TRI-GAS-MIXER-15L

TRI-GAS-MIXER-1.5L

Gas Controller

Manual

IST-1700-REV03
IST-1701-REV03
IST-1702-REV03
IST-1703-REV03
SV 1.0.11.0

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1 Preface

The Tri-Gas-Mixer is a Digital CO_2/O2 Controller which mixes CO_2, Air and Nitrogen[1] to the desired concentration in the CO_2 range 0-10% and O_2 range 0-10%, at controlled pressure.

The Tri-Gas-Mixer is available in two different configurations: **TRI-GAS-MIXER-15L** and **TRI-GAS-MIXER-1.5L**, the first one is supplied with a 40 Liters tank and can flow up to 15 L/min while the second one is supplied with a 5 L tank and can flow up to 1.5 L/min. For both the configurations the Tri-Gas-Mixer must be connected to pressurized sources of CO2, N2 and Air[2]. Minimum input pressure is related to the delivery pressure (see paragraph 8). The output pressure can be regulated by the user to achieve up to 2 barg (29 psi) of premixed gas.

TRI-GAS-MIXER-15L and TRI-GAS-MIXER-1.5L can be used along with Mini-Incubators (for IVF application) as well as with microscope incubators or perfusion chambers (for Live Cell Microscopy) and for all applications where a gas mixture of CO_2 in Air is required.

TRI-GAS-MIXER-15L and TRI-GAS-MIXER-1.5L remove the need for premixed Air/CO_2 and N_2/O_2/CO_2 tanks and can supply the desired gas mixture to several equipment. Different gas lines can be set up to provide different flow rate values for each equipment, as long as the sum of flow rates of all gas lines does NOT exceed 15 L/min for TRI-GAS-MIXER-15L or 1.5 L/min for TRI-GAS-MIXER-1.5L

The Unit includes two main parts: a Control Unit (Tri-Gas Mixer) and a Pressurized Tank. The Tri-Gas Mixer is operated via Touch Screen.

The time required to reach the steady state depends on the volume of the tank and on the working conditions, usually the time for the steady state is 20 minutes. Once the steady state is reached (i.e. gas Setpoint values are reached as displayed on the Touch Screen), the device can be used uninterruptedly.

The Tri-Gas-Mixer is equipped with a CO2-O2 Module containing the CO2 and O2 sensors and allowing to automatically fine-tune the mixing accuracy of the Tri-Gas Mixer. The CO2-O2 Module is factory calibrated using certified gas cylinders. The factory calibration certificate is included, in electronic format, in Tri-gas-Mixer's memory.

The Tri-Gas Mixer also allows you to finely calibrate the CO2-O2 Module or directly by the Tri-Gas-Mixer by using a certified calibration gas cylinders or with a calibration procedure by any external CO_2 and O_2 percentage reader.

The Tri-Gas Mixer features advanced safety routines for ensuring the continuity of gas supply. It automatically switches to a backup premixed cylinder (Span Gas) in case any of the alarm conditions or during the Tri-Gas-Mixer transient time.

The TRI-GAS-MIXER includes LAN connection and remote-control software.

[1] Okolab S.r.l recommends that the gases used with the Tri-Gas Mixer have a very high purity otherwise the presence of impurities in the gas tanks alters the CO_2/O_2 compositions obtained downstream of the Tri-Gas Mixer. In order to be sure of the gases' purity, you can check the composition of each tank with an external meter.

[2] Okolab air compressors are available to provide pressurized background 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.

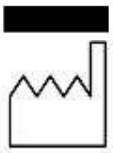
Tip ► *Supplies you with helpful suggestions.*

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

3 Safety Notes

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

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

- Do not use a volatile solvent such as paint thinner to clean the instrument, because deformation or discoloration may occur.
- Use a soft, dry cloth to remove stains from the instrument.
- Do not exceed voltage indicated in this manual and on the product label.
- Avoid excessive induction noise, static electricity and magnetic fields.
- Do not expose this instrument to rain or moisture.
- Do NOT go in close contact with or breathe any gas stream whose composition is different from that of ambient air.
- Prevent throttling and kinking of tubing.
- Check tubing time to time for possible material usage.
- Check that all tubing is well inserted into the connectors so they cannot slip off.
- This device is not designed for use for medical applications.
- Install safety valves and adequate pressure regulators on gas lines before the Tri-Gas-Mixer 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 4 barg. 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. **Tri-Gas-Mixer**, Control Unit.
2. **24V-DC Power Adapter and Power Cord** (x1).
3. **Analog output cable**
4. **TUBE BP – TO TANK**, 1.5 meter long yellow polyurethane tubing with a valve (x1). Use yellow tubing to connect Tri-Gas-Mixer gas port labeled "To tank" to the pressurized tank output port.
5. **Pressurized Tank**.

Note ► *40 Liters for TRI-GAS-MIXER-15L or 5 Liters for TRI-GAS-MIXER-1,5L*

6. **Tank support.**
7. **TUBE BR – FROM TANK**, 1.5 meter long blue polyurethane tubing with a 3 ways valve (x1). Use blue tubing to connect the Tri-Gas-Mixer gas port labeled "From tank" to the pressurized tank input port.
8. **Pressure gauge for CO2, N2, Air, Premixed back up gas** and **Calibration gas**, +regulator+assembly stirrup (x5). Install pressure gauge among the pure CO2, N2, Air, Premixed Gas and Calibration gas tanks' pressure regulators and the corresponding gases input ports.
9. **TUBE A,** teflon rigid tube, to cut and use connecting Air, CO_2, N_2, premixed back up gas supply and the Calibration Gas to the corresponding input ports (Air, CO_2 and N_2, Premixed back up gas, calibration Gas) on the rear panel of the Tri-Gas-Mixer.
10. **TUBE BT,** teflon rigid tube with the compression fitting connectors. Use teflon tube to connect the Tri-Gas-Mixer gas port labeled "Gas Output" to the users

Note ► *All tubes and connectors are 6 mm OD in the Countries in which the metric system is applied or ¼ inch in United States in which the imperial system is applied.*

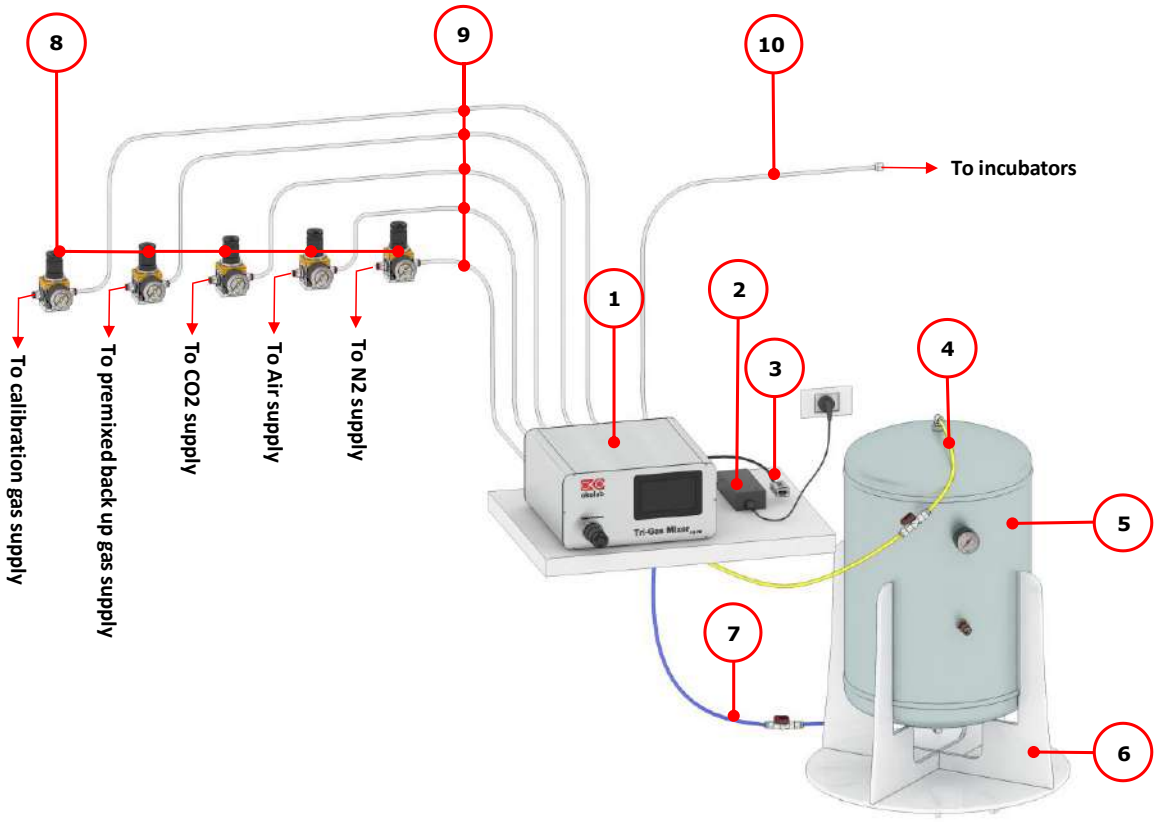


Figure 1. TRI-GAS-MIXER-15L – Components.

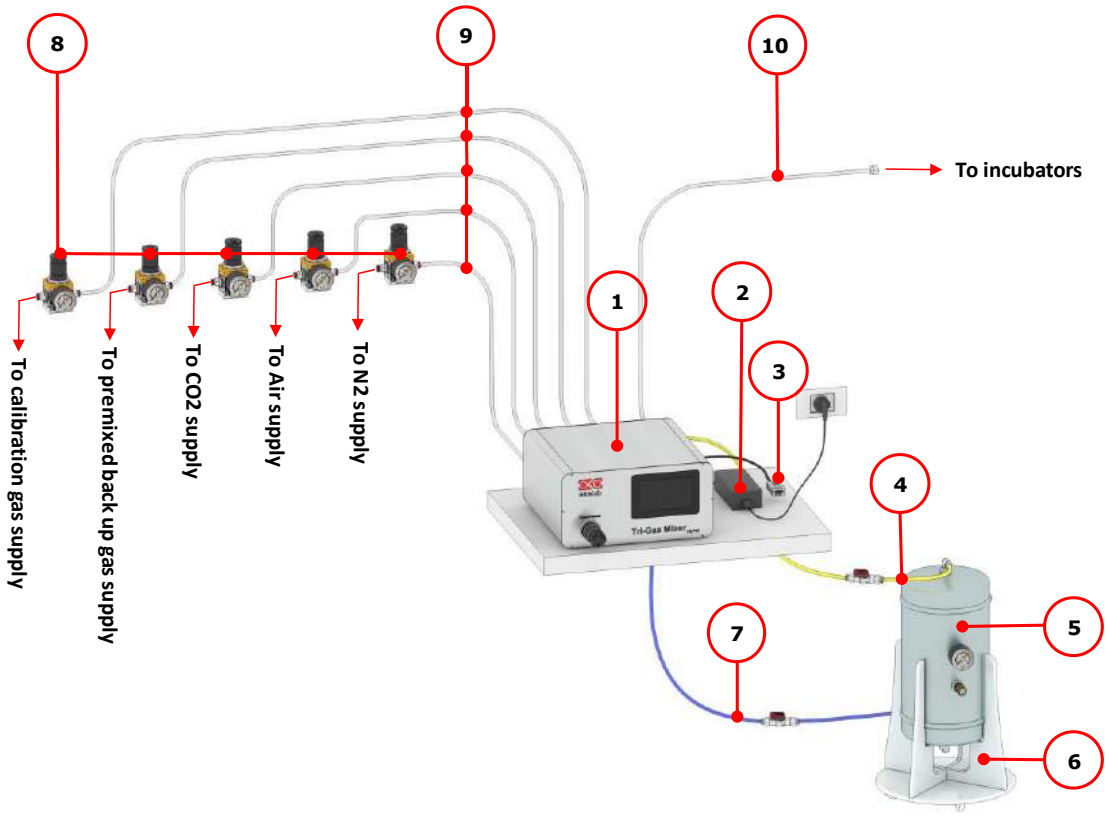


Figure 2. TRI-GAS-MIXER-1.5L – Components.

5 Gas Supply Requirements

- **CO_2**. CO_2 tank with a connector for 6 mm OD rigid tube in the Countries in which the metric system is applied or for ¼ inch OD rigid tube in the Countries in which the imperial system is applied. Gas source must be Standard Purity CO2 (coded as 4.8 that means 99.998 % of CO2) and humidity-free gas. The CO_2 tank must be equipped with a pressure regulator to decrease the pressure from the CO_2 tank pressure to 5 barg
- **N_2**. N_2 tank with a connector for 6 mm OD rigid tube in the Countries in which the metric system is applied or for ¼ inch OD rigid tube in the Countries in which the imperial system is applied. Gas source must be Standard Purity N_2 (coded as 5.0 that means 99.999 % of N2) and humidity-free gas. The N_2 tank must be equipped with a pressure regulator to decrease the pressure from the N_2 tank pressure to 5 barg.

  Note ► *Okolab recommends to use N2 with Standard Purity (coded as 5.0) because the Nitrogen is also the gas used during the automatic calibration procedure*

- **Air.** Air must be available, with a connector for 6mm OD rigid silicon tube in the Countries in which the metric system is applied or for ¼ inch OD rigid tube in the Countries in which the imperial system is applied. The Air tank must be equipped with a pressure regulator to decrease the pressure from the Air tank pressure to 5 barg.

Note *Okolab recommends that the gases used with the Tri-Gas Mixer have a high purity. Otherwise, the presence of impurities in the gas tanks alters the CO2/O2 compositions obtained downstream of the Tri-Gas Mixer. In order to be sure of the gases' purity, you can check the composition of each tank with an external meter.*

Note ► *Okolab air compressors are available to provide pressurized background air, see paragraph 6.*

- **Premixed back up gas.** The Premixed gas must be available, with a connector for 6mm OD rigid silicon tube in the Countries in which the metric system is applied or for ¼ inch OD rigid tube in the Countries in which the imperial system is applied Premixed Gas source must be a gas with a high accuracy because the Tri-Gas-Mixer automatically switches to the backup premixed cylinder in case any of the input gas sources runs low/out or power supply failures. The Premixed gas tank must be equipped with a pressure regulator to decrease the pressure from the tank pressure to 5 barg.
- **Calibration gas.** The calibration gas must be available, with a connector for 6mm OD rigid silicon tube in the Countries in which the metric system is applied or for ¼ inch OD rigid tube in the Countries in which the imperial system is applied. The calibration gas tank must be traceable to certified national standard and with uncertainty of ± 1% of the declared value because the Calibration Gas is used during the CO2 and O2 calibration sensors procedure. The gas calibration tank must be equipped with a pressure regulator to decrease the pressure from the tank pressure to 5 barg.

6 Optional Equipment

The Tri-Gas-Mixer can be equipped with:

- **TUBE-BV,** 2m Teflon tube with **VOC filter** in the middle *(OPTIONAL)*
- **VOC filter magnetic holder** *(OPTIONAL)*
- **Air compressor** *(OPTIONAL)*

Note ►AIR-COMPRESSOR-CP3-15L *for TRI-GAS-MIXER-15L (see Figure 3) and* ***AIR-COMPRESSOR-CP3-1.5L*** *for TRI-GAS-MIXER-1.5L (see Figure 4).*

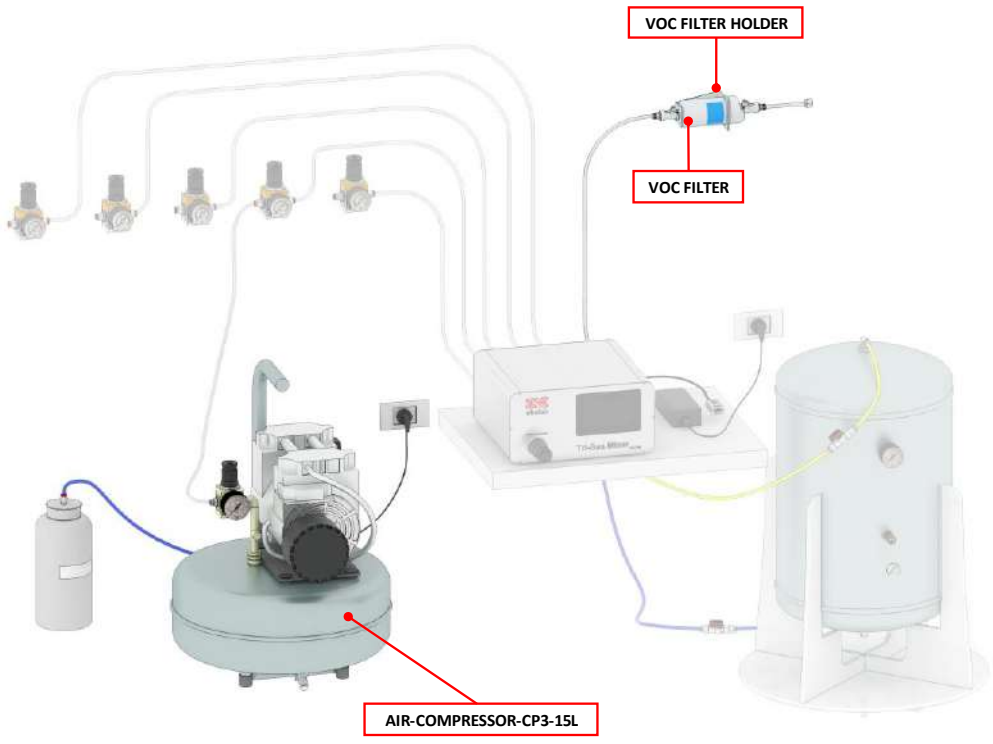


Figure 3. TRI-GAS-MIXER-15L WITH OPTIONAL EQUIPMENT

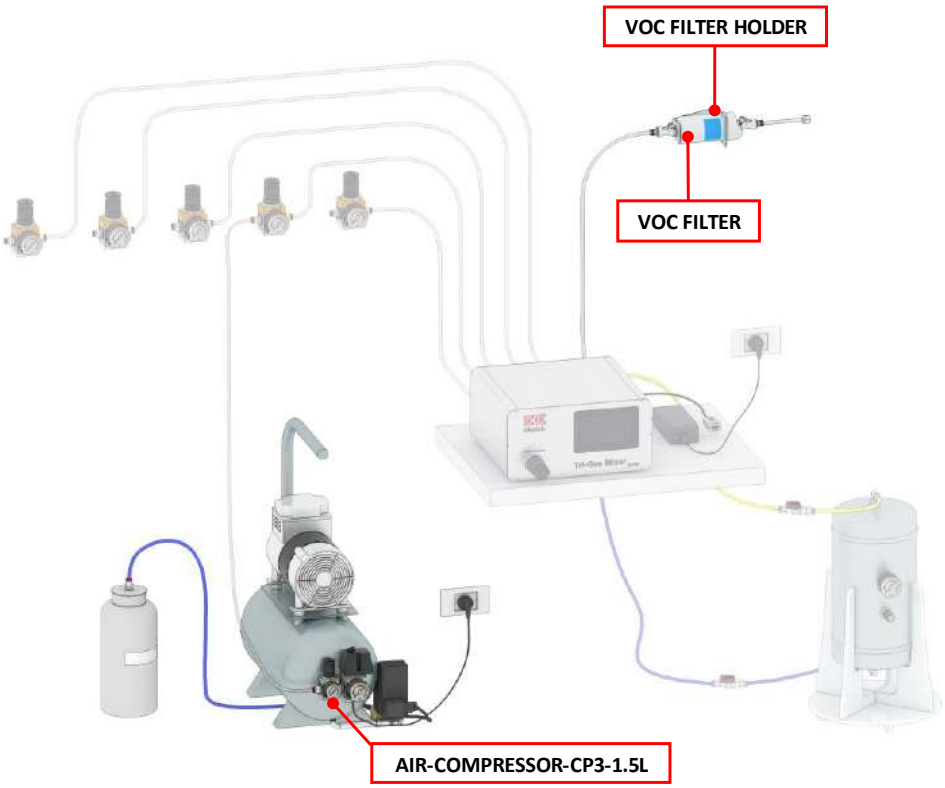


Figure 4. TRI-GAS-MIXER-1.5L WITH OPTIONAL EQUIPMENT

7 Equipment Description

Figure 5 illustrates the Tri-Gas-Mixer front panel:

1. **Display touchscreen.**
2. **Output pressure regulator.**

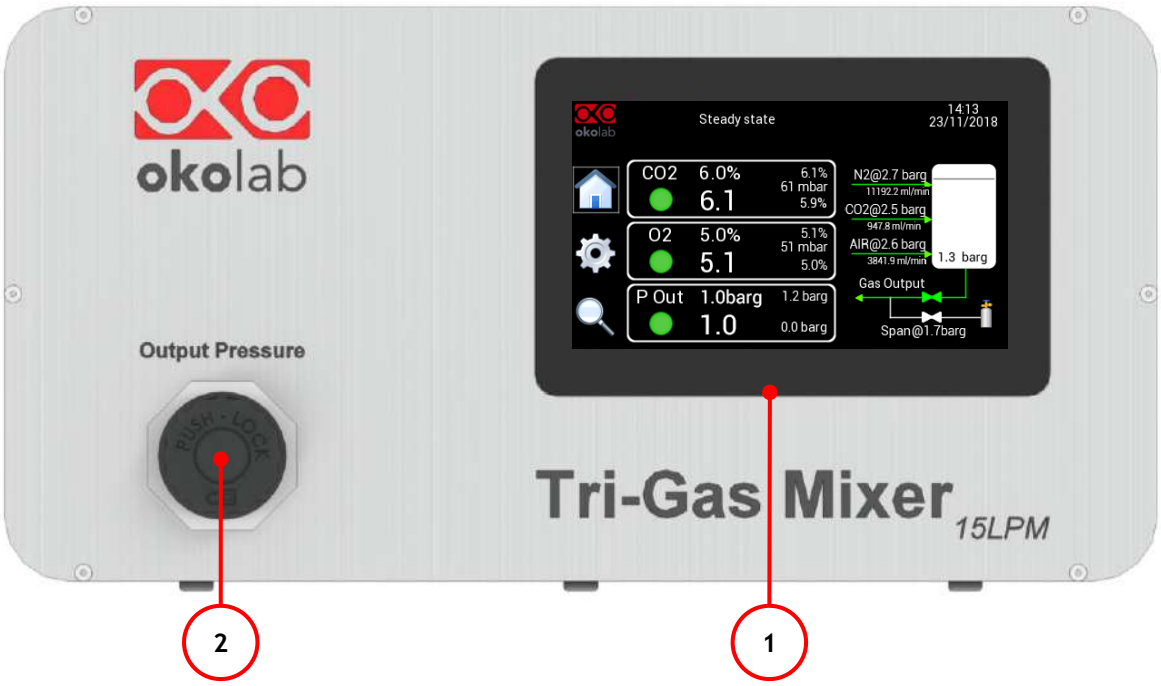


Figure 5. Tri-Gas-Mixer Front Panel.

Figure 6 illustrates the Tri-Gas-Mixer rear panel:

3. **Analog Output** To connect to an external alarm or logging system using analogic signals. See paragraph 8.2
4. **External Alarm Contact closure.** See paragraph 8.2
5. **Lan Connection**.
6. **USB connectors.**
7. **N_2 input.** Push to fit connector to supply N_2 to the Tri-Gas-Mixer.
8. **Air input.** Push to fit connector to supply Air to the Tri-Gas-Mixer.
9. **CO_2 input.** Push to fit connector to supply CO_2 to the Tri-Gas-Mixer.
10. **Purging valve.** Push to fit connector to empty the tank during the transient time.
11. **Calibration gas input**. Push to fit connector to supply the calibration gas during the CO2-O2 Module sensors calibration procedure.
12. **Premixed back up gas input** Push to fit connector to supply the premixed back up gas if an alarm condition occurs or during the transient time.
13. **To Tank.** Push to fit connector to connect the main box to the tank.
14. **From Tank**. O.D push to fit input connector to connect the tank to the main box.
15. **Sampling port** Barb connector for 6mm O.D soft tubes**.** Leave it unplugged during the working standard conditions, it allows to calibrate the gas sensors by an external gas meter.
16. **Mixed Gas Output.** Output compression fitting connector to supply the mixed gas to the users.
17. **Power Input**

18. **Power switch**

Note ► *All tubes and connectors are 6 mm OD in the Countries in which the metric system is applied or ¼ inch in the Countries in which the imperial system is applied*

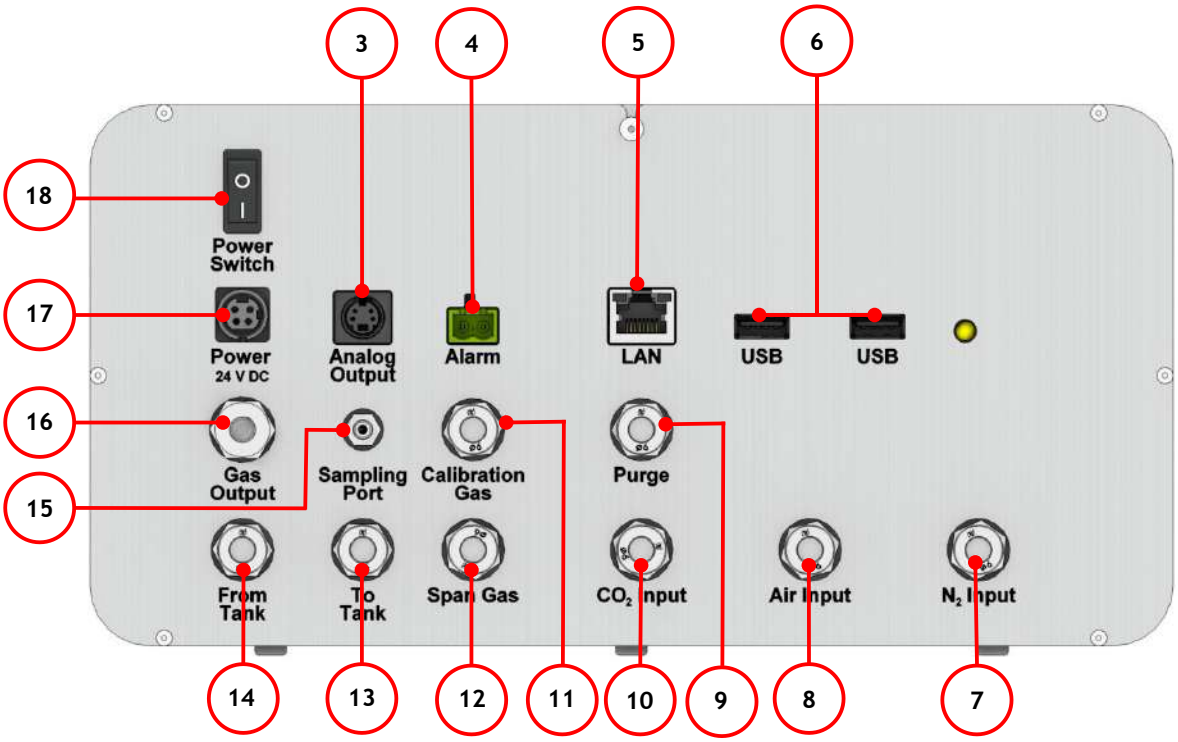


Figure 6. Tri-Gas-Mixer Rear Panel.

8 Installation

The following paragraph illustrates how to install and to use the Tri-Gas-Mixer.

8.1 Setting up Tri-Gas-Mixer

1. Cut the TUBE A according to your needs and use it to connect Air, CO2, N2, Premixed and Calibration Gas supply to the corresponding push to fit connectors on the rear panel of the Tri-Gas-Mixer (see Figure 7 a).

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

To remove tubing from the connectors push the ring while pulling the tubing out.(see Figure 7 b).

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

Figure 7. How to connect and disconnect the tubings from push to fit connectors (a – b).

Before disconnecting any tubing connected to the Tri-Gas-Mixer, make sure that there is no residual pressure, checking the tank manometer and adjusting the pressure gauges upstream of the system.

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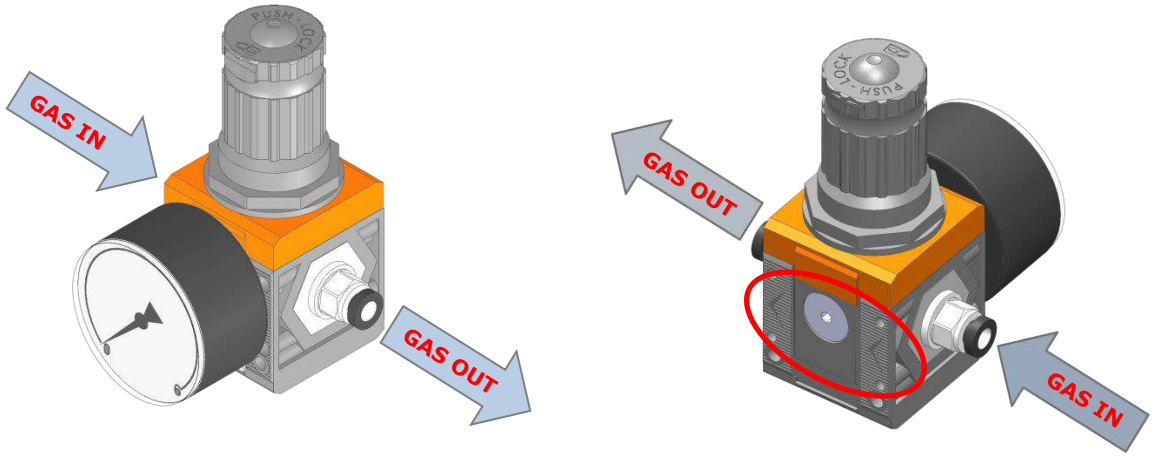
2. Introduce a pressure gauge along the tubes between the gases supply and the Tri-Gas-Mixer to allow releasing pressure when needed.

Note ► *Be careful to follow the direction of the arrow on the rear of the Pressure Gauge for the correct Gas In-Out orientation (See Image b, Figure 8).*



a. 3D. Frontal view ***b. 3D. Rear view***

Figure 8: Input and Output gas ports. See symbol on the rear of Pressure Gauge.

Tip ► *Figure 9 shows how to use the pressure gauge correctly, after its installation, in three steps:*

A. Pull the knob up to release the lock.

B. Rotate the knob until the pressure reaches the desired value (clockwise/counterclockwise to increase/decrease the pressure).

C. Push the knob down to lock it.

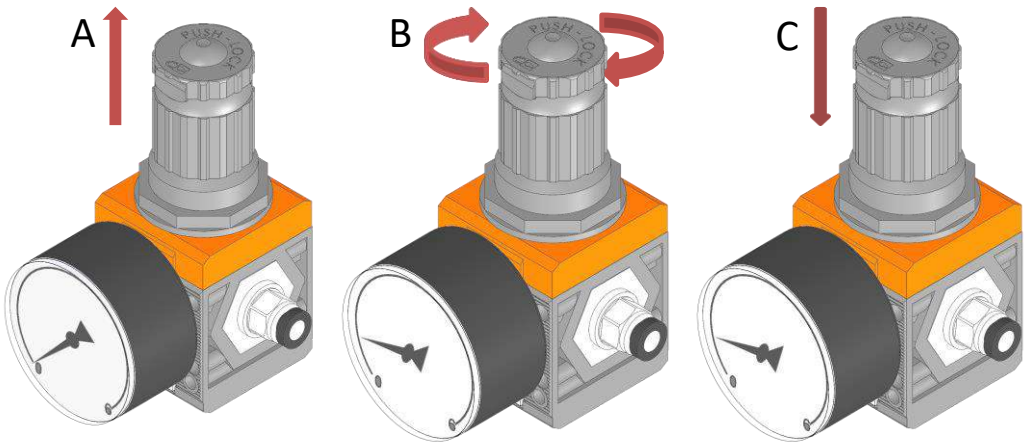


Figure 9 Pressure gauge usage.

The pressure gauges supplied by Okolab cannot be used at an inlet pressure higher than 10 barg (145 psi).

Exceeding this pressure value could damage the pressure gauge. Not exceed 10 barg (145 psi).

Figure 10 shows the connections among the CO_2, Air and N_2 tanks and the respective connectors on the rear panel of the Tri-Gas-Mixer.

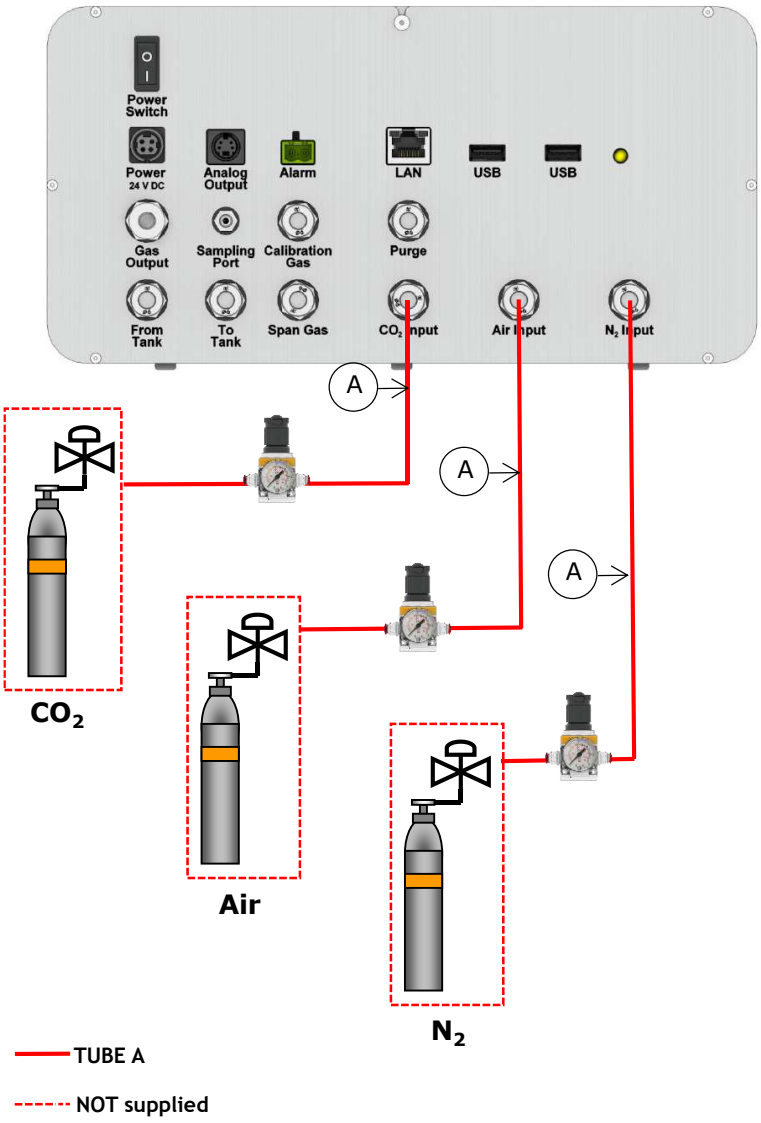


Figure 10. CO_2, Air and N_2 Tanks connections to the back panel of the Tri-Gas-Mixer.

Tip ► *If you have ordered an Okolab air compressor connect it to the Tri-Gas-Mixer as shown in Figure 11, TRI-GAS-MIXER-15L or Figure 12 for TRI-GAS-MIXER-1.5L.*

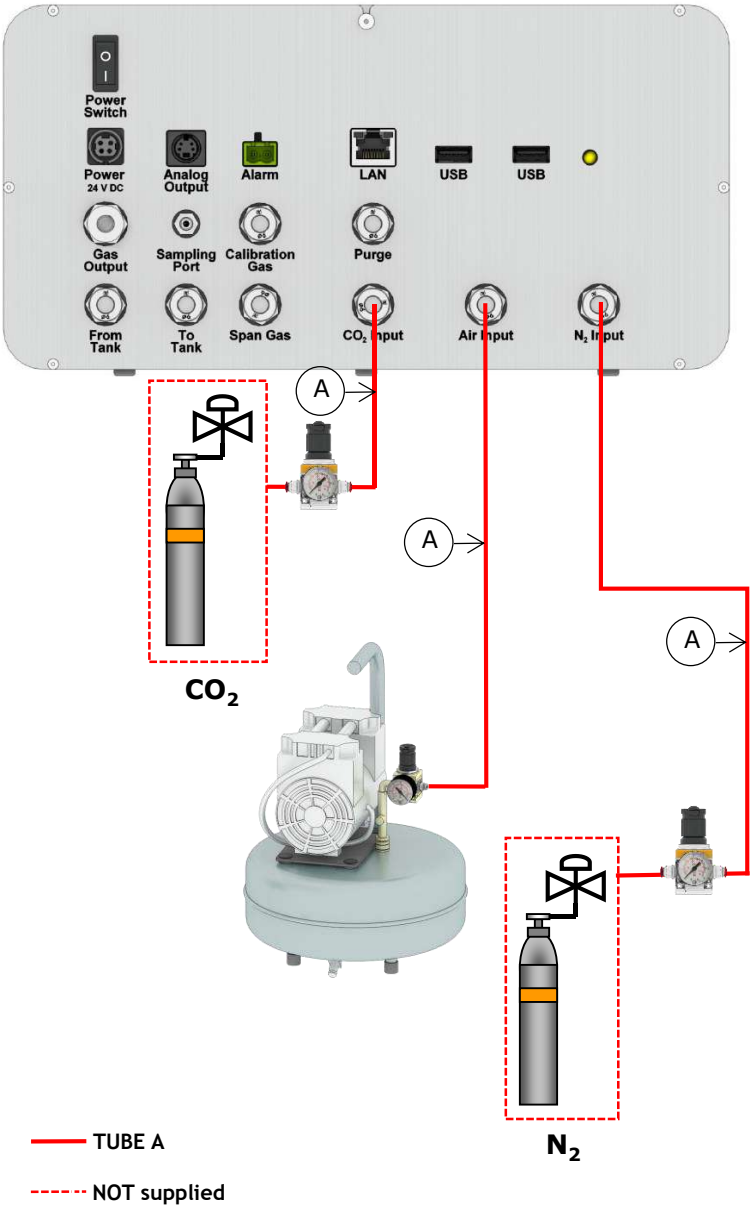


Figure 11. CO_2,N_2 tanks and air compressor connections to the back panel of TRI-GAS-MIXER 15L.

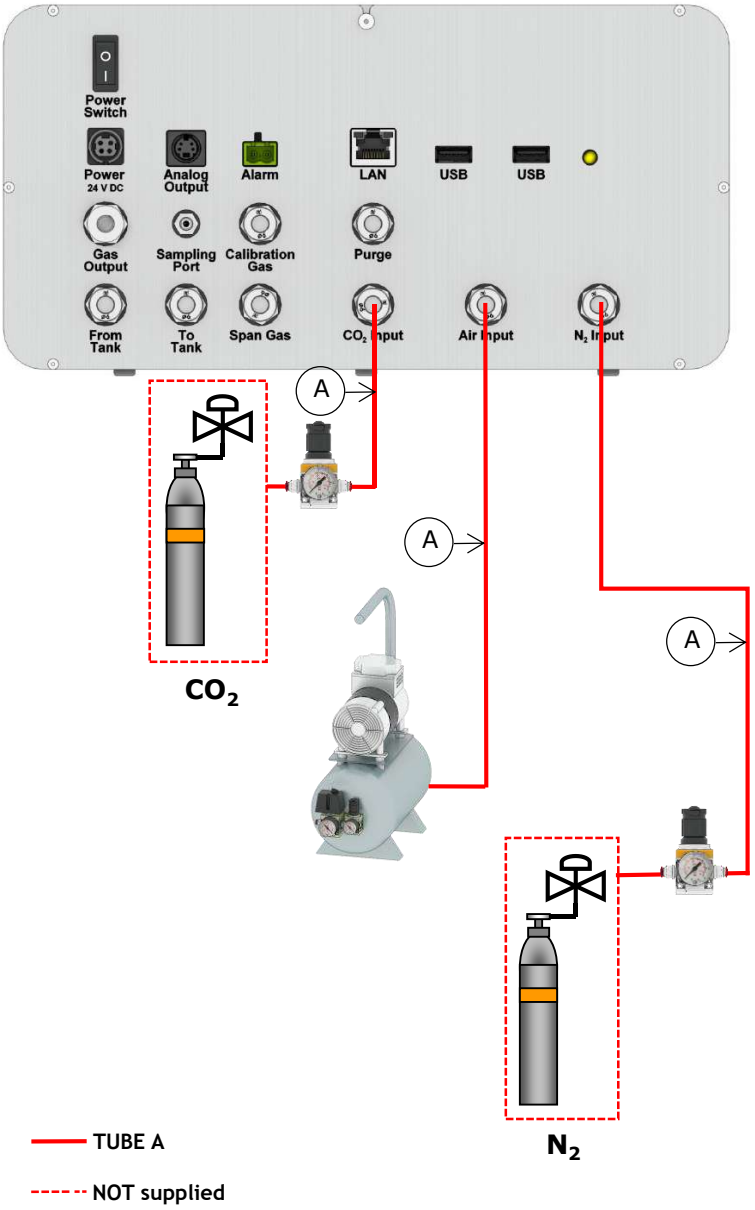


Figure 12. CO_2,N_2 tanks and air compressor connections to the back panel of TRI-GAS-MIXER 1.5L.

Tip ►*The gas supply pressure depends on the output pressure. Set the gases supply pressure at 2.4 barg if the Output pressure is lower or equal than 1 barg, otherwise the supply pressure has to be set at 1.4 barg above the output pressure or at higher pressure without exceeding 4 barg (58 psi for the Air, CO2 and N2 supply).*

Not exceed 4 barg (58 psi). Exceeding this pressure value could damage the Tri-Gas-Mixer components

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Note ►*barg is the pressure above atmospheric pressure*

Note ► *You can find more details on the minimum pressure to set on Output Pressure clicking on the Overview page* 🔍 *or in the widget appearing when you switch the Tri-Gas-Mixer on.*

3. If a premixed back up gas tank is available (not supplied by Okolab), introduce the pressure gauge (supplied by Okolab) between the Premixed back up gas tank and the input gas port labeled “Span Gas” on the rear panel of the Tri-Gas-Mixer, as shown in Figure 13. To install the pressure gauge follow the instructions at the point 2.

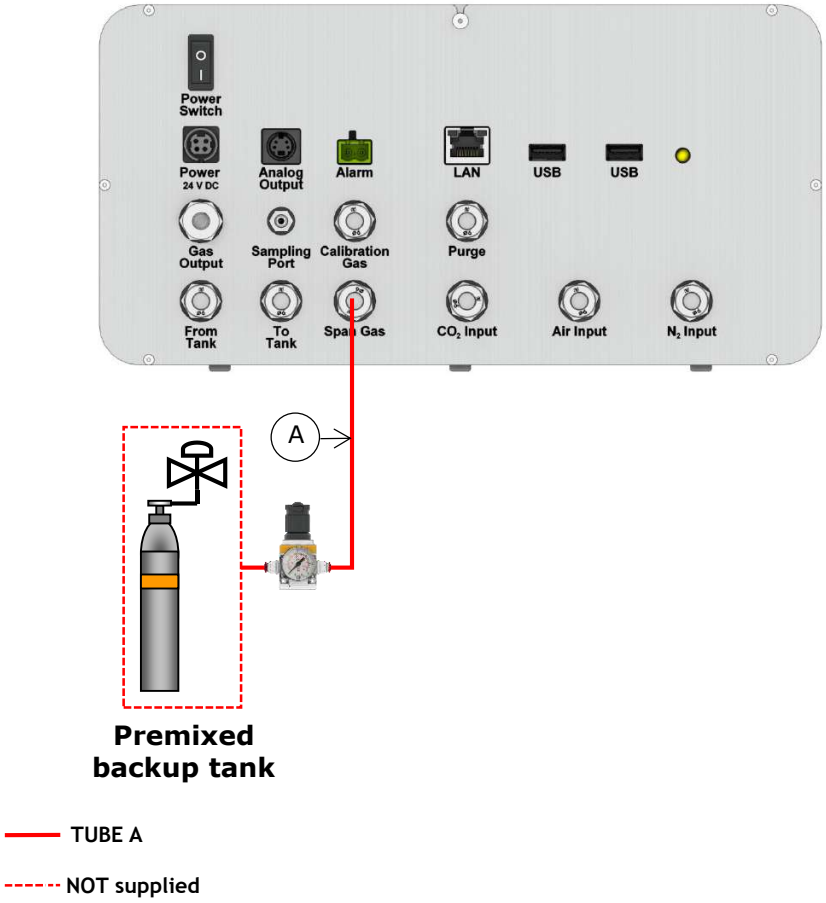


Figure 13 Premixed backup tank connection to the real panel of the Tri-Gas-Mixer

Tip ►*Set the premixed back up gas tank (Span Gas) pressure regulator at 1.2 barg, if the oputput pressure is minor or equal than 1 barg, otherwise set the premixed back up gas tank (Span Gas) pressure regulator to the Output pressure+0.2 barg*

4. If a calibration gas tank is available (*not supplied by Okolab*), introduce the pressure gauge (*supplied by Okolab*) between the calibration gas tank and the input gas port labeled “Calibration Gas” on the rear panel of the Tri-Gas-Mixer, as shown in Figure 14. To install the pressure gauge follow the instructions at the point 2.

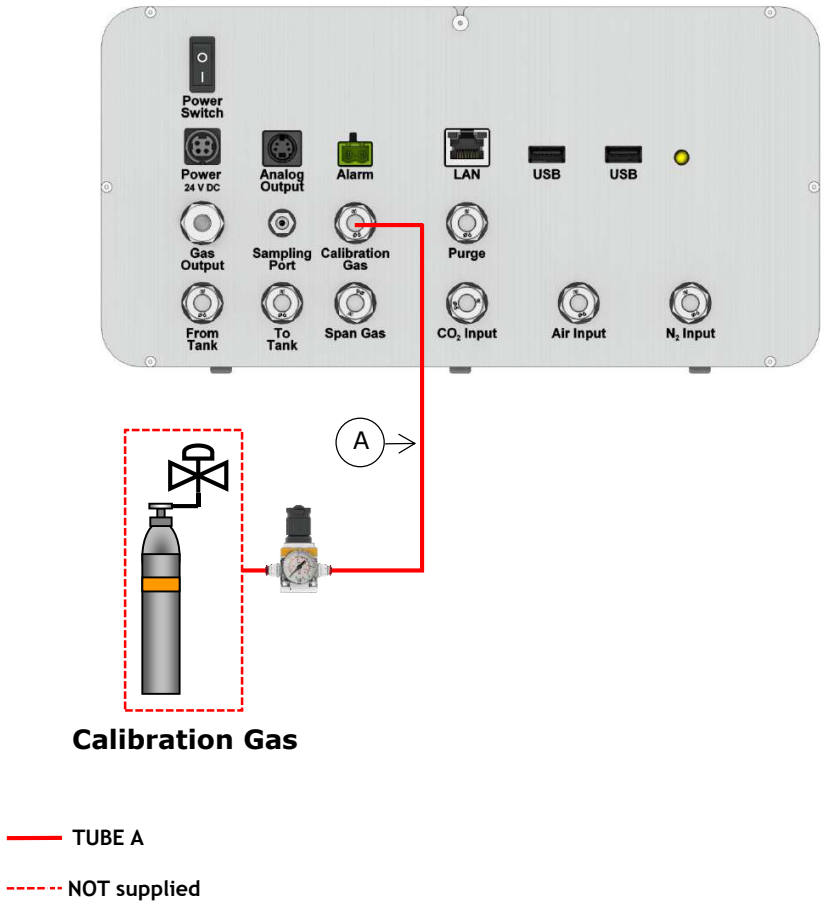


Figure 14 Calibration gas tank connection

Tip ►*Set the Calibration Gas pressure regulator at 2.0 barg*

5. Connect the pressurized tank to the Tri-Gas-Mixer with the two polyurethane tubing, TUBE BR and TUBE BP, as illustrated in Figure 15

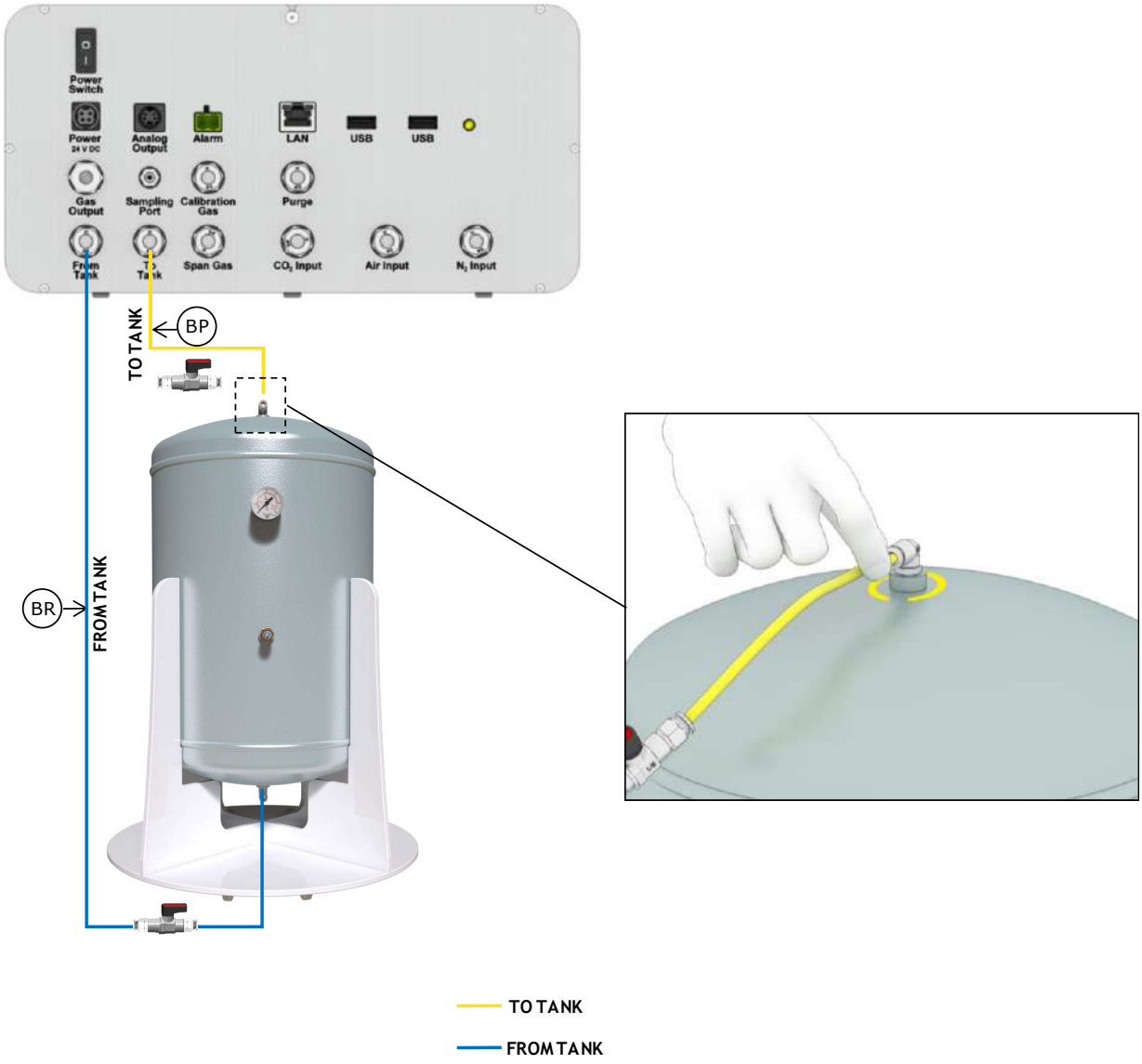


Figure 15. Tank connection

– IMPORTANT PAY EXTRA CARE IN THE FOLLOWING CONNECTION and its ORIENTATION. Connect the TOP port of the Pressurized Tank to the Tri-Gas-Mixer. Tubing and connectors involved in the Tri-Gas-Mixer – pressurized tank- are color-coded. Match colors (blue into blue, yellow into yellow). Push tubing securely all the way into connectors to avoid any gas leak. To remove tubing from these push-in connectors remember to keep pushed the ring.

Tip ►Along the TUBE BP and TUBE BR there is a ball valve. This valve must always be opened during the standard working operation, see the Figure 16 b, d. The ball valve can be used for closing the tank and preserve the gas contained (CLOSED Configuration in Figure 16 a, c)

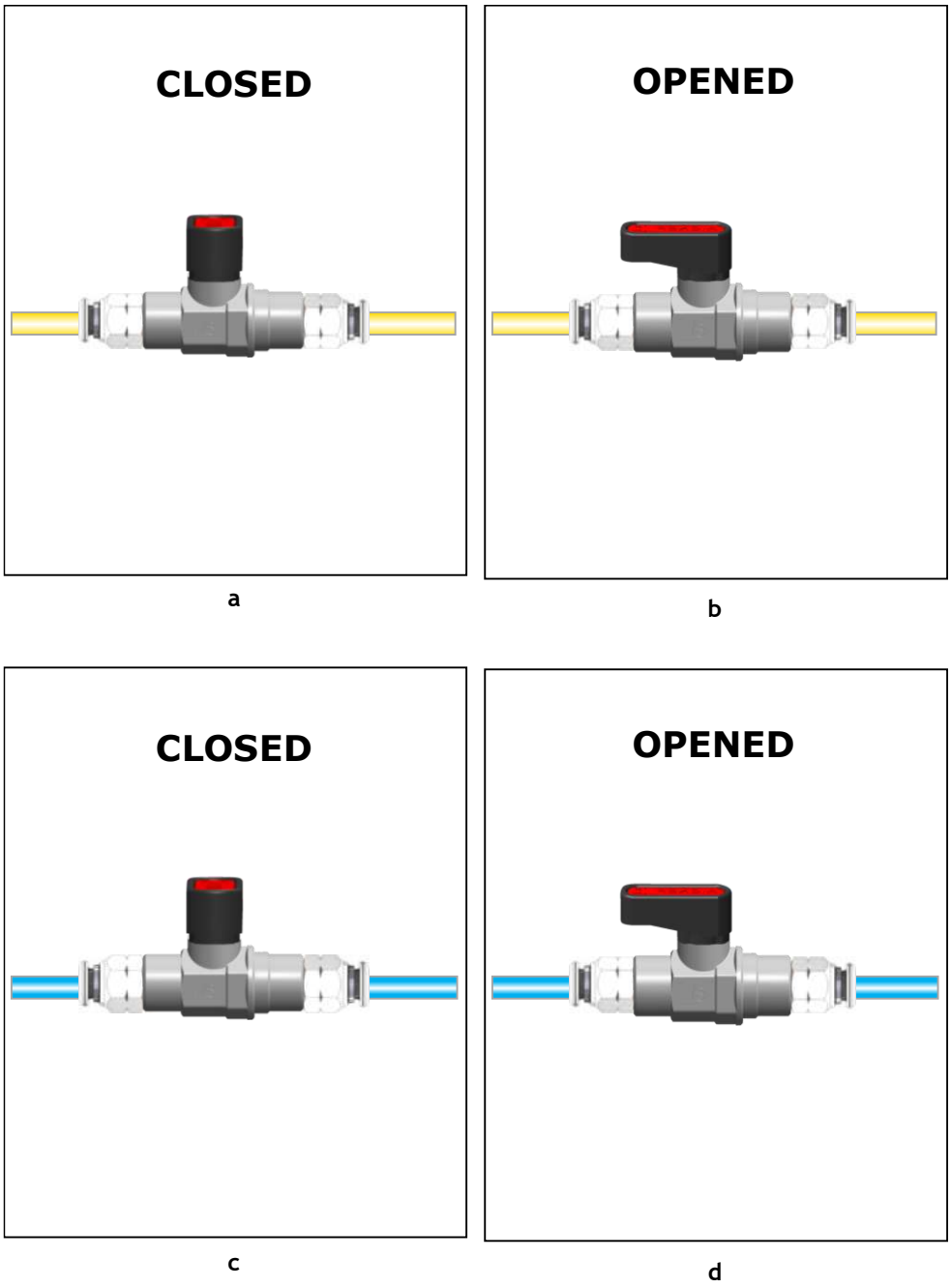


Figure 16. Ball valve positions

Tip ► *The tank is equipped with a safety valve as shown in Figure 17. The Safety Valve opens only if the tank pressure exceeds 3 bar.*

Figure 17. Tanks equipped with safety valves.

6. Connect the **TUBE BT** with the compression fitting connector to the Tri-Gas-Mixer gas port labeled "Gas Output", as shown in Figure 18 a and b and the other side of the tube to the users' line.

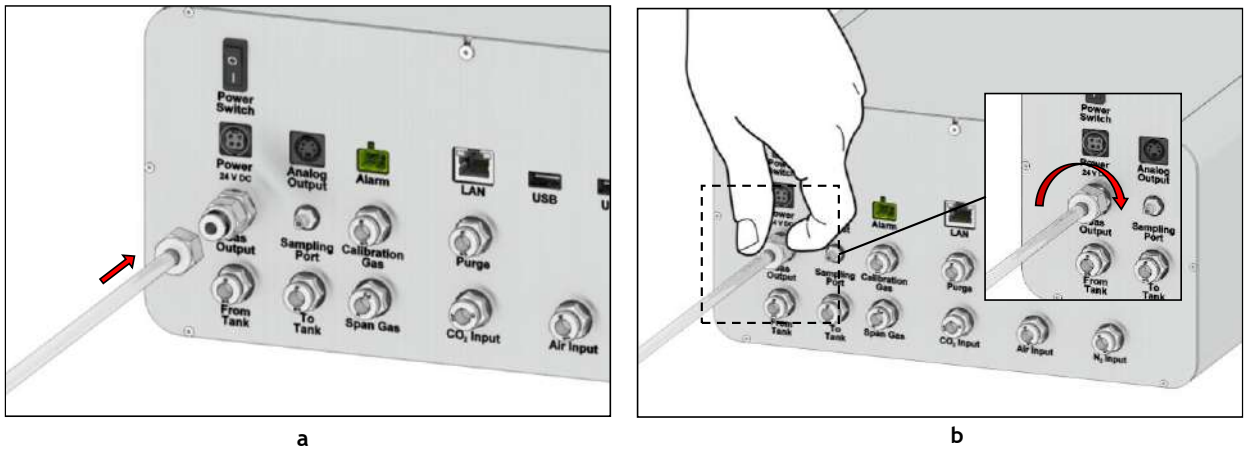


Figure 18. How to connect the TUBE BT gas output tube to the Tri-Gas-Mixer (a- b).

7. If your system is equipped also with VOC Filter, install the tube **TUBE-BV** supplied between the Pressure Gauge downstream of the Tri-Gas-Mixer and the users' line as shown in Figure 19. In order to install the VOC Filter in the correct orientation, follow the gas flow direction indicated on the filter itself.

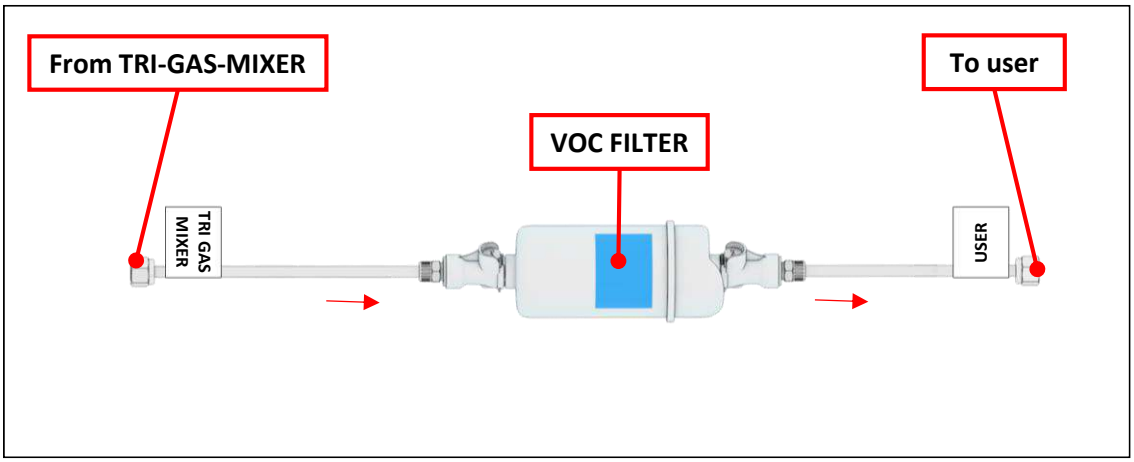


Figure 19 VOC filter installation.

The VOC filter adsorbs part of the CO_2 produced by the Tri-Gas-Mixer, therefore when you install the VOC filter along the users line, you have to leave the incubators empty for an hour in order to allow the system to reach the right CO_2 composition to send to users

8. If you want, use the remaining tube of TUBE A to connect the gas output labeled "Purge Output" on the back panel of the Tri-Gas-Mixer to the external environment. In this way the purging gases coming from the Tri-Gas-Mixer, during the transient time or when empty the tank, will not flow into the room but in the open air.
9. Connect the power adapter to the Tri-Gas-Mixer.
10. To switch the Tri-Gas-Mixer on use the power button on the rear panel.

The Homepage will appear on the touch screen, the color of the Status Indicator on the gas tab is yellow at the start (see paragraph 9.1.3).

11. Select the Setpoint gas compositions from the touch screen Home page (see paragraph 9.1.2).
12. Set the Output pressure from the touch screen Home page (see paragraph 9.1.2) and then regulate it manually by using the Output Pressure regulator on the front panel of the Tri-Gas-Mixer. Follow the instructions below to use the Output Pressure Regulator:
    a. Pull the knob to release the lock.
    b. Rotate the knob until the pressure reaches the desired value (clockwise/counterclockwise to increase/decrease the pressure)
    c. Push the knob down to lock it.

Figure 20. How to regulate the gas output pressure

If you use the Tri-Gas-Mixer without the feature *Span Gas Connected* on, do not regulate manually the premixed gas pressure until the Transient Time completely ends and the compositions status led become green.

13. Wait until the gas compositions light indicators on the Home page become green.
14. Check the output pressure measured is correct; otherwise regulate it at the set point value following the instructions at the point 11.

8.2 Alarm screw terminal

Connect the Alarm screw terminal to the rear panel, as indicated in Figure 21.

Safety extra low voltage powered alarm equipment, not exceeding stated contact rating, may be connected to the screw terminal. Refer to Figure 22 for alarm contact rating.

Tip ►The Screw Terminal is a contact closure alarm which closes its circuit if the Tri-Gas-Mixer triggers alarm.

The contact closure alarm does not close its circuit if the Tri-Gas-Mixer is not powered.

Figure 21. Alarm Contact. Alarm Screw Terminal

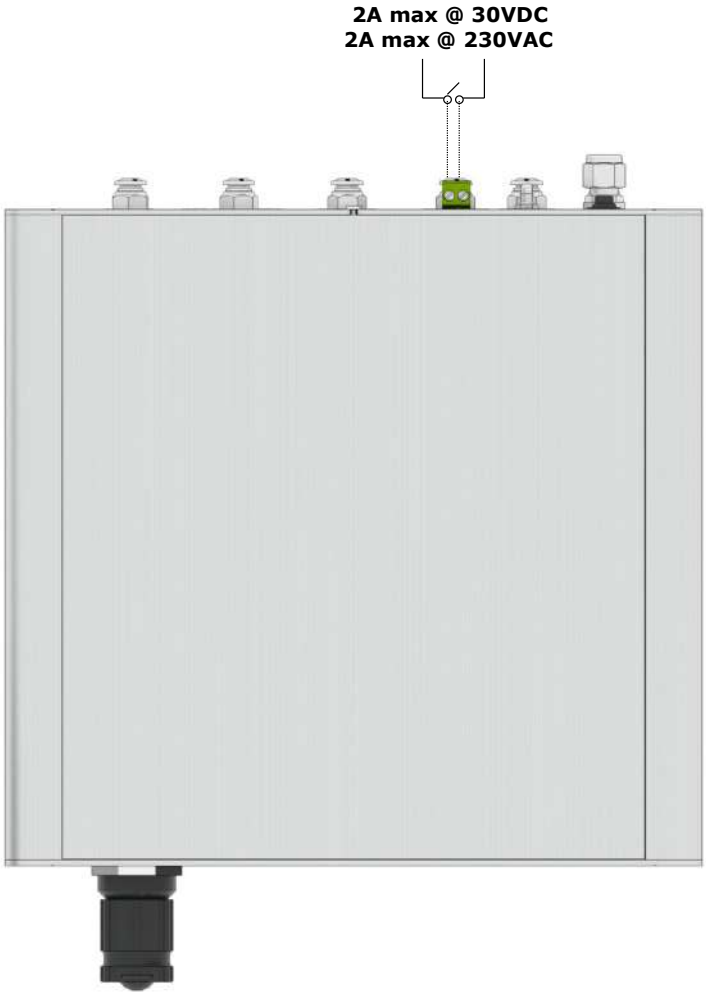


Figure 22 Alarm contacts. Contact rating.

8.3 **Analog Output**

The Tri-Gas-Mixer allows to remote monitor the current CO2 and O2 composition by an external Data logger.

To make this possible, follow the instructions below:

1. Make sure that the Analog output feature is disabled via OKO-TOUCH (see paragraph 9.2.3.4)

Before connecting the Analog Output cable to the rear panel of the Tri-Gas Mixer, you have to disable the Analog Output feature to avoid to damage or break the analog output section.

---

2. Connect the Analog output cable to the connector labeled *Analog Output* on the rear panel of the Tri-Gas-Mixer, as shown in Figure 23

Figure 23 Analog Output connection

3. In order to use the Analog Output correctly, make sure that your external instrument is connected to Okolab connector of the Analog output cable following the indications in Figure 24

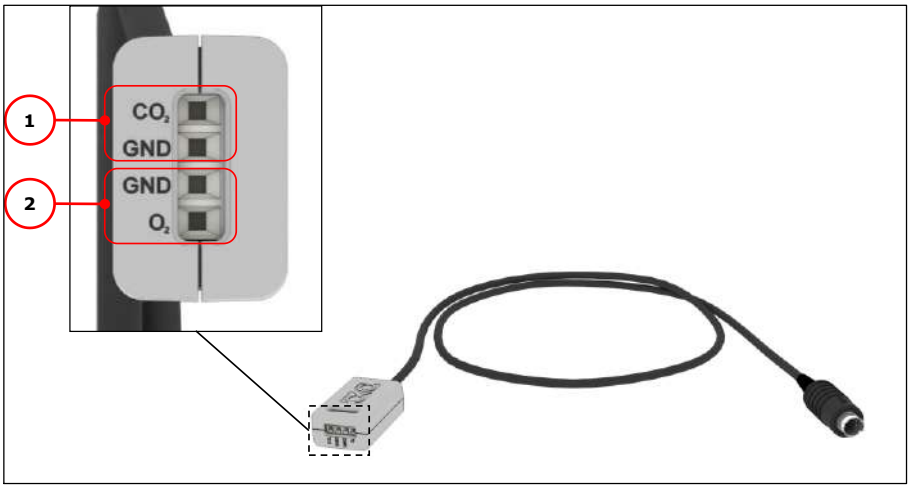


Figure 24 Analog Output connector

4. Enable to the Analog Output via OKO-TOUCH (see 9.2.3.4)

9 User Interface

This chapter describes the user interface of the Tri-Gas-Mixer.

9.1 Home page

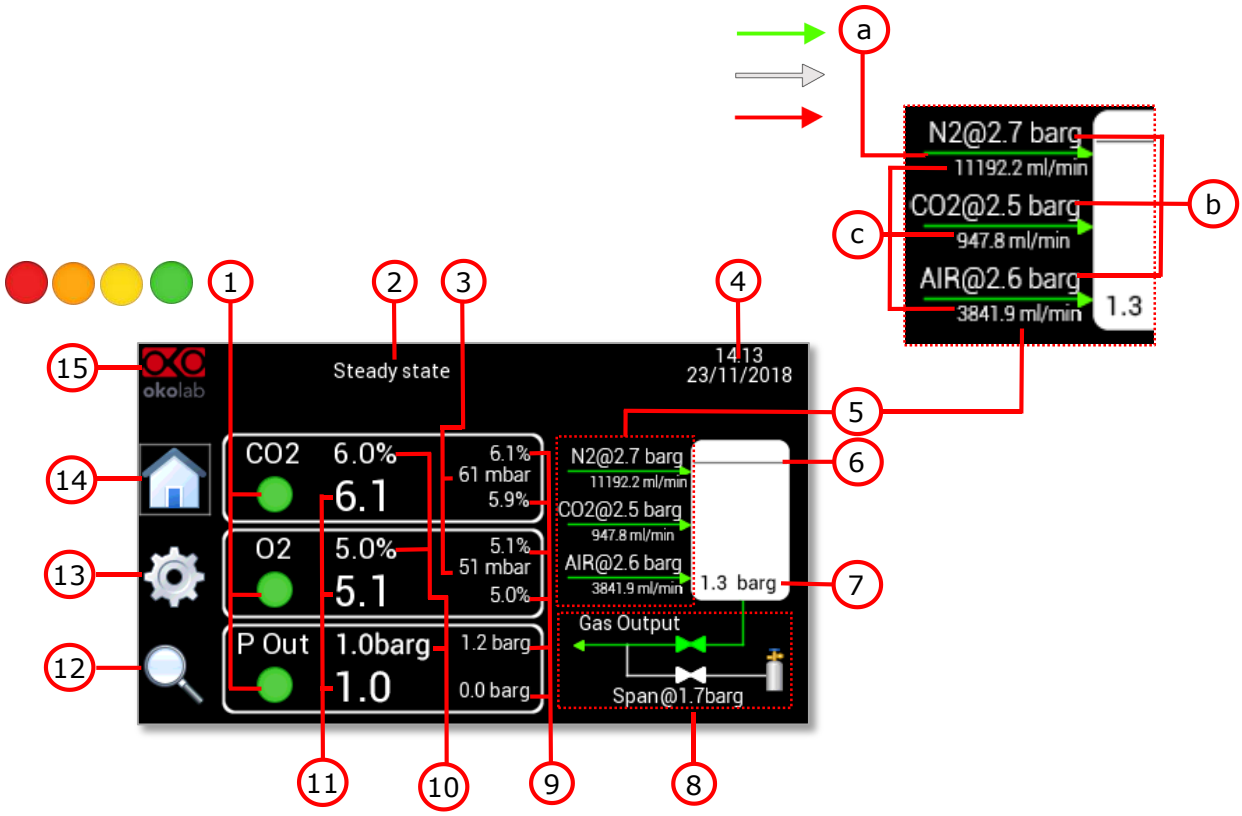


Figure 25. Homepage of Tri-Gas-Mixer Touch Screen Display.

1. Status LED. See paragraph 9.1.3
2. Control Status. It indicates the control phase of the Tri-Gas-Mixer
3. CO_2 and O_2 actual values expressed as partial pressure
4. Time and Date
5. Gas input section:
    a. Status Inlet Flow Indicator. See paragraph 9.1.3
    b. Gases supply (N_2, CO_2 and Air) input pressure
    c. Gases supply (N_2, CO_2 and Air) flowrates from the Tri-Gas-Mixer to the tank.

Note ► *The Tri-Gas-Mixer works filling and emptying the tank with N_2, CO_2 and Air flowrates which depend on the CO_2 and O_2 compositions value set by the touchscreen. The frequency and the duration of the fillings and the emptying depend on the flowrate stapled for the users' line. The input flowrates appear on the Homepage only during the fillings and the indicators become green, while during the emptying, the indicators are white and the flowrates disappear from the homepage (see paragraph 9.1.3)*

6. Indicator of the tank pressure variation. It is present only during the fillings.
7. Current tank pressure
8. Gas Output section. See paragraph 9.1.1.
9. Min/max values of CO_2, O_2 and Output Pressure within the time-frame set in *Options page*, 24 hours or 7 days.
10. Setpoint (see paragraph 9.1.2 to learn how to change the Setpoint value)

11. CO_2, O_2 and Output Pressure current values
12. System overview.
13. Settings icon. Press here to access system options and settings.
14. Homepage icon. Press here to open the homepage.
15. Product info. Press here to know generic info about Tri-Gas-Mixer and running time.

Tip ►*The Tri-Gas-Mixer is pre-set at a 6% CO_2 concentration and 5% O_2 hence when you switch it on the system will start operating to reach these Setpoint values.*

9.1.1 Gas output section

The gas output section, see Figure 26, indicates the source of the mixed gas, tank or Span Gas. It shows you the Tri-Gas-Mixer working condition.

a. Status Outlet Flow Indicator. See paragraph 9.1.3
b. Current premixed back up gas pressure.
c. Status Span Flow Indicator. See paragraph 9.1.3

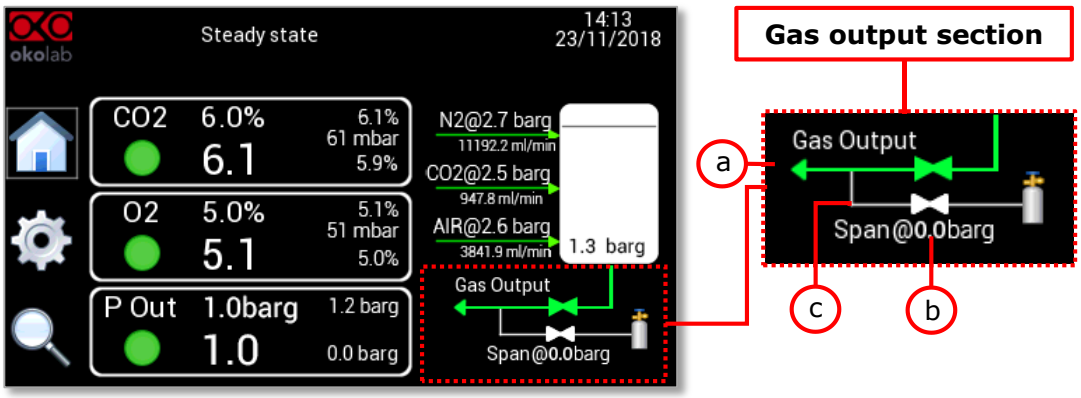


Figure 26. Gas Output section. Details

Read the following table to know the current working operation of the Tri-Gas-Mixer.

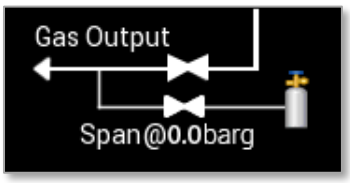
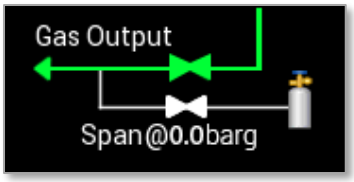
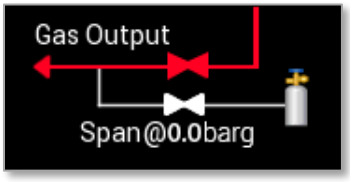
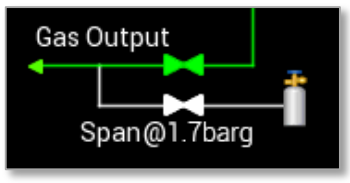
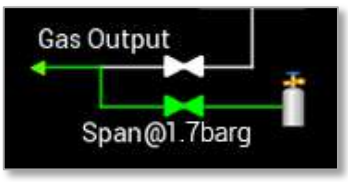
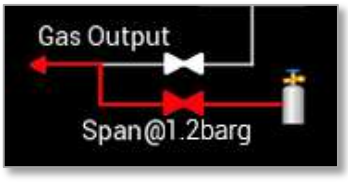
	• The Gas Output is connected to the Span Gas line but there is not flowrate along line • Span Gas tank is not connected
	• The Gas Output is connected to the Tri-Gas-Mixer tank and there is flowrate along line, the valve is opened • Span Gas tank **is** not connected
	• The Gas Output is connected to the Tri-Gas-Mixer tank and there is flowrate along line but it is out of the user specifications, the valve is opened. • Span Gas tank **is** not connected • The Tri-Gas- Mixer is on alarm
	• The Gas Output is connected to the Tri-Gas-Mixer tank, the valve on this line is opened (green) • There is not flowrate from Span Gas tank, the valve on this line is Closed (white) • Span Gas tank connected with a pressure higher than the minimum pressure value
	• The Gas Output is connected to the Span Gas tank, the valve on this line is opened (green) • There is not flowrate from the Tri-Gas-Mixer tank, the valve on this line is Closed (white) • Span Gas tank connected with a pressure higher than the minimum pressure value
	• The Gas Output is connected to the Span Gas tank but it is out of the user specifications, the valve on this line is opened (red) • There is not flowrate from the Tri-Gas-Mixer tank, the valve on this line is Closed (white) • Span Gas tank connected with a pressure lower than the minimum pressure value

Table 1. Gas Output section description

9.1.2 How to enter the Setpoint

To input a new CO_2, and O_2 Setpoint, touch the corresponding tab, as indicated Figure 27 a, Figure 28a. The Setpoint regulation page appears as in the Figure 27 b, Figure 28 b. You can modify the Setpoint by clicking on *+ and* –. Once you have input the new CO_2, O_2, press *Save* (2 in Figure 27 b and Figure 28 b) to save or *Cancel* to undo.

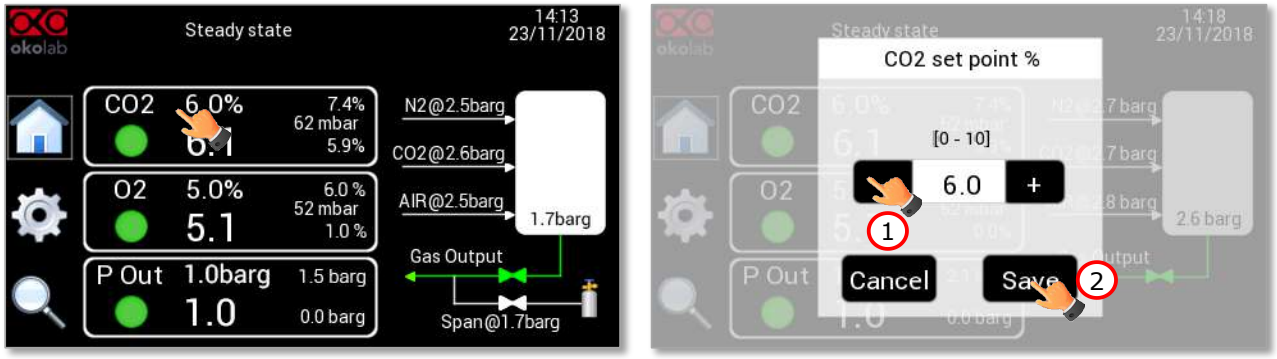


Figure 27. How to change the CO_2 Setpoint (a – b).

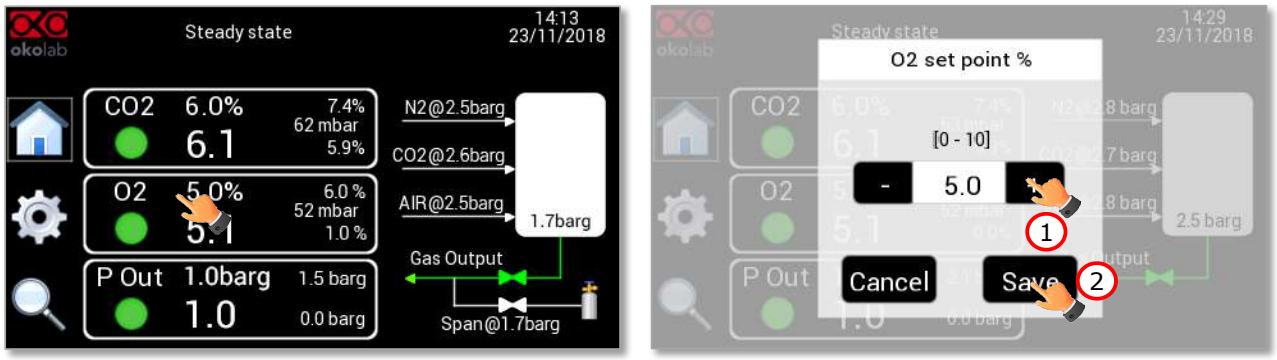


Figure 28. How to change the O_2 Setpoint (a – b).

Note ►*After any CO_2 and O_2 Setpoint change the Tri-Gas-Mixer enters into a transient regime, the Status Indicators turn yellow (see paragraph 9.1.3). If you have the premixed back up gas tank (Span Gas) connected, the Tri-Gas-Mixer sends the premixed gas (Span gas) to the users during the transient time. The Tri-Gas-Mixer Homepage appears as shown in Figure 29.*

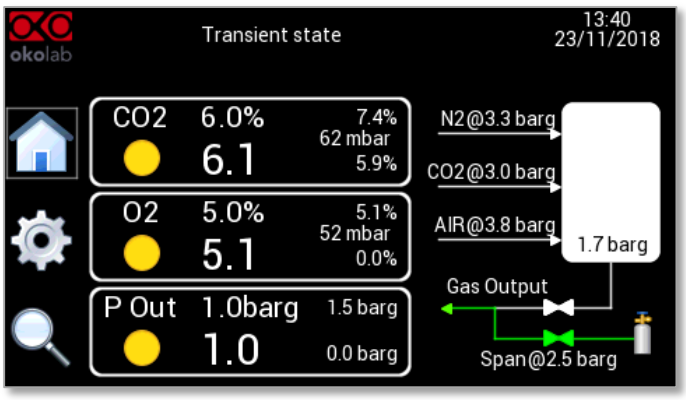


Figure 29. Homepage during the Transient Time with Span Gas enabled.

To input a new Output Pressure Setpoint, touch the corresponding tab, as indicated in Figure 30 a. The Setpoint regulation page appears as in the Figure 30 b. You can modify the Setpoint by clicking on *+ and* –, then press *Save* (2 in Figure 30 b) to save or *Cancel* to undo.

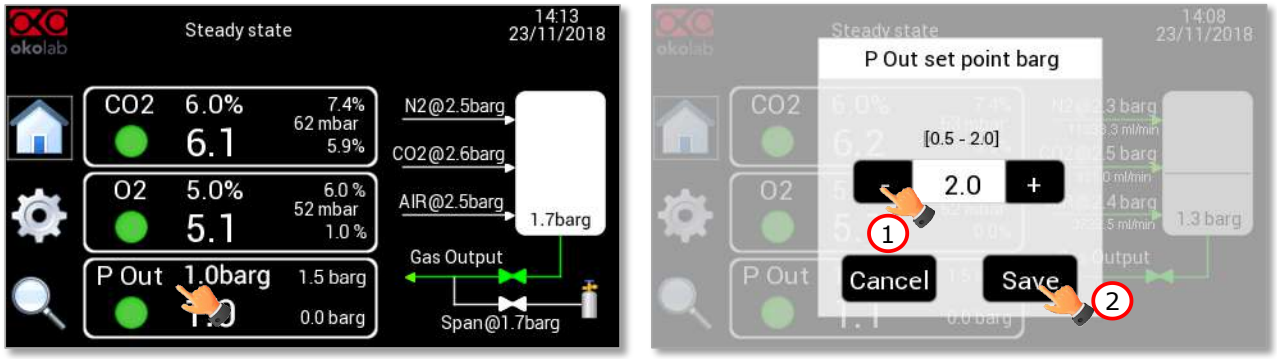


Figure 30. How to change the Output Pressure Setpoint (a – b).

Tip ►*The Output Pressure depends on the gas supply pressure. If the gas supply pressure values are too low for the set Output Pressure, the widget in Figure 31 a appears with the pressure values in red. Here you can read the gas supply pressure values you must set to start properly the Tri-Gas-Mixer. Once you have regulated correctly the gases supply pressure, the pressure values become green and you can press on "Next" to continue.*

Figure 31. Gases supply pressure check after an output pressure changing (a – b).

Tip ►*Even the tank working pressure depends on the set output pressure, therefore when change the output pressure the system checks that the tank pressure is compatible with your choice and, if it is not so, the wizard shown in Figure 32 appears until the system is ready to start correctly.*

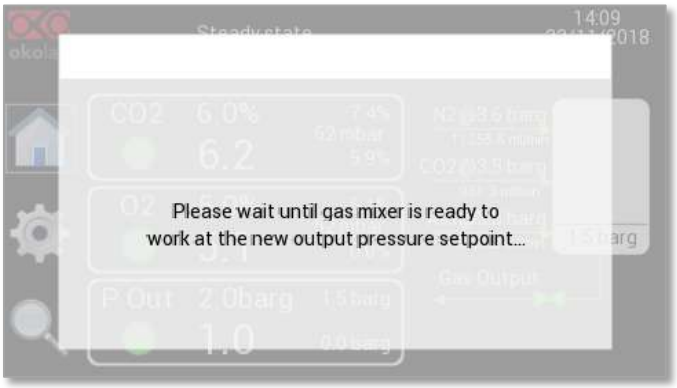


Figure 32. Output Pressure Warning.

Once you have inserted the output pressure via touchscreen; you have to manually regulate the pressure using the pressure regulator on the front panel of the Tri-Gas-Mixer. See Figure 20

9.1.3 Status icons

Tri-Gas-Mixer can assume four different status, which are represented by the colors assumed by the Status Indicator and, as indicated in the following table:

	The GREEN color indicates that the Setpoint value has been reached (within the deviation defined in the alarm page, see paragraph 9.2.3.1) and that the system is working properly. **Controller Status: NORMAL**
	The YELLOW color indicates that the controller is in transient regime. The Yellow light appears 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 the Tri-Gas-Mixer reaches the CO_2, O_2 compositions or the set Output Pressure, the Status changes to NORMAL and the color turns GREEN. If the Tri-Gas-Mixer cannot reach the Setpoint values, the Status changes to ALARM and the color turns ORANGE. **Controller Status: TRANSIENT**
	The ORANGE color indicates that the current gas concentration is not correct and its value is out of the set deviation (see section "*Alarms*" in paragraph 9.2.3.1). The ORANGE color on the Output pressure status indicates that the set pressure has not been reached. Most commonly this is related to gas leaks or gas source(s) running low. Verify that all cables are correctly connected. Check all tubing for gas leaks and pressure in gas supply tanks. **Controller Status: ALARM**
	The RED color on the CO2 and O2 compositions status indicates that there is a problem with the unit itself (for example the gas sensor module is broken or disconnected). The system is on alarm. Turn the system off, wait for 5 minutes, and turn it back on. If the color is still red, contact Okolab at www.oko-lab.com for support. **Controller Status: ALARM**

Table 2. Status Led description

TRI-GAS-MIXER use colored arrows to indicate the status of the inlet and outlet flowrates, as indicated in the following tables:

	The green Status INLET flow indicator indicates that the inlet gas flowrate value is correct and that the system is working properly. **Controller Status: NORMAL**
	The white Status INLET flow indicator indicates that there is not an inlet flowrate. The system is working properly, it is not in alarm and no action is needed. **Controller Status: NORMAL**

	The red Status INLET flow indicator indicates that the inlet gas flowrate value is not correct. Most commonly this is related to gas leaks or gas source(s) running low. Check all tubing for gas leaks and pressure in gas supply tanks. **Controller Status: ALARM**

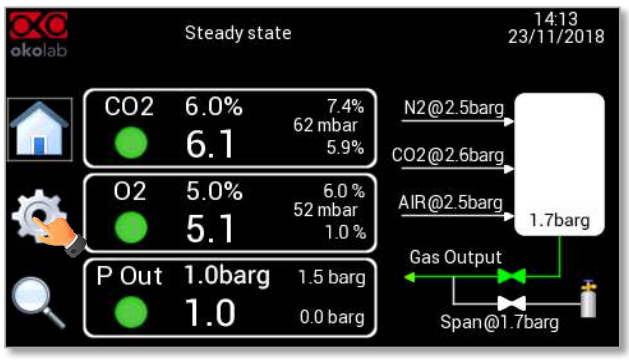
Table 3 Status Inlet flow indicator description

	The GREEN color indicates that the valve is opened and the flowrate value guarantees the user's specifications.
	The WHITE color indicates that the valve is closed and there is no flowrate along the gas line.
	The RED color indicates that the valve is opened. There is flowrate along the gas line but it is out of the user specifications.

Table 4. Status Outlet flow indicator description

9.2 Settings

Press on the *Settings* icon (see Figure 33 a) to access to Settings menu (see Figure 33 b).



a b

Figure 33. How to access to Settings menu (a – b).

9.2.1 Span

If a Premixed back up gas cylinder is connected to the Tri-Gas-Mixer (see Figure 13), the Tri-Gas-Mixer sends the premixed gas from the back up cylinder (Span Gas) to the incubators in case any of the alarm conditions or during the Tri-Gas-Mixer transient time.

Once you have connected the premixed back up gas cylinder to the Tri-Gas-Mixer, you have to flag the checkbox labeled *Span Gas Cylinder connected* in the Settings-Span Gas page, as shown in Figure 34 a and b, in this way the Tri-Gas-Mixer actives the alarms logic relative to the Premixed Gas pressure.

Figure 34 b shows also what is the pressure value at which you have to set the pressure regulator of your premixed cylinder for a proper operation of the Tri-Gas-Mixer.

Note ►*The checkbox labeled "Span Gas Connected" is flagged by default. Disable the checkbox labeled "Span Gas Connected" when a premixed gas cylinder is not connected to the Tri-Gas-Mixer.*

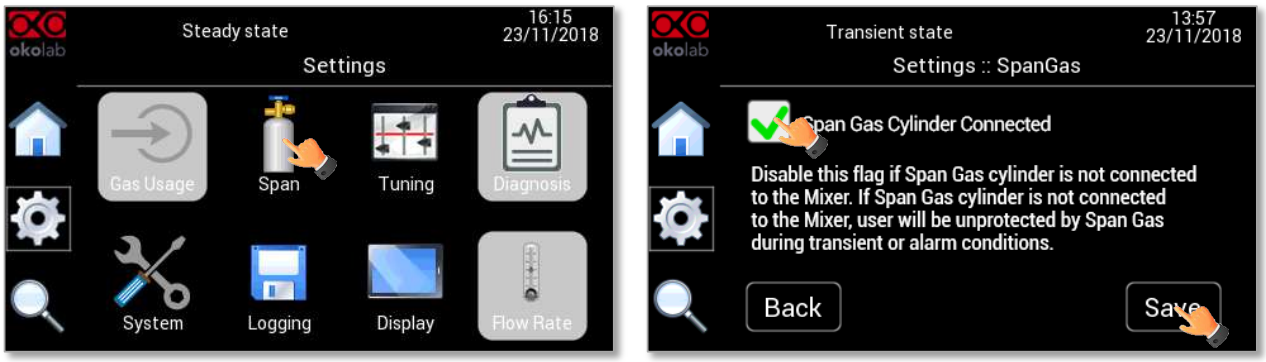


Figure 34. Gas Settings (a – b)

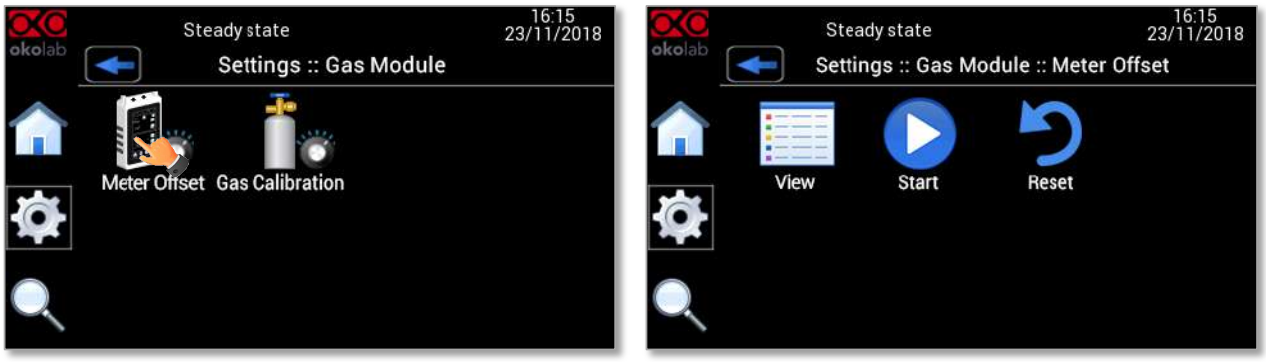
9.2.2 Gas Module

The Tri-Gas-Mixer is equipped with a CO_2-O_2 Module factory calibrated using certified gas cylinders allowing to automatically fine-tune the mixing accuracy of the Tri-Gas Mixer. The CO_2-O_2 Module can be manually fine-tuned by any external CO_2 and O_2 percentage reader or by an automatic calibration procedure. Press the *Gas Module* icon to access to Gas Module page.

Figure 35. How to access to Gas Module submenu (a – b).

9.2.2.1 Meter Offset (with an external meter)

Press on *Meter Offset* icon to manually calibrate the instrument by using LEO as external meter (NOT provided) (see Figure 36 a). The page shown in Figure 36 b opens.



a b

Figure 36 How to enter the Meter Offset page

9.2.2.1.1 View

Press on *View* icon to display the latest offset (see Figure 37 a). Figure 37 b shows the table containing the compositions values read during the calibration (external meter readings and Tri-Gas-Mixer readings) and the offset values obtained at the end of the calibration and stored in the Tri-Gas-Mixer.

a b

Figure 37.View Sensor calibration status

Note ► *If no calibration has been performed, the Settings::View Offset page is as in Figure 38*

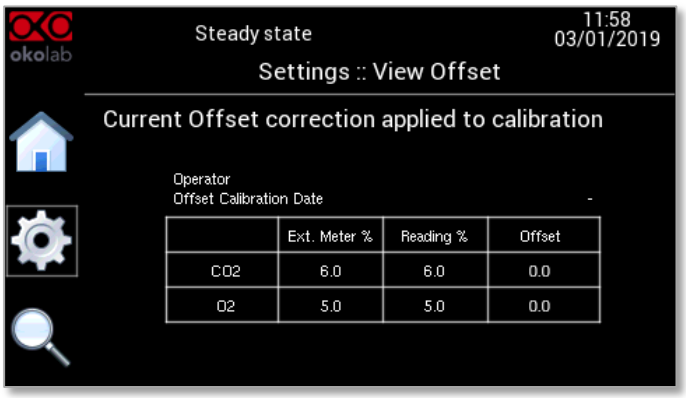
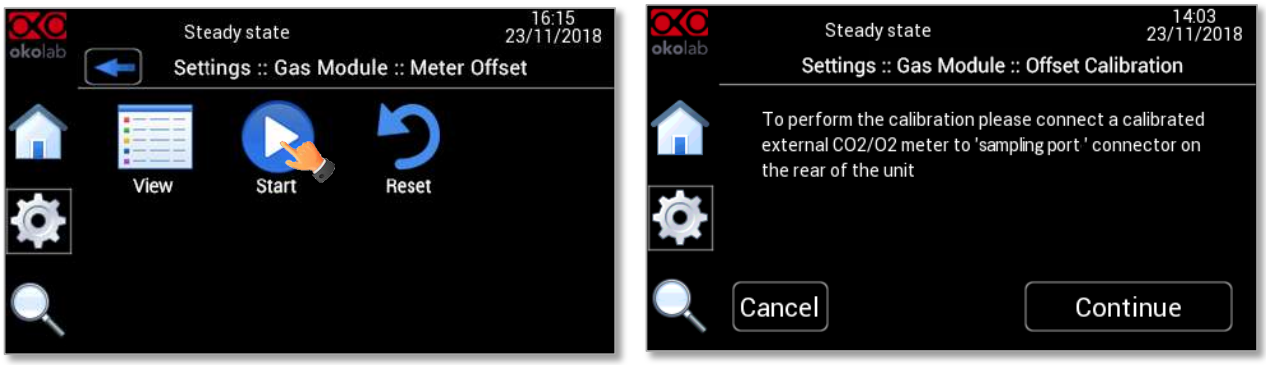


Figure 38 View sensor calibration status without

9.2.2.1.2 Start

Press on *Start* icon (see Figure 39 a) for starting the manual procedure and follow the instructions shown in the page opening (see Figure 39 b)

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



a **b**

Figure 39. How to start a calibration procedure by an external gas meter (a – b).

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. Remove the red connector from the TUBE-A (supplied with LEO, Figure 40) and connect the end of the tube to the *Sampling Port* on the rear panel of Tri-Gas-Mixer (see Figure 41).

Figure 40. TUBE-A supplied with LEO.

2. Connect the clear connector of TUBE-A (supplied with LEO, Figure 40) to LEO Gas Inlet port labeled with icon IN (1 in Figure 41).
3. Put the cap on LEO Gas Input port labeled with icon IN (2 in Figure 41).
4. Start a *Gas Single Point* measurement in *Diffusion Mode* on LEO (please refer to LEO User Manual).

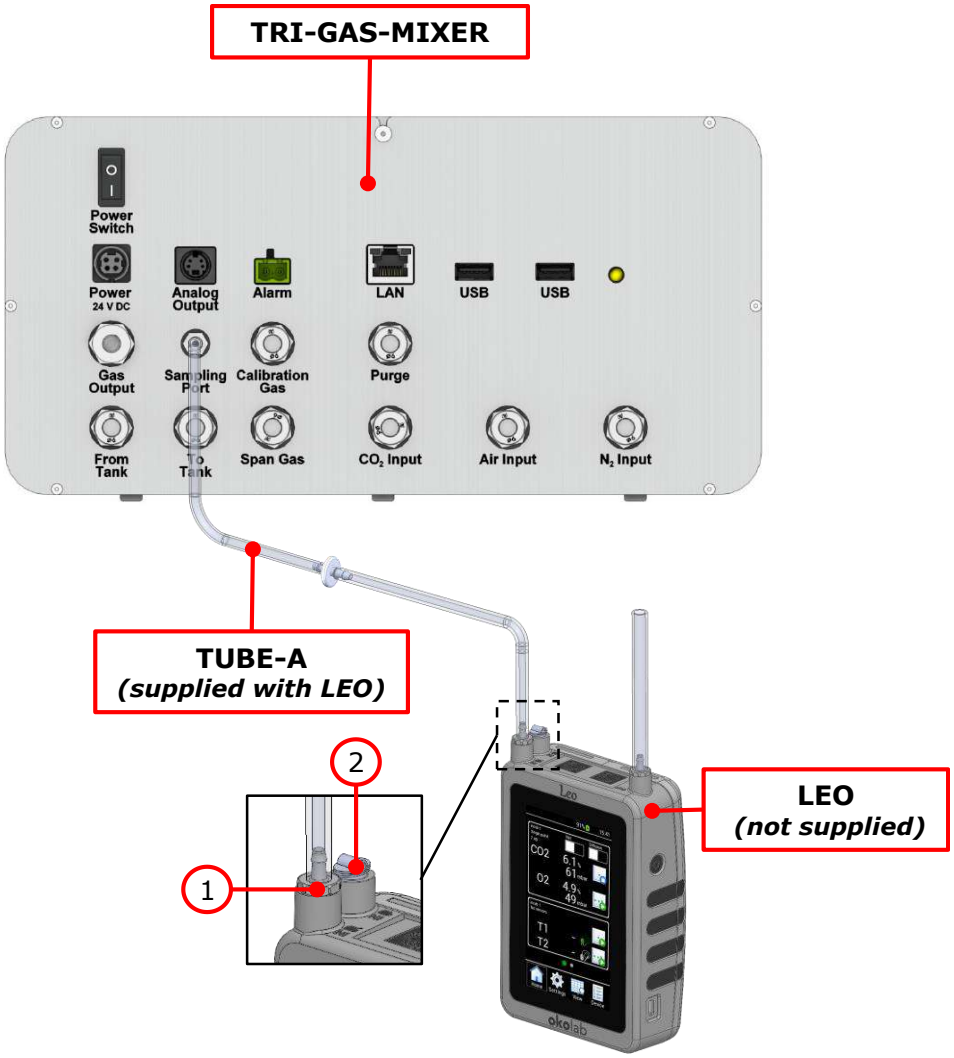


Figure 41. External Gas Meter Connection.

5. Press on *Continue* button as shown in Figure 39 b.

6. The page shown in Figure 42 appears. Wait until LEO stabilizes the CO_2 and O_2 readings; this may take 5-6 minutes. Then press on *Continue* button as shown in Figure 42.

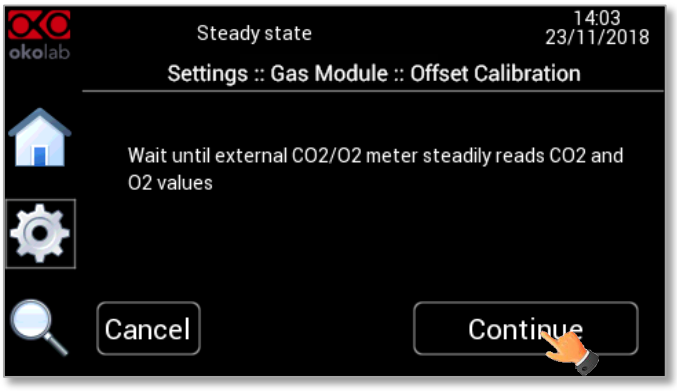


Figure 42. Wait until external gas meter steadily reads.

7. In the open page, press on the *External Meter* Tab (as shown in Figure 43 a). The Figure 43 b appears.

Figure 43. Manual Calibration (a – b).

8. Press on +/- icons to input the CO_2 (1 in Figure 43 b) and O_2 (2 in Figure 43 b) compositions read by LEO (i.e. 6.1% for CO_2 and 4.8% for O_2), then press *Ok* (3 in Figure 43 b).

   Note ► *The Tri-Gas-Mixer display returns to the previous screen. It displays on the left (External Meter tab) the CO_2 and O_2 compositions read by the external gas meter, as just entered. The values in Gas Mixer tab are the values read by Tri-Gas-Mixer (see Figure 44).*

9. Press on *Continue* button (see Figure 44 a) to make a calibration using the input values read by LEO as references.

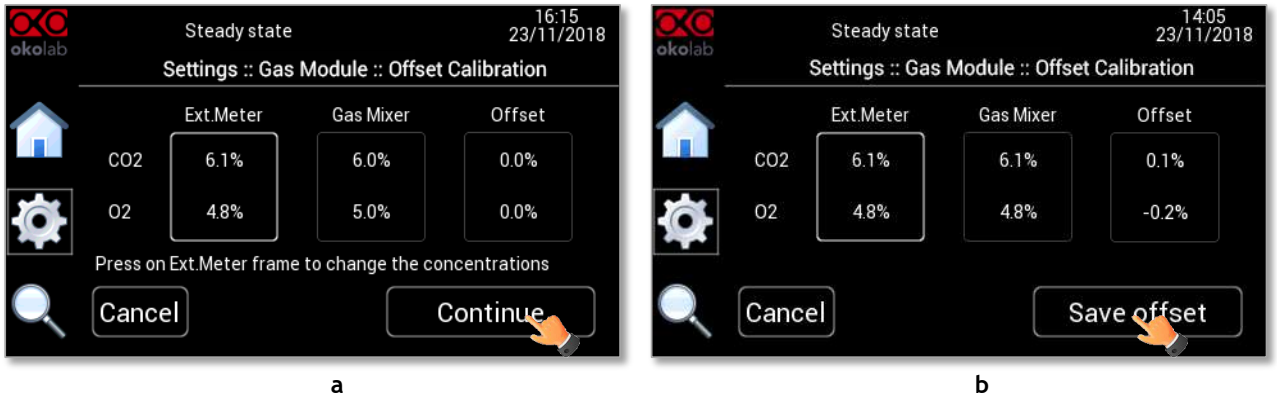


Figure 44. Manual Calibration Correction (a – b).

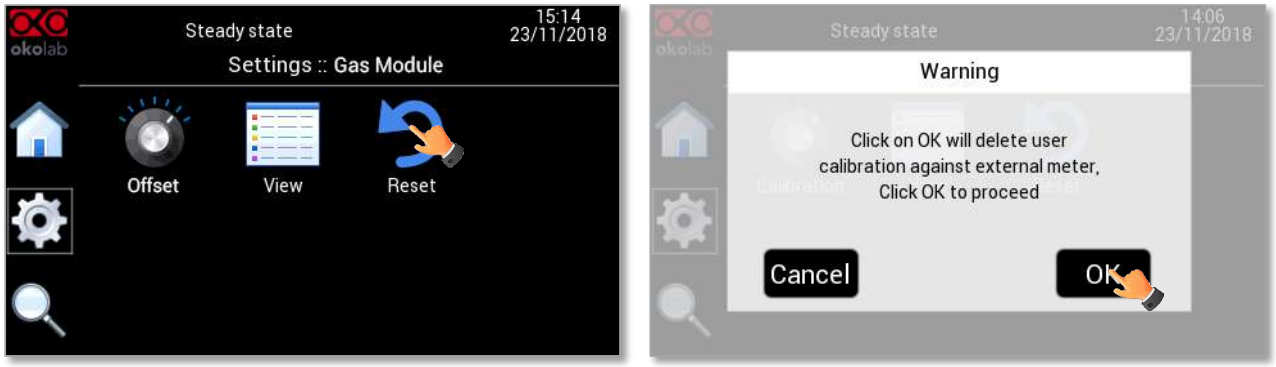
   Note ► *By pressing Continue, the system will perform a calibration using the External Meter as a reference. The offset resulting from the calibration will be displayed in the Offset tab (see Figure 44 b).*

10. Press on *Save offset* button to save the calibration (see Figure 44 b).

    Note ► *Wait some minutes, depending on the flow consumption, before repeating the calibration with the external meter and to check for the accuracy*

9.2.2.1.3 Reset

Press on *Reset* icon to reset the calibration gas offset to the factory values (see Figure 45 a). After clicking, a pop-up message appears. If you are sure to proceed and restore factory values, press *Ok*, as shown in the Figure 45 b.



a b

Figure 45. Reset offset calibration (a – b).

9.2.2.2 Gas Calibration

9.2.2.2.1 Manual procedure

Before starting the calibration procedure follow the steps indicated below:

1. Make sure that the Tri-Gas-Mixer is at the steady state, the CO2 and O2 LED are green on touchscreen Hompage

   Note ► *Okolab recommends to wait for the steady state before starting a manual calibration procedure in order to calibrate the sensors at the desired CO2 and O2 compositions. In any case, the manual procedure can also be started during a transient time*

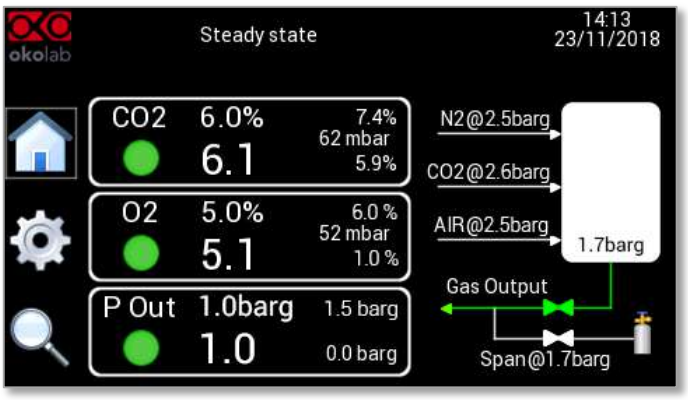


Figure 46. Homepage at the steady state

2. Connect the Gas calibration tank to the *Gas Calibration* port on the rear panel of the Tri-Gas-Mixer, if you do not have connected it during the system installation. See Figure 47

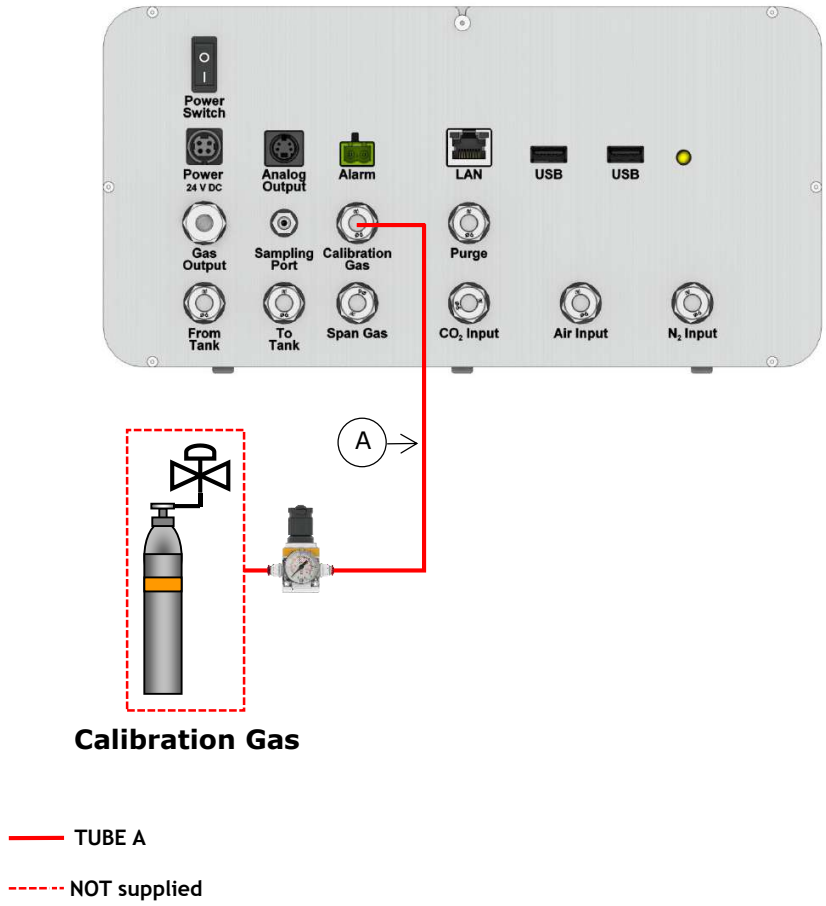


Figure 47 Calibration gas connection

Note ► *The Calibration procedure must be done by using certified gas cylinders. Okolab recommends to use a calibration gas tank with uncertainty of ± 1% of the declared value and with a gas concentration close to the concentration used during the standard working conditions.*

3. Set the Calibration Gas pressure at 2.0 barg

4. Press on *Gas Module* icon (see Figure 49 a) and select *Gas Calibration* icon in the page opening (see Figure 49 b).

Figure 48 How to enter the Gas Calibration page

5. Press on *Gas Settings* icon (see Figure 49 a) and flag the gas on the reference of the gas that you want to calibrate (see Figure 49 b)

   Note ► *The Tri-Gas-Mixer allows the calibration of one or both gases. You can choose flagging only CO2 Reference, or O2 Reference, or both.*

Figure 49. How to choose the gas to calibrate

6. Insert the CO2 and/or O2 reference value clicking on + and – as shown in Figure 50. Set here the values reported on Calibration Gas certificate.

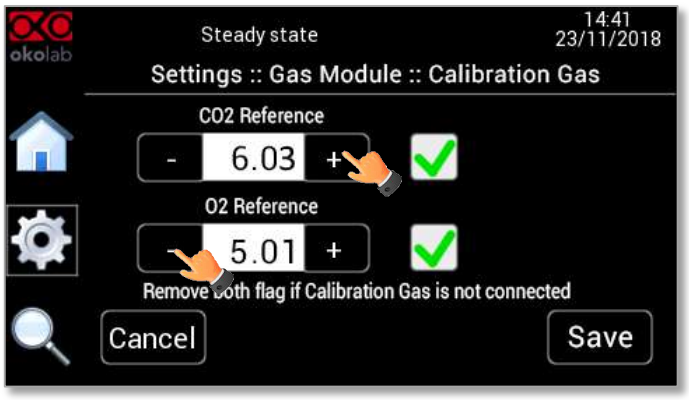


Figure 50 How to insert the CO2 and O2 reference values

7. Once you have chosen the gas to calibrate and inserted the reference values, press on *Save* (see Figure 51 a) and then on *Start* icon (see Figure 51 b). The page with the calibration process in progress appears (see Figure 52)

a b

Figure 51 How to start the Gas Calibration procedure

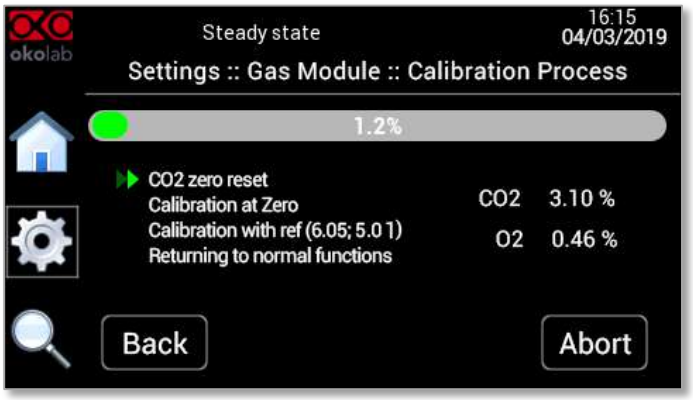


Figure 52. Gas Calibration in progress

Note ► *The Gas Calibration procedure has four steps:*

- *CO2 Zero reset: preliminary step for correcting the zero of the CO2 sensor*
- *Calibration at Zero: to correct the zero of the CO2 and O2 sensors*
- *Calibration with ref: to correct the CO2 and O2 sensors reading at the CO2 and O2 gas reference values*
- *Returning to normal functions: this is a time allowing the Tri-Gas-Mixer to return to the standard working conditions*

During the Gas Calibration procedure, the Gas calibration page becomes as shown in Figure 53. If you press on *Progress* icon , the page shown in Figure 52 appears.

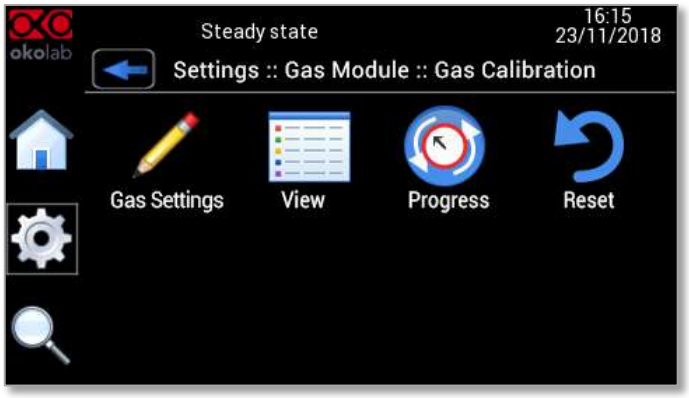


Figure 53 Gas Calibration page during the calibration procedure

During the Gas Calibration procedure the Tri-Gas-Mixer homepage appears as shown in Figure 54.

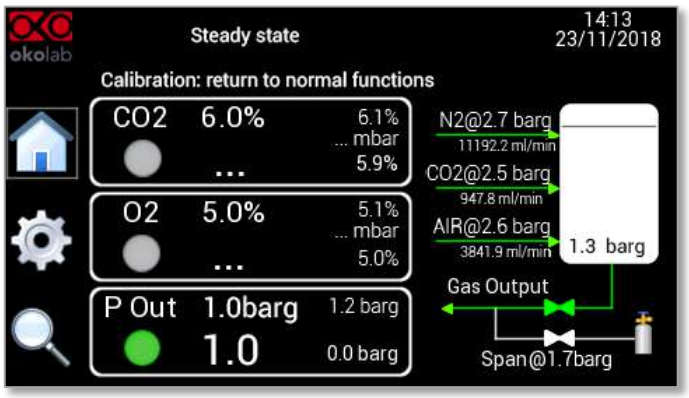


Figure 54. Homepage during the Gas Calibration procedure.

Note ► *The Gas Calibration takes from 15 to about 30 minutes to complete the procedure.*

Note ► *You can repeat the Gas calibration procedure whenever you believe it is necessary.*

9.2.2.2.2 Auto procedure

The Tri-Gas-Mixer features a procedure, *Gas Calibration*, to periodically calibrate the CO2 and O2 sensors. For the best accuracy on the sensors measurements, the procedure is automatically repeated every seven days.

Auto procedure with a Calibration Gas cylinder connected

In order that the auto procedure is correctly applied, make sure that:

1. The Gas Calibration tank is connected to the Tri-Gas-Mixer as shown in Figure 55

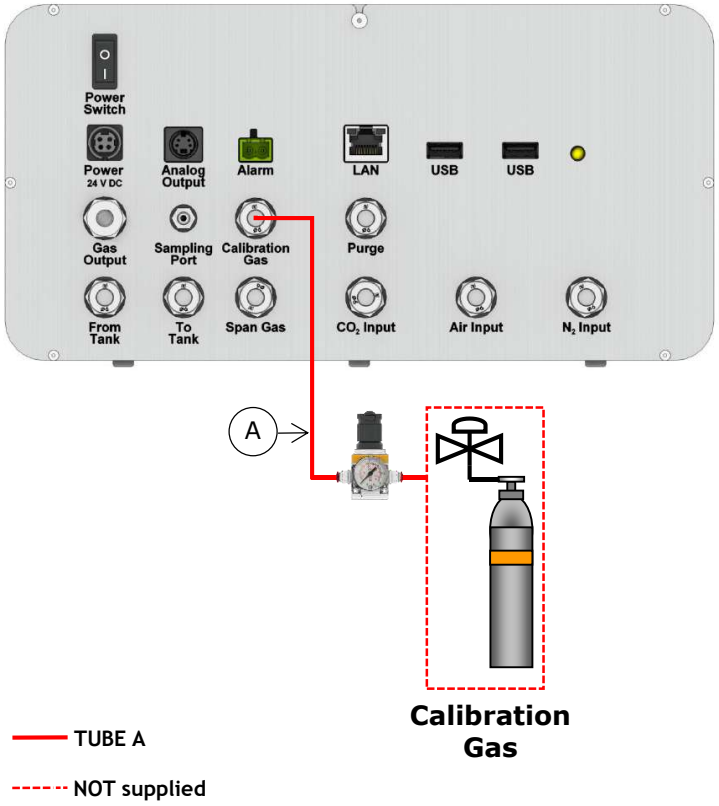


Figure 55 Gas calibration tank connection

2. The Calibration Gas tank pressure regulator is set at 2.0 barg

3. The CO2 and/or O2 checkboxes are flagged, see Figure 56 and Figure 57

Figure 56 How to enter the Gas Calibration page

Figure 57 How to choose the gas to calibrate

4. The reference CO2 and O2 values are inserted as shown in Figure 58

Note ► *The Tri-Gas-Mixer allows the calibration of one or both gases. You can choose flagging only CO2 Reference, or O2 Reference, or both.*

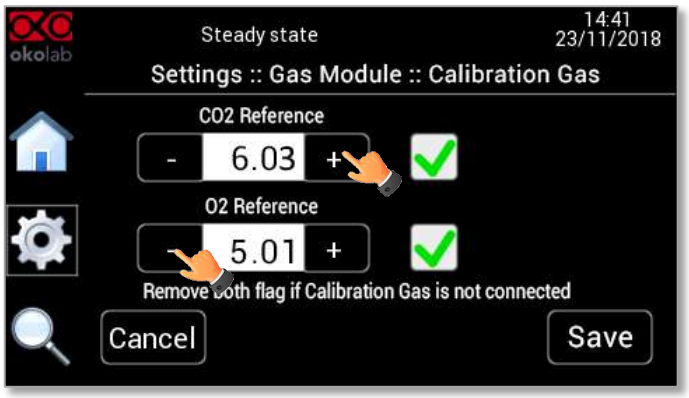


Figure 58. Calibration gas reference values

If the calibration gas tank is connected and both the CO2 and O2 reference values are flagged, the auto Gas Calibration procedure occurs, every seven days, with the following steps:

- *CO2 Zero reset: preliminary step for correcting the zero of the CO2 sensor*
- *Calibration at Zero: to correct the zero of the CO2 and O2 sensors*
- *Calibration with ref: to correct the CO2 and O2 sensors reading at the CO2 and O2 gas reference values*
- *Returning to normal functions: this is a time which allows the Tri-Gas-Mixer to return to the standard working conditions*

If you choose to calibrate only one gas, CO2 or O2, the auto Gas Calibration procedure occurs, every seven days, with the following steps:

- *CO2 Zero reset: preliminary step for correcting the zero of the CO2 sensor*
- *Calibration at Zero: to correct the zero of the CO2 or O2 sensor*
- *Calibration with ref: to correct the CO2 or O2 sensor reading at the CO2 or O2 gas reference value*
- *Returning to normal functions: this is a time which allows the Tri-Gas-Mixer to return to the standard working conditions*

Auto procedure without a Calibration Gas cylinder connected

If you choose to not calibrate the CO2 and O2 sensors and therefore you do not connect the Gas Calibration tank to the Tri-Gas-Mixer, remember to not flag the CO2 and O2 checkboxes in Calibration Gas page (see Figure 59)

When you choose to not calibrate the CO2 and O2 sensors and therefore you do not connect the Gas Calibration tank to the Tri-Gas-Mixer the auto Gas Calibration procedure occurs in any case, every seven days, with the following steps:

- *CO2 Zero reset: preliminary step for correcting the zero of the CO2 sensor*
- *Returning to normal functions: this is a time which allows the Tri-Gas-Mixer to return to the standard working conditions*

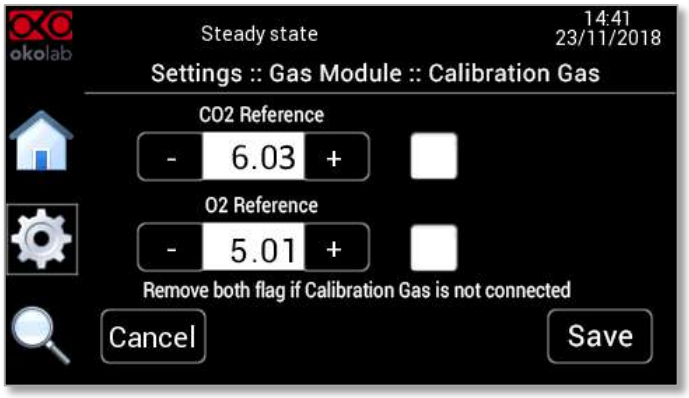


Figure 59. CO2 and O2 reference page

Note ► *The Gas Calibration takes from 15 to about 30 minutes to complete the procedure.*

During the Gas Calibration procedure the Tri-Gas-Mixer homepage appears as shown in Figure 60, with a message describing the calibration step in progress (circled in red in Figure 60)

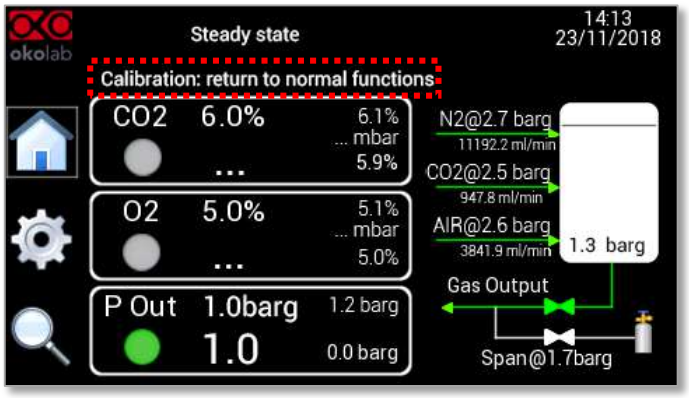


Figure 60. Homepage during the Gas Calibration procedure.

If you press on Set point widget, the dialog shown in Figure 61 appears and warns you about the gas calibration in progress. Press on *View* button for more info on the gas calibration in progress, the page in Figure 62 opens.

Figure 61 Warning appearing during the calibration procedure

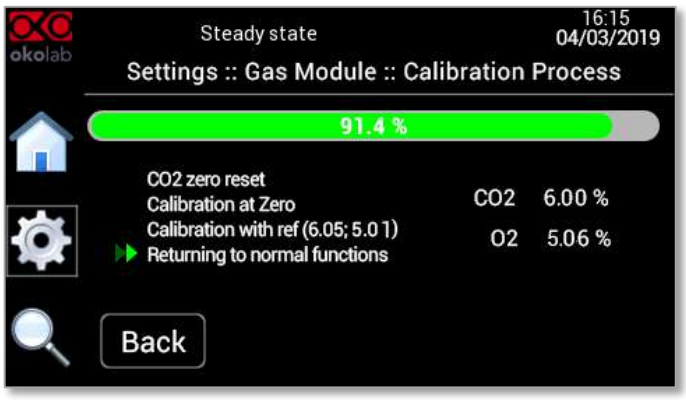


Figure 62 calibration process in progress

During the Gas Calibration procedure, also the Gas calibration page changes becoming as shown in Figure 63. If you press on *Progress* icon , the page shown in Figure 62 appears.

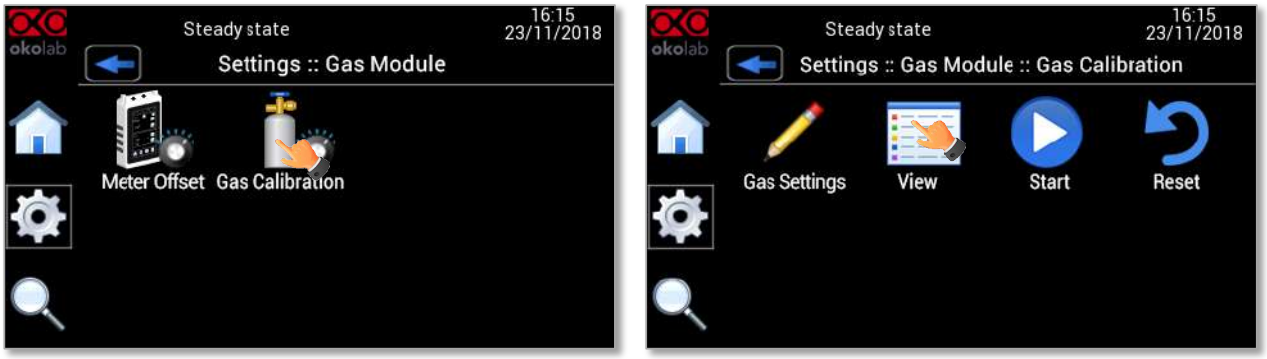
Figure 63 Gas Calibration page during the calibration procedure

9.2.2.2.3 View

Press on *View* icon to display the latest results of the previous calibration procedure on O2 and CO2 and the factory calibration values (see Figure 64 a and b).

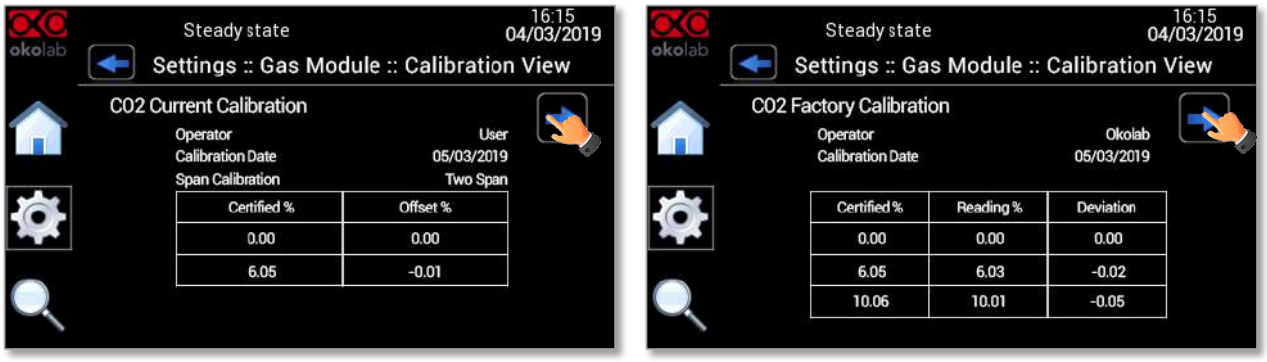
The page shown in Figure 65 a starts with the table of the CO2 Current Calibration. Press on the blue arrow at the top right corner to view the CO2 Factory Calibration (see Figure 65 b), the O2 Current Calibration (see Figure 66 a) and the O2 Factory Calibration (see Figure 66 b)

Note ► *If no calibration has been performed, only the CO2 and O2 Factory Calibration tables appear in these pages.*



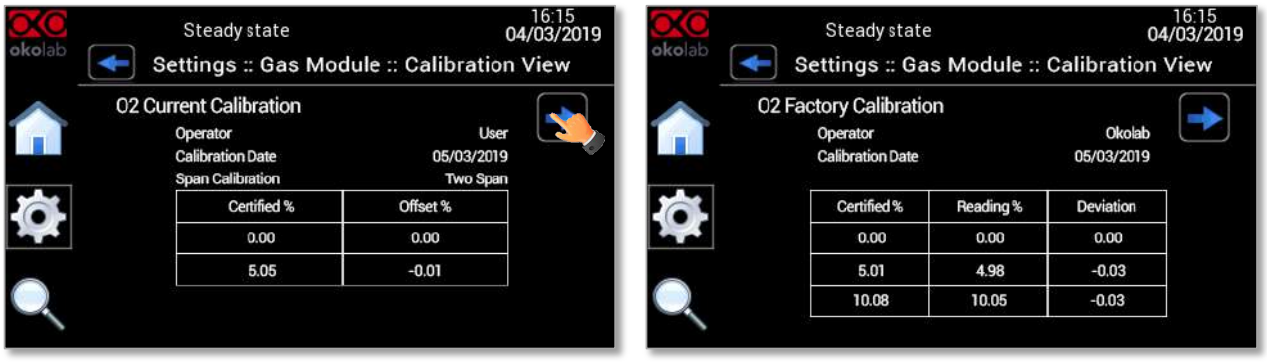
a b

Figure 64 How to enter the View page



a b

Figure 65. CO2 Calibration a. Current Calibration b. Factory Calibration

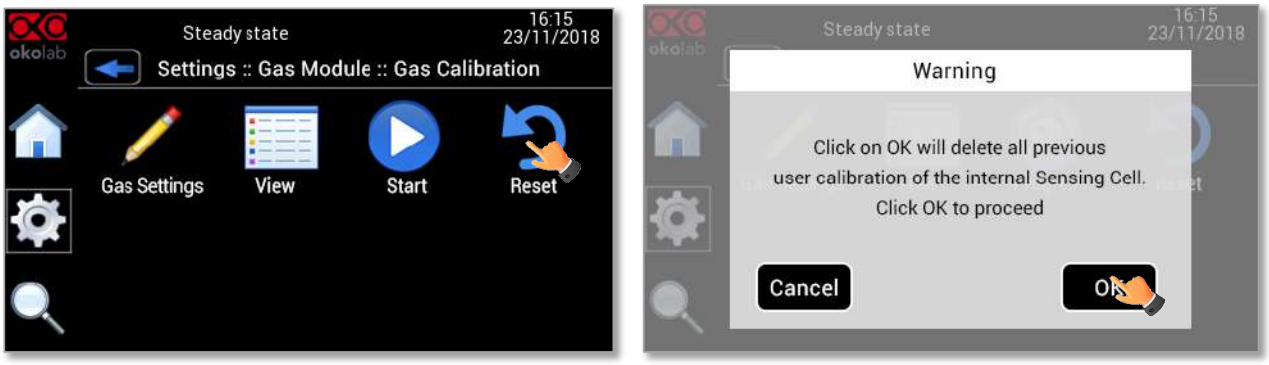


a b

Figure 66 O2 Calibration a. Current Calibration b. Factory Calibration

9.2.2.2.4 Reset

Press on *Reset* icon , see Figure 67 a, to reset the gas calibration offset to the factory values. After clicking, a pop-up message appears, if you are sure to proceed and restore factory values, press *Ok*, as shown in the Figure 67 b.



a b

Figure 67Reset to the Factory gas calibration

9.2.3 System

Press on *System* icon (see Figure 68 a) to enter the *System* menu (see Figure 68 b).

a b

Figure 68. How to enter in System menu (a – b).

9.2.3.1 Alarms

The *Tri-Gas-Mixer* allows the activation of visual and audio alarms.

To set the alarms specifications, press the *Alarms* icon (see Figure 69 a), then follow the indications below:

1. Click on the *CO2* Tab, Figure 69 b and/or *O2* Tab to set the gas deviation for a period of time then the system displays an Alarm and triggers, if the *Buzzer* is active.

   Tip ►*Flag the Buzzer checkbox (Figure 69 b) if you want the Alarm to be acoustical as well rather than just being displayed.*

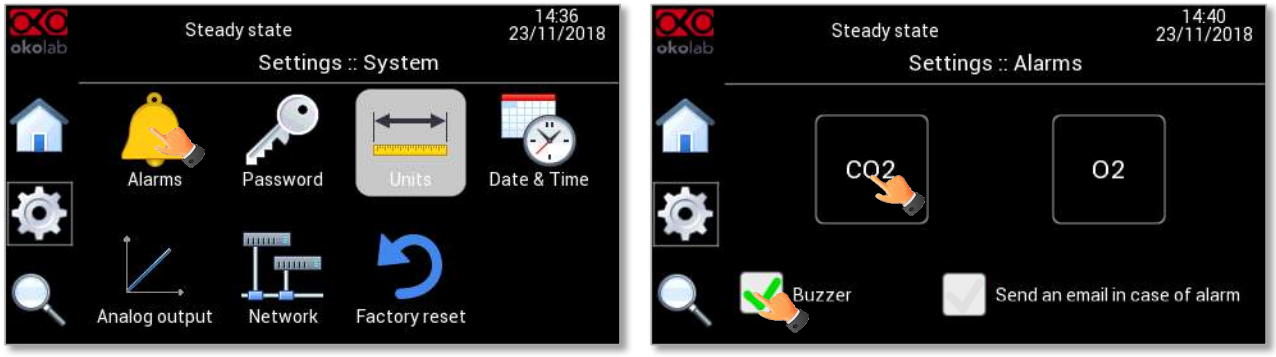


Figure 69. How to enter in Alarms page (a -b).

2. Insert the *Deviation %* value by pressing the *+/-* icons (1 in Figure 70 a).

   Note ►*The Deviation % value defines the tolerance from the Setpoint. If the tolerance exceeds the inserted value for a time higher–than the inserted Time Alarm, an Alarm is displayed on the touchscreen, the composition status icon becomes orange. The system triggers, if the buzzer is active. In these conditions, if the premixed back up gas(Span Gas) is Connected, the Tri-Gas-Mixer sends the premixed back up gas to the users while entering in transient time until the O_2 and CO_2 composition values return within the set tolerance. If the premixed back up gas (Span Gas) is not Connected, the Tri-Gas-Mixer continues to send the mixed gas to the users until the compositions do not exceed the Critical Deviation. Read point 4.*

   Note ►*The Deviation % value range is 0.2-2.0 %.*

3. Insert the *Alarm Time* by pressing the *+/-* icons (2 in Figure 70 a).

   Note ►*The Alarm Time value defines the time for which the CO2 and/or O2 value may remain outside the allowed tolerance before Tri-Gas-Mixer triggers in alarm.*

   Note ►*The Alarm Time range is 5-600 seconds.*

4. Press on *Critical deviation* button (3 in Figure 70 a) to set the CO_2 critical deviation and insert the Critical deviation % value by pressing the +/- icons (1 in Figure 70 b).

   Note ►*The Tri-Gas-Mixer uses the set Critical Deviation value only if you do not have a premixed back up gas or if The Span Gas pressure is lower than minimum useful pressure.*

   Note ►*If the deviation from the set point exceeds the inserted value and you have not connected the premixed back up gas (Span Gas), the system enters in transient time and it does not send premixed gas (Span Gas) to the user until the compositions return within the inserted deviation.*

5. Press Ok to save (2 in Figure 70 b).

Figure 70. How to set the Deviation and Time Alarm (a – b).

Note ► *If you flag the "Mixer always sends gas output" checkbox (see Figure 71), Tri-Gas-Mixer sends gas to the users even if the CO_2 reading value is out of the allowed tolerance.*

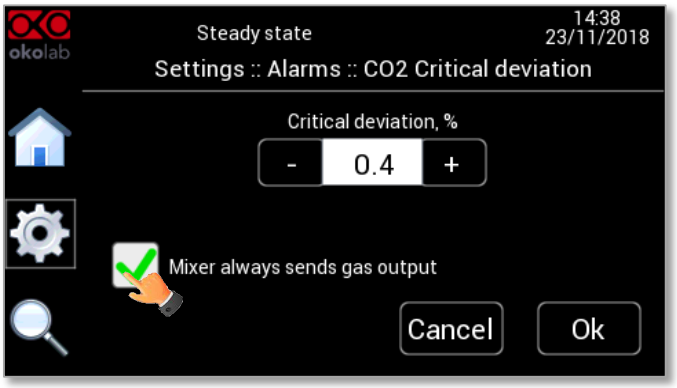


Figure 71.Mixer always sends gas output.

9.2.3.2 Password

Tri-Gas-Mixer allows to set-an access password. If the password is enabled, the Tri-Gas-Mixer ask you to insert the password each time you touch the touchscreen after thirty minutes from the last display use.

Note ► *The Tri-Gas-Mixer has a factory password that you can find in Tri-Gas-Mixer documents. Preserve this password because you can use it if you don't remember the last inserted password.*

1. Press on Password icon to access to Password settings page and flag on "*Password Enabled*" to enable the password use.

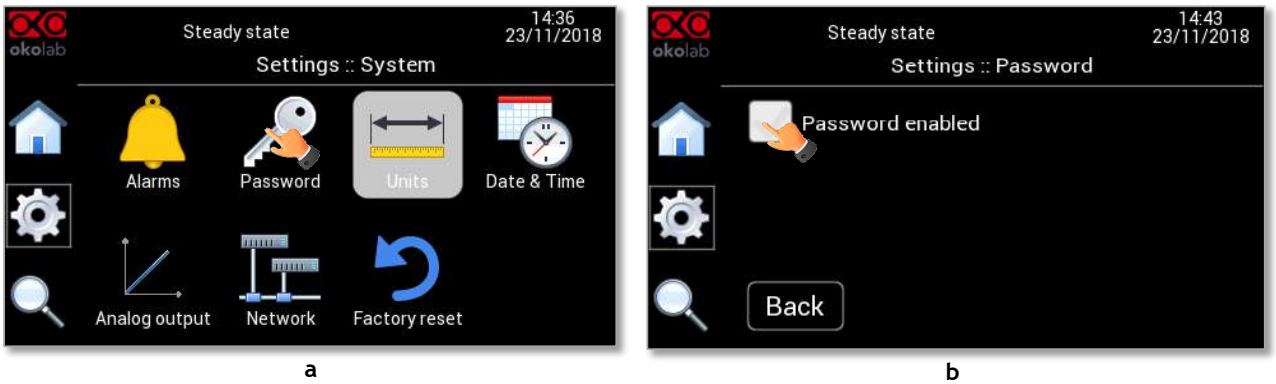


Figure 72.How to enter to Password page (a – b).

2. Once you have enabled the password the keyboard shown in Figure 73 opens and you can insert the new password. Press *Ok* to save, 2 in Figure 73

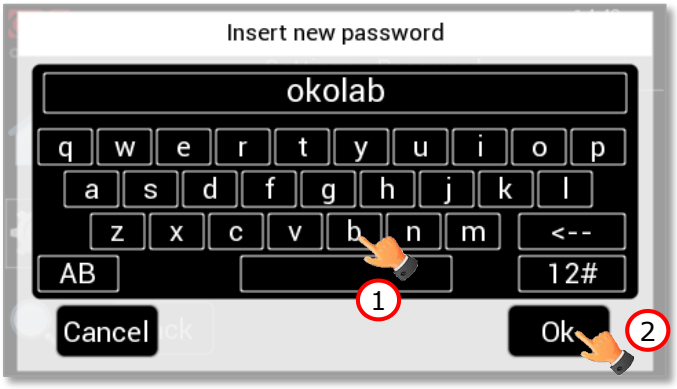


Figure 73.How to set the password.

Note ►*When the first password has been stored, the Password page becomes as in Figure 74 and you-could change it each time you want, pressing on "Change password"*

Figure 74. Password changing

9.2.3.3 Date & Time

To set Date & Time, follow the instructions below:

1. Press the *Date & Time* icon (see Figure 75) to enter the *Date&Time* page

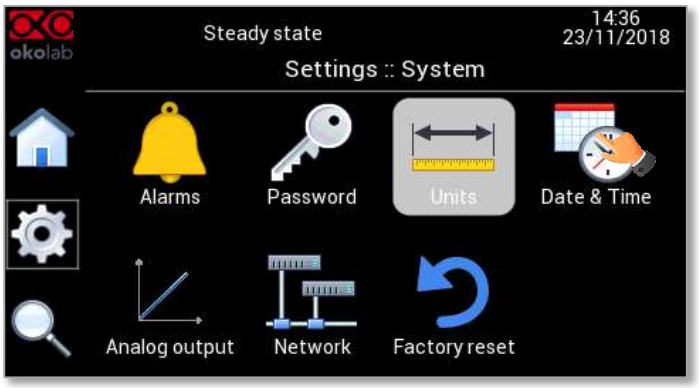


Figure 75. How to enter in Date&Time setting.

Press *Change* (see

2. Figure 76 a) to enter the *Set Date* page.

3. Change the date using *+ and –* (1,2,3 in Figure 76 b). Click on *Save* to confirm (4 in Figure 76 b) or *Cancel* to undo

   Tip ►*Okolab recommends checking the Date & Time Settings the first time you turn Tri-Gas-Mixer on because the current Date & Time values are stored at each reading.*

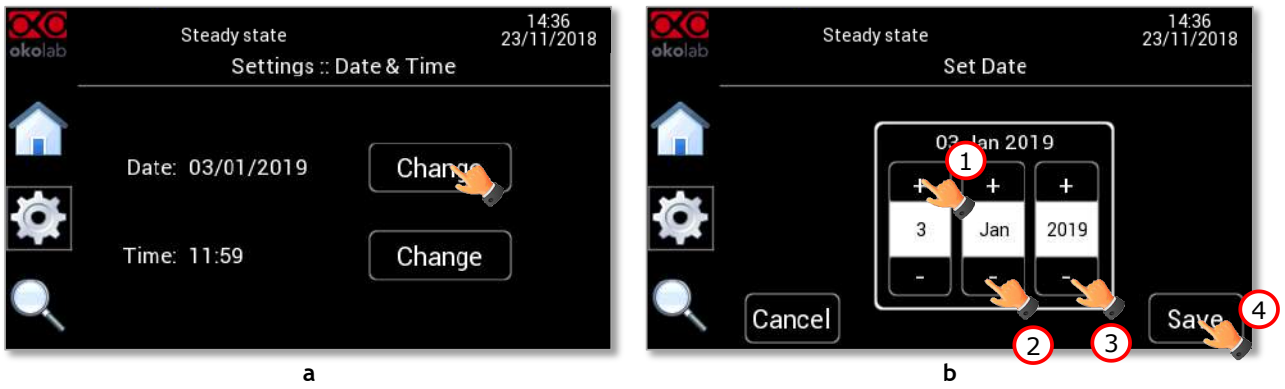


Figure 76. Set Date.

4. Press *Change* (see Figure 77 a) to enter the *Set Time* page.

   Note ►*The default time format is a 24-hour clock.*

5. Change the time using *+ and –* (1 and 2 in Figure 77 b).

6. Press Save to confirm (3 in Figure 77 b) or *Cancel* to undo.

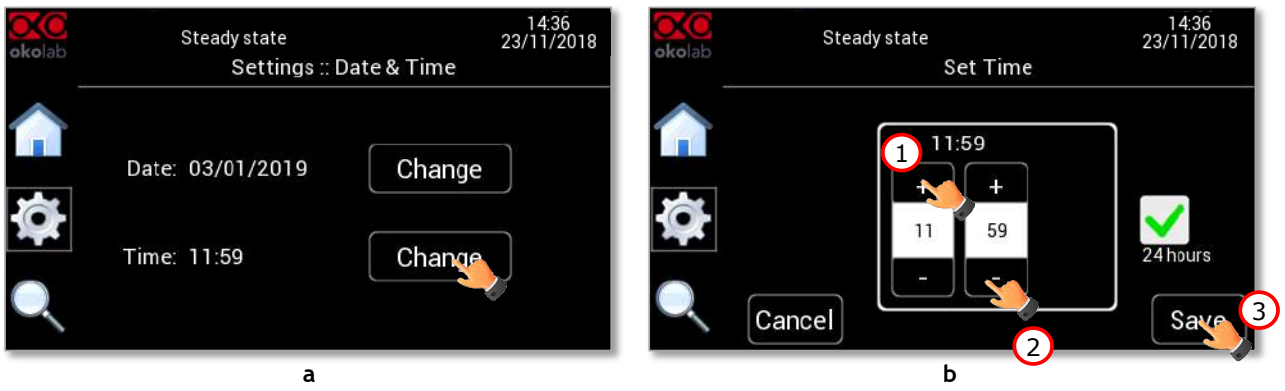


Figure 77. Set Time.

Tip ► *Deselect the 24 hours box, if you want to use the hour format based on 12 hours (1 in Figure 78). If you have selected 12 hour clock format, press on am or pm button (2 in Figure 78) when you set the time.*

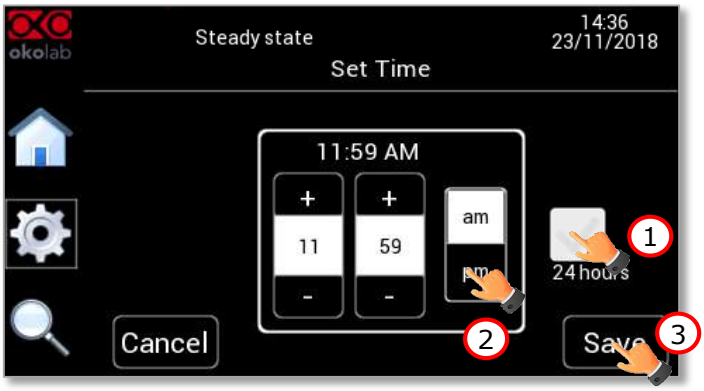


Figure 78. Date and Time.

9.2.3.4 Analog Output

The Tri-Gas-Mixer allows the remote monitoring of the current CO2 and O2 composition by an external instrument.

To enable/disable the Analog Output feature:

1. Make sure that the Analog Output cable is connected as described in the paragraph 8.3

2. Press on the *System* icon and then on the *Analog Output* icon to enter the Analog Output page

Figure 79 How to enter Analog Output page

The Analog Output is disabled by default, as shown in Figure 80

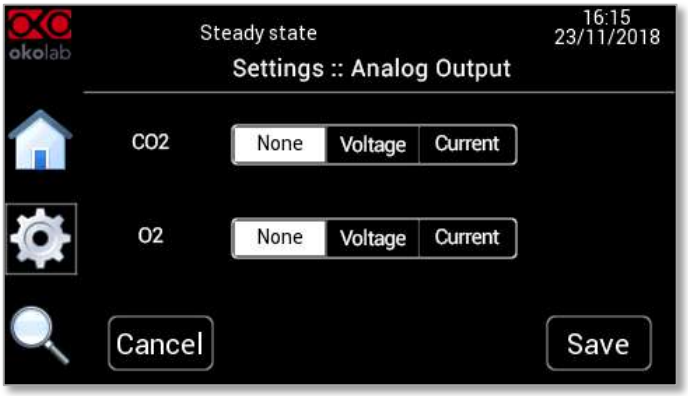


Figure 80 Analog Output page. Analog Output disabled

If your system can read Voltage in the range [0.0 - 10.0] Volt, select *Voltage* for CO2 and/or O2 and then press on *Save*, as shown in Figure 81

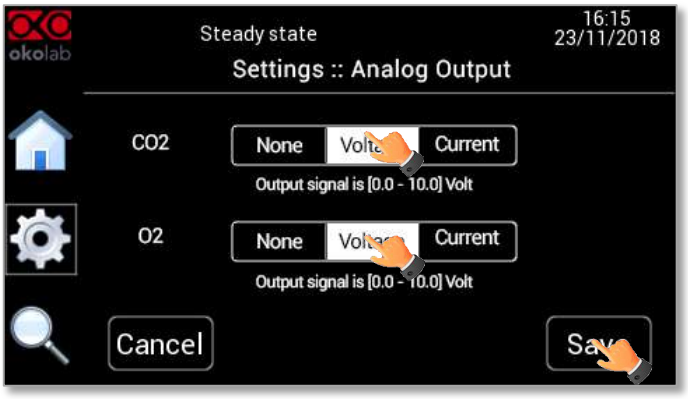


Figure 81 Analog Output page. Analog Output enabled on the voltage signal

If your system can read Current in the range [0.0 - 20.0] mA, select *Current* for CO2 and/or O2 and then press on *Save*, as shown in Figure 82

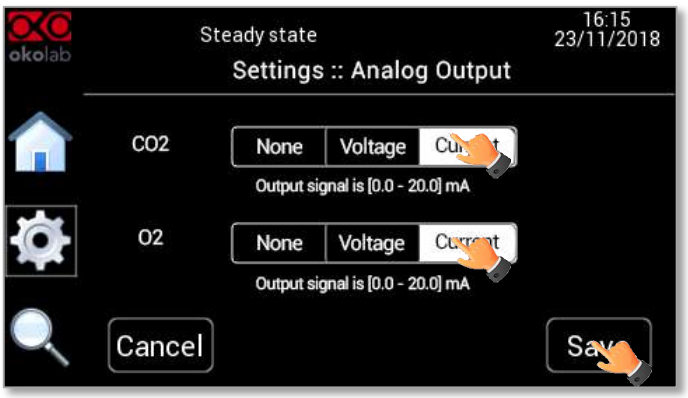


Figure 82 Analog Output page. Analog Output enabled on the current signal

9.2.3.5 Network

The Tri-Gas-Mixer can be connected to the Network by Ethernet or by Wi-**F**i. To connect the Tri-Gas-Mixer to the Network press the *Network* icon as shown in Figure 83 a, the page in Figure 83 b opens.

Figure 83. How to enter to Network page (a – b).

If you want to use the Ethernet connection, follow the instructions below:

1. Connect the LAN cable to the rear panel of the Tri-Gas-Mixer as shown in Figure 84.

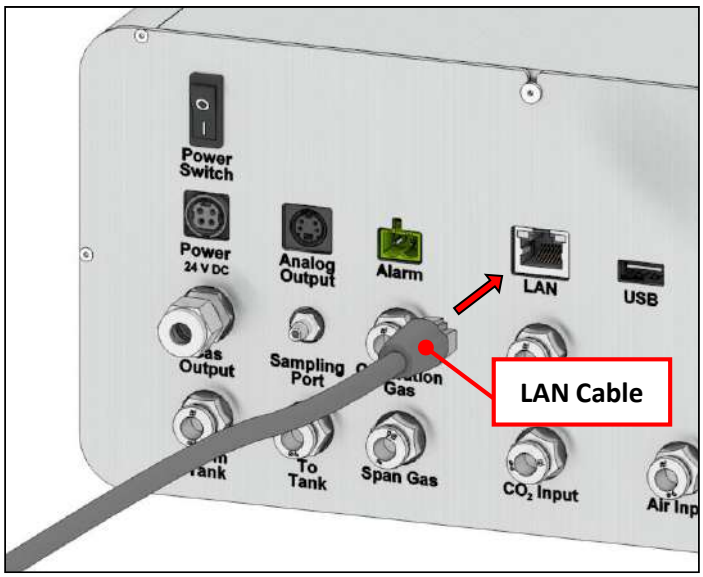


Figure 84. LAN cable connection.

2. Press on the Ethernet icon in Network page, see Figure 85, a and choose the DHCP or the Static network connection.

   Touch on the *DHCP* check box, see Figure 85, b, if the network to which the Tri-Gas-Mixer has to be connected automatically assigns the IP address via the DHCP server.

   Note ►*Please, make sure that your network has a DHCP server and that any device can be connected with no request to the network administrator. If so, the Tri-Gas-Mixer should get a dynamic IP from the DHCP server.*

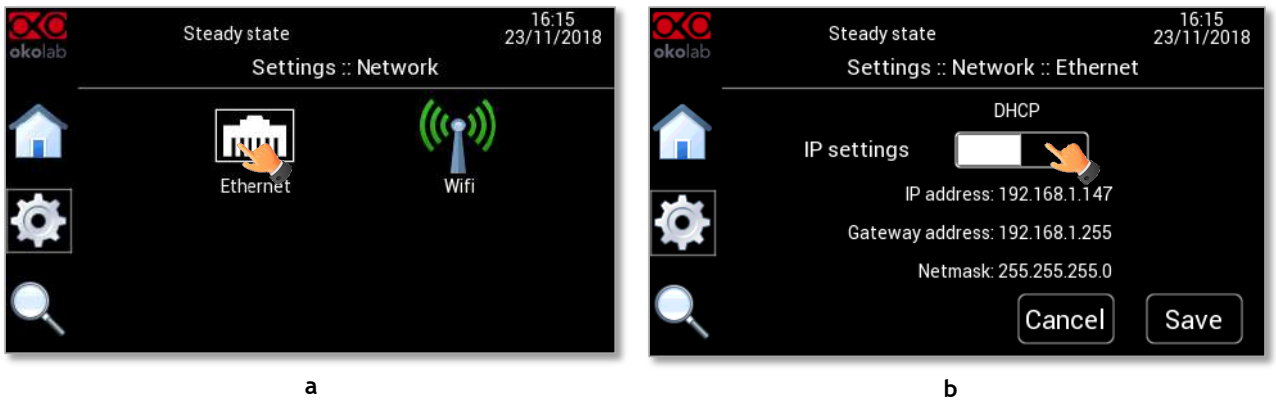
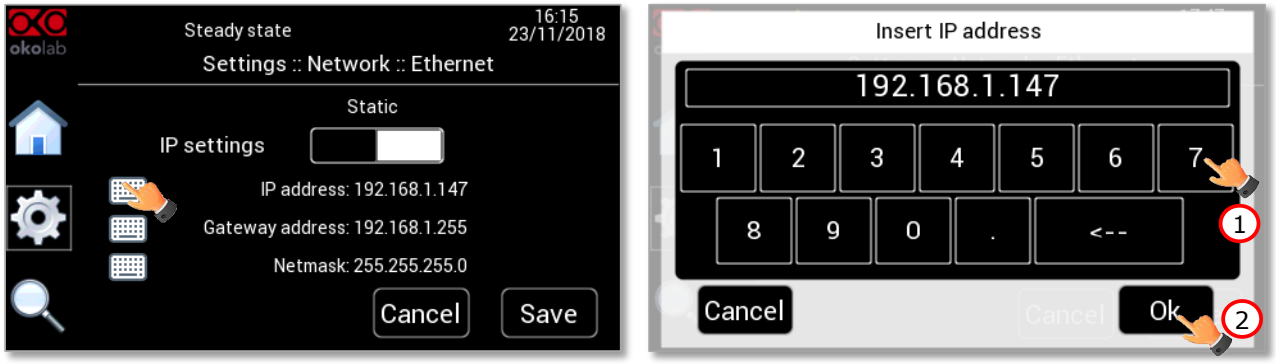


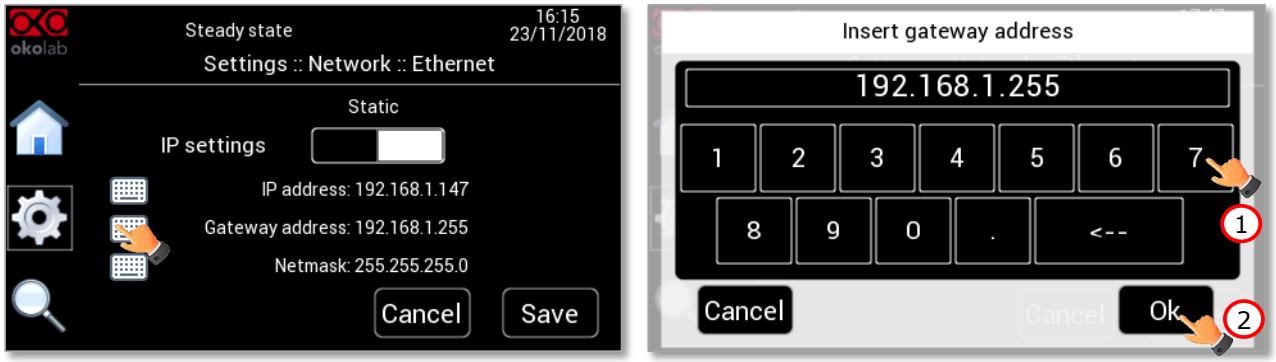
Figure 85. Network connection via Ethernet (a – b).

If you press on the *Static* check box, you have to manually enter the IP address, the Gateway address and the Netmask touching on the related keybord and following the indications shown in Figure 86, Figure 87 and Figure 88



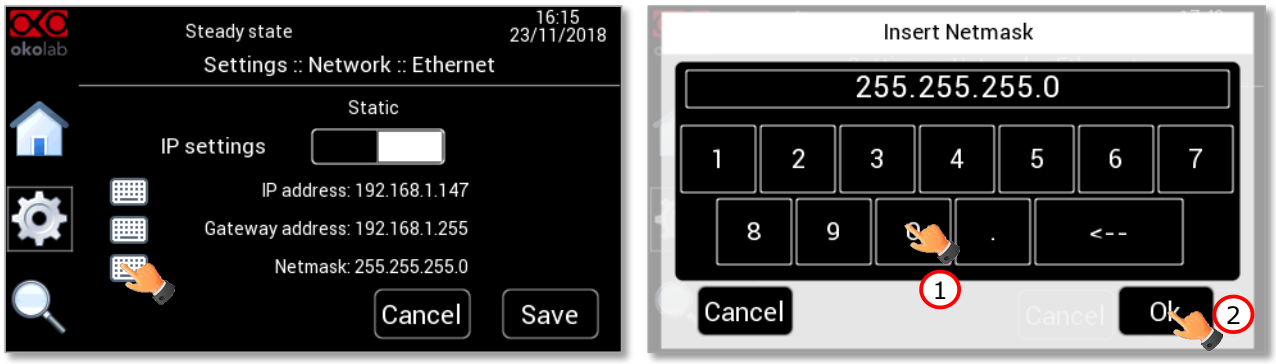
a b

Figure 86. IP address insertion



a b

Figure 87. Gateway address insertion



a b

Figure 88. Netmark insertion

3. Once you have entered the IP address, the Gateway address and the Netmask, press on *Save,* see Figure 89

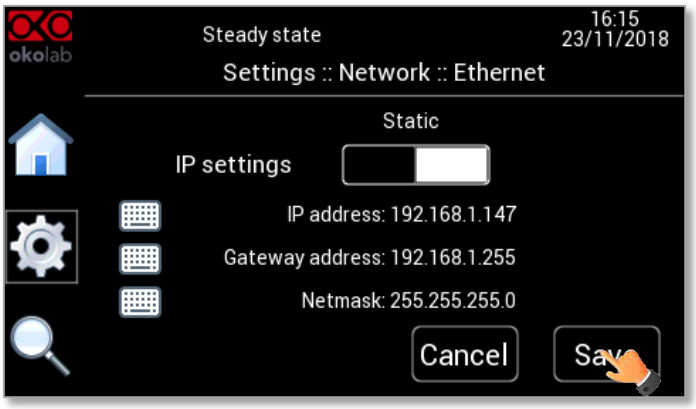


Figure 89 Static Network Connection.

If you want to use the Wi-Fi connection, follow the instructions below:

1. Connect the Dongle Usb to the rear panel of the Tri-Gas-Mixer.

Note ► *You may use any IEEE 802.11 b/g/n Wi-Fi compliant module based on the* ***RaLink RT5370N*** *chip*

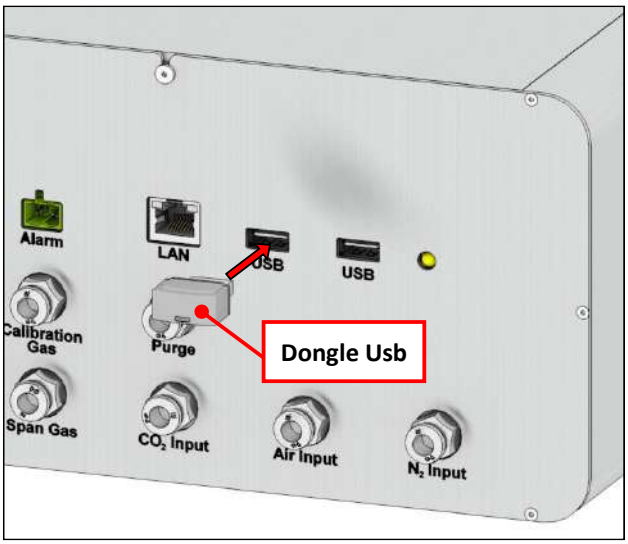
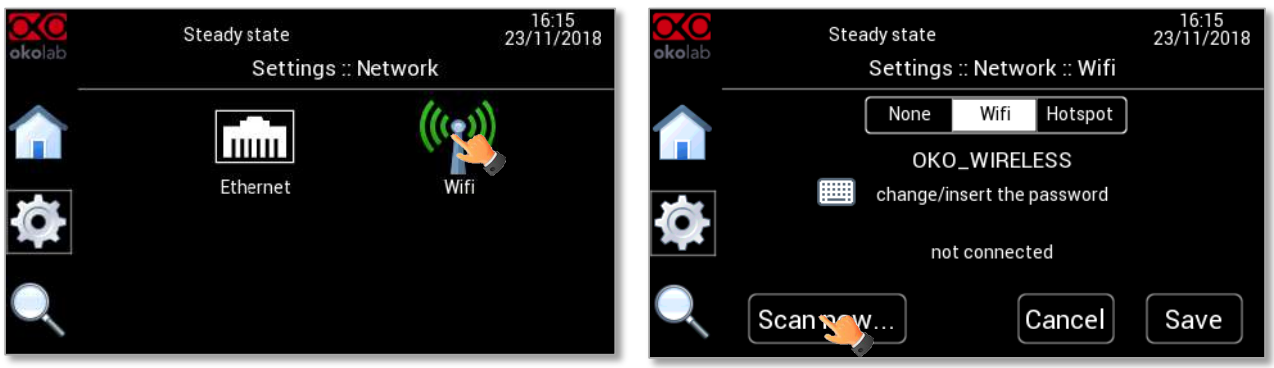


Figure 90. Dongle Usb connection.

2. Press on the *Wi-Fi* icon , see Figure 91, a.



a **b**

Figure 91 How to enter in Wi-Fi page (a – b).

3. Press the *Scan now* button to choose among the available Wi-Fi networks, the dialog in Figure 92, a opens and you can press on the Wi-Fi network at which the Tri-Gas-Mixer has to be connected.

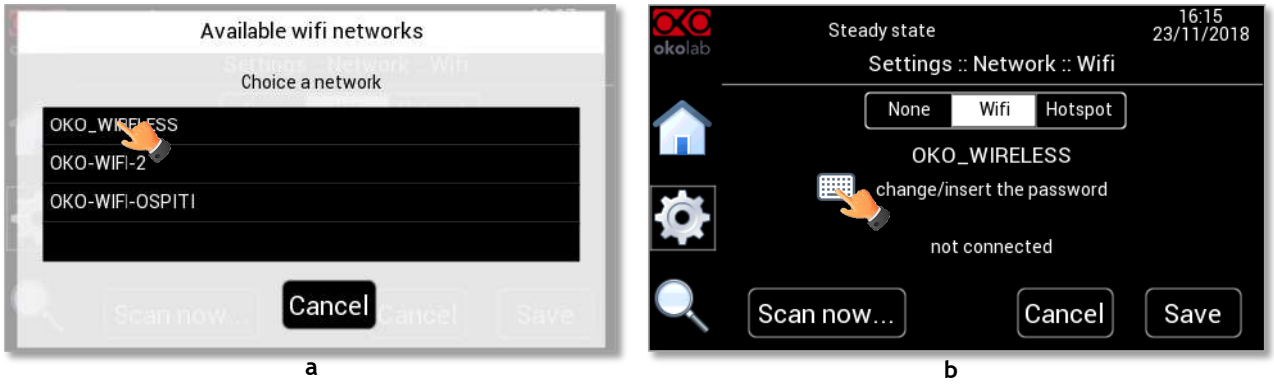


Figure 92. Wifi connection (a – b).

4. Enter the Wi-Fi password using the related keyboard, as shown in Figure 92, b and then follow the steps shown in in Figure 93, a and b.

Figure 93. How to enter in Wifi page (a – b).

9.2.3.6 Factory reset

Press on *Factory Reset* icon (see Figure 94 a) to restore the default factory settings. Press *Ok* to start Factory Reset or *Cancel* to undo in the open page (see Figure 94 b).

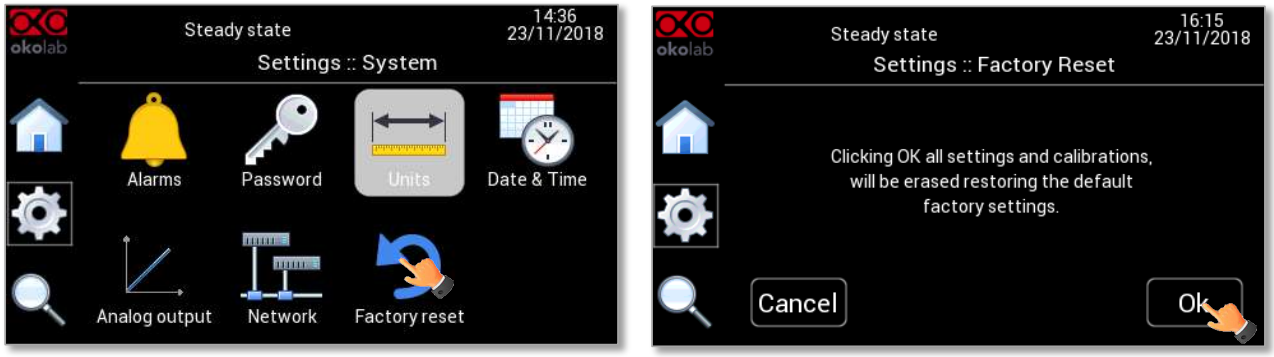


Figure 94. Factory Reset (a – b).

9.2.4 Logging

The Tri-Gas-Mixer is equipped with a local memory to store the composition readings. These data can be downloaded on a USB stick on user request. To download the stored data follow the instructions below:

1. Connect the USB key to the USB port on the rear panel of the Tri-Gas-Mixer, as shown in Figure 95. The *Usb* Icon appears on the Homepage (see Figure 96).

Figure 95. Download Data.

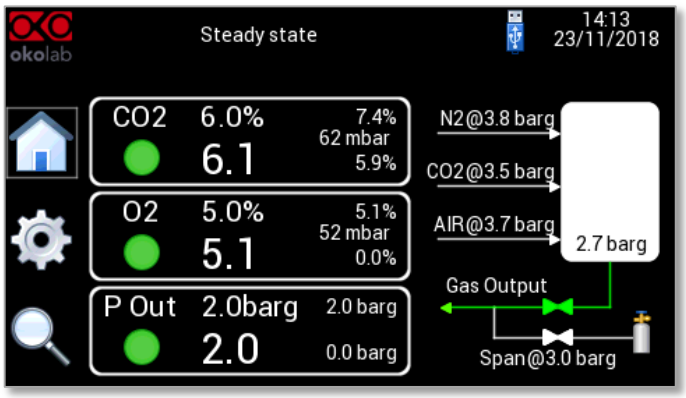


Figure 96. USB Icon displayed when a USB key is connected to the Tri-Gas-Mixer.

2. Press the *Logging* icon (see Figure 97 a) to access to the *Download* page (see Figure 97 b).

3. Press the *Download Now* button (1 in Figure 97 b) to download data to the USB key and then press *OK* (2 in Figure 97 b) and wait until the download is completed.

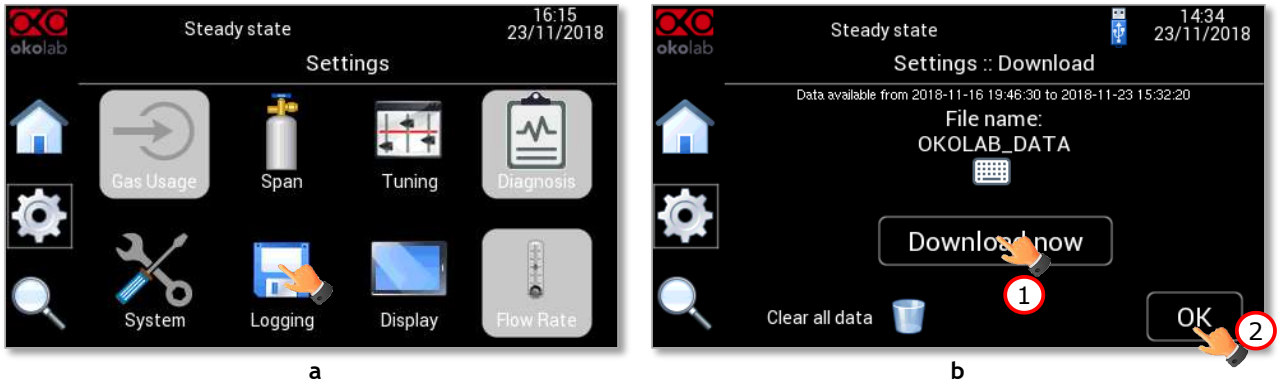


Figure 97. How to download data (a – b).

To delete all data stored on the Tri-Gas-Mixer local memory, press on the *Clear all data* icon (see Figure 98 a). A pop-up message appears, as shown in Figure 98 b. Press *Yes* to confirm.

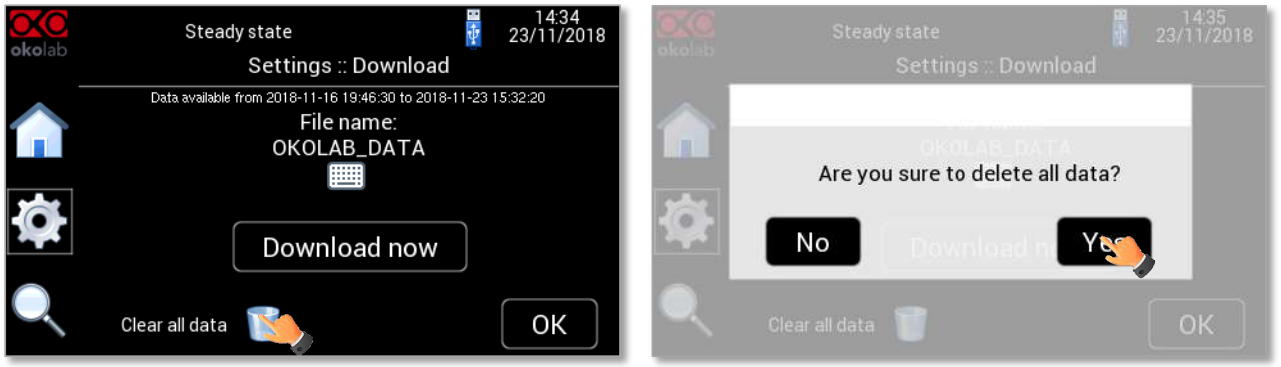


Figure 98.How to delete data (a – b).

9.2.5 Display

To log in in the *Display* page, press on the *Display* icon , as shown in Figure 99 a. As shown in Figure 99 b, in the *Display* page it is possible to set:

- *Options*: to modify the displayed time frame and sound buzzer frequency (see paragraph 9.2.5.1).
- *Brightness*: to modify the display brightness (see paragraph 9.2.5.2).
- *Calibration*: to start a new Touch screen calibration (see paragraph 9.2.5.3).
- *Themes*: to modify the theme (see paragraph 9.2.5.4).
- *Reset*: to delete user calibration and restore factory values (see paragraph 9.2.5.5).

a b

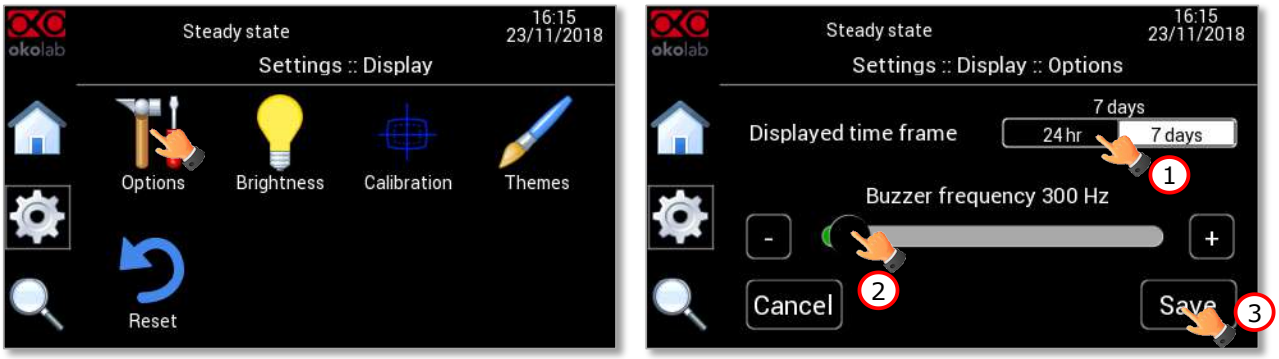
Figure 99.Display settings (a – b).

9.2.5.1 Options

Press on the icon (Figure 100) and set the *Displayed time frame* in which the compositions and output pressure minimum and maximum values are collected. You can choose between *24hrs* and *7 days* (1 in Figure 100 b).

Tip ► *The 24 hrs Displayed time frame is set by default.*

Slide your finger along the *Buzzer frequency* bar (2 in Figure 100 b) or click the +/- icons to modify the buzzer sound frequency. Then press *Save* (3 in Figure 100 b).



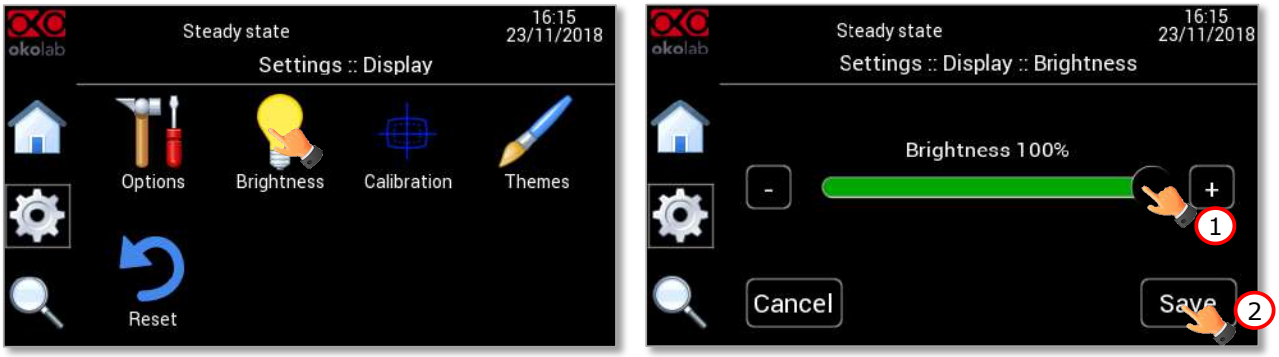
a b

Figure 100. Touch Options (a – b)

9.2.5.2 Brightness

Press the icon (see Figure 101 a) to modify the display *Brightness.* Scroll the *Brightness* bar (1 in Figure 101 b) or press the *+/-* icons in the page that opens.

Press on *Save* to obtain the right configuration of *Brightness* (2 in Figure 101 b).



a b

Figure 101. Brightness display page (a – b).

9.2.5.3 *Calibration*

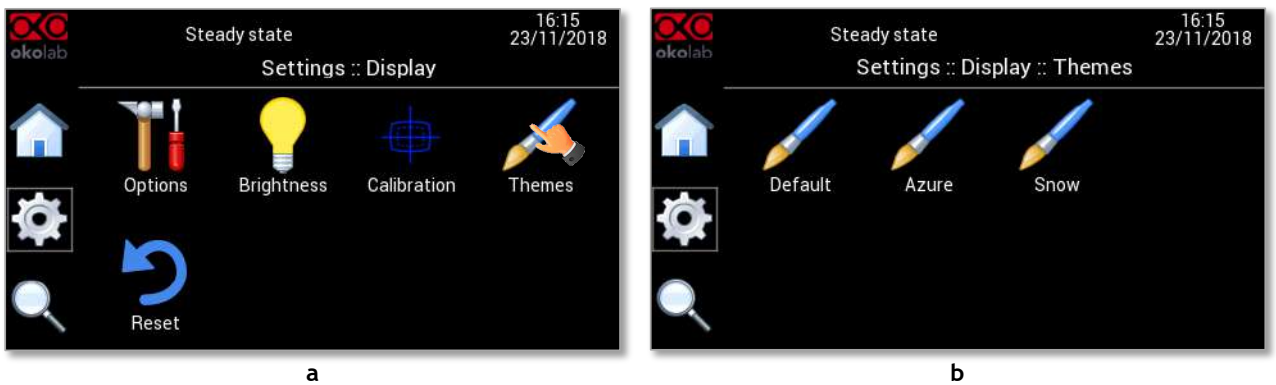
Press the *Calibration* icon to start the Touch Screen Calibration. Tap on the blue dots until the calibration is completed (see Figure 102 b).

a b

Figure 102. Start Touch Screen Calibration (a – b).

9.2.5.4 *Themes*

To modify the display *Theme,* press the *Themes* icon (see Figure 103 a) and select the theme you prefer (see Figure 103 b).

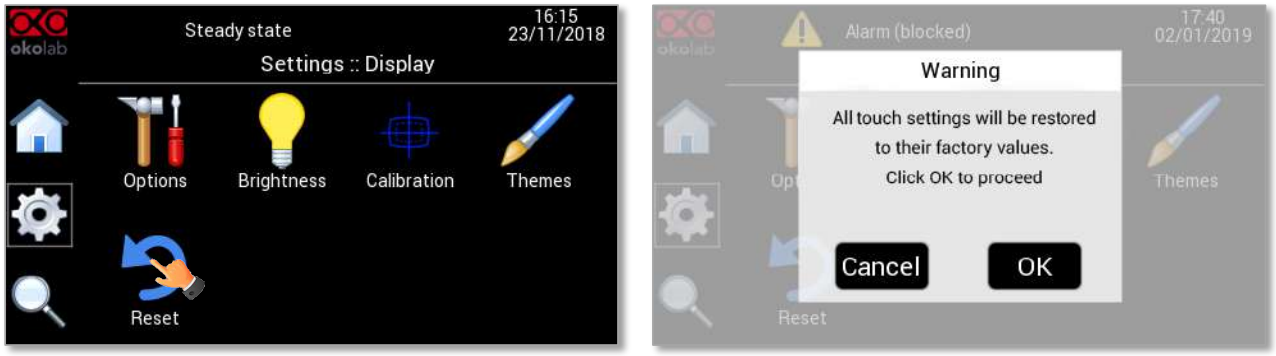


a b

Figure 103. Display settings: Theme (a – b).

9.2.5.5 Reset

Press on *Reset* icon (see Figure 104 a) to restore the default factory settings, a pop-up dialog box appears (see Figure 104 b). Press *Ok* to start Factory Reset or *Cancel* to undo (see Figure 104 b).

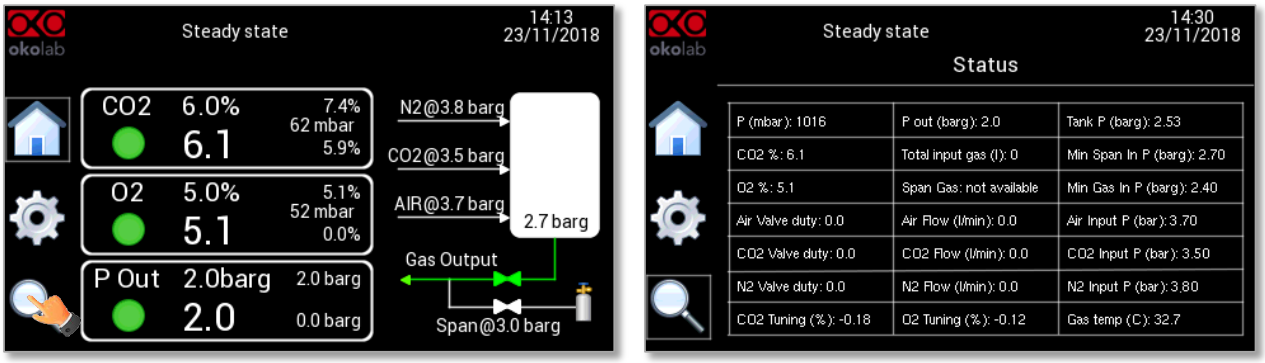


a b

Figure 104. Display settings: Theme (a – b).

9.3 Overview

Press on the icon to open the status page, as show in Figure 105 a.



a b

Figure 105. Overview Status page. (a) How to enter in the Overview Page (b) Overview Status Page

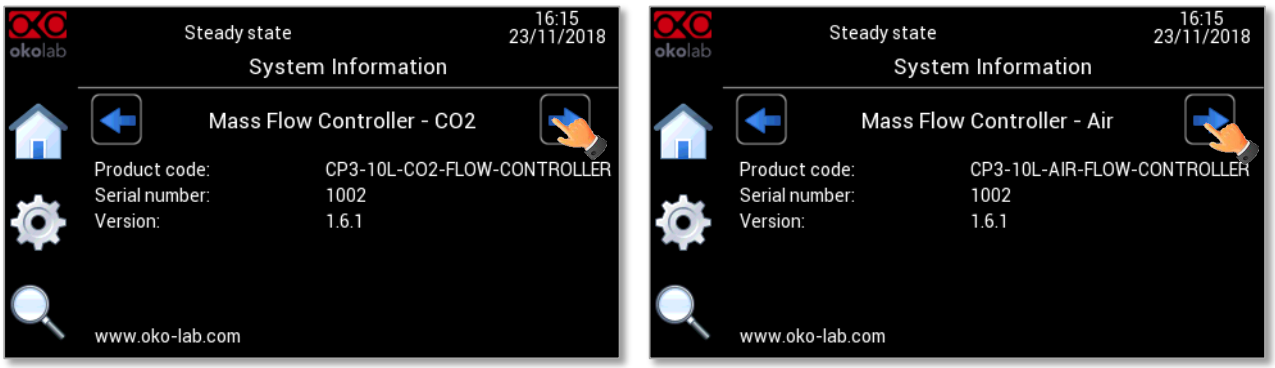
Note ►*This page contains data useful for technical/control reasons. In case you require support from one of Okolab engineers you may be asked for some of these data*

9.4 System information

Press the icon to access the *System information* pages, as shown in Figure 106 a. These pages contain the information related to the Tri-Gas-Mixer (see Figure 106 b), Mass Flow Controllers (see Figure 107and Figure 108 a), Gas Module (see Figure 108 b), Pressure Module (see Figure 109 a) and Web Module (see Figure 109 a).

a b

Figure 106. System information page selection (a – b).



a b

Figure 107. System information CO2 and Air Mass Flow Controller (a – b).

a b

Figure 108. System information N2 Mass Flow Controller and Gas Module (a – b).

a b

Figure 109. System information Pressure and Web Module (a – b).

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

10 CO2-O2-Module extraction

The Tri-Gas-Mixer is equipped with a CO2-O2 Module which allows to fine-tune automatically the mixing accuracy of the Tri-Gas Mixer; it can be manually fine-tuned by any external CO_2 and O_2 percentage reader also.

Should CO2-O2 Module breakage occurs or in case of CO2-O2 module extraction for a new factory calibration, you can replace it or continue to work without the CO2-O2 module.

To extract the CO2-O2 Module, follow the instructions below:

1. Loosen the screw by using a hexagonal key (2.5mm), as shown in Figure 110.

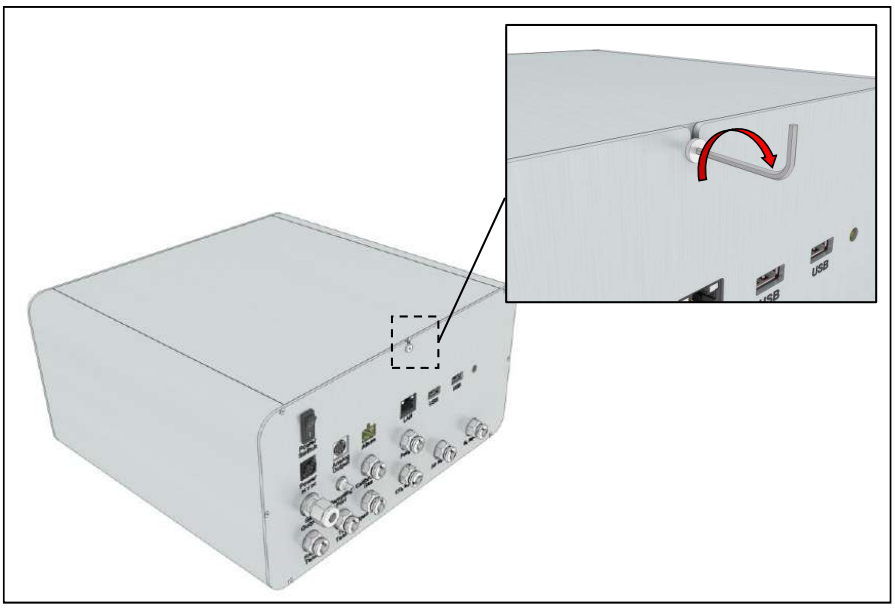


Figure 110. Loosen the screw by using a hexagonal key.

2. Slide and remove the cover of the Tri-Gas-Mixer (see Figure 111).

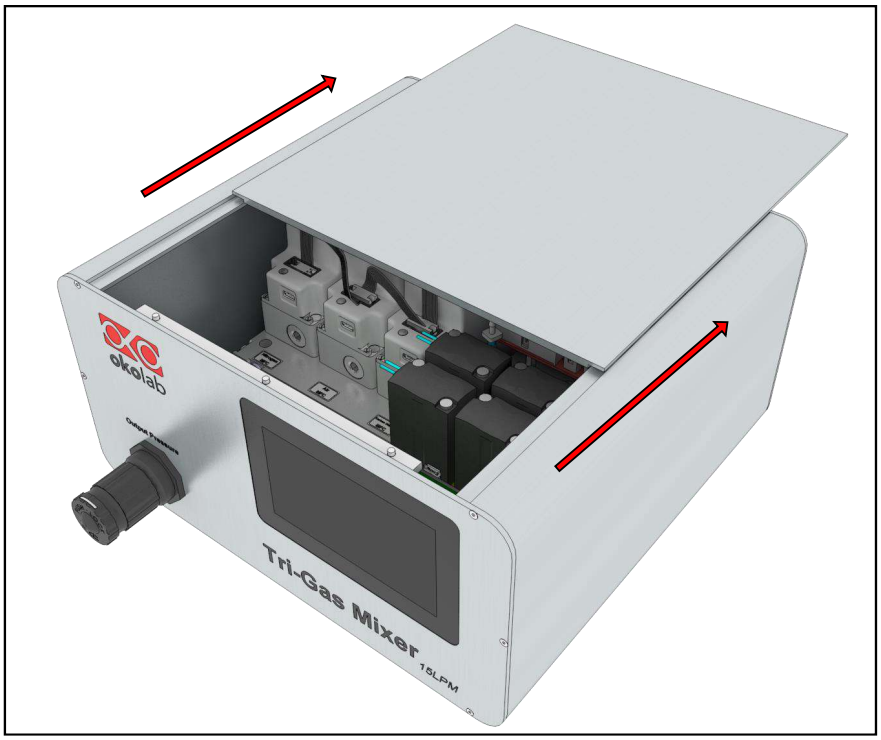


Figure 111. Remove the cover of the Tri-Gas-Mixer.

3. Disconnect the tubes from the Gas IN and Gas OUT connectors of the CO2- O2 Module, see Figure 112.

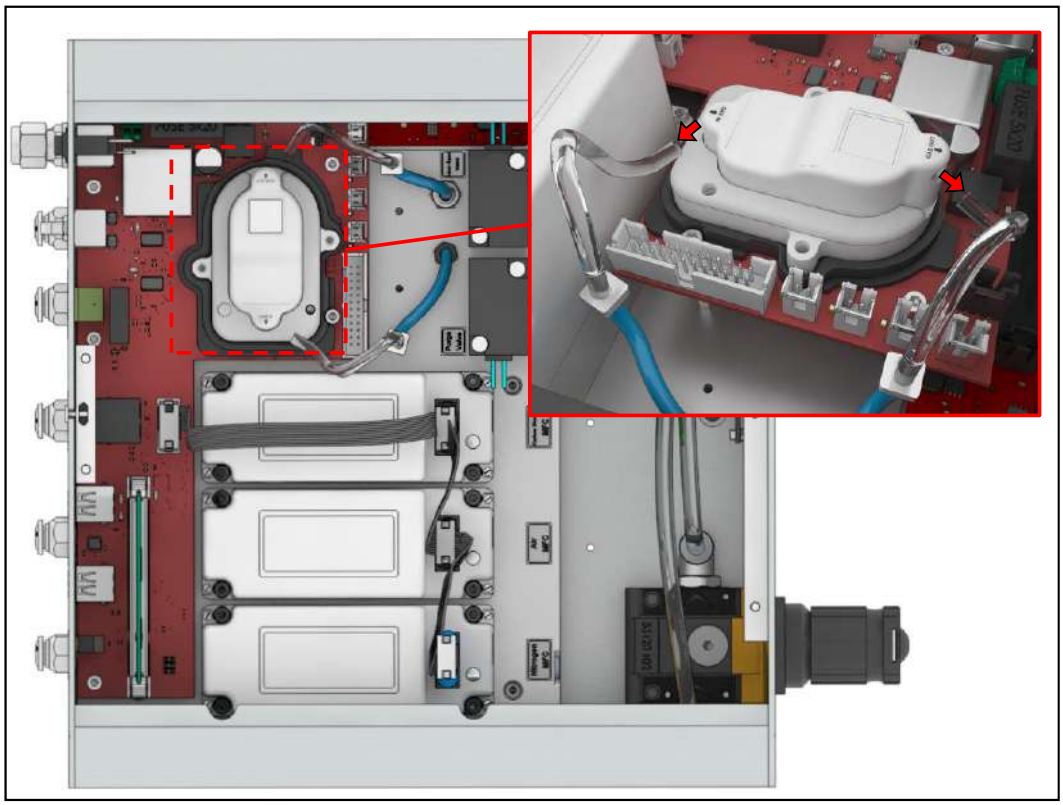


Figure 112. Disconnect the tubes from CO2-O2 Module.

4. Loosen the screws by using a hexagonal key (1.5 mm), see Figure 113.

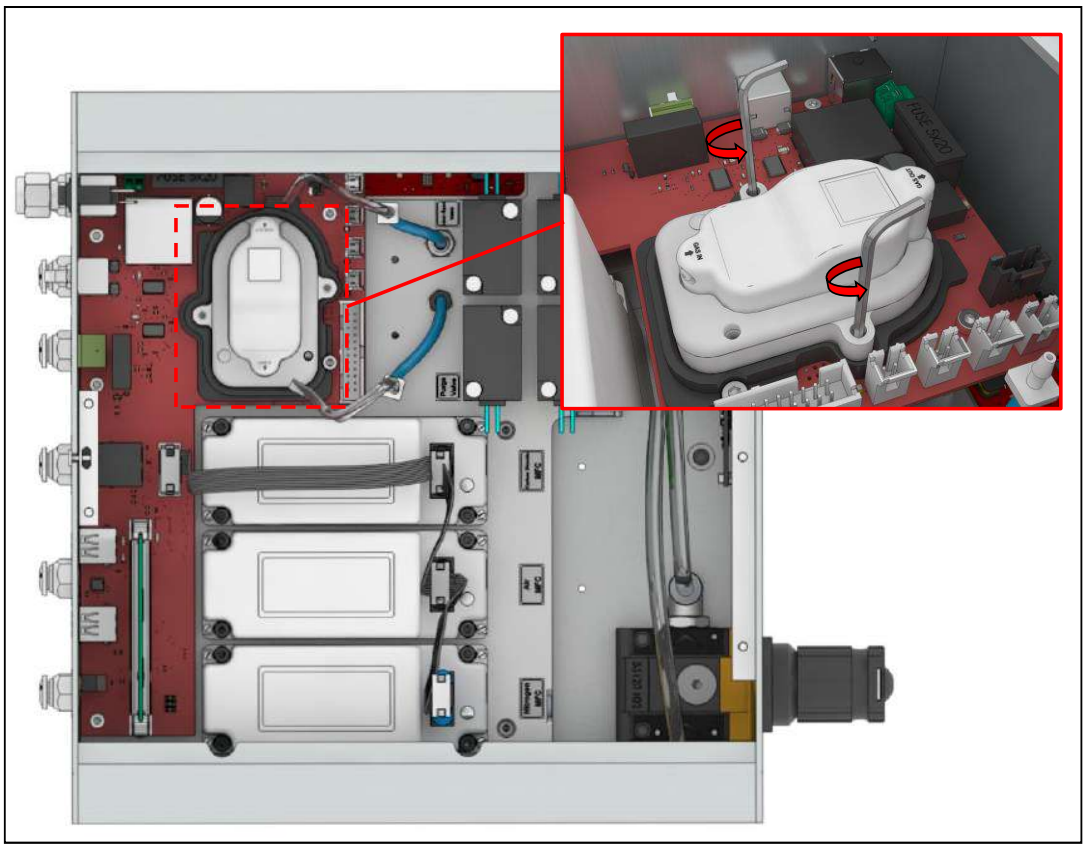


Figure 113. Loosen the screws on the CO2-O2 Module.

5. Lift the CO2-O2 Module up from the Tri-Gas-Mixer as shown in Figure 114 and replace it with the new CO2-O2 Module, required to Okolab

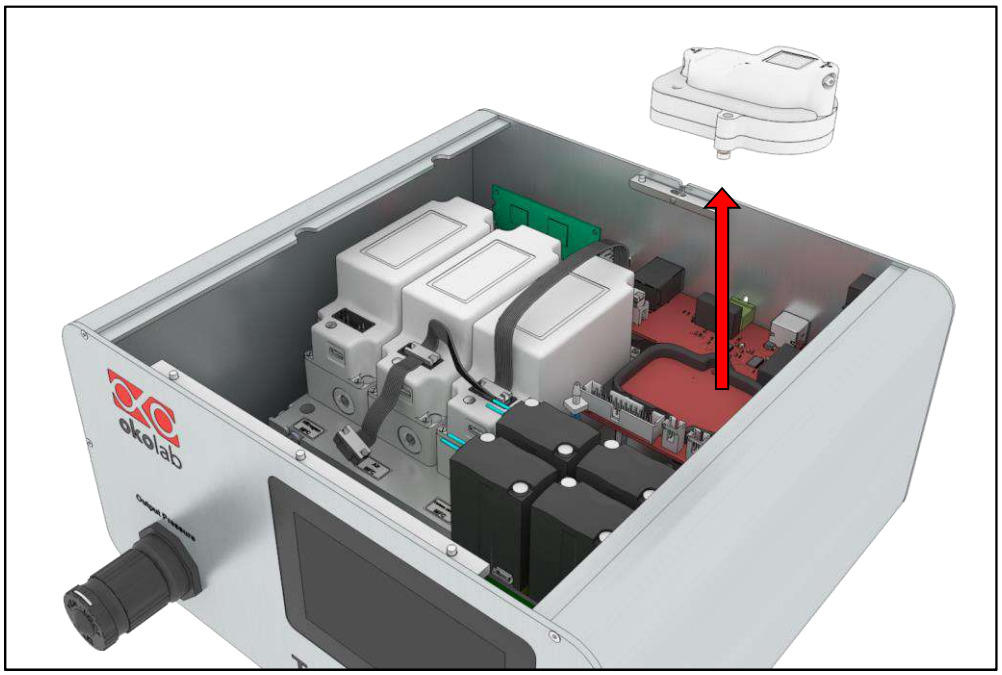


Figure 114. Extract the CO2-O2 Module from the Tri-Gas-Mixer.

6. Once you have replaced CO2-O2 Module, slide and put the cover of the Tri-Gas-Mixer (see Figure 115).

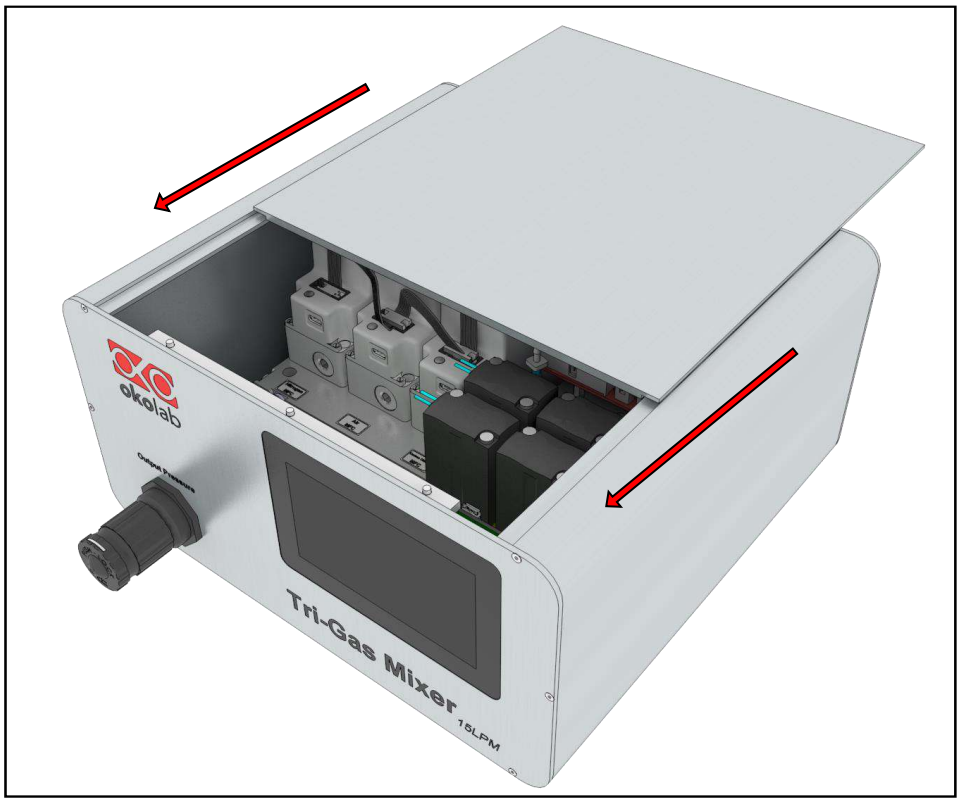


Figure 115.Cover repositioning

7. Tighten the screw clockwise by using a hexagonal key (1.5mm) as shown in Figure 116.

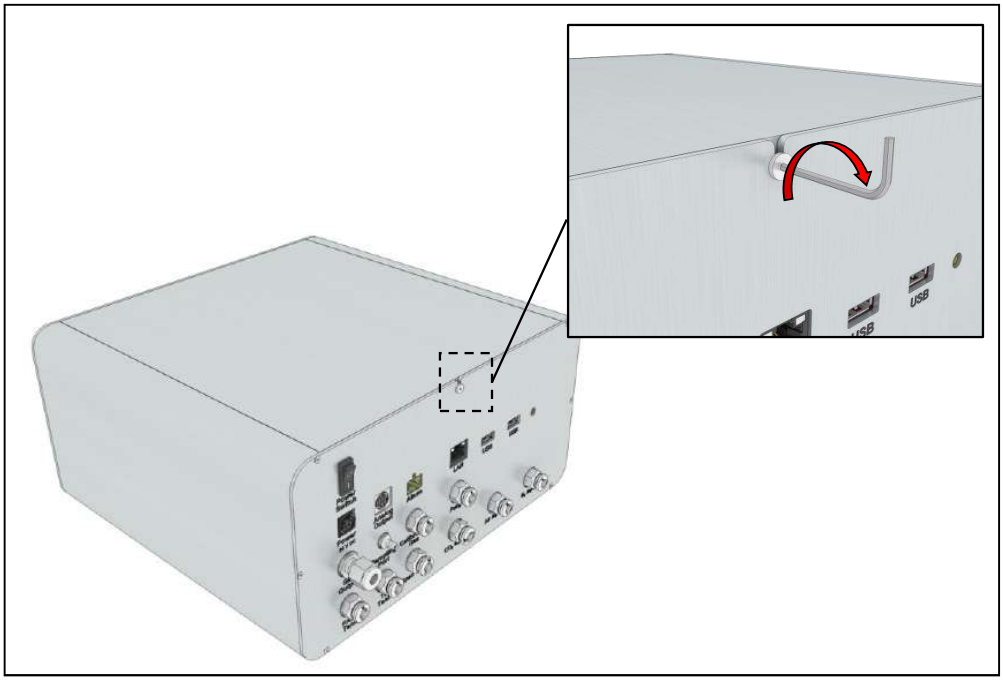


Figure 116.How to thread the cover screw

To verify the correct installation of CO2-O2 Module, press the icon Okolab to access to *System Information* pages (see Figure 117 a). Click the right arrow icon to move to CO2-O2 Module information panel (see Figure 117 b)

Figure 117 How to open the System Information page

In case of correct installation, it will appear replaced CO2-O2 Module information: product code, serial number and version (see Figure 118).

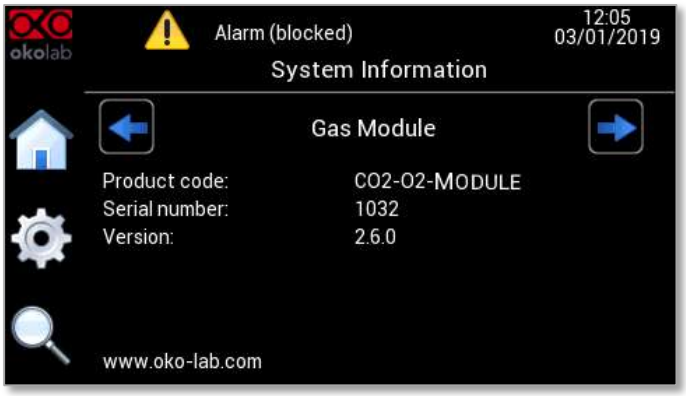


Figure 118. N2 Gas Flow Controller System Information page

In case of improper installation, an alarm message will appear with the CO2-O2 Module in red. Information about product code, serial number and version will not be reported (see Figure 119).

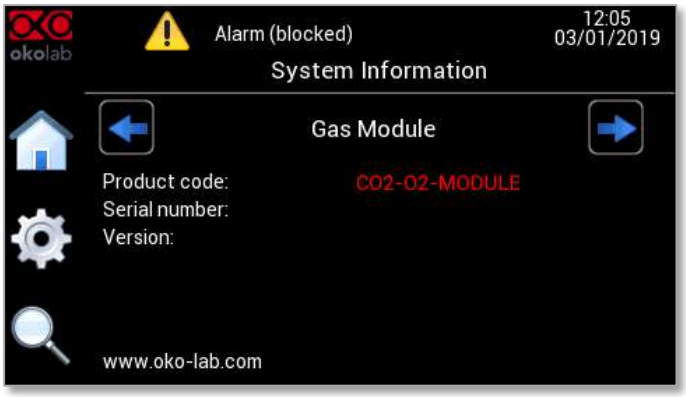


Figure 119. CO2-O2-MODULE System Information page. Incorrect replacement

The Tri-Gas Mixer can also work without CO2-O2-Module. To continue to operate the Tri-Gas-Mixer, connect the internal tubes by using the Sensing cell bypass supplied by Okolab, as shown in Figure 120 and then follow the steps 6 and 7 to close the Tri-Gas-Mixer.

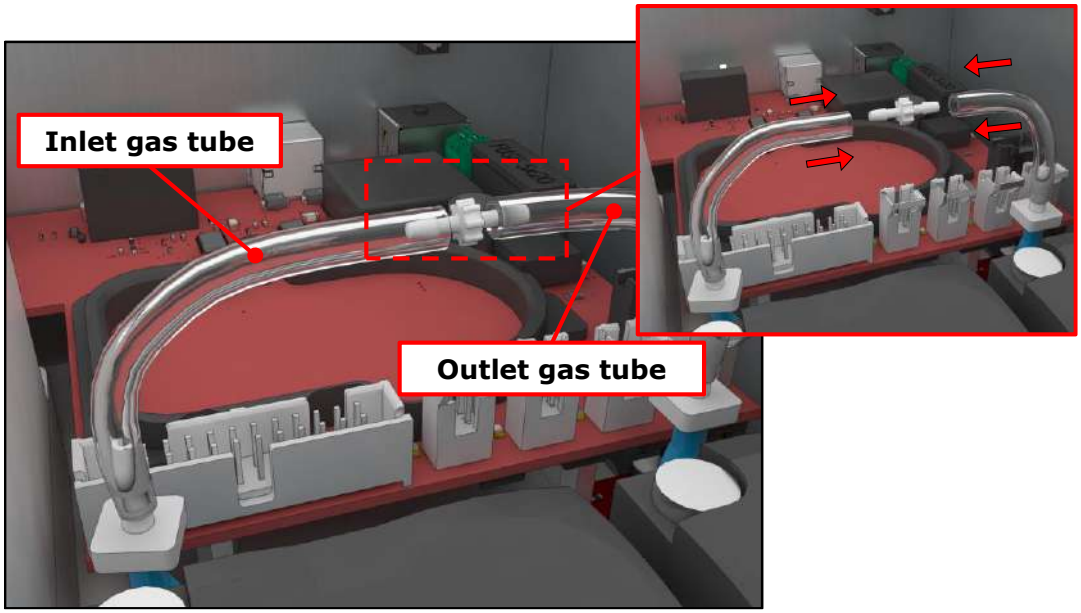


Figure 120. Tri-Gas-Mixer internal connections without using CO2-O2 Module.

When you work without CO2-O2 Module, the Homepage becomes as in Figure 121.

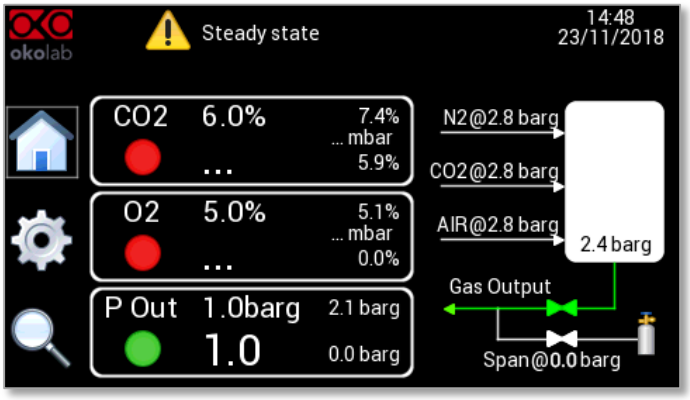


Figure 121 Homepage when the Tri-Gas-Mixer works without CO2-O2 Module

10.1.1 Tuning

Once extracted the CO2-O2 Module, the Tri-Gas-Mixer cannot check the accuracy of the concentrations over time but it continues to work in the same conditions in which it worked before extracting the CO2-O2 Module. In this case, you can verify the current CO_2 and O_2 concentrations connecting an external gas meter to the sampling port on the rear panel of the Tri-Gas-Mixer, see Figure 41.

Moreover, you can calibrate the system using the Tuning feature as explained below.

When the Tri-Gas-Mixer operates without CO2-O2 Module, the Settings page appears as shown in Figure 122. The *Tuning* icon appears.

Figure 122. Settings page when the Tri-Gas-Mixer operates without CO2-O2 Module.

To calibrate the Tri-Gas-Mixer by using LEO as external meter (NOT provided) follow the instruction below:

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

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

---

1. Connect LEO to the Tri-Gas-Mixer as shown in paragraph 9.2.2.1 in Figure 41 and start a *Single Point measurement* on LEO.

2. Wait until LEO stabilizes the CO_2 and O_2 readings; this may take 5-6 minutes.

3. Press on *Tuning* icon on the Tri-Gas-Mixer touch screen (see Figure 123 a) to enter the *Tuning* page.

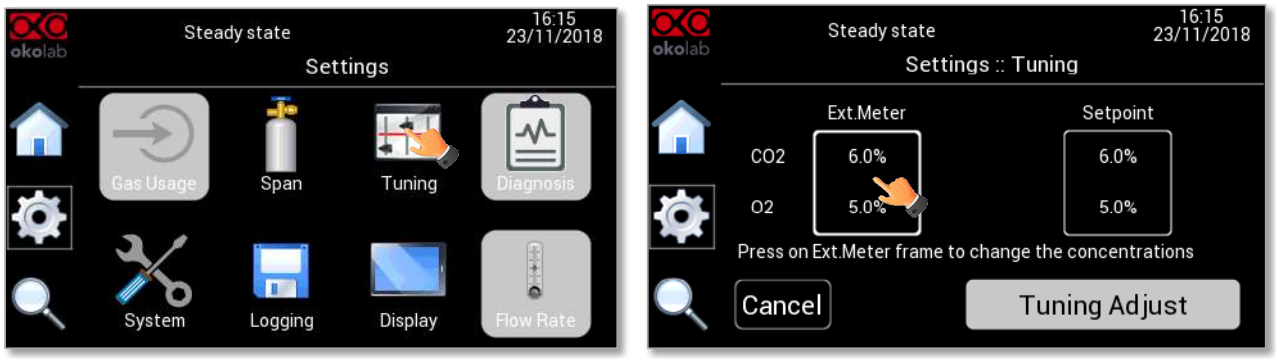


Figure 123. How to insert a Tuning adjustment (a – b).

4. The page shown in Figure 123 b appears. Press on *Ext Meter* button as shown in Figure 123 b.

5. Press on *+/-* icons to input the CO_2 (1 in Figure 124 a) and O_2 (2 in Figure 124 b) compositions read by LEO (i.e. 6.2% for CO_2 and 4.8% for O_2).

6. Press *Tuning Adjust* (3 in Figure 43 b).

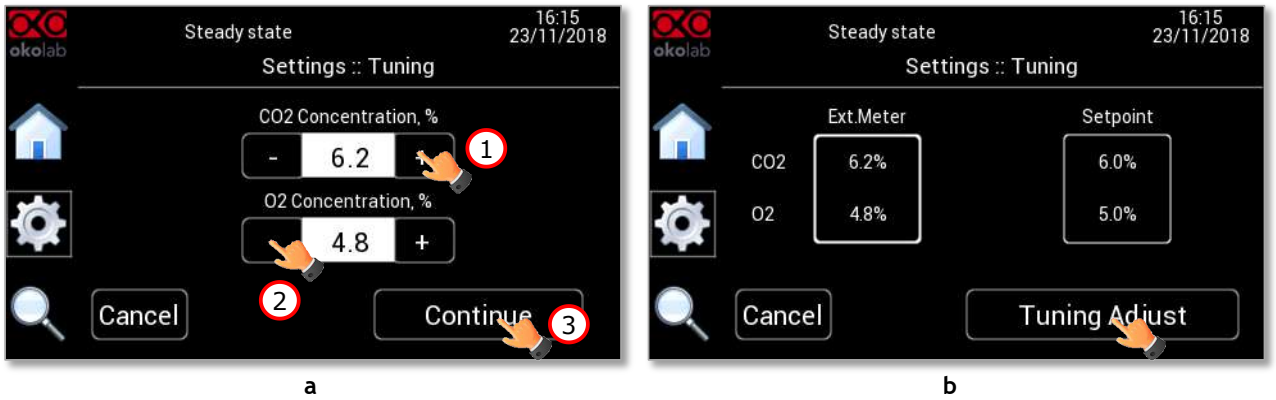


Figure 124. Tuning adjustment (a – b).

Note ►Wait some minutes, according to the flow consumption, before repeating the Tuning Adjust by the external meter and checking for the accuracy.

11 Mass Flow Controller extraction

The Mass Flow Controllers could be extracted from the Tri-Gas-Mixer for the replacement.

Before working inside the unit, close the pressure gauge of CO2, N2, Air, Premixed back-up gas and Calibration gas to decrease the pressure of all inlet gases to zero.

Tip ► *Figure 1 shows how to correctly use the pressure gauge, after installation, in three steps:*

D. Pull the knob up to release the lock.

E. Rotate the knob until the pressure reaches the desired value (counterclockwise to decrease the pressure).

F. Push the knob down to lock it.

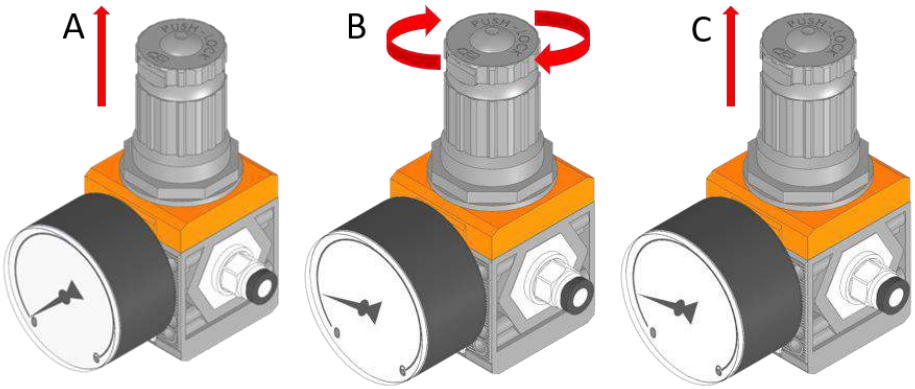


Figure 125. Pressure gauge usage

Make sure that the valve along the TUBE BP – TO TANK and the TUBE BR – FROM TANK is open (see Figure 126.)

Tip ► Remember to connect a tube for purging (not provided by Okolab).

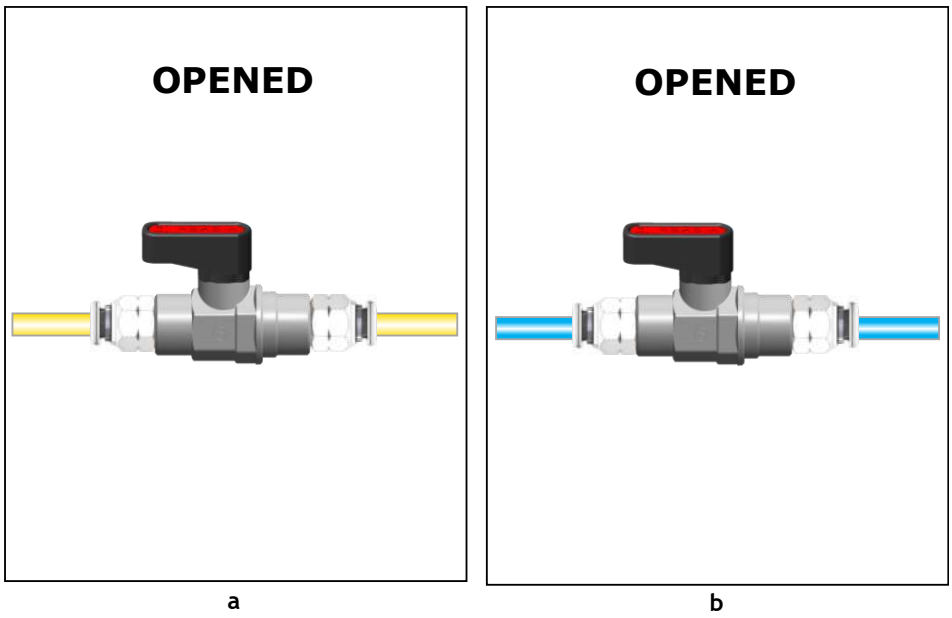


Figure 126. Tubes Valves position

Disconnect the Tri-Gas-Mixer from the main power supply. Switch the Tri-Gas-Mixer off using the power button on the rear panel and unplug the power cord from the electrical outlet (see Figure 127).

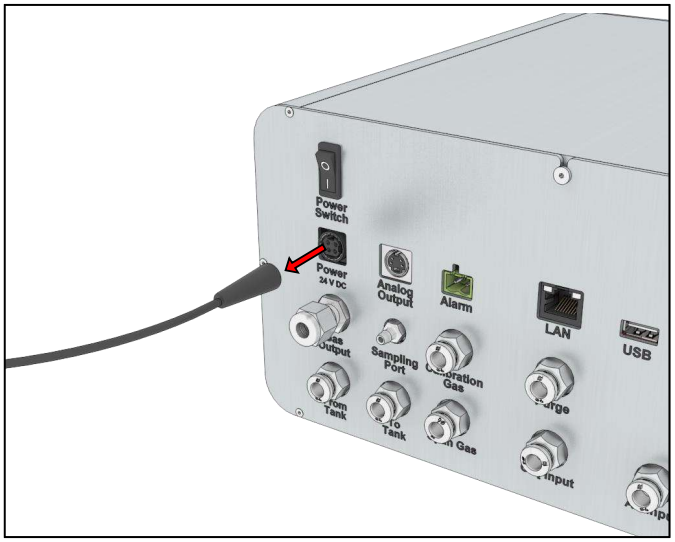


Figure 127 Power cord unplugging

Follow then the instructions below to extract the Gas Flow Controller from the Tri-Gas-Mixer:

1. Loosen the screw counterclockwise by using a hexagonal key (1.5mm), as shown in Figure 128.

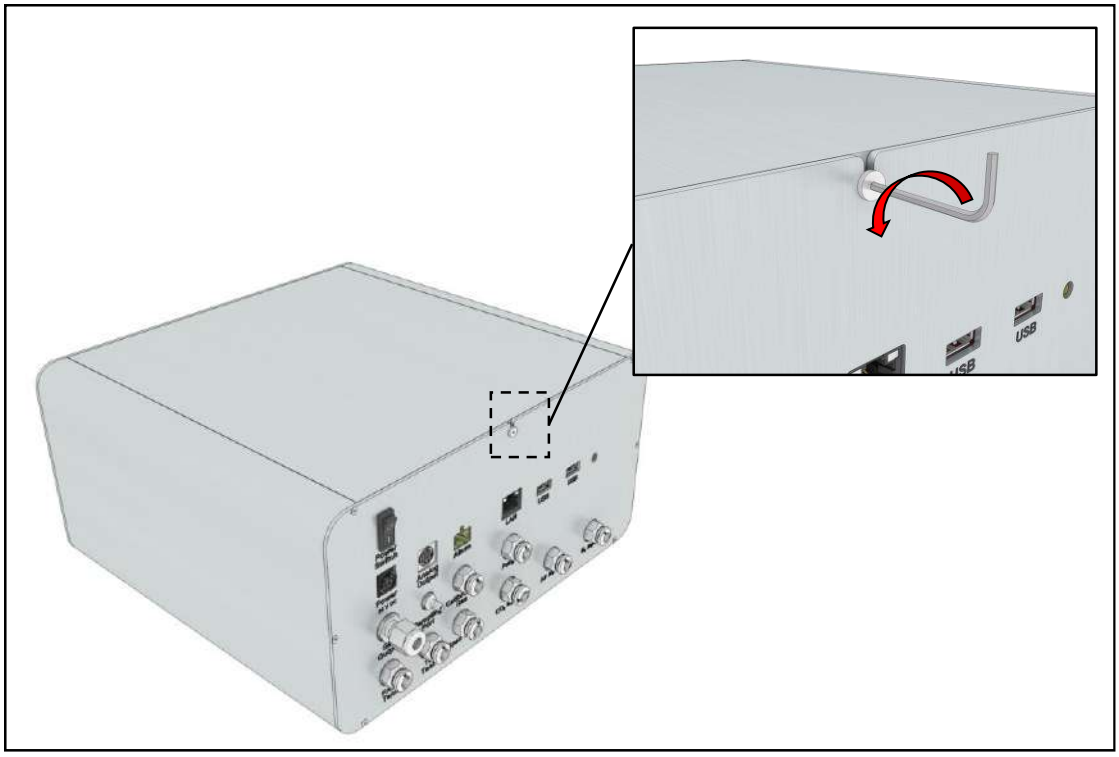


Figure 128. Loosen the screw by using a hexagonal key.

2. Slide and remove the cover of the Tri-Gas-Mixer (see Figure 129).

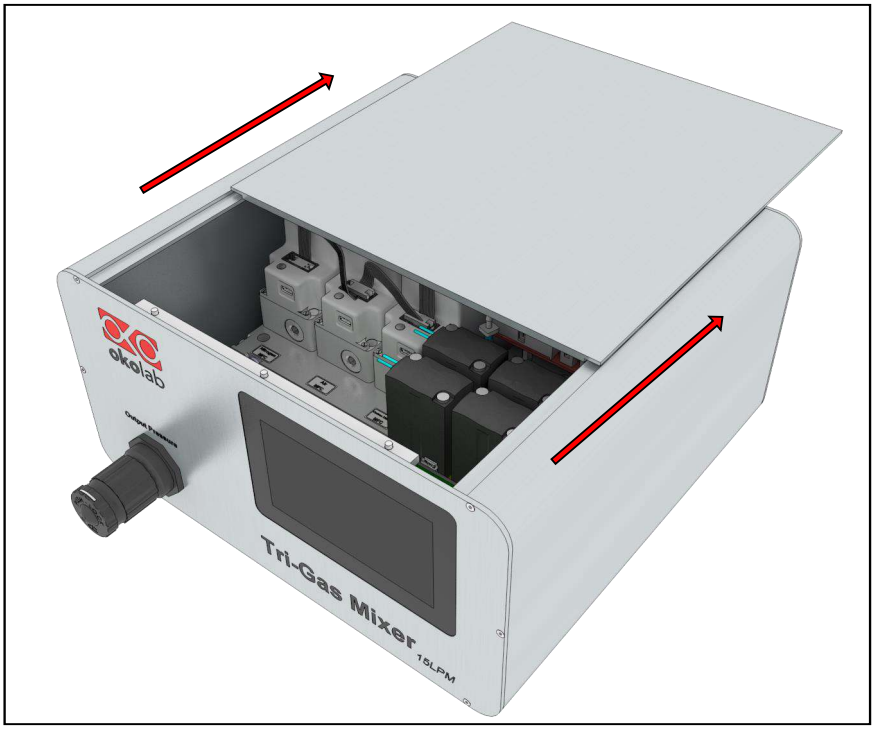


Figure 129. Cover removal .

3. Disconnect the ribbon cable from the Gas Flow Controller, see Figure 130.

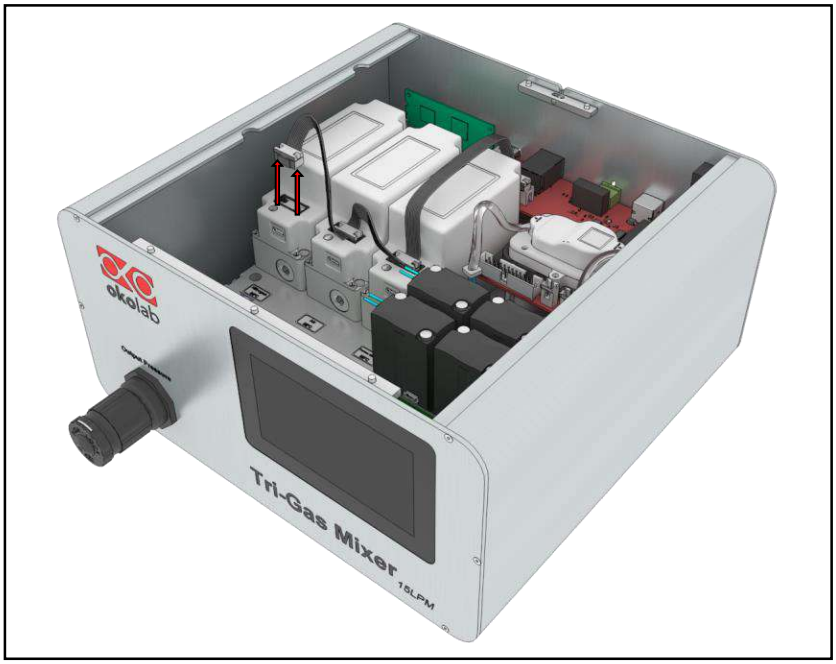


Figure 130. Ribbon cable disconnection

4. Loosen the screws counterclockwise by using a hexagonal key (2.5 mm) as shown in Figure 131

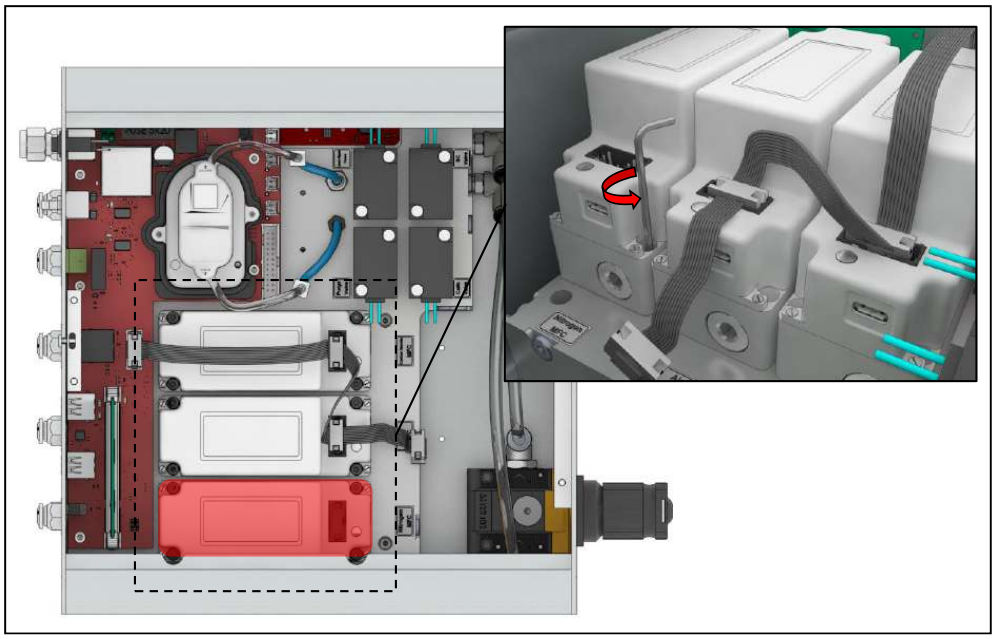


Figure 131. How to loosen the screws on the Mass Flow Controller.

5. Lift the Mass Flow Controller up from the Tri-Gas-Mixer as shown in Figure 132

Figure 132. Mass Flow Controller extraction.

Follow the instructions below to insert the new Mass Flow Controller, required to Okolab:

1. Position the Mass Flow Controller in order that its fixing holes correspond to the threaded holes in the joint panel (see Figure 133)

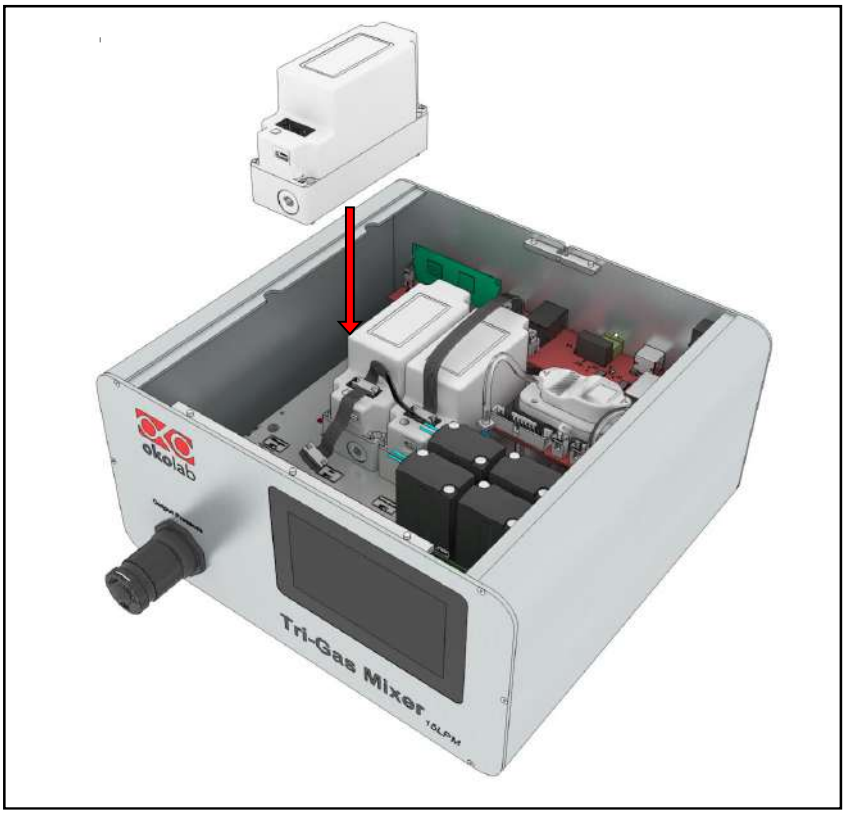


Figure 133 Mass flow controller replacement

2. Turn clockwise the screw number 1 by using a hexagonal key (2.5 mm). Complete almost one turn of the screw. Do not tighten completely the screw (see Figure 134).

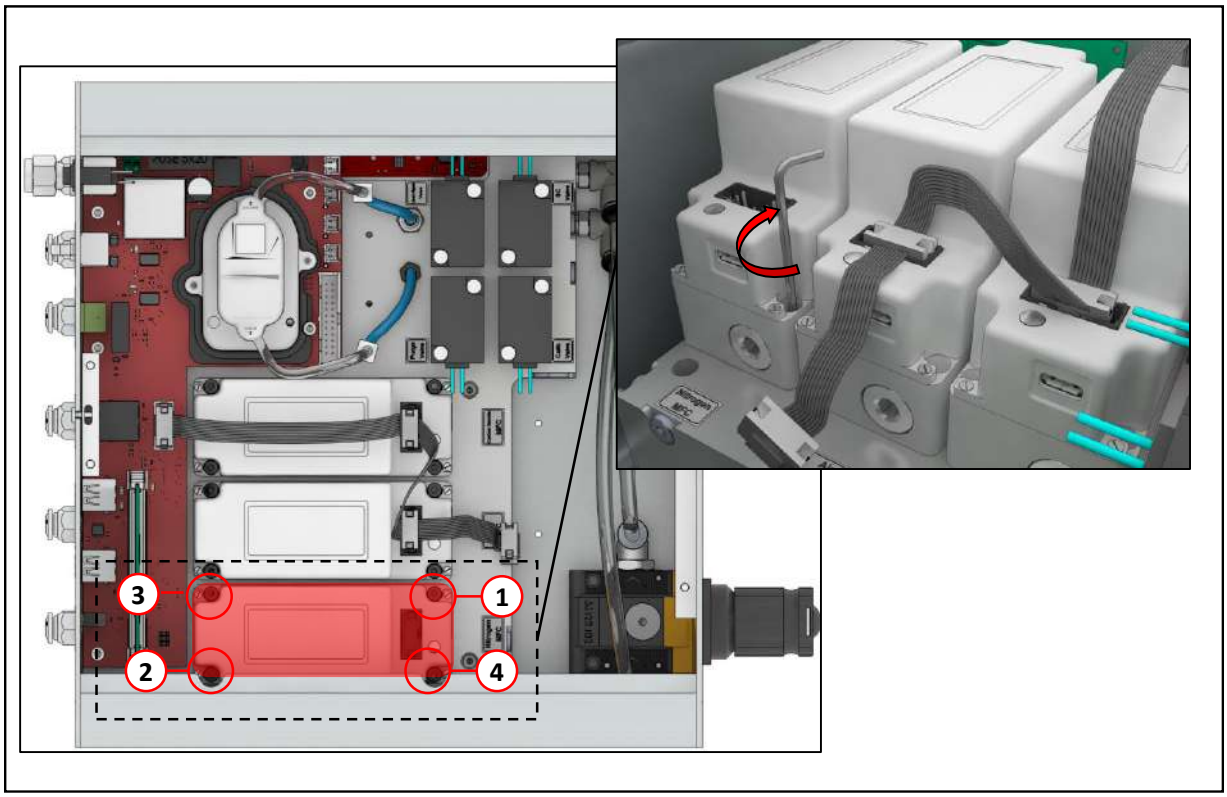


Figure 134.How to loosen the mass flow controller screws

3. Proceed turning the screw into the opposite hole (the screw number 2). Complete almost one turn of the screw. Do not tighten completely the screw (see Figure 134).
4. Continue with the screw number 3 and number 4. Complete almost one turn of the screws. Do not tighten completely the screw (see Figure 134).
5. Turn the screws sequentially until the screws are fully tightened simultaneously (see Figure 135). Make sure to tighten the screws until the end stop is reached (Almost 4 -5 turns are necessary).

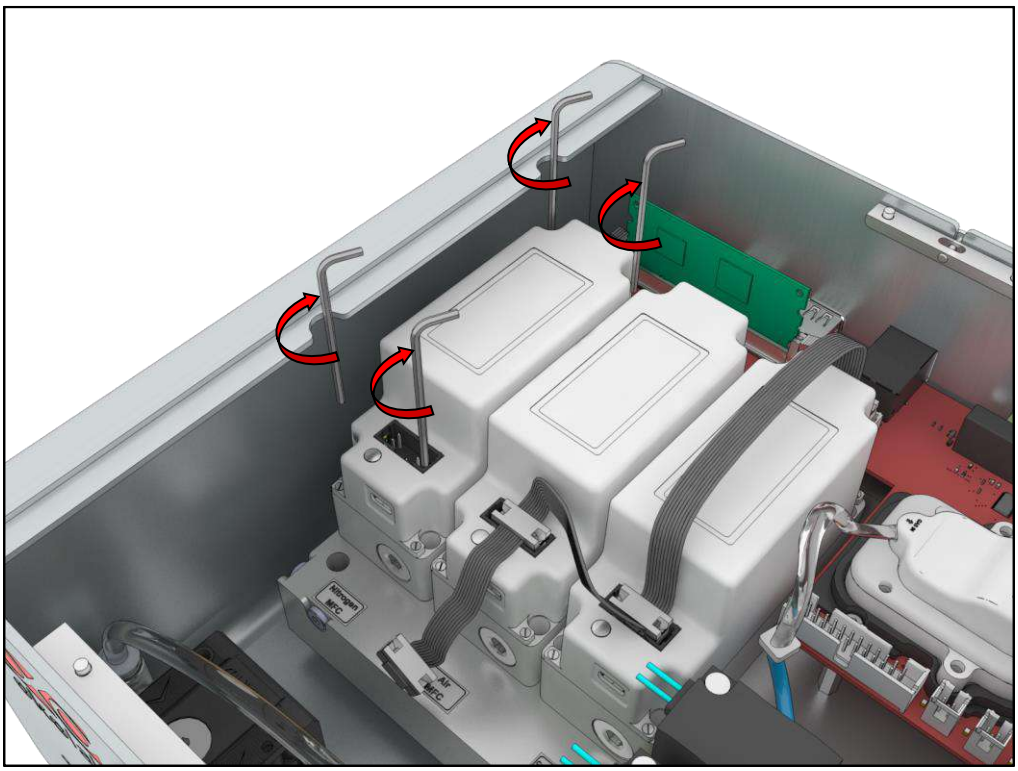


Figure 135.How to thread the Mass Controller screws

***Note**: Completely tightening only one screw in the group may cause an improper installation of the Mass Flow Controller.*

6. Connect the ribbon cable to the Mass Flow Controller (see Figure 136).

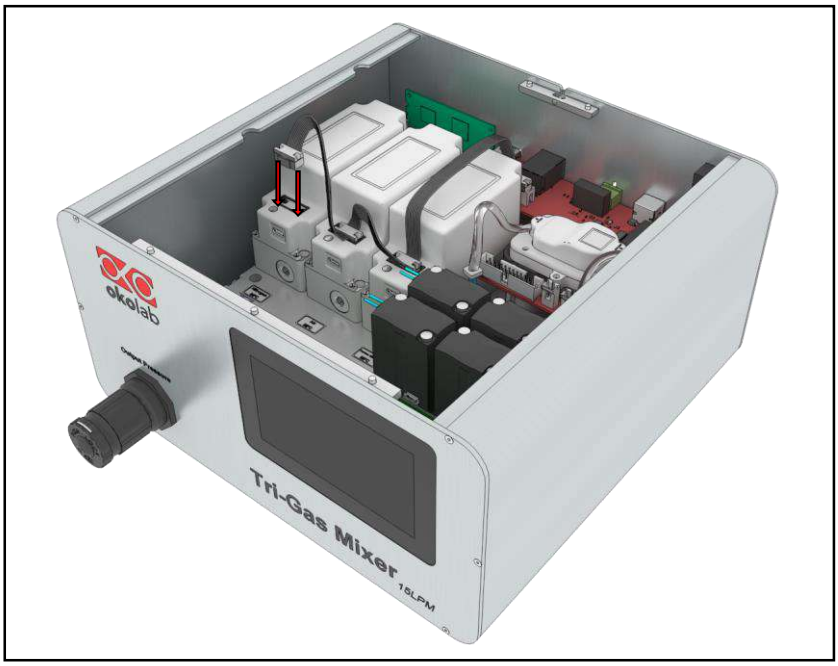


Figure 136.Ribbon cable connection

7. Slide and put the cover of the Tri-Gas-Mixer (see Figure 137).

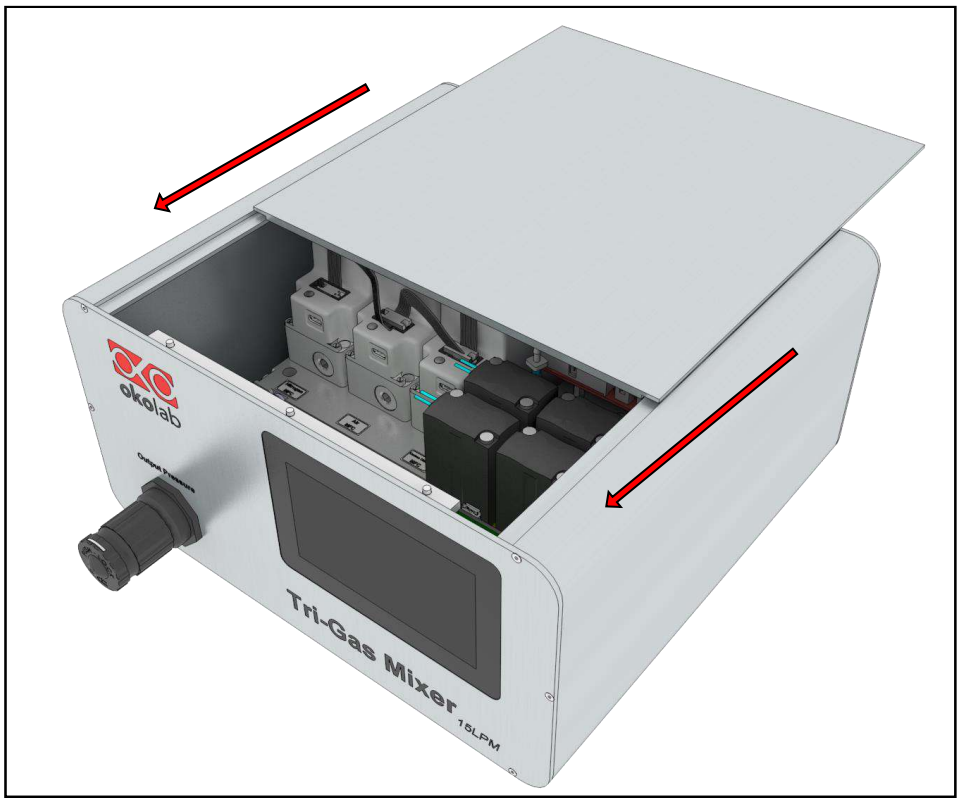


Figure 137.Cover repositioning

8. Tighten the screw clockwise by using a hexagonal key (1.5mm) as shown in Figure 138.

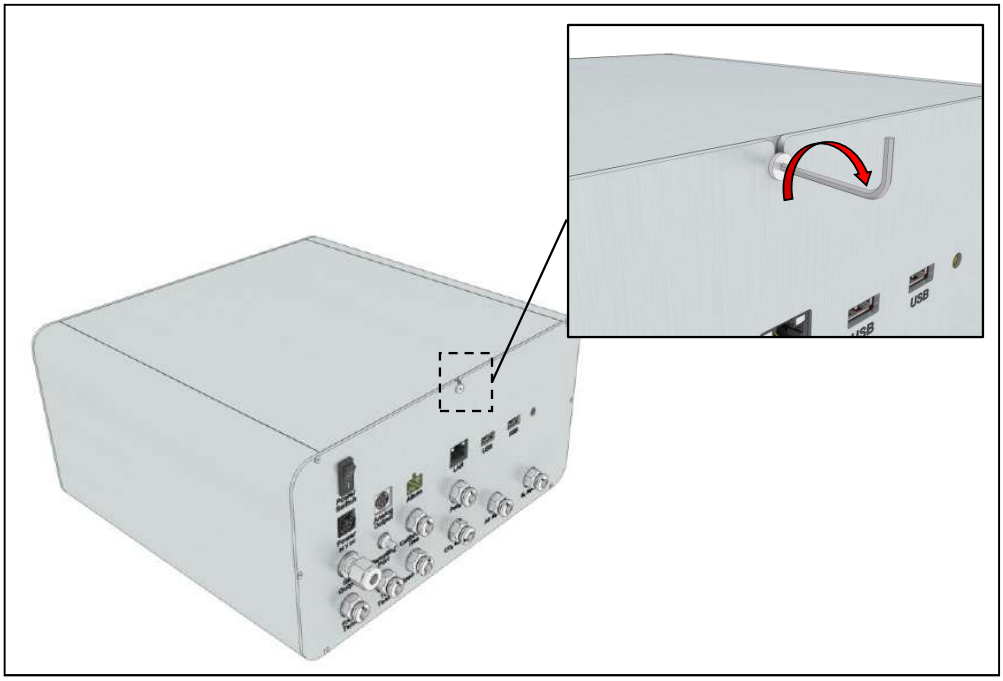


Figure 138. Cover repositioning

9. Connect the Tri-Gas-Mixer to the mains power supply. Switch the Tri-Gas-Mixer on using the power button on the rear panel and plug the power cord from the electrical outlet (see Figure 139).

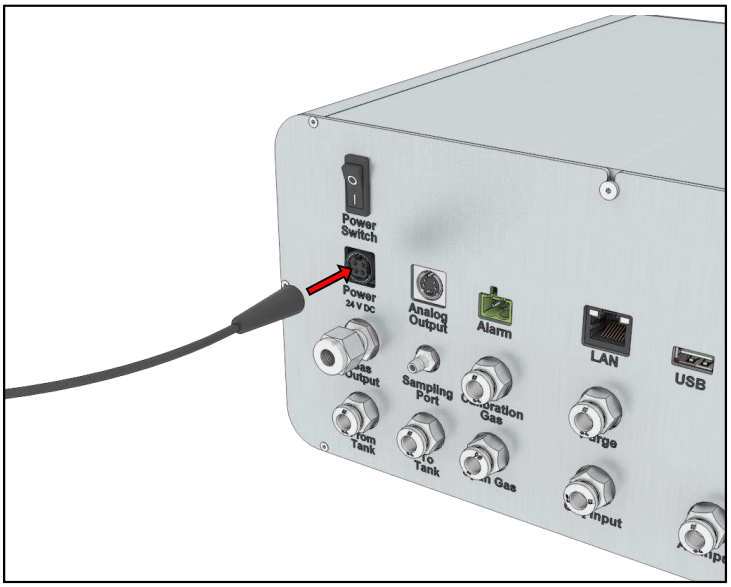


Figure 139. Power cord plugging

10. Rotate the knob of the pressure gauge of the inlet gases until the pressure reaches the desired value.

11. To verify the correct installation of the Mass Flow Controller, press the icon Okolab okolab to access to *System Information* pages (see Figure 140 a). Click the right arrow icon to move to Mass Flow Controller information panel (see Figure 140 b)

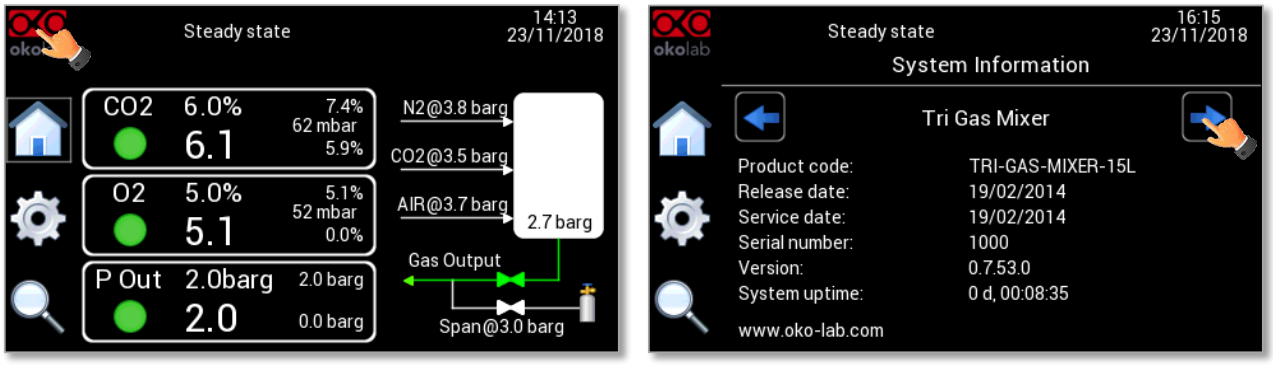


Figure 140 How to open the System Information page

In case of correct installation, it will appear replaced Mass Flow Controller information: product code, serial number and version (see Figure 141).

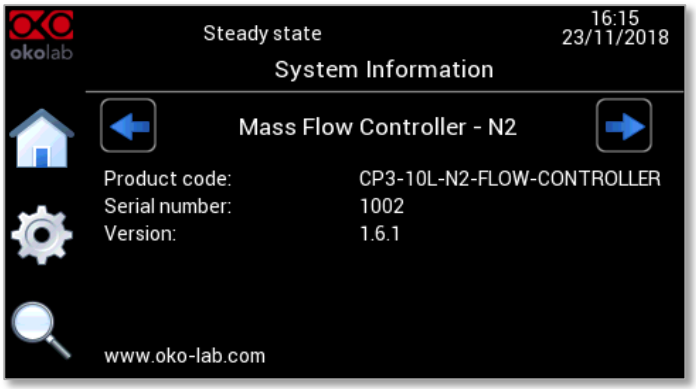


Figure 141. N2 Gas Flow Controller System Information page

In case of improper installation, an alarm message will appear with the Mass Flow Controller in red. Information about product code, serial number and version will not be reported (see Figure 142).

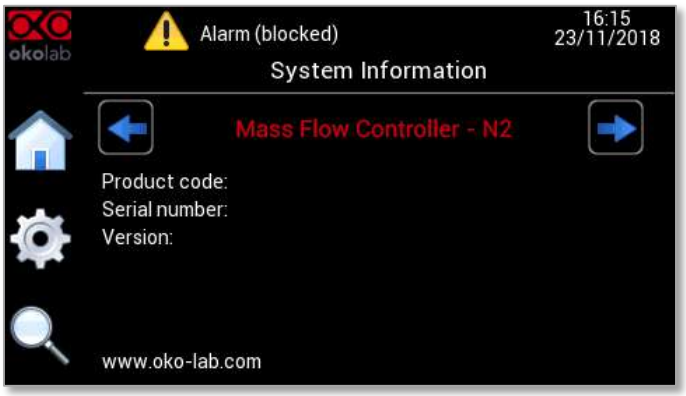


Figure 142.Message for mass flow controller improper installation

12 Cleaning & Maintenance

Cleaning

Please, follow the instructions below to clean the Tri-Gas-Mixer:

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

Maintenance

- Verify periodically the status of all hoses/ tubing. If some hoses/ tubing are 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 CO2-O2 Module each 5 years. Contact Okolab to receive a new CO2-O2 Module.

13 Support

13.1 Troubleshooting

Incorrect operations are often mistaken for malfunction. If you think that there is something wrong with a component, see the troubleshooting scheme below. Sometimes the trouble may lie in another component. Investigate the others components, electrical appliance and pneumatic system being used. If the trouble cannot be rectified even after exercising the checks listed below, ask for Okolab support at info@oko-lab.com.

Alarm	Probable cause	Remedy
Low Output Pressure	Output pressure regulator is not properly adjusted	Manually adjust the output pressure by using the knob on the front panel of the Tri-Gas-Mixer
	Output Flow rate is higher than the maximum output gas flow rate (15 l/min or 1.5 l/min)	Reduce the output gas flow rate consumption
	There is a gas leakage	Check all tubes and connectors. If the trouble persists, contact Okolab to receive assistance
Low Span Gas Inlet Pressure	The Span Gas (Premixed back up gas)pressure Regulator is not properly adjusted	Manually adjust the Span Gas pressure regulator at the proper working pressure
	The Span Gas (Premixed back up gas) cylinder is empty	Replace the Span Gas (Premixed back up gas) cylinder
Low N2 Gas Inlet Pressure	N2 Pressure Regulator is not properly adjusted	Manually adjust the N2 pressure regulator at the proper working pressure
	The N2 cylinder is empty	Replace the N2 cylinder
Low CO2 Gas Inlet Pressure	CO2 Pressure Regulator is not properly adjusted	Manually adjust the CO2 pressure regulator at the proper working pressure
	The CO2 cylinder is empty	Replace the CO2 cylinder
Low AIR Gas Inlet Pressure	Air Pressure Regulator is not properly adjusted	Manually adjust the Air pressure regulator at the proper working pressure
	The Air cylinder is empty	Replace the Air cylinder
Low Tank Pressure	Output Flow rate is higher than the maximum output gas flow rate (15 l/min or 1.5 l/min)	Reduce the output gas flow rate consumption
	There is a gas leakage	Check all tubes and connectors. If the trouble persists, contact Okolab to receive assistance
	TUBE-BR valve is closed	Verify that TUBE-BR valve position is correct
High Tank Pressure	Trouble with Purge Valve	Contact Okolab to receive assistance
Communication Error with Pressure sensors	Pressure sensors broken	Contact Okolab to receive assistance
Communication Error with CO2 and O2 sensors	CO2-O2 Module broken	Contact Okolab to receive assistance
CO2 Composition far from the setpoint	Gas Supply purity is low	Verify Gas Supply Purity
	CO2-O2 Module broken	Contact Okolab to receive assistance
	Trouble during CO2-O2 Module calibration procedure	Start a CO2-O2 Module Manual Calibration Procedure
	N2, Air or CO2 mass flow controller broken	Contact Okolab to receive assistance
O2 Composition far from the setpoint	Gas Supply purity is low	Verify Gas Supply Purity
O2 Composition far from the setpoint	CO2-O2 Module broken	Contact Okolab to receive assistance

Alarm	Probable cause	Remedy
	Trouble during CO2-O2 Module calibration procedure	Start a CO2-O2 Module Manual Calibration Procedure
	N2, Air or CO2 mass flow controller broken	Contact Okolab to receive assistance
Outlet Pressure Sensor Reading out of the range	Output Pressure sensors broken	Contact Okolab to receive assistance
Inlet Span Gas Pressure Sensor Reading out of the range	Inlet Span Gas Pressure sensors broken	Contact Okolab to receive assistance
Tank Pressure Sensor Reading out of the range	Tank Pressure sensors broken	Contact Okolab to receive assistance
N2, Air or CO2 Zero point or high leakage	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
N2, Air or CO2 Flow rate far from set point	TUBE-BR valve is closed	Verify that TUBE-BR valve position is correct
	Pressure sensor of N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
N2, Air or CO2 Valve Zero Current	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
Communication error with N2, Air or CO2 flow sensor	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
N2, Air or CO2 Inlet Pressure Reading out of the range	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
Communication Error with N2, Air or CO2 MFC	N2, Air or CO2 flow controller broken	Contact Okolab to receive assistance
Last gas calibration failed N2 MFC communication error.	Communication error with N2 Flow Controller	Contact Okolab to receive assistance
Last gas calibration failed Low N2 inlet pressure.	N2 pressure regulator is not properly adjusted	Manually adjust N2 Pressure Regulator. Please run Gas Calibration procedure from Settings -> Gas Module.
	N2 Cylinder is empty	Replace N2 Cylinder. Please restart the Gas Calibration procedure from Settings -> Gas Module.
Last gas calibration failed Gas Module communication error.	Communication error with CO2-O2 Module	Please restart Gas Calibration procedure from Settings -> Gas Module. If the problem persists, replace the CO2O2-Module or contact Okolab to receive assistance
Last gas calibration failed CO2-O2 Module Disconnected.	CO2-O2 Module is disconnected during the last gas calibration	Please reconnect CO2-O2 Module and restart the Gas Calibration procedure from Settings -> Gas Module. If the problem persists, contact Okolab to receive assistance
Last gas calibration failed Calibration failed at zero.	N2 cylinder purity is lower than 99.999%	Use N2 cylinder with a high purity.
Last gas calibration failed Procedure failed at calibration gas.	Gas Calibration settings are not correct	Verify gas calibration settings in Settings -> Gas Module -> Calibration Gas and restart the procedure
	Gas Calibration cylinder is not connected	Connect Gas Calibration cylinder. Please restart the Gas Calibration procedure from Settings -> Gas Module.
	Gas Calibration cylinder is empty	Replace Gas Calibration Cylinder. Please restart the Gas Calibration procedure from Settings -> Gas Module.

Alarm	Probable cause	Remedy
Last gas calibration failed Readings too far from calibration gas.	Gas Calibration setting are not correct	Verify gas calibration settings in Settings -> Gas Module -> Calibration Gas and restart the procedure
	Gas Calibration cylinder is not connected	Connect Gas Calibration cylinder. Please restart the Gas Calibration procedure from Settings -> Gas Module.
	Gas Calibration cylinder is empty	Replace Gas Calibration Cylinder. Please restart the Gas Calibration procedure from Settings -> Gas Module.
Problem on Gas Module readings.	N2 cylinder purity is lower than 99.999%	Use N2 cylinder with a high purity.
	CO2-O2 Module broken	Contact Okolab to receive assistance

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

14 Technical Specifications

TRI-GAS-MIXER 15 L – Technical Specifications	
Output maximum flowrate	15L/min
Output pressure	0-2 bar (0-30 psi) regulated with embedded pressure gauge
CO2 range	0-10%
CO2 accuracy	±(1.0% of Full Scale+2%raeding%). It is usually ±0.1@6.0%
CO2 sensor	Non Dispersive InfraRed (NDIR) dual wave length detector
O2 range	0-10%
O2 accuracy	±1.0% of Full Scale. It is usually ±0.1%
O2 sensor	Optical Oxygen Sensor.
Air compressor	Air Compressor 15L
Mixer dimensions	270x140x325 mm
Mixing tank size	40L
Input gas	CO2, N2, Air @ 1.4 bar (20.3psi) above output pressure

TRI-GAS-MIXER 1.5 L – Technical Specifications	
Output maximum flowrate	1.5L/min
Output pressure	0-2 bar (0-30 psi) regulated with embedded pressure gauge
CO2 range	0-10%
CO2 accuracy	±(1.0% of Full Scale+2%raeding%). It is usually ±0.1@6.0%
CO2 sensor	Non Dispersive InfraRed (NDIR) dual wave length detector
O2 range	0-10%
O2 accuracy	±1.0% of Full Scale. It is usually ±0.1%
O2 sensor	Optical Oxygen Sensor.
Air compressor	Air Compressor 1.5L
Mixer dimensions	270x140x325 mm
Mixing tank size	5L
Input gas	CO2, N2, Air @ 1.4 bar (20.3psi) above output pressure

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16 Manual Revision Table

Revision Number	Additions or changes	Date
01	Edited	December 2018
02	Modified equipment	April 2019
03	Modifed tubing	June 2019

WARRANTY

Okolab S.r.l. warrants “Tri-Gas-Mixer” 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 **it** 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 **the** 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.