIT-BL [0-20; 1-95] connects to any Okolab Bold Line T controller. In this case, a single OKO-TOUCH operates both, the Bold Line T controller and CO₂-O₂-UNIT-BL [0-20; 1-95].

CO₂-O₂-UNIT-BL [0-20; 1-95] is also 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 the compressed air.

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.*

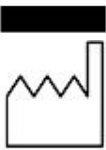
2.2 Symbols on the product label



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 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-O2-UNIT-BL [0-20; 1-95] 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 5 barg (72.5 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 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.
 - 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-O2-UNIT-BL [0-20; 1-95]**, 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 as spare replacement.
3. **TUBE-AL (x1)**. Polyurethane 1.3 m long blue tube 6mm OD with valved in-line connector, connected to a Silicon 15cm long transparent tube 4mm ID plus PTFE filter in the middle. Use TUBE-AL to connect the CO2-O2-UNIT-BL [0-20; 1-95] to your device or to the humidifier, if it is present.

Note ► *If you purchased CO2-O2-UNIT-BL [0-20; 1-95] with H201-T-UNIT or H101-T-UNIT, you receive the TUBE-AI, Polyurethane 1.3 m long blue tube 6mm OD with valved in-line connector, connected to a Silicon 15cm long transparent tube 4mm ID plus PTFE filter in the middle, connected to a Polyurethane 1m long blue tube 6mm OD. Use TUBE-AI to connect the CO2-O2-UNIT-BL [0-20; 1-95] to the cage incubator.*

4. **TUBE-A (x2). Rigid tubes**, Polyurethane 3m long 6mm OD each. Use TUBE-A to connect N₂ and CO₂ supply to the corresponding input ports (N₂ and CO₂) on the rear panel of the CO2-O2-UNIT-BL [0-20; 1-95].
5. **Pressure Gauge for CO2 + regulator + assembly stirrup (x1)**. Install pressure gauge between the pure CO2 supply pressure regulator and the corresponding CO2 input port on the rear panel of CO2-O2-UNIT-BL [0-20; 1-95].
6. **TUBE-AF (x1)**. Polyurethane 3m long yellow rigid tube 6mm ID with valved in-line connector. Use TUBE-AF to connect O₂ supply to the corresponding input port (O₂) on the rear panel of the CO2-O2-UNIT-BL [0-20; 1-95].
7. **24V-DC Power Adapter (x1)**.

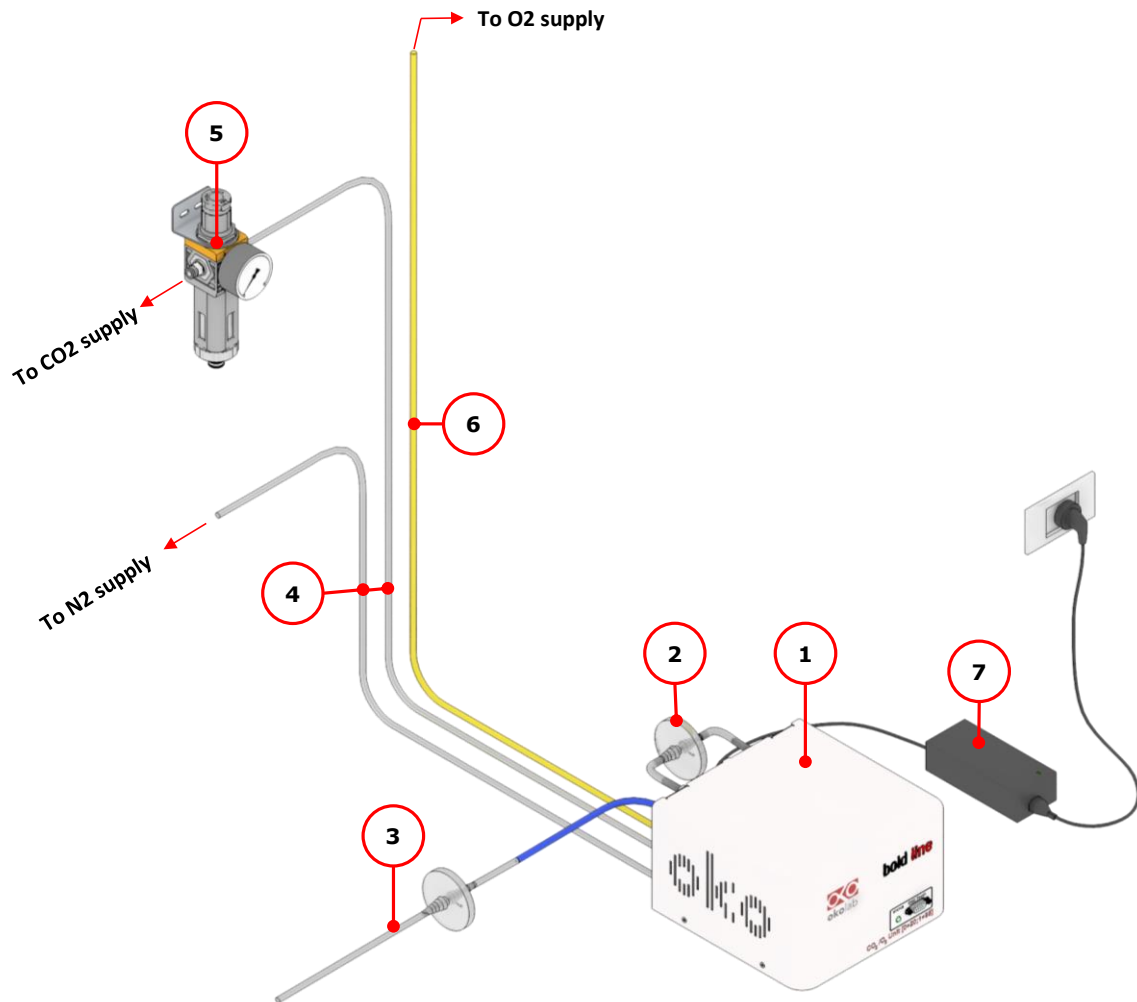


Figure 1. CO2-O2-UNIT-BL [0-20; 1-95] – components.

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.
- **N2.** N2 must be available within the pressure range **0.6 - 1 barg (8.7 – 14.5 psig)**, with a connector for 6mm OD rigid silicon tube. Gas source must be Standard Purity N2 (coded as 4.5 that means 99.995 % of N2) and humidity-free gas.
- **O2.** O2 must be available within the pressure range **0.6 - 1 barg (8.7 – 14.5 psig)**, with a connector for 6mm OD rigid silicon tube. Gas source must be Standard Purity O2 (coded as 4.5 that means 99.995 % of O2) 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 to the compressed air, OKO-AIR-PUMP-BL allows to use background Air.

6 Compatibility

CO2-O2-UNIT-BL [0-20; 1-95] 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** (*only in case it is required to work in "CO2 in Air" mode*)
- **H101-BASIC-BL**
- **H101-CRYO-BL**
- **H201-T-UNIT-BL**
- **H301-T-UNIT-BL-PLUS**
- **HM-ACTIVE**
- **H101-HM**
- **HM-VF**

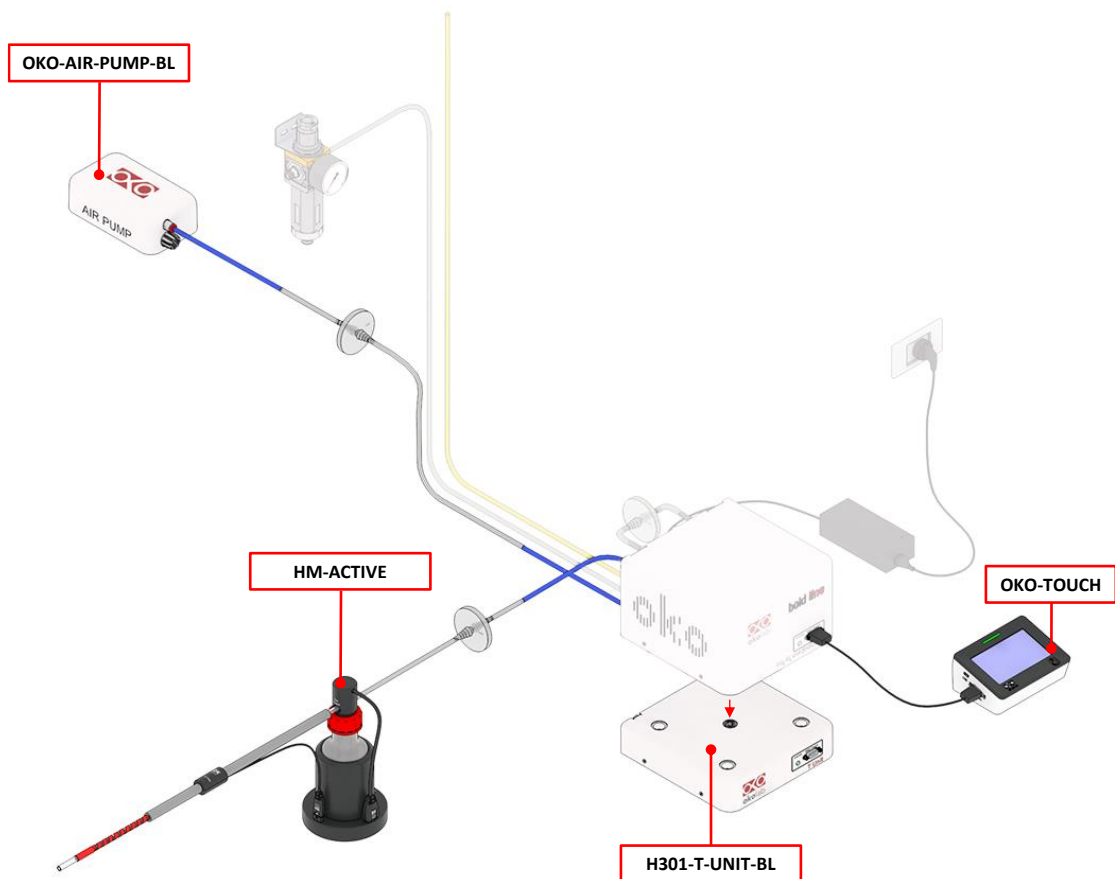


Figure 2. CO2-O2-UNIT BL [0-20; 1-95] within a typical H301 configuration.

- **DATA-LOG.** 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.

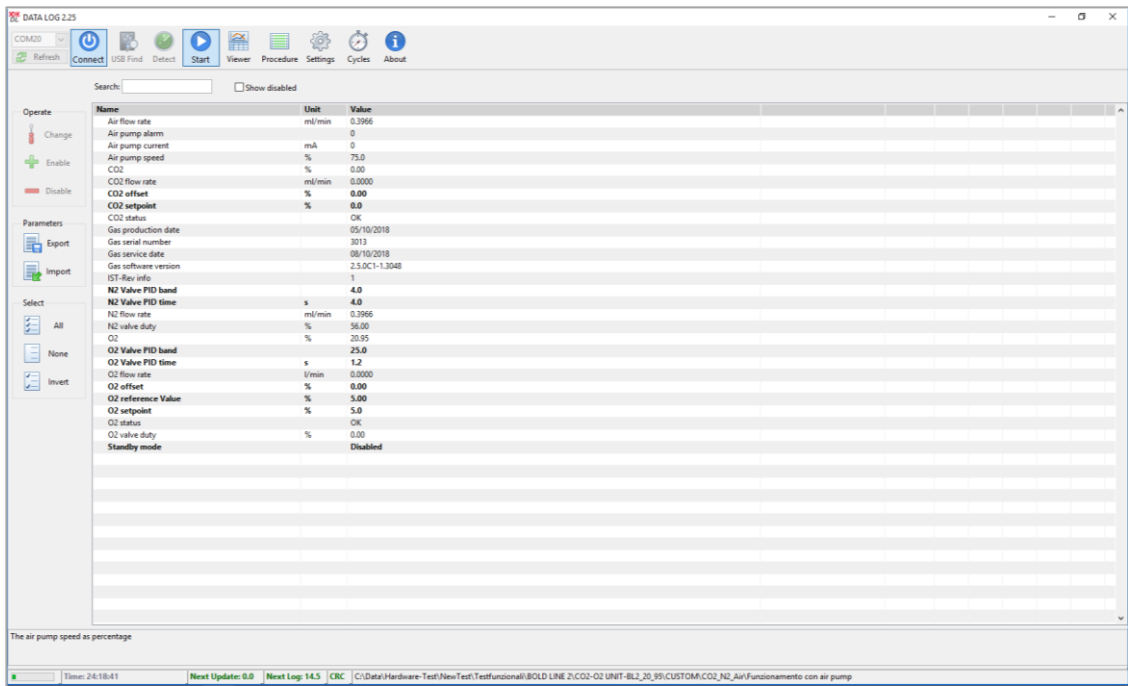


Figure 3. DATA LOG software.

- **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-O2-UNIT-BL [0-20; 1-95] front panel:

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

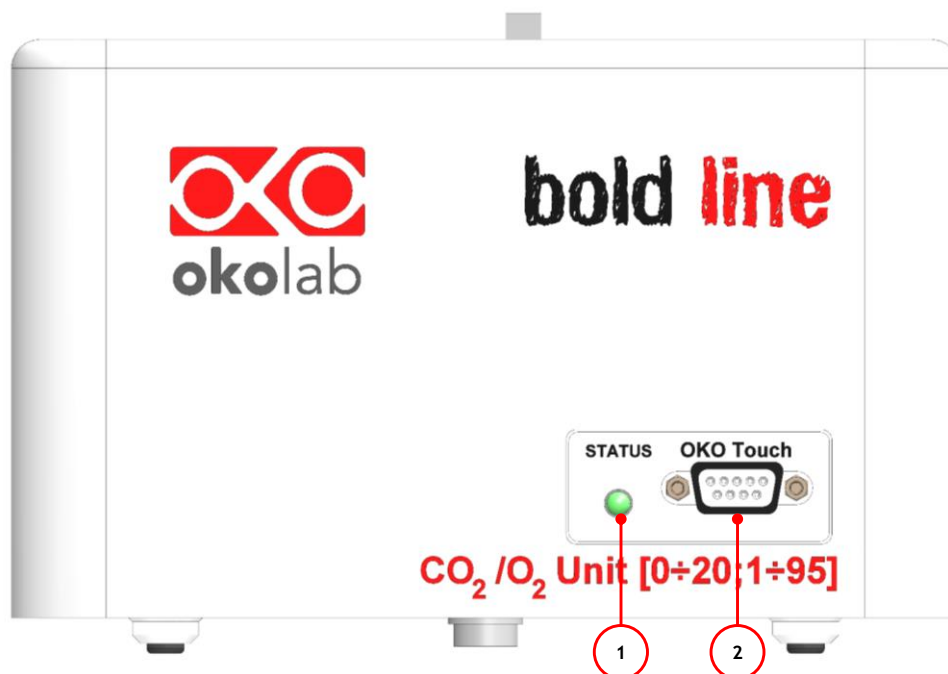


Figure 4. Gas Controller Front Panel Overview.

Figure 5 illustrated CO2-O2-UNIT-BL [0-20; 1-95] rear panel:

1. **Filter Out.** Connector for TUBE-CB.
2. **Filter In.** Connector for TUBE-CB.
3. **Gas Output.** Mixed gas input: valved in-line connector.
4. **Power Input.**
5. **OKO-AIR-PUMP-BL connector.** Leave unplugged if CO2-O2-UNIT-BL [0-20; 1-95] is not equipped with OKO-AIR-PUMP-BL.
6. **HM-ACTIVE connector.** Leave unplugged if CO2-O2-UNIT-BL [0-20; 1-95] is not equipped with HM-ACTIVE.
7. **GPIO (General Purpose Input Output) connector.**
8. **USB connector.**
9. **O2 Input.** Valved in-line connector for 6 mm O.D. rigid tubing to supply O2 to the mixer.
10. **CO2 Input.** Push to fit Input connector for 6 mm O.D. rigid tubing to supply CO2 to the mixer.
11. **N2 Input.** Push to fit Input connector for 6 mm O.D. rigid tubing to supply N2 to the mixer.

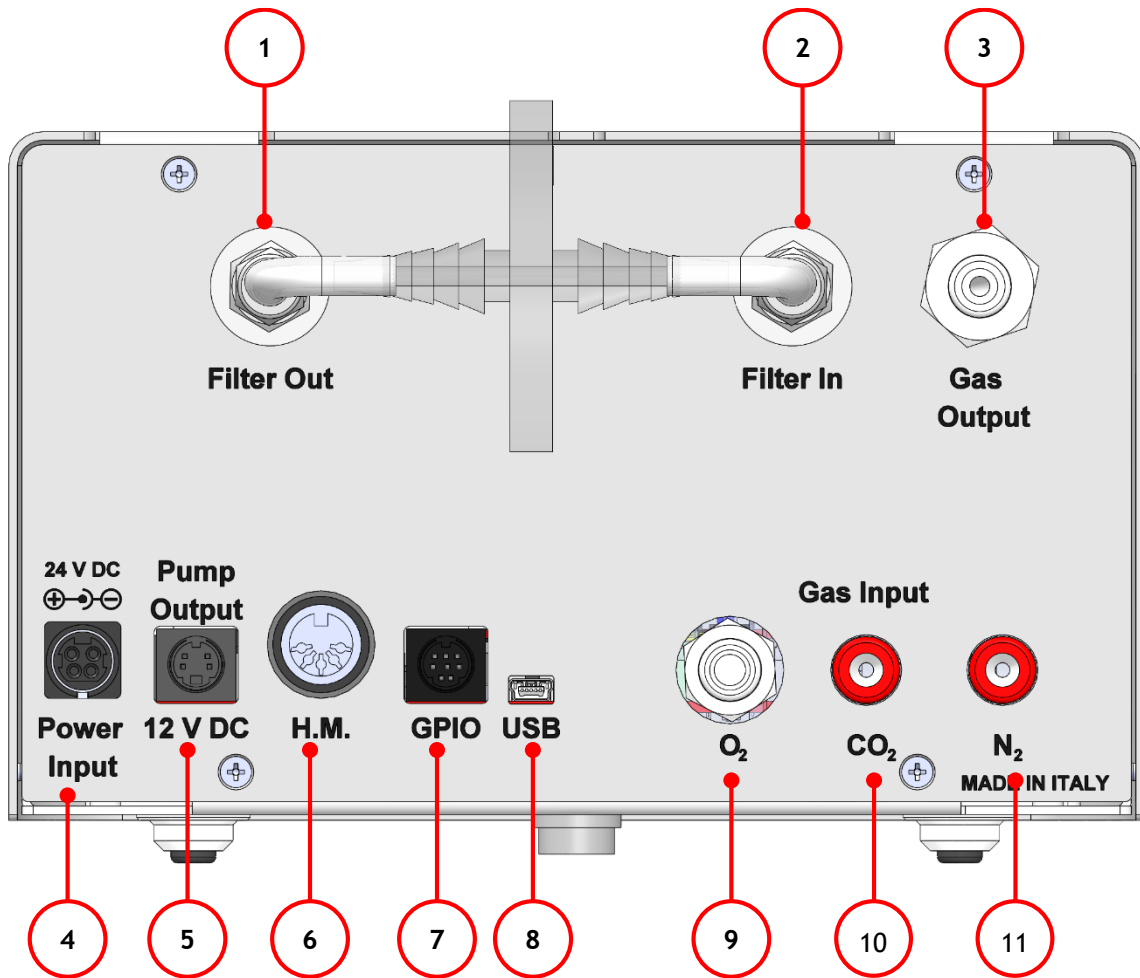


Figure 5. Gas Controller Rear Panel Overview.

8 Installation

The following paragraph illustrates how to install and to use CO2-O2-UNIT-BL [0-20; 1-95].

8.1 Setting up CO2-O2-UNIT-BL [0-20; 1-95]



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** between the CO2 supply and CO2-O2-UNIT-BL [0-20; 1-95]. Follow the arrow on the rear of the Pressure Gauge for the correct Gas In-Out (see Figure 6).

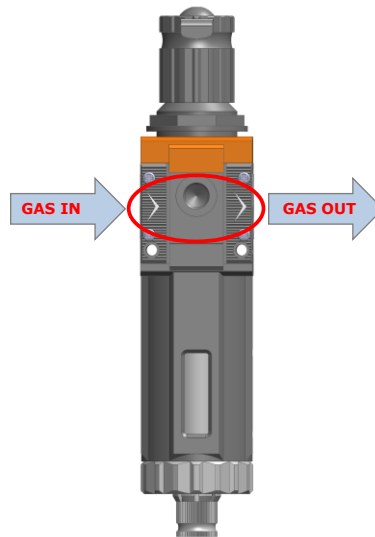


Figure 6. Input and Output gas ports. See symbol on the rear of Pressure Gauge.

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.

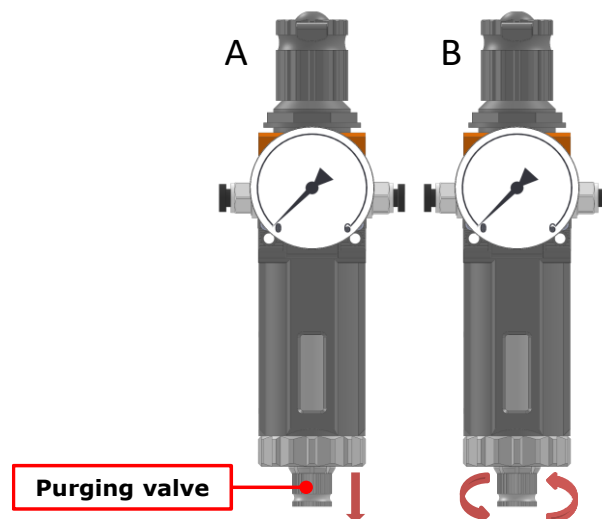


Figure 7. How to close the purging valve of the Pressure Gauge.

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.

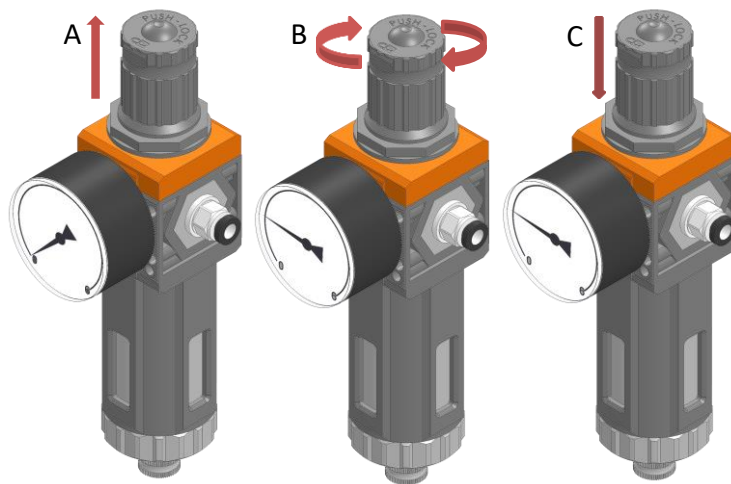


Figure 8. Pressure gauge using.

2. Install the **TUBE-CB** on the rear panel of CO2-O2-UNIT-BL [0-20; 1-95]. It filters the mixed gas before it enters in contact with CO2-O2-UNIT-BL [0-20; 1-95] gas sensors. Connect the TUBE-CB with the *Filter In* and *Filter Out* connectors on the rear panel of CO2-O2-UNIT-BL [0-20; 1-95] (1, 2 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-O2-UNIT-BL [0-20; 1-95] (see Figure 9).

Note ► CO2-O2-UNIT-BL [0-20; 1-95] cannot operate if the TUBE-CB is not connected.

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

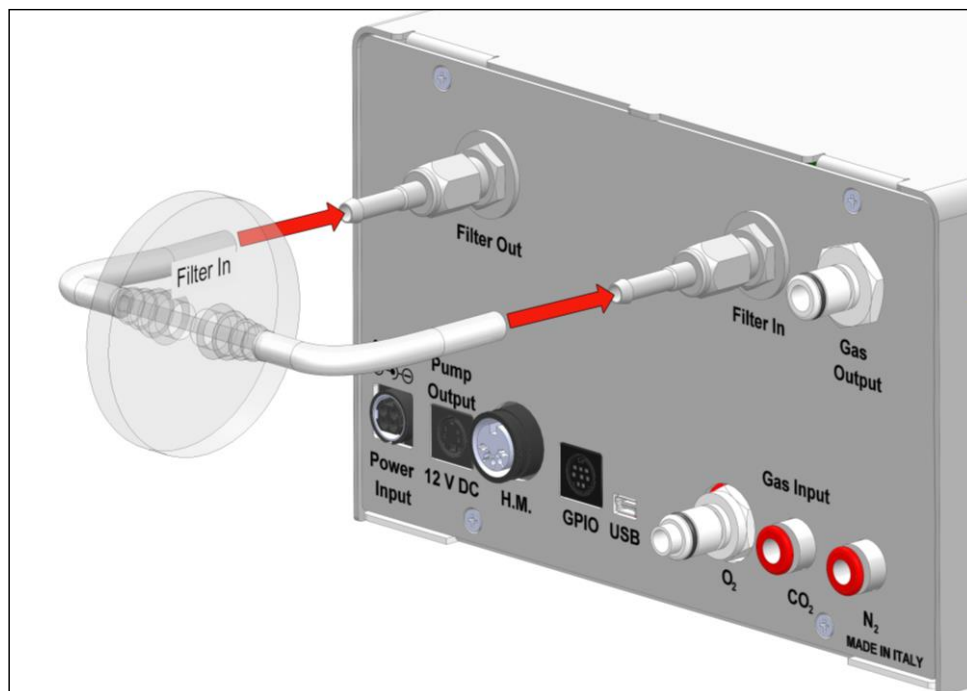


Figure 9. How to install TUBE-CB.

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 N₂ supply to the corresponding push to fit connectors on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] by using TUBE-A (see Figure 10 a). Set CO₂ pressure at 1.4 barg (20.3 psig). Set N₂ pressure within the range 0.6 – 1 barg (8.7 – 14.5 psig).

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

Note ► Do not exceed 5 barg (72.5 psig) for CO₂ and N₂ supply.

To remove tubing from the connectors, push the red rubber ring while pulling the tubing (see Figure 10 b).

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

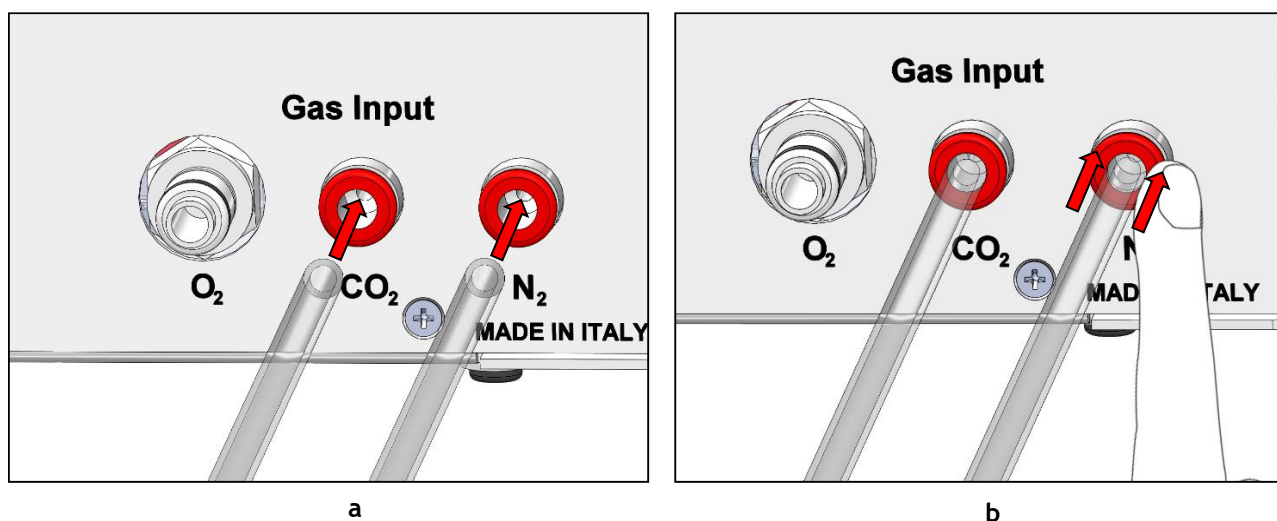


Figure 10. How to connect (a) and disconnect (b) tubings from push to fit connectors.



Before disconnecting any of tubing connected to CO₂-O₂-UNIT-BL [0-20; 1-95], make sure there is no residual pressure by adjusting the pressure gauges upstream of the system and the tanks.

4. Connect O₂ supply to the corresponding valved in-line connector on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] (9 in Figure 5) by using TUBE-AF. Push the valved in-line connector of TUBE-AF into O₂ Input on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] until you hear a lockout click (see Figure 11 a). Set O₂ pressure within the range 0.6 – 1 barg (8.7 – 14.5 psig).

Note ► Do not exceed 5 barg (72.5 psig) for O₂ supply.

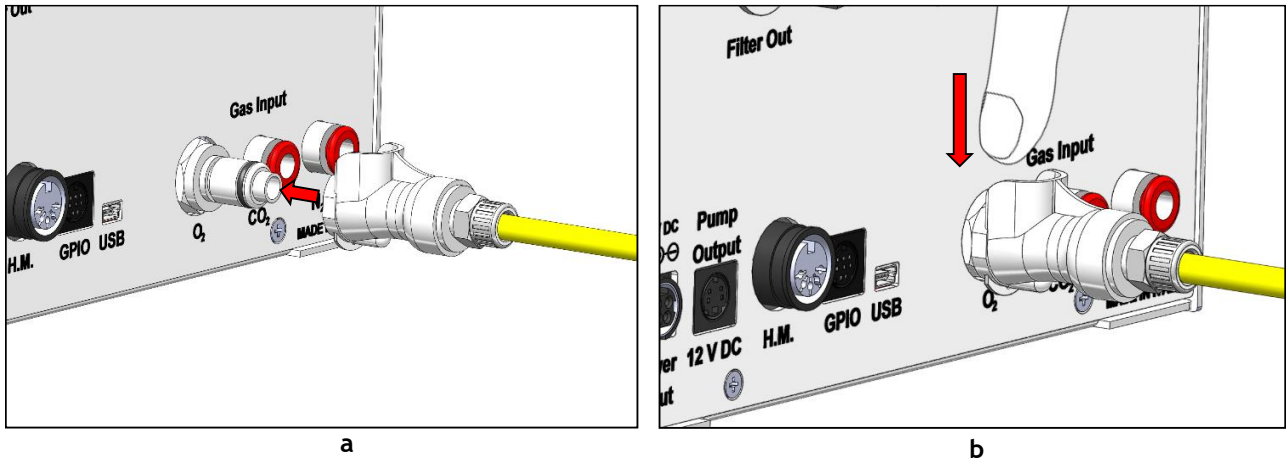


Figure 11. How to connect (a) and disconnect (b) tubings from valved in-line connectors.

To remove tubing from the connector, press on the metallic part on the top of the connector (see Figure 11 b).

Tip ► If the tubing does not come out easily, do not force it, simply make sure the metallic part on the top of connector is properly pressed.

- Figure 12 shows the connections between the CO₂, N₂ and O₂ tanks and the respective connectors on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] when you work in CO₂/O₂/N₂ mode.

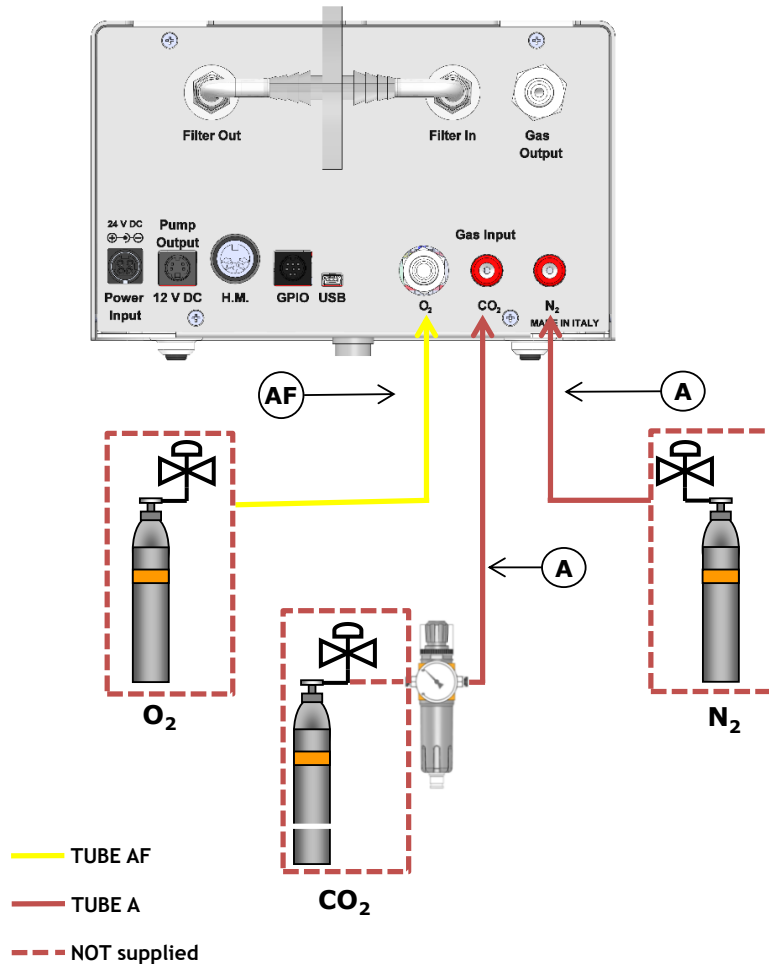


Figure 12. CO₂, N₂ and O₂ tanks connections to the back panel of CO₂-O₂-UNIT-BL [0-20; 1-95].

6. Figure 13 shows the connections between the CO₂ and Air and the respective connectors on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] when you work in *CO₂ in Air* mode. In this case, you have to connect the Air supply to the N₂ connector on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95].

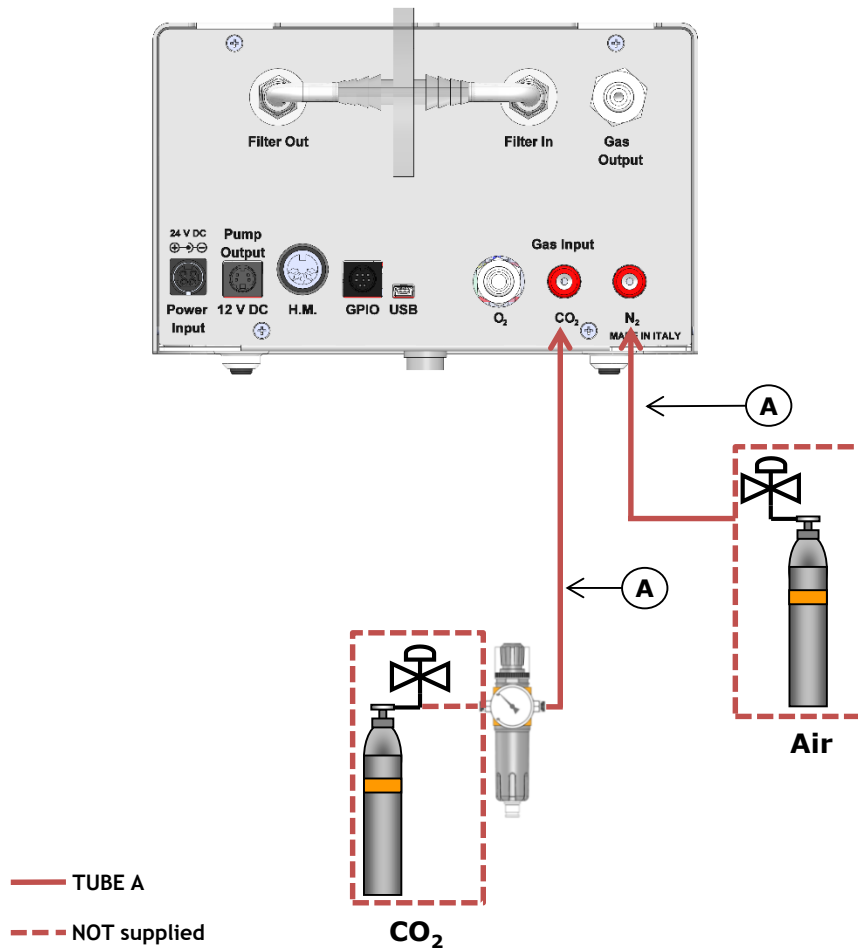


Figure 13. CO₂ and Air tanks connections to the back panel of CO₂-O₂-UNIT-BL [0-20; 1-95].

Tip ► In case you need Air/CO₂ mixtures instead of O₂/N₂/CO₂ mixtures, so that you're running CO₂-O₂-UNIT-BL [0-20; 1-95] in "*CO₂ in Air* mode", then you have to connect a 100% Air tank or compressed line to the N₂ input on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95], therefore first disconnect the previous connection to the Nitrogen supply. When you work in "*CO₂ in Air* mode", the Oxygen supply valve is automatically closed.



Air has to be supplied ONLY when you run CO₂-O₂-UNIT-BL [0-20; 1-95] in *CO₂ in Air* mode, otherwise gas input must be Nitrogen, Oxygen and CO₂, each of them from respective tanks.

Tip ► If you have ordered OKO-AIR-PUMP-BL, connect TUBE-B between the OKO-AIR-PUMP-BL and the connector labeled N₂ on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] (see Figure 14).

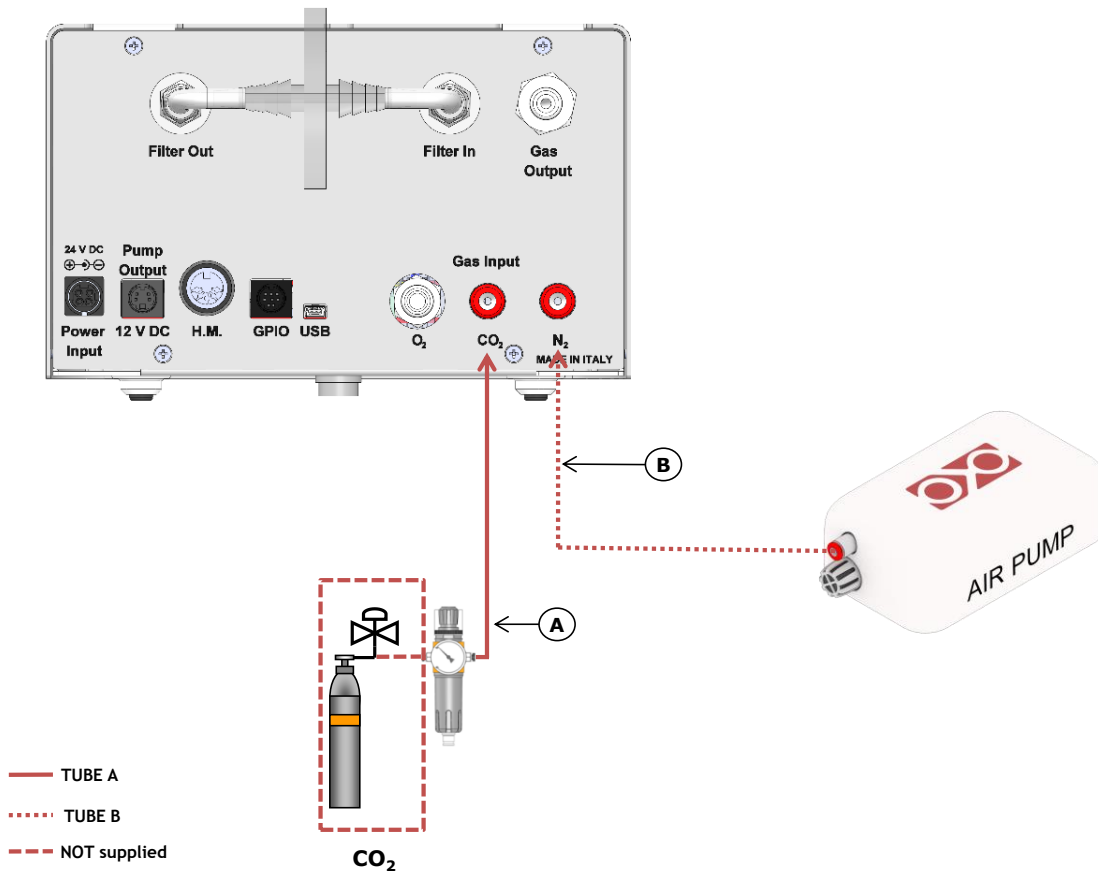


Figure 14. CO₂ and Air Pump connections to the back panel of CO₂-O₂-UNIT-BL [0-20; 1-95].

7. Connect the valved in-line connector of the TUBE-AL to the gas port labeled “Gas output” on the rear panel of CO₂-O₂-UNIT-BL [0-20; 1-95] and the other side of the TUBE-AI to your device, as shown in Figure 15.

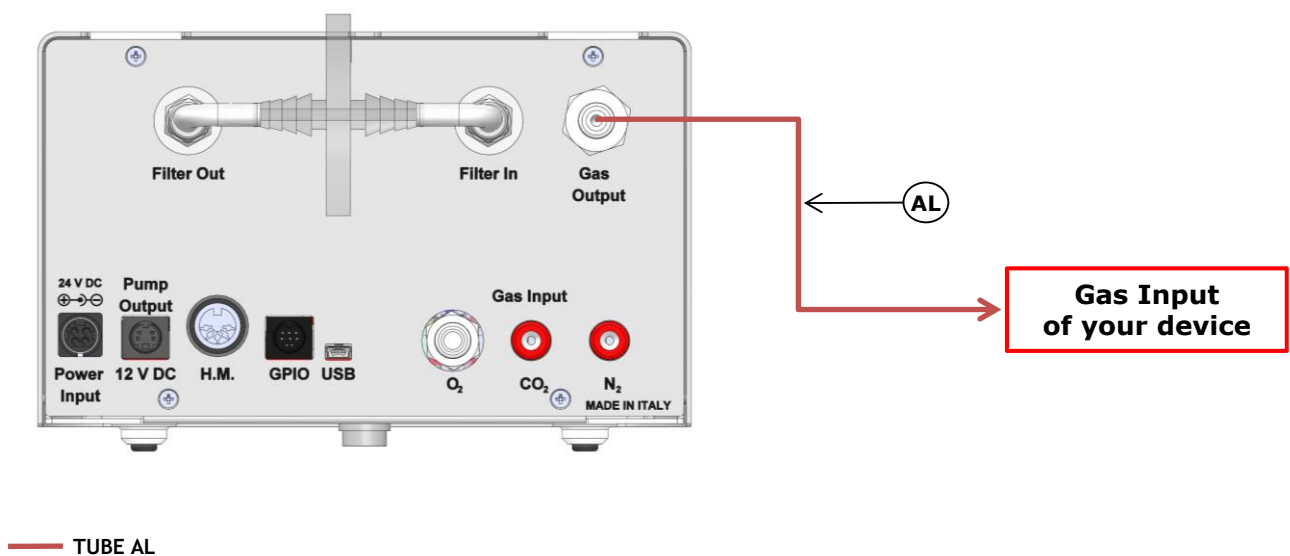


Figure 15. Gas Output connections.

Note ► If you purchased CO2-O2-UNIT-BL [0-20; 1-95] with H201-T-UNIT-BL or H101-T-UNIT-BL, use the TUBE-AI supplied to connect the CO2-O2-UNIT-BL [0-20; 1-95] gas output to the cage incubator (see Figure 16).

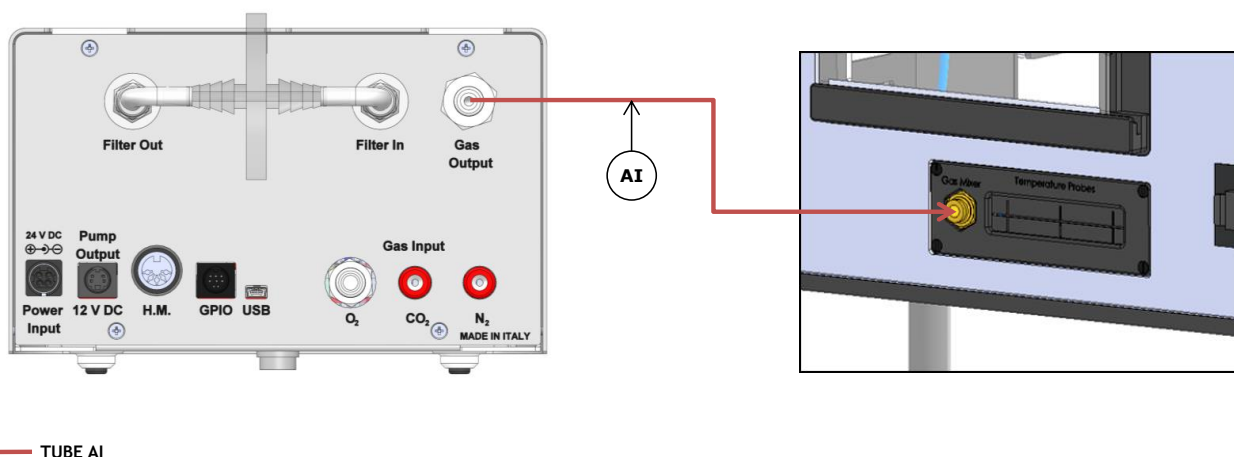


Figure 16. Gas Output connections with a Cage Incubator.

8. Connect the touch screen interface OKO-TOUCH to CO2-O2-UNIT-BL [0-20; 1-95] with the RS232 serial cable as illustrated in Figure 17.

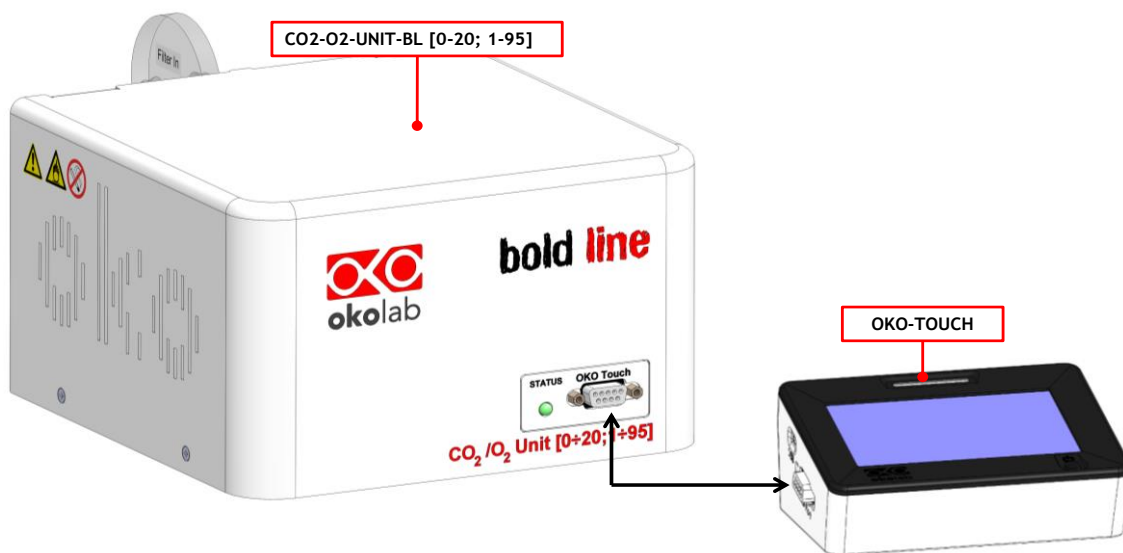


Figure 17. Oko Touch Connection.

9. Connect the power adapter to CO2-O2-UNIT-BL [0-20; 1-95] (7 in Figure 1).
10. To switch CO2-O2-UNIT-BL [0-20; 1-95] on use the power button on OKO-TOUCH. The Status LED (1 in Figure 4) on the front of CO2-O2-UNIT-BL [0-20; 1-95] will turn green.
11. Once the system has been initialized the Status LED on the front of CO2-O2-UNIT-BL [0-20; 1-95] 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 20 and Figure 23) on the gas tab will be yellow at the start.
12. Select the Setpoint gas composition from the touch screen Home page (see Paragraph 9.1.1).

13. The light indicator on the Home page becomes green when the Setpoint compositions are reached and are stable.

8.2 How to assemble CO2-O2-UNIT-BL [0-20; 1-95] with a Bold Line T controller

CO2-O2-UNIT-BL [0-20; 1-95] can be used as a stand-alone device or in combination with any one of the Bold Line T controllers.

Figure 18 shows how to assemble CO2-O2-UNIT-BL [0-20; 1-95], for example, with a H301-T UNIT-BL-PLUS.

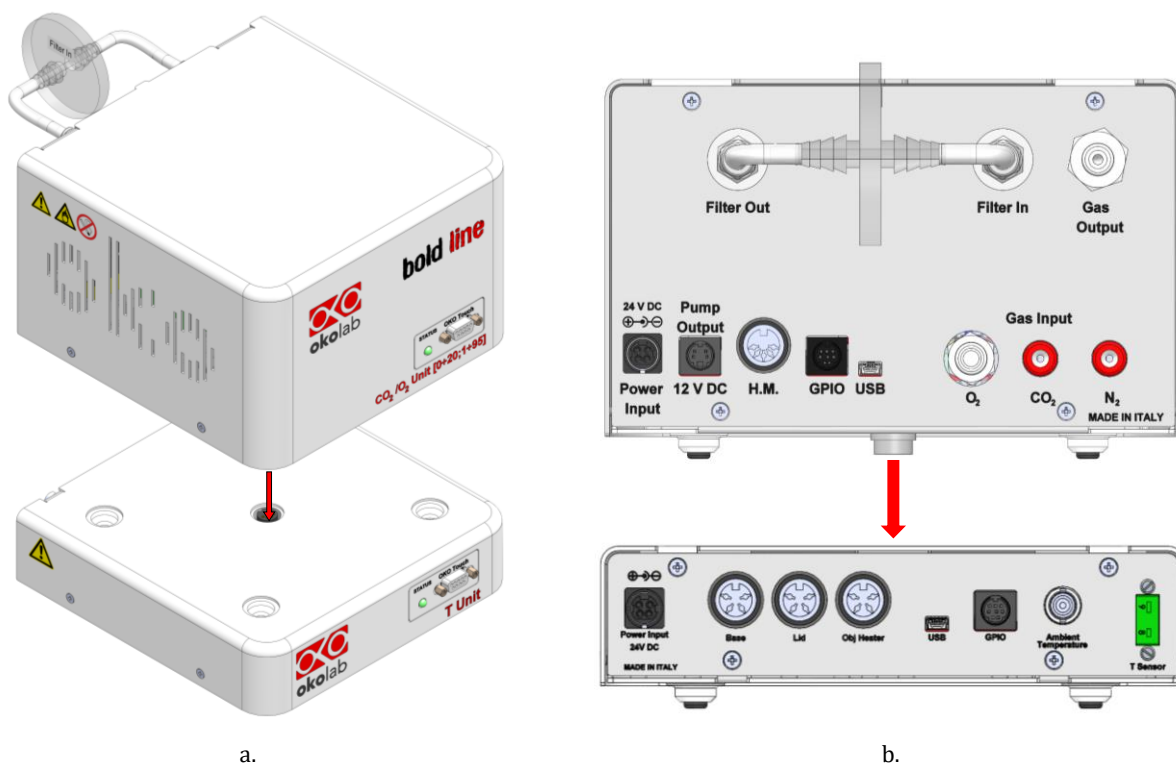


Figure 18. CO2-O2-UNIT-BL [0-20; 1-95] and H301-T-UNIT-BL-PLUS.

CO2-O2-UNIT-BL [0-20; 1-95] 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/O₂ parameters will appear on the OKO-TOUCH Touch Screen interface Home page.

Tip ► 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 (see Figure 19).



Figure 19. CO2-O2-UNIT-BL [0-20; 1-95] and H301-T-UNIT-BL PLUS on stock.



If you have CO2-O2-UNIT-BL [0-20; 1-95] 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-O2-UNIT-BL [0-20; 1-95].

9.1 Home page

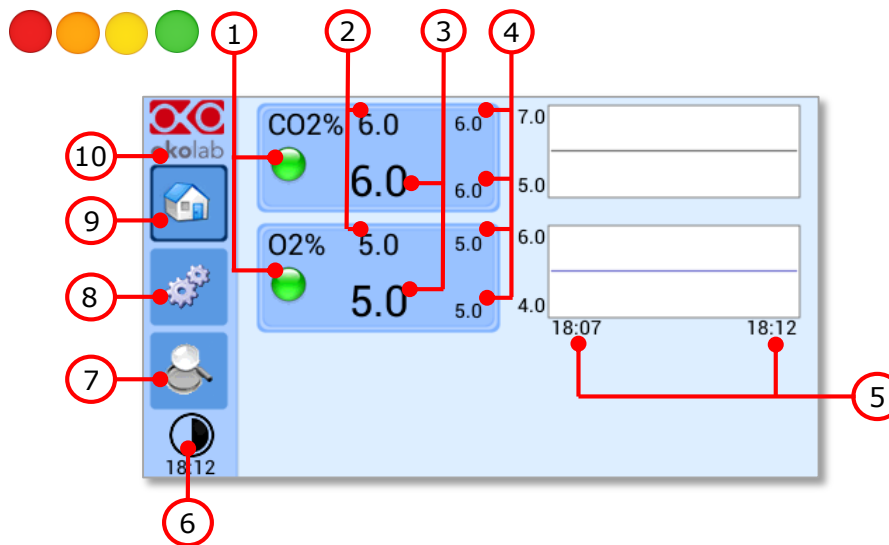


Figure 20. Homepage of CO2-O2-UNIT-BL [0-20; 1-95] Touch Screen Display.

1. Status Indicator.
2. CO₂ and O₂ Setpoint (see 9.1.1 to learn how to change the Setpoint value).
3. CO₂ and O₂ current value.
4. Min/max CO₂ and O₂ 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-O2-UNIT-BL [0-20; 1-95] and running time.

Tip ► The OKO-TOUCH is pre-set at 5% CO₂ and 5% O₂.

9.1.1 How to enter the Setpoint

To input a new CO₂ or O₂ Setpoint, touch the corresponding tab, as indicated in Figure 21 a and Figure 22

a.

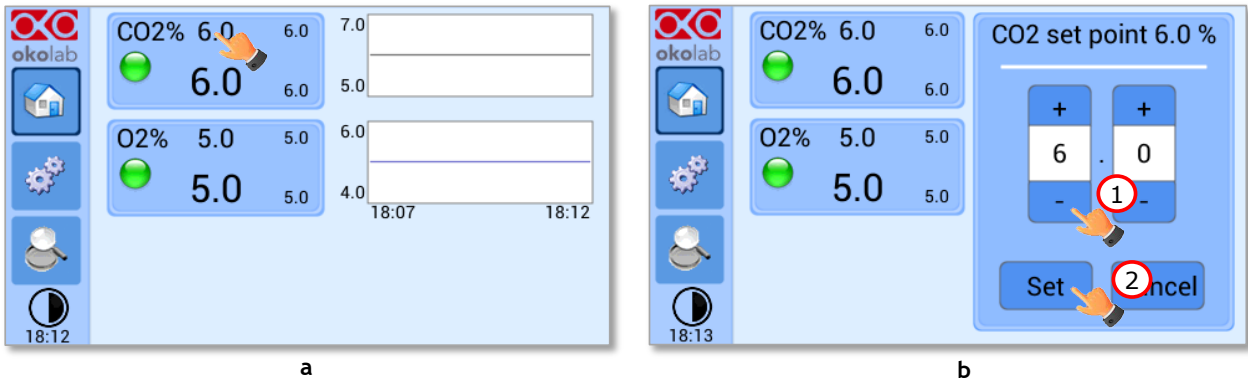


Figure 21. How to change the CO₂ Setpoint (a – b).

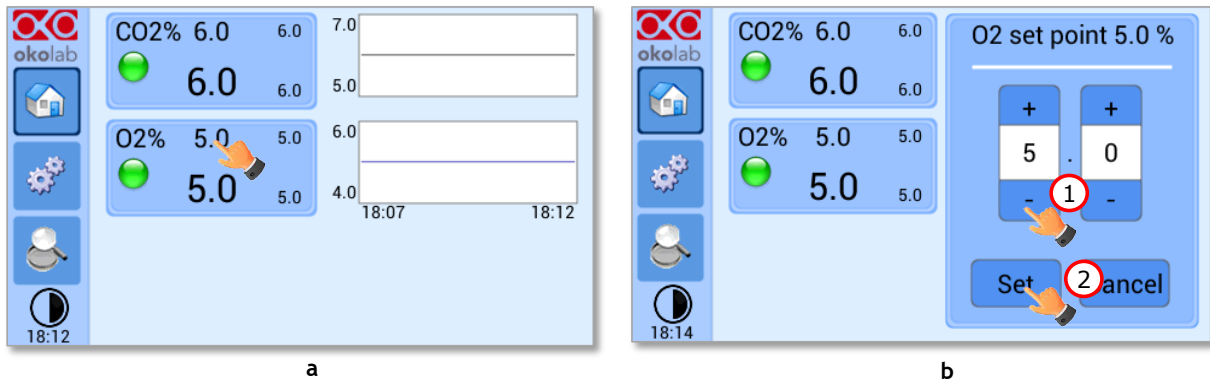






Figure 22. How to change the O₂ Setpoint (a – b).

The Setpoint regulation page will appear as in the Figure 21 b and Figure 22 b. You can modify the Setpoint by clicking on + and -. Once you have input the new CO₂ or O₂ Setpoint, press Set (2 in Figure 21 b and 2 Figure 22 b) to save or Cancel to undo.

Tip ► After any change in the Setpoint value, CO₂-O₂-UNIT-BL [0-20; 1-95] enters into a transient regime, the Status Indicator and the TOP LED (see Figure 23) turn yellow (see paragraph 9.1.2). During the transient regime, CO₂-O₂-UNIT-BL [0-20; 1-95] will not trigger on alarm.

9.1.2 Controller Status: colours led and meaning

CO2-O2-UNIT-BL [0-20; 1-95] can assume four different status, which are represented by the colors assumed by the Status Indicator and by the TOP LED (see Figure 23):

	<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-O2-UNIT-BL [0-20; 1-95] reaches the CO₂ and/or O₂ composition, CO2-O2-UNIT-BL [0-20; 1-95] Status changes to NORMAL and the color turns GREEN. If CO2-O2-UNIT-BL [0-20; 1-95] 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 <i>ALARMS</i> 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 23). To enable/disable the TOP LED follow the instruction reported in paragraph 9.2.2.3.

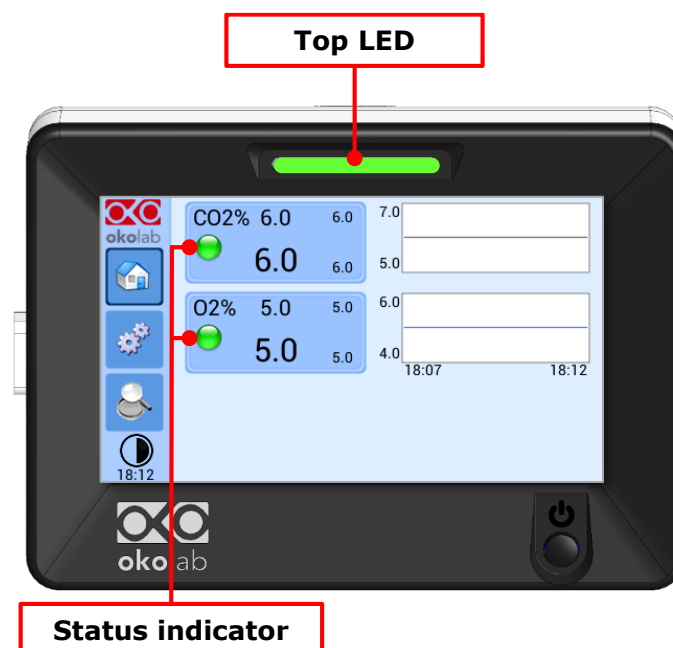


Figure 23. Status Indicator and TOP LED.

9.2 Settings

9.2.1 Gas

Press on *Settings* icon  to enter the *Settings* menu, as shown in the Figure 24 a.

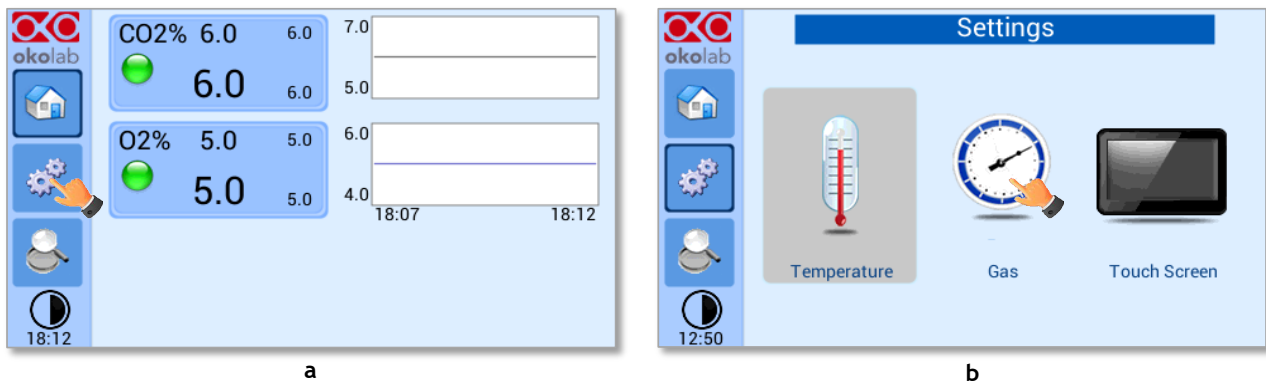



Figure 24. Gas Settings (a – b).

To enter the Gas Settings Submenu, press the Gas Icon  (see Figure 24 b). Then the page shown in Figure 25 appears.

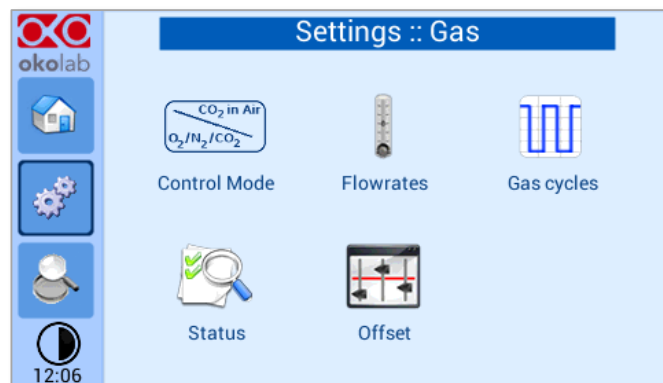


Figure 25. Gas Settings submenu.

9.2.1.1 Control Mode

C02-O2-UNIT-BL [0-20; 1-95] can work in two alternative modes:

- **O2/N2/CO2 mode.** In this control mode C02-O2-UNIT-BL [0-20; 1-95] is supplied with Nitrogen, Oxygen and CO2 from respective tanks and you can regulate CO2 in the range 0-20% and Oxygen in the range 1-95%;
- **CO2 in Air mode.** You can use this control mode when you need to simply have Air/CO2 mixtures and you don't need to regulate Oxygen too.

You can switch from the standard $O_2/N_2/CO_2$ mode to the CO_2 in Air mode and back by the Touchscreen, as described below.

Press the icon  to set which Control Mode you want to use (see Figure 26 a).

Note ► The $O_2/N_2/CO_2$ mode is already set by default.

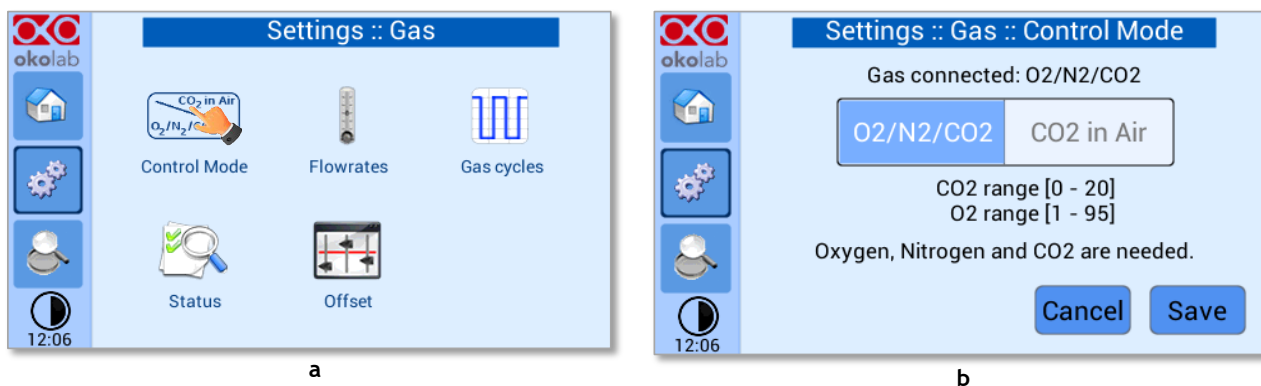


Figure 26. Control mode page (a - b).

When you just need an Air/ CO_2 mixture, press the CO_2 in Air button (1 in Figure 27 a) and Save to confirm (2 in Figure 27 a).

A pop-up message appears as shown in Figure 27 b, warning about the gas connections.



When you work in CO_2 in Air mode nothing needs to be connected to O_2 Input on CO_2 - O_2 -UNIT-BL [0-20; 1-95] rear panel. If an Oxygen tank was previously attached, no need to disconnect it because in this working mode, the Oxygen valve is automatically closed. Air has to be connected to the N_2 Input, from an Air tank/compressed line, and a CO_2 tank has to be connected to CO_2 Input (see Figure 13).

If you want to use OKO-AIR-PUMP-BL (Air Pump), flag on *Enable air pump* checkbox (1 in Figure 27 b), then press *OK* to confirm (2 in Figure 27 b).

Tip ► To connect the Air Pump (OKO-AIR-PUMP-BL) to the CO_2 - O_2 -UNIT-BL [0-20; 1-95], see Figure 14.

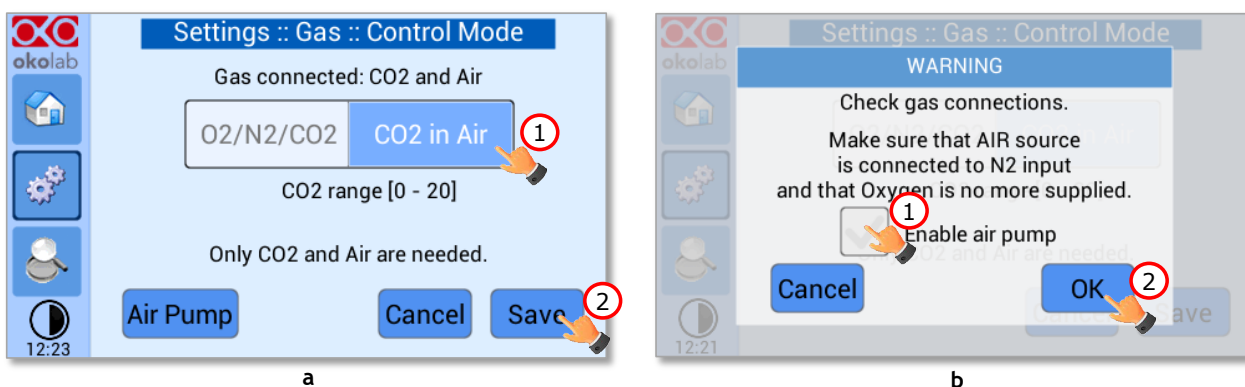


Figure 27. How to set CO_2 in Air mode (a - b).



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 *Air Pump* button (see Figure 27 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 (1 in Figure 27 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.

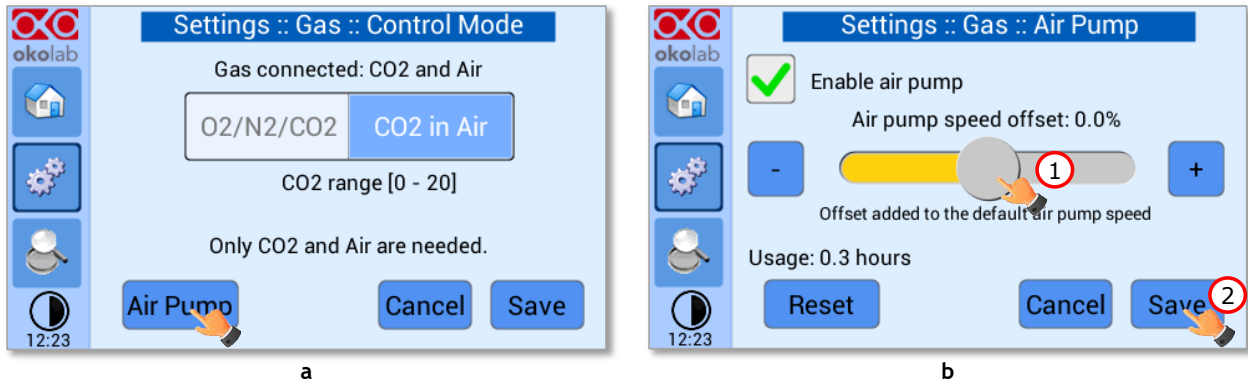


Figure 28. Air pump settings (a - b).

You can check the Air Pump usage on the time counter that reports the hours of the Air Pump usage (1 in Figure 29 a).

Press the *Reset* button to reset the usage of the Air Pump if a new Air Pump is installed (see Figure 29 a). Click on *Yes* button to confirm in the pop-up message appearing, see Figure 29 b.

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

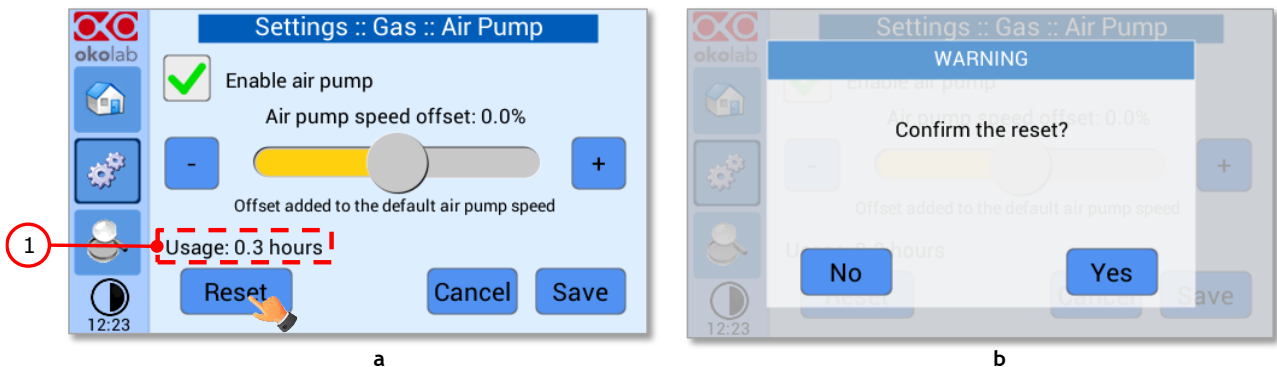


Figure 29. Air pump advanced settings (a - b).

When running the system in *CO2 in Air Mode*, the Homepage will appear as in Figure 30.

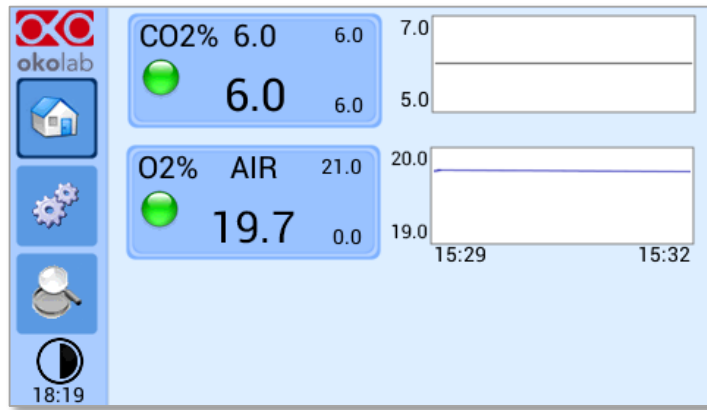



Figure 30. Homepage operated in CO2 in Air mode.

9.2.1.2 Flowrates

Press the *Flowrates* icon  to check how many liters per minute of O₂, CO₂ and N₂ the system is consuming (see Figure 31 a and b). 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 31 b) to set the gas flowrate in the range 0.2÷0.4 L/min by scrolling the *Total Flow* bar (1 in Figure 32) in the page that opens.

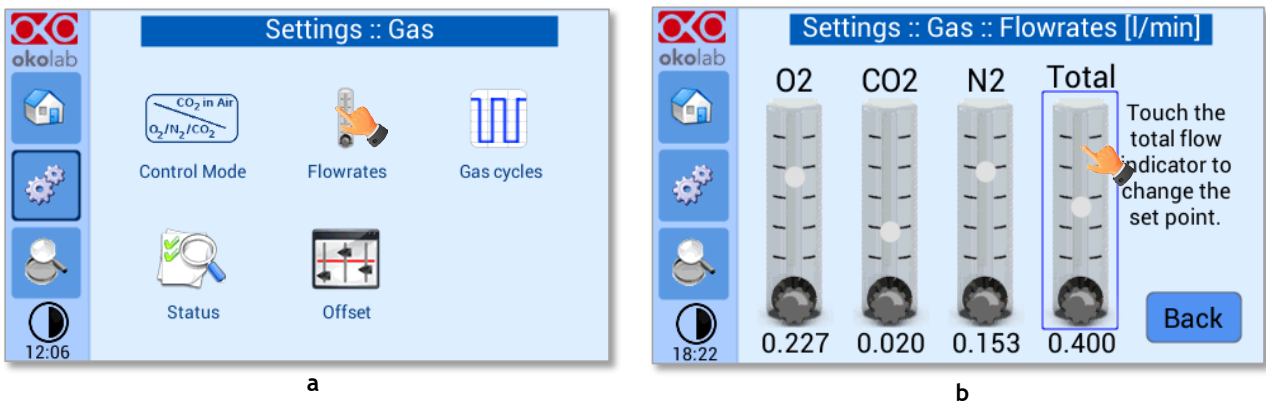


Figure 31. Flowrates View (a - b).

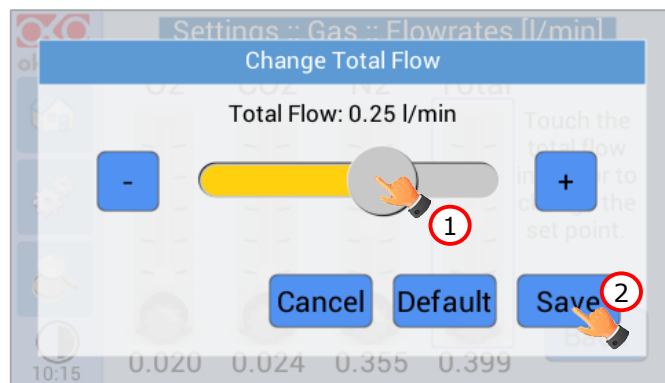


Figure 32. How to change the total flow rate.

Note ► When setting the flowrate for values below 0.2 l/min, the warning message “Total Flow not allowed” appears (see Figure 33).

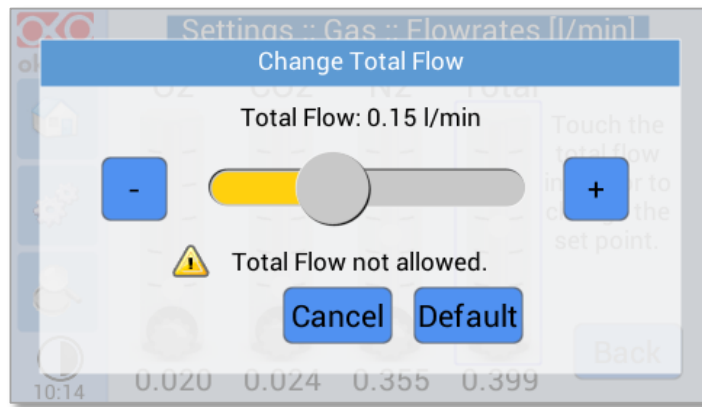


Figure 33. CO₂-O₂-UNIT-BL [0-20; 1-95] flowrate for values below 0.2 l/min.

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 Figure 33). In this working mode three dots will appear in Homepage instead of CO₂% and O₂% current value and the indicator will turn yellow.

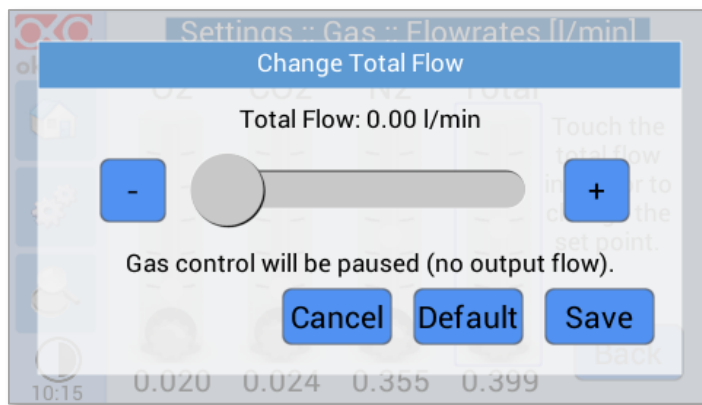



Figure 34. Setting the flowrate at 0.0 l/min.

9.2.1.3 Gas cycles

This function allows switching between two different CO₂/O₂ concentrations. Press the *Gas cycle* icon  to set a gas concentration cycle (see Figure 35 a).

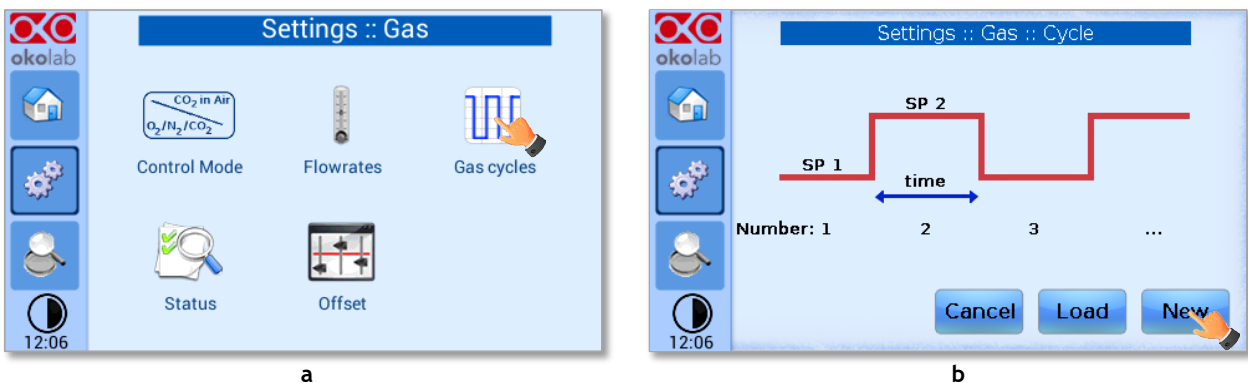


Figure 35. CO₂/O₂% Cycles Subpage (a – b).

You can decide whether setting a new gas cycle (*New*, as shown in Figure 35 b) or load a previously saved one (*Load*). To set a new CO₂ and O₂ concentrations cycle, follow the indications below:

1. Choose the two CO₂ and O₂ concentrations between which you want to switch (*SP1*: Setpoint 1 and *SP2*: Setpoint 2, as shown in Figure 36).
2. Set the duration in hours and minutes you want the system to dwell on each concentration (1 in Figure 37).
3. Set the number of cycles (*Number*) you want the system performs (2 in Figure 37). Finally press *Next*> (3 in Figure 37).

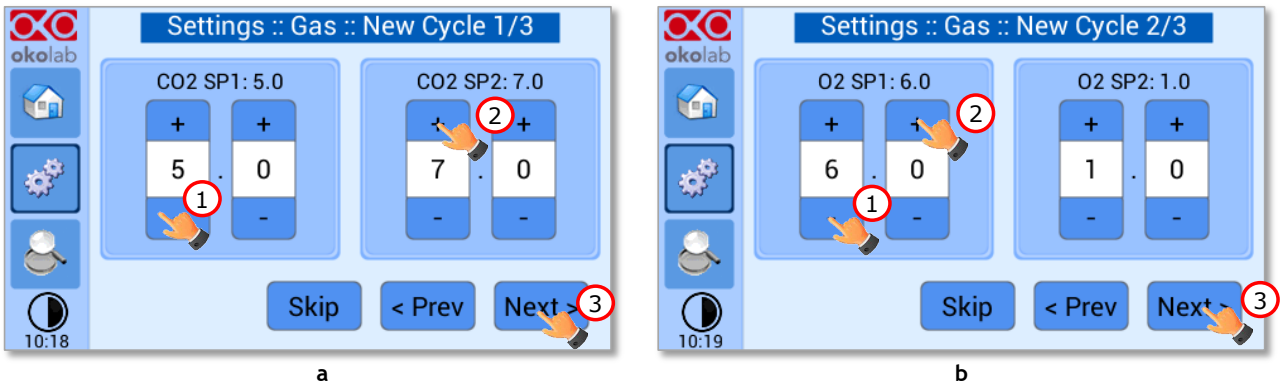


Figure 36. CO₂ and O₂ Concentrations cycles settings (a - b).

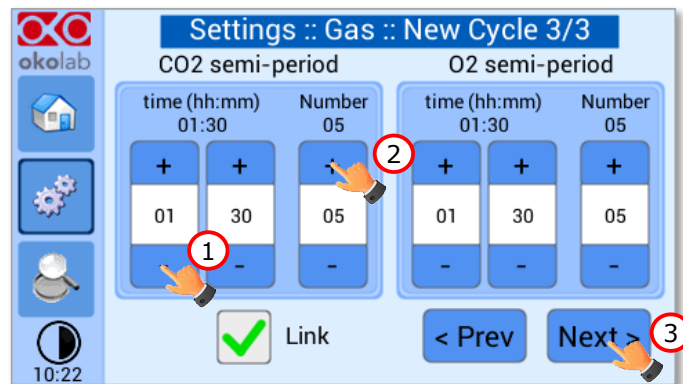


Figure 37. Set the duration of the Gas Cycle.

4. Once you have adjusted the settings, the *Cycle Summary* page will be displayed (see Figure 38 a). Press *Save As* if you want to save the CO₂/O₂ Cycle program to be recalled for future experiments.

Note ► You can save up to 4 different CO₂/O₂ Cycles programs. Saving a 5th one will overwrite the first one.

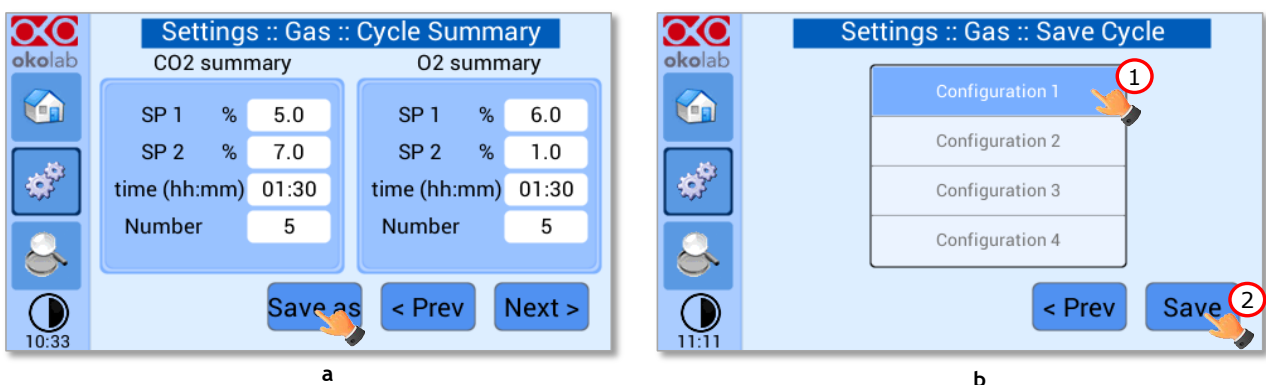


Figure 38. Cycle Summary and Configuration Saving (a - b).

5. Schedule the time for the concentration cycle to start (see Figure 39).

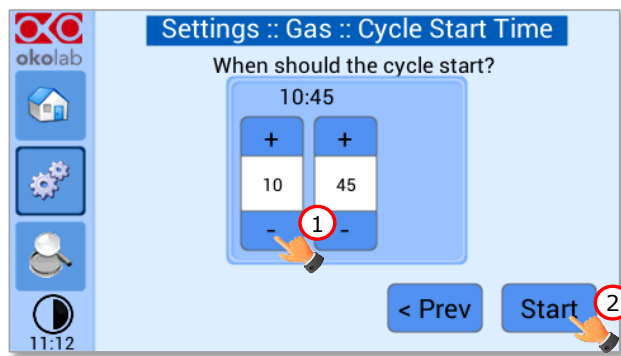



Figure 39. Cycle Start.

The cycle will start at the time set. A concentration cycling icon  will be displayed on the Homepage as a reminder (see Figure 40).

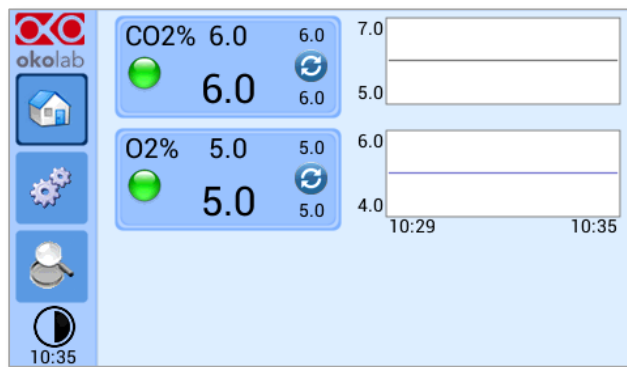


Figure 40. Icon in Homepage during a CO₂/O₂% cycle.

Note ► Trying to change Setpoint or starting a new cycle while a cycle is still running will open the window in Figure 41. You can press Abort to abort the cycle. Pressing “View” will open the current cycle settings. Press Home to undo.

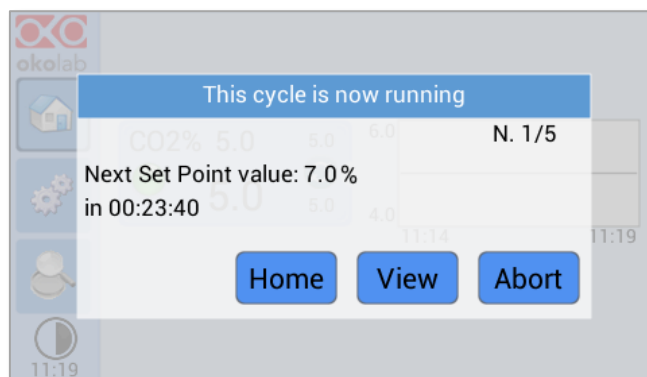



Figure 41. Warning shown if you try to change Setpoint during a gas cycle.

9.2.1.4 Status

Press the Status icon  (see Figure 42 a) to check CO₂-O₂-UNIT-BL [0-20; 1-95] performance.

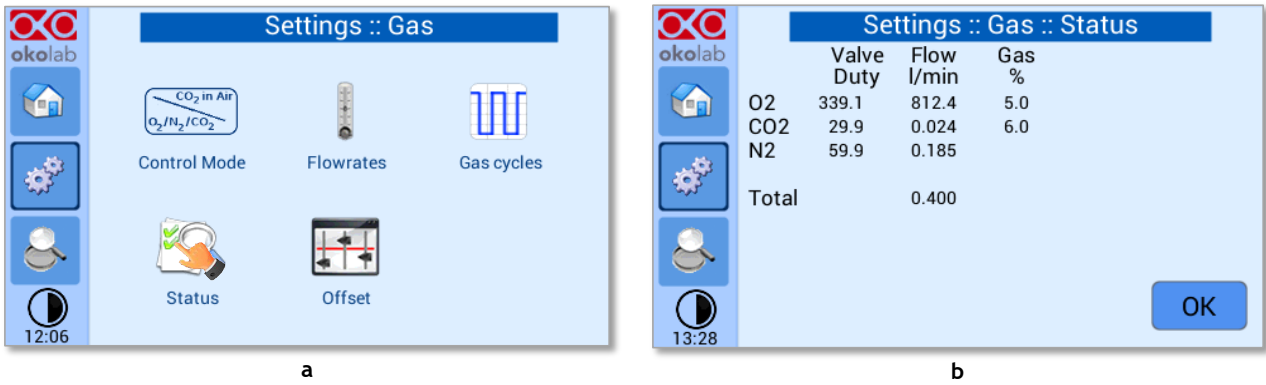



Figure 42. Status page (a - b).

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

9.2.1.5 Offset (with external meter)

Press on *Offset* icon  to calibrate the instrument by LEO as external meter (NOT provided).

Note ► You can use any external gas meter to make an accurate calibration.

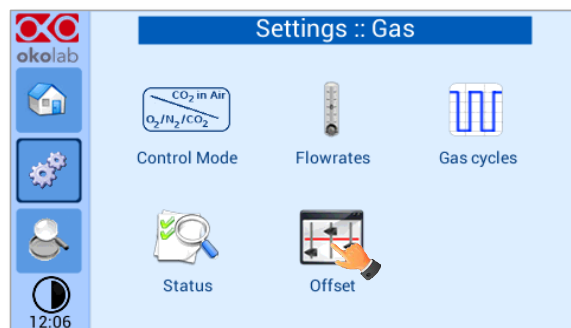


Figure 43. How to enter a gas offset calibration.





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

To run the gas sensor calibration using LEO as external gas meter, follow the indications below:

1. Connect the TUBE-AL to the TUBE-A (supplied with LEO, Figure 44), using the Fitting tube (3 in Figure 45) supplied with LEO.



Figure 44. TUBE-A supplied with LEO.

2. Connect the TUBE-A to LEO Gas Inlet port labeled with icon  (1 in Figure 45).
3. Put the cap on LEO Gas Input port labeled with icon  (2 in Figure 45).

4. Start a *Gas Single Point* measurement in *Diffusion Mode* on LEO (please refer to LEO User Manual).

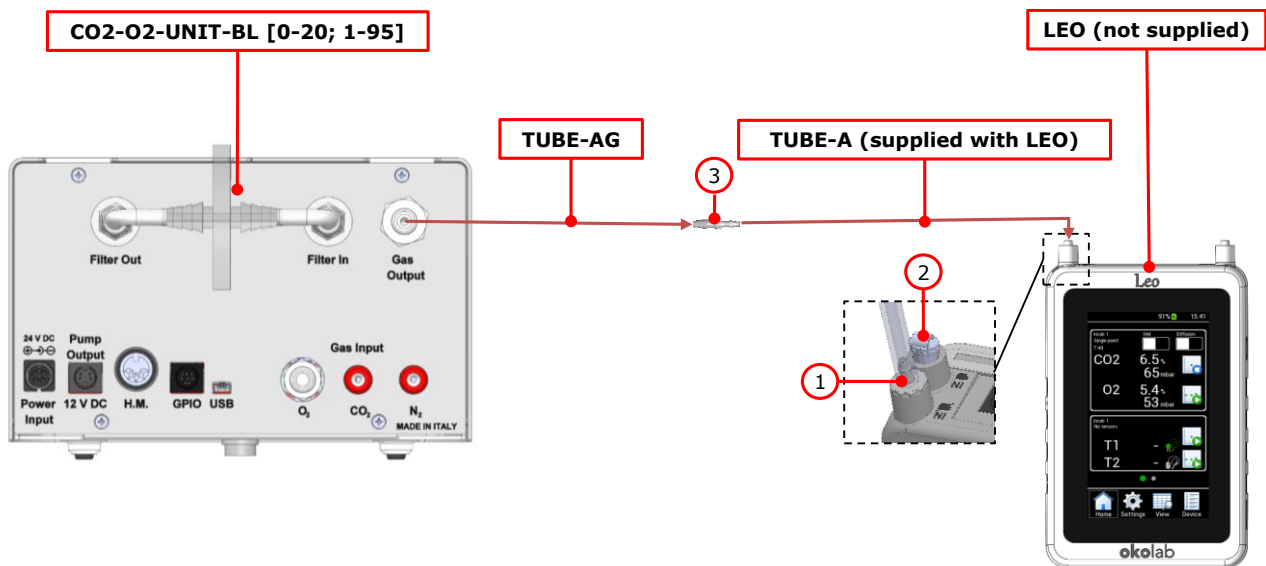


Figure 45. External Gas Meter Connection.

5. Wait until LEO stabilizes the CO₂ and O₂ readings; this may take 10-15 minutes.
6. Press on the *External Probe* Tab (as shown in Figure 46 a) in *Offset* page on the OKO-TOUCH display. The Figure 46 b appears.
7. Press on +/- icons to input the CO₂ (1 in Figure 46 b) and O₂ (2 in Figure 46 b) levels read by LEO (i.e. 6.5% for CO₂ and 5.4% for O₂), then press *Save* (3 in Figure 46 b).

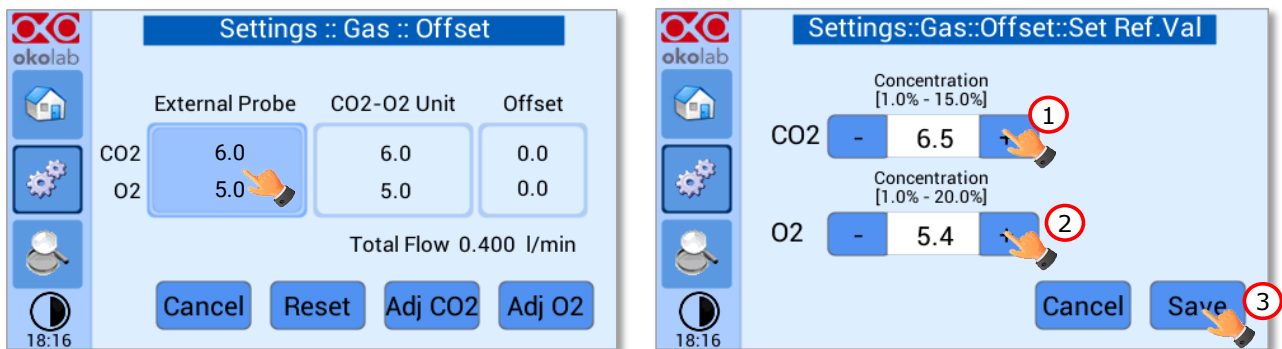


Figure 46. Manual Calibration (a - b).

Note ► The Touch Screen will go back to the previous screen. It will display on the left (*External Probe* tab) the CO₂ and O₂ levels read by the external Gas meter, as just input. The value in CO₂-O₂ Unit tab is the value read by CO₂-O₂-UNITL-BL [0-20; 1-95] (see Figure 47).

8. Press *Adj CO₂* (see Figure 47) and/or *Adj O₂* to make a calibration using the input value from LEO as a reference.

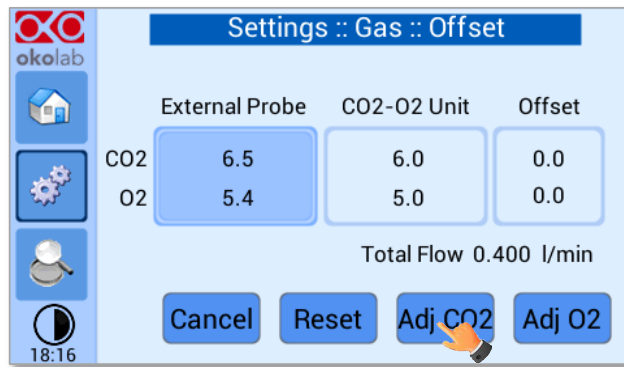


Figure 47. Manual Calibration Correction.

Note ► By pressing *Adj CO2 / Adj O2*, the system will perform a calibration using the *External Probe* as a reference. The offset resulting from the calibration will be displayed in the *Offset* tab (see Figure 48).

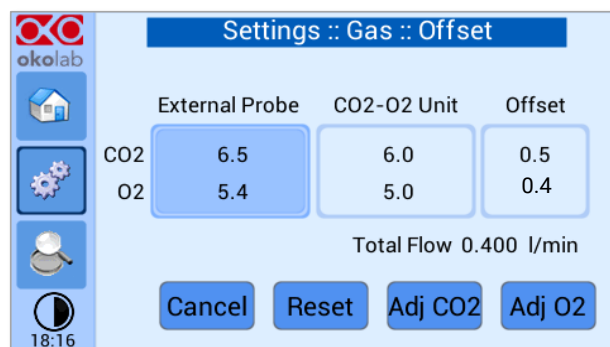


Figure 48. Manual Calibration End.

Note ► By pressing on *Reset* the system will delete all custom calibration and restore the factory values (see Figure 48).

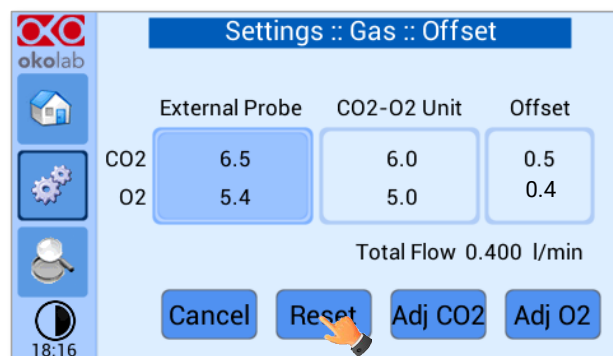


Figure 49. Restore the factory values.

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 51). 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 50 a). Press the *CO2 Digital Input* icon (see Figure 50 b) and / or *O2 Digital Input* icon to activate the Digital Input on CO2 and /or O2 Setpoint.

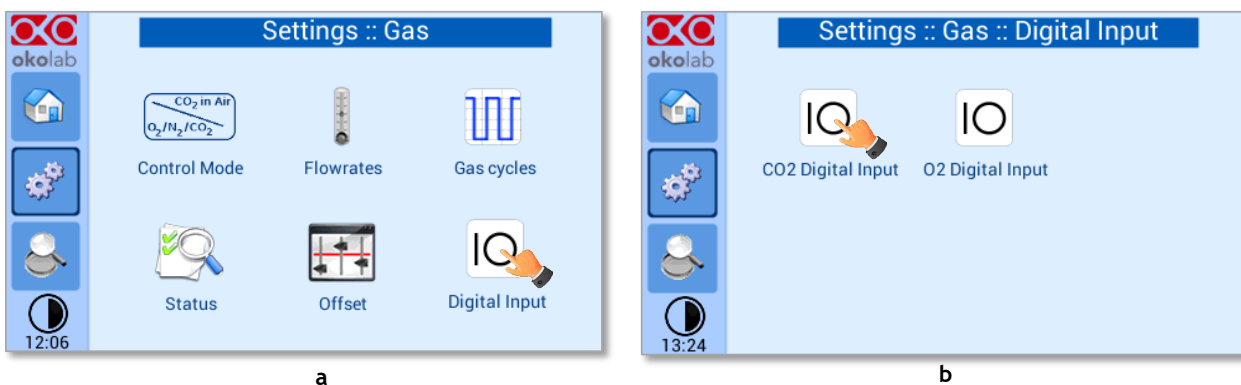


Figure 50. Digital input.

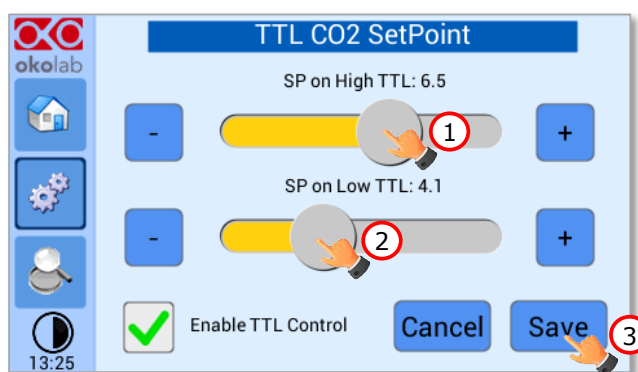




Figure 51. CO2 Setpoint with Digital input.

9.2.2 Touch Screen configuration

Press on *Settings* icon  to enter the *Settings* menu, as shown in the Figure 52 a. To enter the Touch Screen configuration menu, press on the icon , as shown in Figure 52 b.

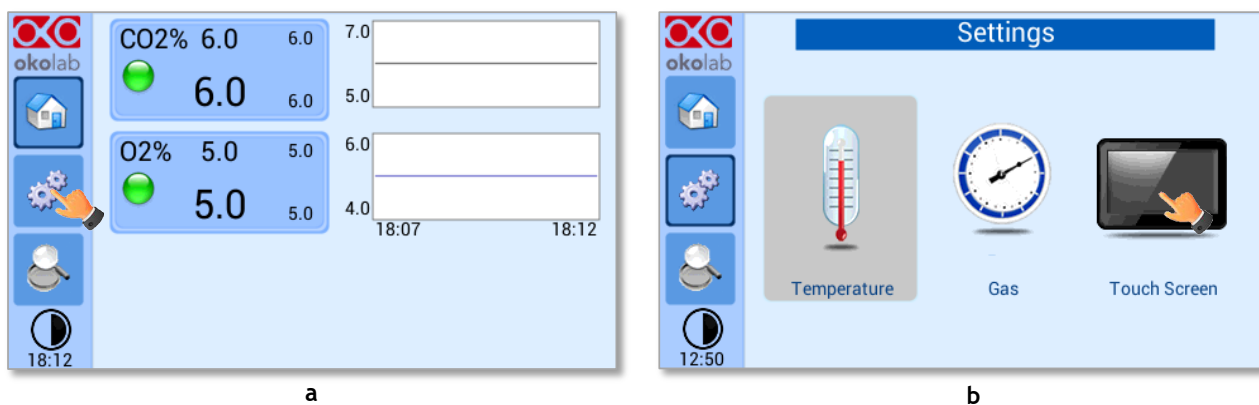



Figure 52. Touch screen settings (a - b).

9.2.2.1 Touch Screen Options

Press the *Options* icon  (see Figure 53 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/O₂ values are collected.

To insert the time frame, press the + / - icons or scroll the *Chart history length* bar (1 in Figure 53 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 53 b), then press *Save* (4 in Figure 53 b) to confirm.

Note ► To activate a sound at each touch, flag the *Touch Buzzer* checkbox (3 in Figure 53 b).

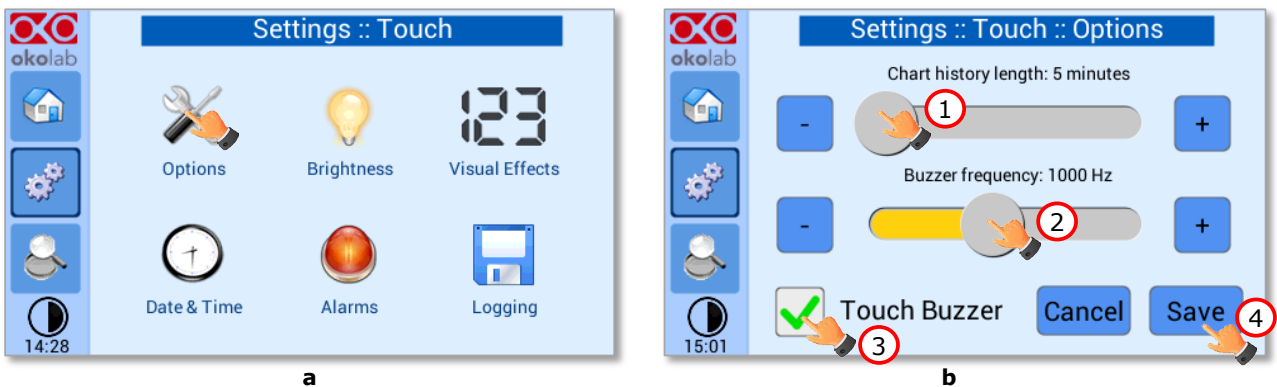



Figure 53. Touch Options (a - b).

9.2.2.2 Touch Screen Brightness

Press the icon  (see Figure 54 a) and scroll the bar (1 in Figure 54 b) or press the + / - icons in the page that opens to modify display *Brightness*. Set the required configuration and press *Save* (2 in Figure 54 b) to confirm.

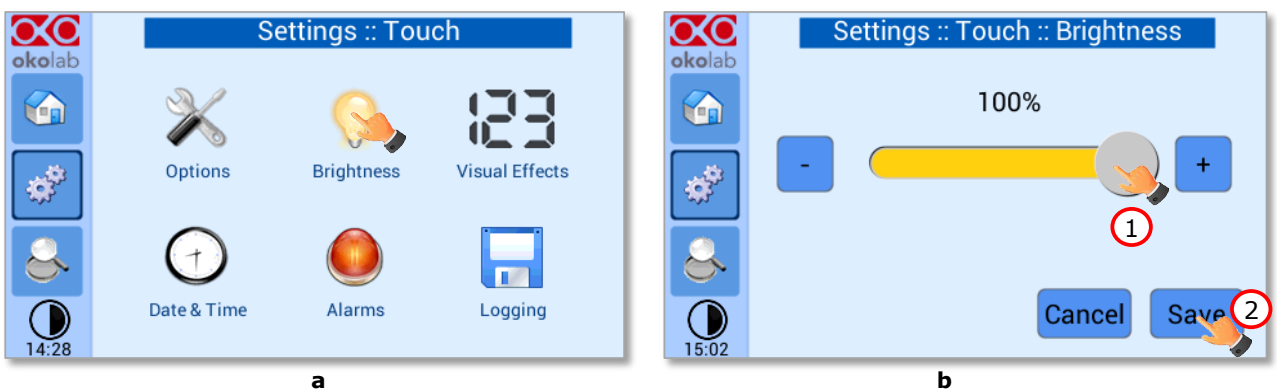


Figure 54. Brightness display page (a - b).

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 55 a.

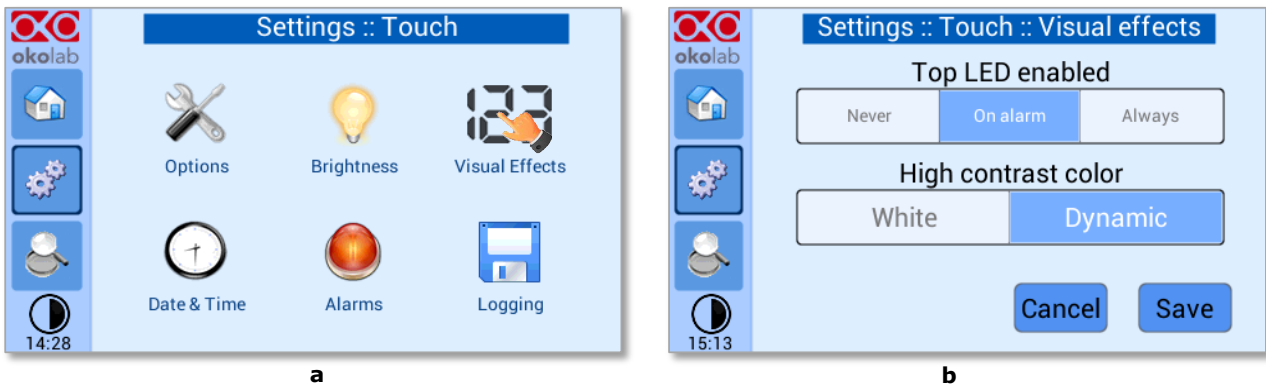




Figure 55. Visual Effects (a – b).

- **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-O2-UNIT-BL [0-20; 1-95] 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 9.1.2.

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 56 a).
2. Set the values by using the +/- icons (1 and 2 in Figure 56 b).

Tip ► Flag the 24 hours box, if you want to use the hour format based on 24 hours (3 in Figure 56 b).

3. Click on *Save* to confirm (4 in Figure 56 b) or *Cancel* to undo.

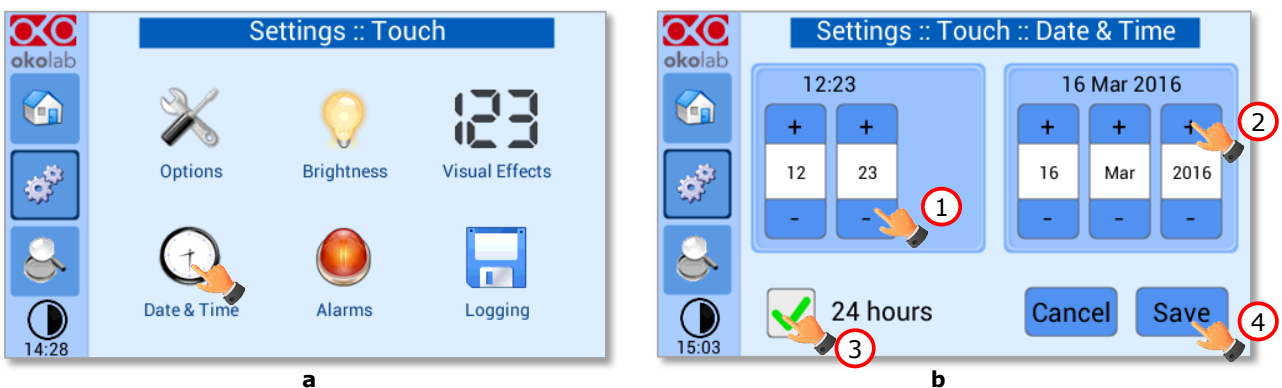




Figure 56. Touch screen settings. Date and Time (a – b).

9.2.2.5 Alarms

CO2-O2-UNIT-BL [0-20; 1-95] also allows activating visual and audible alarms.

To set the alarms specifications, press the *Alarms* icon  (see Figure 57 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 57 b.

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

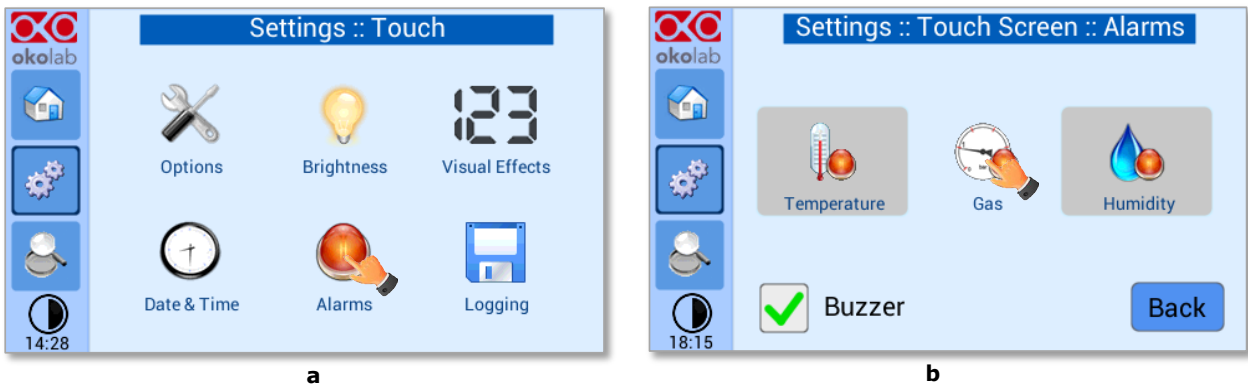


Figure 57. How to enter in Alarms page (a - b).

2. Insert the Gas Deviation by scrolling the bar (1 in Figure 58) 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 58) or pressing the +/- icons.

Note ► The Gas Time value defines the time for which the CO₂ / O₂ composition may remain outside the allowed tolerance before CO₂-O₂-UNIT-BL [0-20; 1-95] triggers in alarm.

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

4. Press Save (3 in Figure 58) to confirm.

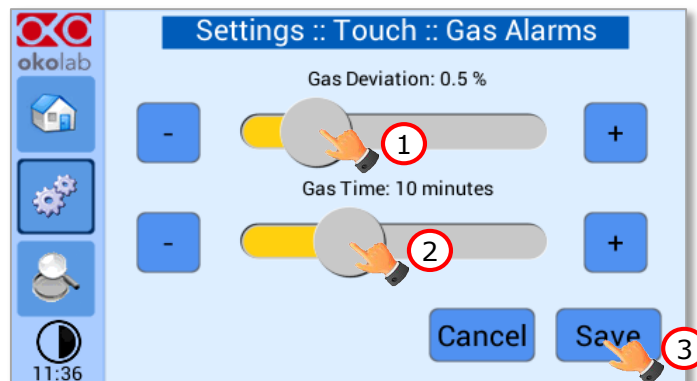


Figure 58. How to set the Deviation and Time Alarm.

Figure 58. 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-O2-UNIT-BL [0-20; 1-95] 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 59.

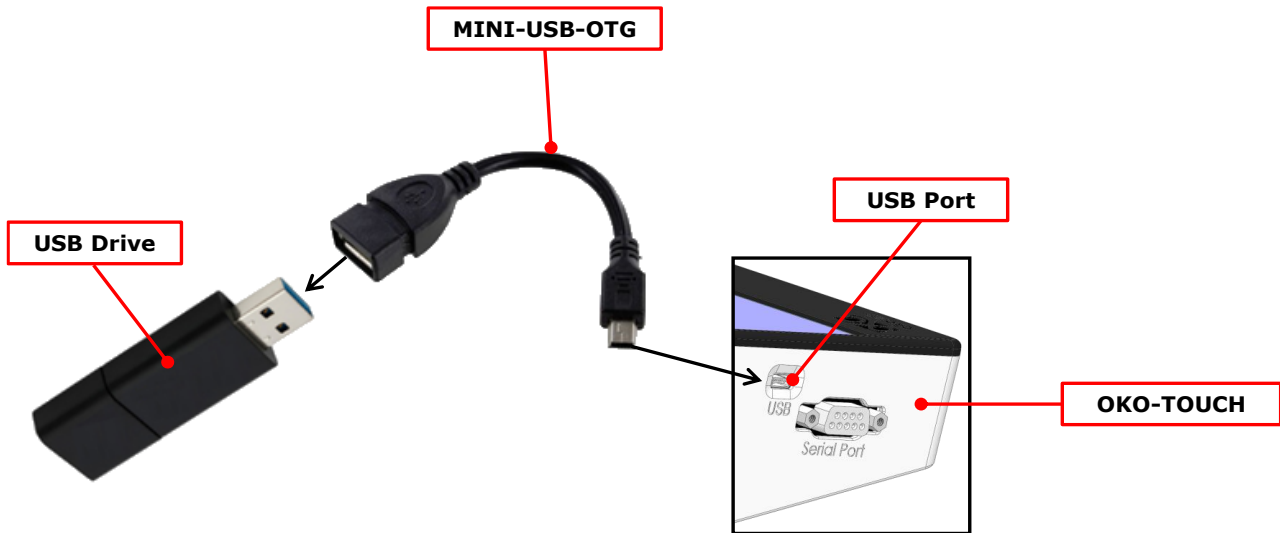




Figure 59. USB drive connection.

To activate the logging, follow the steps indicated below:

1. Press on *Settings* icon  (see Figure 60 a) and press on *Touch screen* icon  on the window that opens next (see Figure 60 b).

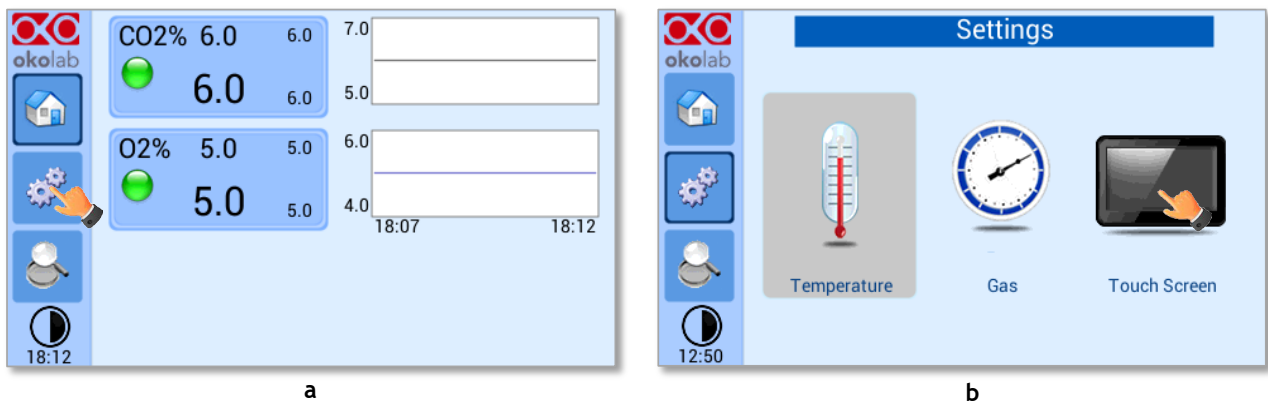




Figure 60 (a) How to enter the setting menu; (b) how to enter the Touch Screen menu.

2. Press on *Logging* icon  (see Figure 61 a) and flag *Internal memory* in the page that appears (see Figure 61 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 62

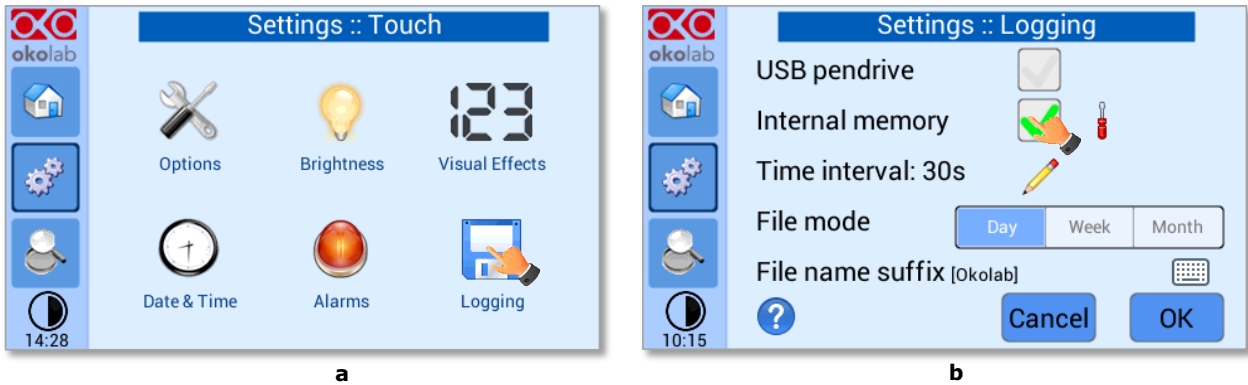


Figure 61. Logging. (a) How to enter in the logging menu; (b) logging in internal memory.

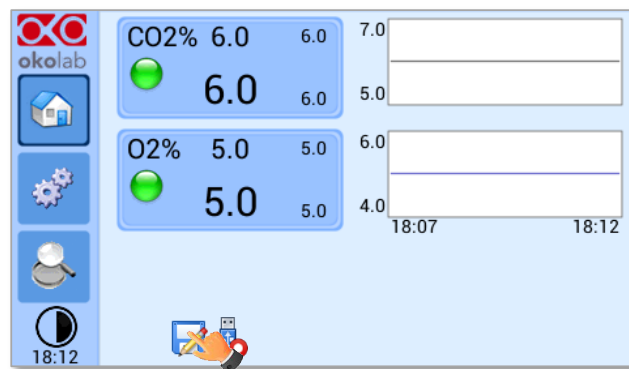



Figure 62. How to access the Logging page from the Homepage.

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

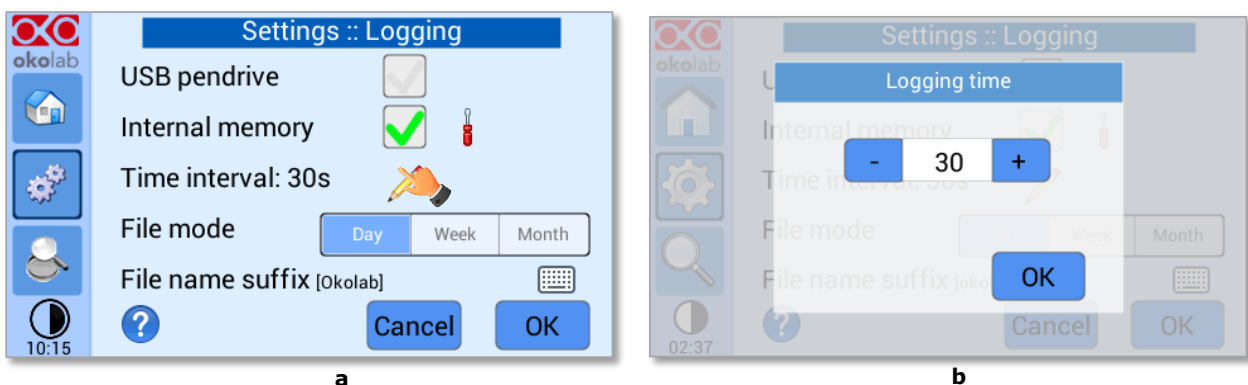



Figure 63. How to set the logging time (a – b).

- Choose how you want to organize the data when downloaded, by pressing on Day, Week or Month, see Figure 63 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 64 a.
6. Press Save, see Figure 64 b.

Tip ► With the selections as in Figure 63 and in Figure 64, the data will be downloaded on the USB drive as shown in Figure 65.

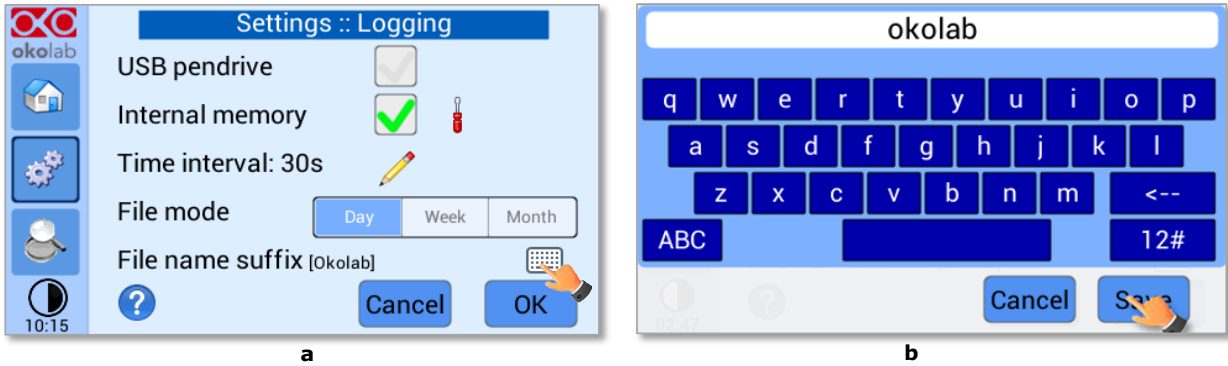


Figure 64. Data Logging. How to define the suffix for the downloaded files (a – b).

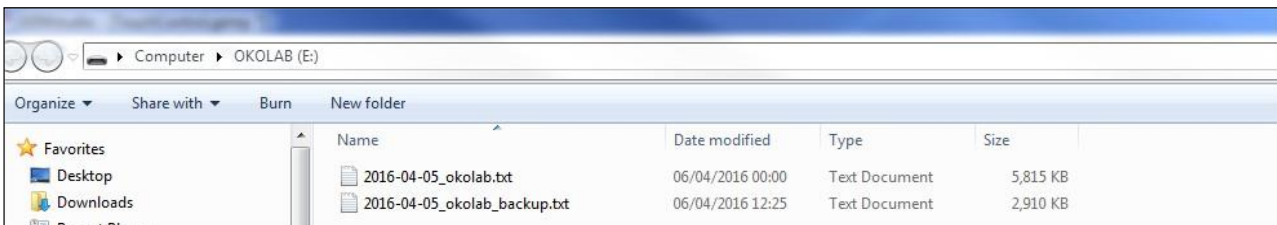



Figure 65. Downloaded files on the pen drive.

Note ► If you press on the screwdriver icon  (see Figure 66 a) you can view the logging starting date, the available memory and the latest download, see Figure 66 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.

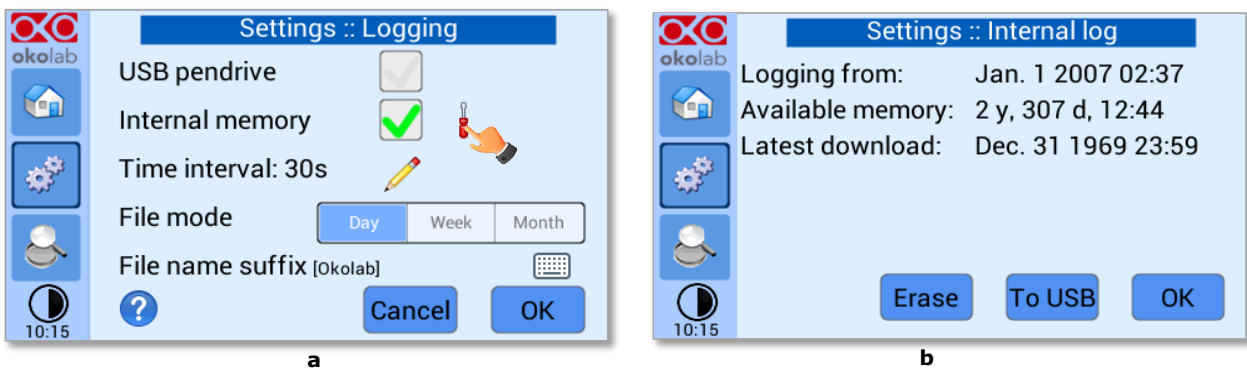
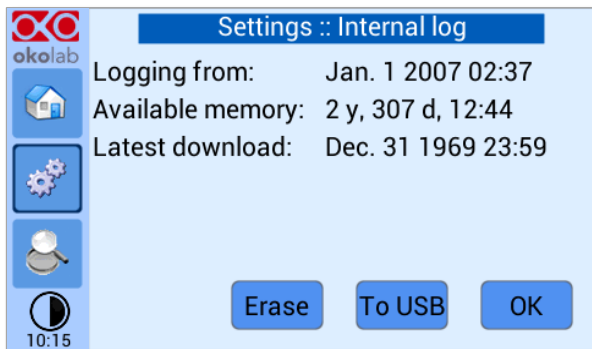
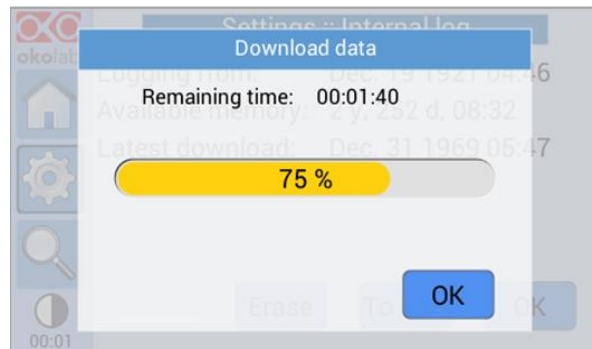


Figure 66. Internal memory status. (a) Logging page settings; (b) Internal log page settings.

To download the data, press on *To USB* or on *Erase* if you want to delete the data, see Figure 66 b.



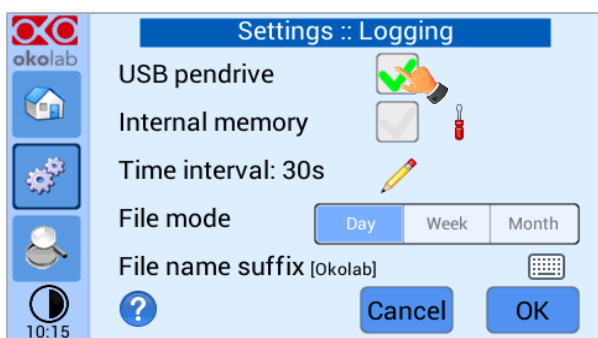
a



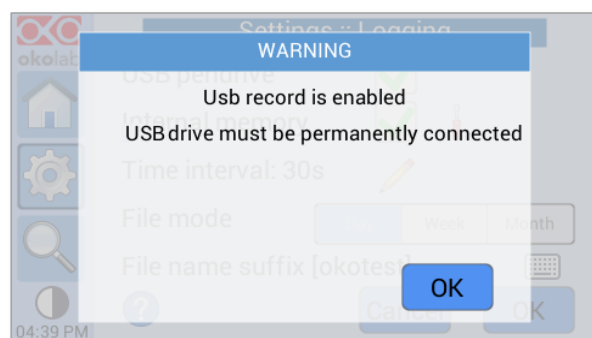
b

Figure 67. Download to USB.

You can activate the logging also on the *USB drive*, by flagging on *USB drive*, see Figure 68 a.



a



b

Figure 68. 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 68 b, and will store the data on the USB drive.

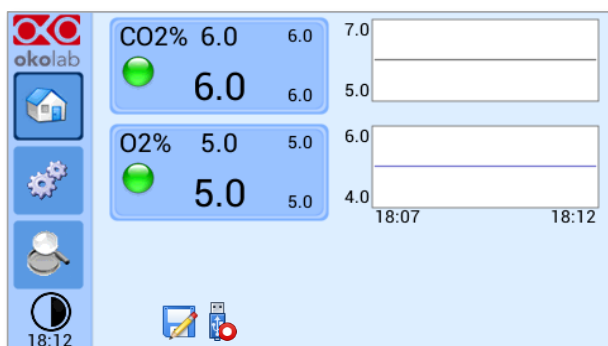



Figure 69. Logging to USB drive.

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 69.

9.3 Overview

Press on the icon  to open the *Overview* page as show in Figure 70 a.

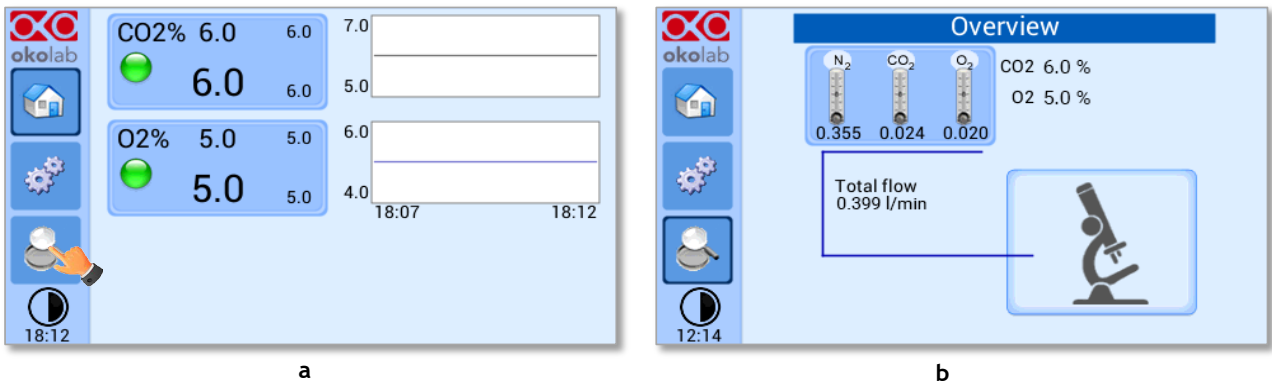


Figure 70. Overview Status page. (a) How to enter in the Overview Page (b) Overview Status Page.

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-O2-UNIT-BL [0-20; 1-95] features two display modalities: *Icon mode* and *Glance Mode*, as shown in



Figure 71 a and b. You can swap between the two display modalities by pressing on icon .



Figure 71. Display modalities. (a) Icon Mode; (b) Glance Mode.

9.5 Info page



Press the icon  to access the Info Page, as shown in Figure 72. This page contains the information related to the OKO-TOUCH (as shown in Figure 73 a) and to CO2-O2-UNIT-BL [0-20; 1-95] version (as shown in Figure 73 b).

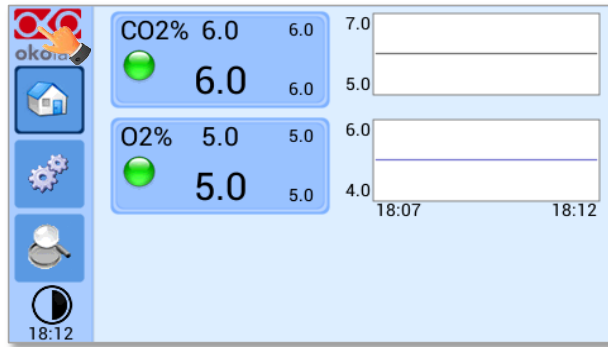


Figure 72. Info page selection.

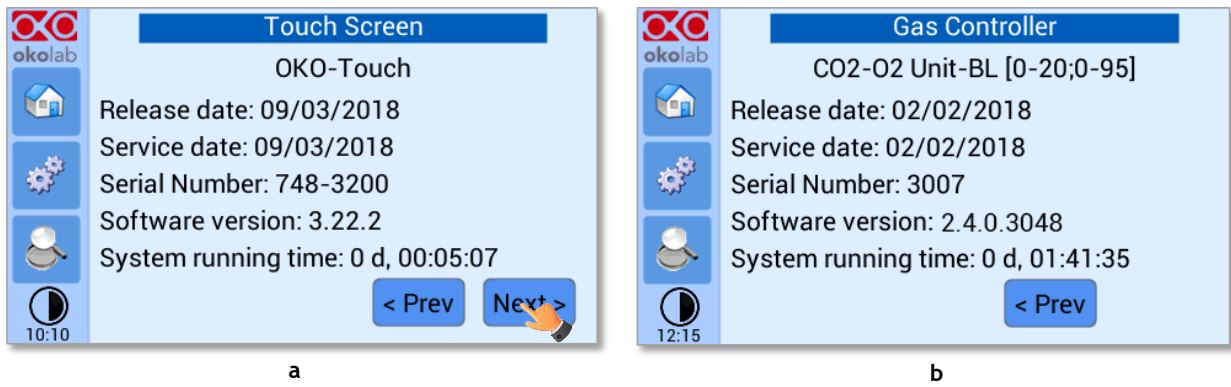


Figure 73. Info page OKO-Touch (a) and CO2-O2-UNIT-BL [0-20; 1-95] (b).

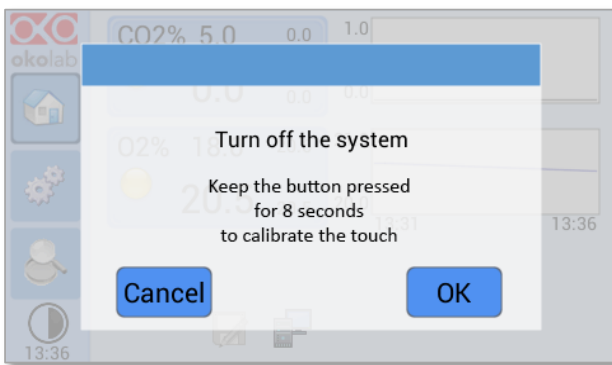
Tip ► Please have this information handy when contacting Okolab for support

10 Touch Screen Calibration

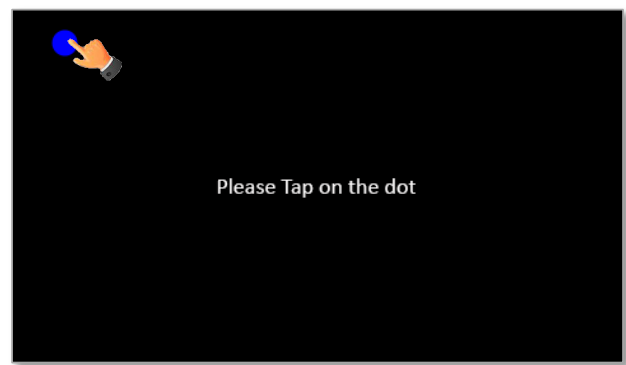
Keep pressed the *ON/OFF* button on OKO TOUCH for 7 seconds to start the Touch Screen Calibration (see Figure 74). While holding the button, the pop-up message shown in Figure 75 a appears. Then tap blue calibration dots until the calibration is complete (see Figure 75 b).



Figure 74. How to enter in Touch Screen Calibration.



a



b

Figure 75. Start Touch Screen Calibration (a – b).

11 Cleaning & Maintenance

Cleaning

Please, follow the instructions below to clean CO2-O2-UNIT-BL [0-20; 1-95]:

- 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-O2-UNIT-BL [0-20; 1-95].

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

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

13 Technical Specifications

CO2-O2-UNIT-BL [0-20; 1-95] – Technical Specifications	
CO ₂	Range: 0-20% Step size: 0.1% Accuracy: ± 0.2% @ 5.0% Sensor: 10 year-life, Non Dispersive InfraRed (NDIR) dual wave length detector Recommended Calibration Interval: 1 year
O ₂	Range: 0-95% Step size: 0.1% Accuracy: ± 0.2% @ 5.0% Sensor: 5 year-life, optical sensor Recommended Calibration Interval: 1 year
Input Gas	CO ₂ , N ₂ and Air
Total Flow rate	0.2-0.4 L/min
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 35 W max (85 W max if used together with HM-ACTIVE)
Weight	3.5 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
No power supplied to Unit	Power plug is disconnected	Connect plug securely
No Gas flow rate stability	Pressure drop	Check gas tanks and/or compressed lines
		Change the PTFE filter with degree of filtration 0.2 micron
No CO ₂ or O ₂ read	The Unit is off	Switch the Touch Screen on
	The PTFE filter with degree of filtration 0.2 micron is dirty	Change the PTFE filter with degree of filtration 0.2 micron
Gas leak on the rear of the control box	Not properly inserted tubes	Strongly push the tube into the push to fit connector
No Gas arrives to the incubating chamber	Missing connection	Make sure you have attached the TUBE-CB on the rear of CO ₂ -O ₂ -UNIT-BL [0-20; 1-95]
	Gas source closed	Open gas tanks regulators
Fast sample drying	No Gas arrives to the incubating chamber	See above
	Humidifying Module empty	Fill it with distilled water until 50 mm below the top of glass column.
	Humidifying Module not heated	Correctly connect the heater of the Humidifying Module

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16 Manual Revision Table

Revision Number	Additions or changes	Date
01	Edit new form factor User Manual	October 24th 2018
02	Format Revision	January 21st 2019
03	Setting up and tubing revision	February 8th 2019
04	Equipment correction	May 23rd 2019
05	Cleaning & Maintenance	January 24th 2020
06	Update of OKO-AIR PUMP-BL	November 05th 2020

WARRANTY

Okolab S.r.l. warrants "CO2-O2-UNIT-BL [0-20; 1-95]" 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 result 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.