



SMART Carbon Monoxide Analyzer



User Manual



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1 WELCOME

Thank you for purchasing monOx, the world first SMART Carbon Monoxide Analyzer specifically designed for Scuba divers.

You can use monOx either as a stand-alone device or connected to your smartphone via Bluetooth.

When you use monOx together with the My Nitroxbuddy App you can analyze your scuba tanks using your smartphone or tablet. You can also save logs of your analysis and add to them useful information such as images, tank info, fill cost, and dive operator.

2 MONOX OVERVIEW

monOx is a Carbon Monoxide analyzer optimized to detect Carbon Monoxide in the 0 to 20ppm range.



Integrated Tank adapter

Dot Matrix LCD with Backlight

Carbon Monoxide Sensor

Rechargeable Li-Ion battery

Activation button

Data logger:
- Carbon Monoxide
- Temperature
- Ambient Pressure

monOx features a user rechargeable Li-Ion battery, a Dot-matrix LCD display and a Bluetooth low energy transceiver so it can be programmed and/or controlled with a smartphone or a tablet.

The monOx housing includes an integrated tank adapter so it can be used to analyze a gas directly from a SCUBA tank. Additionally DiveNav offers a low pressure BC adapter accessory that mounts directly on the housing.

3 WARNINGS

WARNING: Scuba Diving is a dangerous activity. Diving with an incorrect breathing gas mix could lead to serious personal injury and even death. Make sure you know how to properly calibrate and use your monOx. Read and follow the instructions contained in this manual.

WARNING: Do not use monOx if it is not calibrated.

WARNING: Keep monOx away from heat sources.

WARNING: Do not expose monOx to direct sunlight.

WARNING: Do not dive if your breathing gas mix contains Carbon Monoxide.

WARNING: Do not place monOx under heavy object such as scuba tanks.

WARNING: Store monOx in a dry place.

WARNING: Do not immerse monOx underwater.

WARNING: monOx includes an electrochemical sensor containing chemicals which can cause burns if they come in contact with eyes, skin and other body parts. Dispose of sensors according to local regulations.

WARNING: monOx is designed for use at atmospheric pressures only. It is not designed for use in a hyperbaric chamber. Use of monOx in a hyperbaric chamber will result in incorrect readings and may damage the unit.

4 BEFORE FIRST USE

When you unpack your monOx make sure you have received all the accessories; if you have ordered a basic monOx you should have received also an USB charging cable. If you have ordered a monOx DELUXE, in addition to the USB cable you should have also received a carrying case and the Low Pressure Inflator adapter. Please note that the carrying case is NOT waterproof.

Before you use your monOx for the first time make sure that it has not been damaged during shipping or that internal components did not come loose. First check monOx for any sign of damage then gently shake it and listen for any rattling sound.

Now turn ON your monOx by pushing the activation button and check for the battery symbol to be full. If not, place monOx under charge for a couple of hours.

If monOx shows a Carbon Monoxide value higher than zero it could be due to the fact that the analyzer might have been exposed to high values of Carbon Monoxide during shipping. In this case just place monOx in an area well ventilated and away from possible sources of Carbon Monoxide and let it recover for an hour or so.

5 QUICK GUIDE

To turn ON your monOx just push the activation button; monOx will first show a welcome screen and then, if there are no errors or warnings conditions, will enter the main screen.

See the SETTINGS section for more details on errors or warnings conditions and the various operating screens supported by monOx.

There is no need to turn OFF your monOx as it will automatically go to sleep after a couple of minutes. You can program the sleep time using the My Nitroxbuddy app. See the My Nitroxbuddy app tutorial on www.divecomputertraining.com for more information.

monOx comes with a Carbon Monoxide sensor that is already factory calibrated and its calibration should last about 1 year from the factory shipment date.

See the CARBON MONOXIDE SENSOR section for more info on how to calibrate the Carbon Monoxide sensor.

To use your monOx if the unit is asleep turn it ON by pushing the activation button, then, once monOx shows the main screen, position your monOx in front of the valve of the scuba cylinder containing the breathing gas you want to analyze and open the tank valve slowly so to limit the gas flow to few liters per minute.

Hold steady and after few seconds you will see the value of CO updating on the display. We recommend to hold the analyzer in position for about 60 seconds.

Once the analysis is completed you have the option to hold the results on the screen for about 60 seconds; to do so, just push the button until you see the letter "H" next to CO on the top of the display.

6 SETTINGS

6.1 Button

monOx 's single button has two modes: PUSH or HOLD. PUSH is when you push the button for about one second and then you release it.

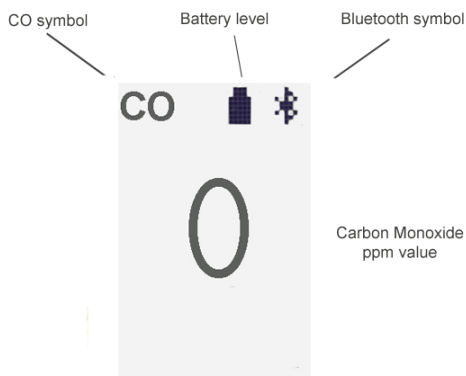
HOLD is when you push the button for more than 2 seconds and then you release it.

For multiple pushes, like when navigating a sub-menu, you will need to wait about one second between consecutive pushes.

6.2 Display

MonOx is equipped with a Dot-Matrix LCD display with user programmable backlight; you can program the intensity of the backlight and its duration.

The image below shows the Normal Operating Mode screen.



The bluetooth symbol could be either OFF, ON or flashing. When it is flashing it means that monOx is advertising its presence and it is ready to be connected to a smartphone equipped with the My Nitroxbuddy app.

If the bluetooth symbol is always ON it means that monOx is actually connected to a smartphone.

If the bluetooth symbol is OFF it means that the radio is sleeping.

To awake the bluetooth radio just PUSH the activation button and the bluetooth symbol will begin to flash and will continue to do so for about 2 minutes. After that period that bluetooth radio will go back to sleep.

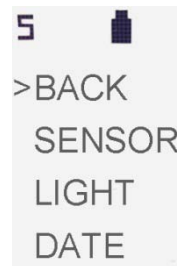
6.3 Menu Navigation

The navigation among the various menus is done via a combination of HOLD and PUSH. In general a HOLD enters a sub-menu while a PUSH moves the cursor to the next item in the menu.

To enter the Main Settings menu from the Normal Operating Mode just HOLD the button.

Please note that the stand-alone settings are accessible only when monOx is NOT connected to a smartphone.

If you try to access the Main Settings menu while the analyzer is connected to a smartphone, the analyzer will display a warning screen and will give you the option to disconnect from the smartphone.



This image on the right shows the Main Settings menu.

This menu contains 4 sub-menus: BACK, SENSOR, LIGHT and DATE.

To access a sub-menu first position the > pointer on the line you want to select by as many PUSH as required then enter the sub-menu by a HOLD.

If you HOLD when BACK is selected you will go back to the previous menu. In the case of the image above you will go back to the Normal Operating Mode.

The S symbol on the top row indicates that you are in the settings operating mode.

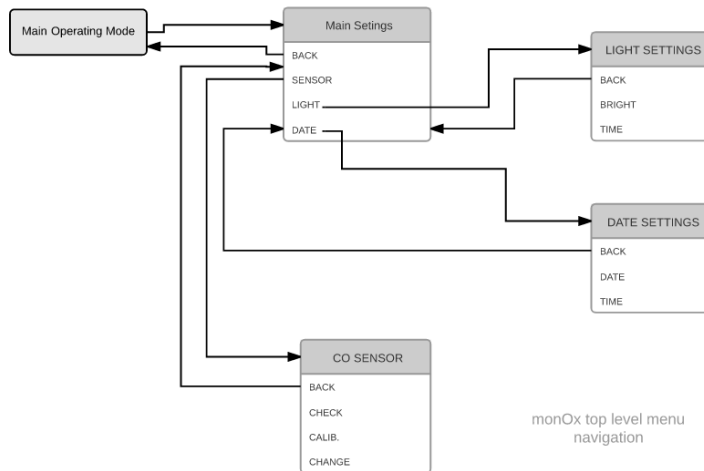
The SENSOR sub-menu allows you to access settings for the Carbon Monoxide sensor.

The LIGHT sub-menu allows you to program intensity and duration of the backlight.

The DATE sensor allows you to program date and time.

Please note that the settings available in stand-alone mode are a sub-set of the full set of settings available with the My Nitroxbuddy app.

See below the top level view of monOx menus.



7 CARBON MONOXIDE SENSOR

monOx comes with a Carbon Monoxide sensor that is already factory calibrated and its calibration should last about 1 year from the factory shipment date. More often you calibrate the CO sensor and more accurate it will be.

monOx uses an extremely sensitive CO sensor designed to operate below 100ppm but if it is exposed to a very high concentration of Carbon Monoxide (like putting it behind the tailpipe of a car - or riding for a long time in heavy traffic) the CO sensor could take few hours to go back to zero and it could also get permanently affected as the zero baseline could go up a bit - but this could be easily solved by performing a zero calibration.

If you do not have access to certified calibration gasses or if you do not want to perform the Carbon Monoxide sensor calibration yourself you can return your monOx to us and we will calibrate it for you. Please check with DiveNav customer service for costs and procedures.

7.1 CO Sensor Bump Test

It is good practice to periodically verify if the Carbon Monoxide sensor is working properly. The simplest way to do so is to perform a bump test using your breath.

According to a paper from Ryter and Choi, the exhaled Carbon Monoxide value of non-smokers could be about 3 ppm while the mean value of exhaled Carbon Monoxide for smokers was 17 ppm.

Before you perform a bump test, you might want to enable the display of the decimal digit (to display "0.0" instead of just "0"). To do so, connect to your monOx with a smartphone equipped with the My Nitrox buddy app, go to the settings and enable "Display Decimal".

Now, take a long breath hold it as long as you can and then slowly exhale it into your monOx.

If you are a non smoker you might see values up to 3 ppm. If you are a smoker the CO value could be much higher.

More you hold your breath before exhaling and more the CO value will change.

7.2 CO Sensor Calibration

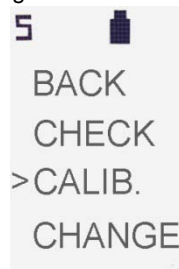
As indicated earlier, with monOx you can perform a Carbon Monoxide sensor calibration either with the stand-alone unit or with the assistance of a smartphone.

To calibrate the Carbon Monoxide sensor while in stand-alone mode, first turn the unit ON.

Then, while the unit is in the Normal Operating Mode, HOLD the button and enter the Main Settings menu.

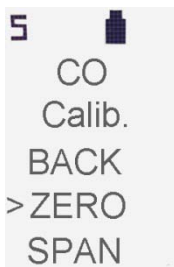
Now, PUSH the button to position the pointer on the SENSOR sub-menu and HOLD the button to enter it. Scroll down to select the CALIBRATION sub-menu and enter it.

In this menu you can perform either a ZERO point calibration or a SPAN calibration.



7.2.1 ZERO point Calibration

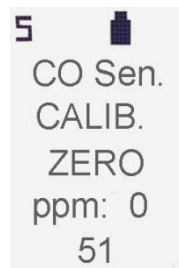
The ZERO point calibration could be used to take care of the slow aging of the Carbon Monoxide sensor as it resets the CO display to zero.



In order to perform a ZERO point calibration you need to have a reference gas with 0 ppm such as a scuba tank containing good air or just ambient air.

In the CO CALIBRATION sub-menu select the ZERO sub-menu and then enter it.

Now, expose monOx to a reference gas with 0 ppm and, when ready, PUSH the button; monOx will show the screen on the right and initiate a 60 seconds countdown.



During a Carbon Monoxide sensor calibration it is very important to expose monOx to a known source of gas flowing at a constant rate.

WARNING: If you plan to perform an Carbon Monoxide sensor calibration by using ambient air make sure you are far from sources of pollution like cars, trucks, boats and that you let monOx ambient for at least 5 minutes before performing the calibration as the gas flow within the device is reduced and a shorter period might produce incorrect results.

We recommend you perform the ZERO point calibration frequently.

7.2.2 SPAN Calibration

The procedure to perform the SPAN calibration is similar to the one used for the ZERO point calibration; the most notable difference is that you will need to use a certified calibration gas containing 20ppm of Carbon Monoxide.

7.3 CO Sensor Replacement

You can replace the Carbon Monoxide sensor yourself or send your monOx back to us for service and sensor replacement.

If you want to replace the CO sensor yourself you will need first to open monOx by removing the 3 screws on the back of the unit and the large O-ring on the tank adapter.

Then unplug the CO sensor from the board and replace it with the new one and close the unit.

WARNING: the Carbon Monoxide sensor contains chemicals which can cause burns if they come in contact with eyes, skin and other body parts. Dispose of the Carbon Monoxide sensor according to local regulations.

After you have physically replaced the sensor you will need to properly program the analyzer; to do so go to the CO SEN sub-menu, scroll down to the CHANGE sub-menu and enter it.



Now, PUSH the button to confirm that you have replaced the Carbon Monoxide sensor and monOx will acknowledge it and turn off after a few seconds.

Please note that when you replace the Carbon Monoxide sensor you will need to calibrate the new sensor; first you will need to perform the ZERO point calibration using a gas containing 0 ppm CO and then you will need to perform the SPAN calibration.

WARNING: After replacing a Carbon Monoxide sensor you will need to make sure that monOx is properly powered (battery is almost full) and wait at least 4 hours before you can proceed with the CO sensor calibration. Performing a CO sensor calibration too soon after a sensor replacement might produce incorrect results.

8 BATTERY

monOx is equipped with a user replaceable LIR 10440 AAA 3.7V rechargeable battery that can be easily recharged using the provided USB cable. We strongly recommend you keep the battery properly charged all times.

WARNING: If you do not keep the battery properly charged the battery might die off and you might not be able to recharge it all.

WARNING: If you let the battery become very empty or even die, it might take several hours to recharge it.

WARNING: If you let the battery die, the Carbon Monoxide sensor might lose power. When the Carbon Monoxide loses power it will lose its bias. Once you re-apply power to the Carbon Monoxide sensor it might need several hours to recover its original status.

9 WARRANTY

DiveNav, Inc. (the "Company") warranty obligations for monOx (the "Product") are limited to the terms set forth in this document as well as those set forth in the Warranty section of the company website.

Company warrants the Product against substantial defects in material and workmanship under normal use for a period of one (1) year from the date of original purchase (the "Limited Warranty").

This Limited Warranty is non-transferable and covers only the original purchaser.

An original or copy of the sales receipt from the original sales retailer or Company website is required to validate the warranty coverage.

This Limited Warranty does not cover the battery and products purchased through non-authorized dealers. Warranty claims must be made directly to the Company.

9.1 Limitation of Liability

IN NO EVENT SHALL COMPANY, NOR ITS AFFILIATES, NOR ITS EMPLOYEES, OFFICERS, DIRECTORS, AGENTS, CONTRACTORS, DISTRIBUTORS, SUPPLIERS OR ASSIGNS (THE "RELEASED PARTIES") BE LIABLE TO YOU OR ANY THIRD PARTY FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGE ARISING OUT OF THE USE OF THE PRODUCT, INCLUDING, WITHOUT LIMITATION, PROPERTY DAMAGE, LOSS OF VALUE OF THE PRODUCT, DEATH, INJURY OR ANY OTHER DAMAGES THAT MAY BE CAUSED TO YOU, YOUR FAMILY, HEIRS, ESTATE OR ASSIGNS. NOTWITHSTANDING ANY DAMAGES THAT YOU MIGHT INCUR FOR ANY REASON WHATSOEVER (INCLUDING, WITHOUT LIMITATION, ALL DAMAGES REFERENCED HEREIN) AND ALL DIRECT OR GENERAL DAMAGES IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND OTHERWISE), THE ENTIRE LIABILITY OF THE COMPANY SHALL BE LIMITED TO THE AMOUNT ACTUALLY PAID BY YOU FOR THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

9.2 Exclusions and Limitations

Company's Limited Warranty applies only to the Product. The warranty does not apply to any non-Company products, even if packaged or sold with the Product. This warranty does not apply to damage caused by abuse, misuse, accident, tampering, force majeure, or modifications of the Product.

9.3 Remedy

Your sole and exclusive remedy for a breach of this Limited Warranty, and Company's sole and entire liability is, at Company's discretion, to repair or replace the defective Product or refund the purchase price of the defective Product within thirty (30) calendar days of the date of purchase. Repair or replacement (including part and labor) shall be made at Company's expenses. Company reserves the right to send you a replacement product that is the same or an equivalent substitute. Replacement products will be furnished only on an exchange basis. Replacement products are warranted as above for the remainder of the original applicable Product warranty period.

9.4 Warranty Disclaimer

EXCEPT AS SET FORTH ABOVE IN THIS LIMITED WARRANTY, THE PRODUCT IS PROVIDED ON AN "AS IS" BASIS AND THE COMPANY MAKES NO OTHER EXPRESS OR IMPLIED WARRANTIES TO THE EXTENT PERMITTED BY LAW AND SPECIFICALLY DISCLAIMS AND EXCLUDES ALL IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IF SUCH DISCLAIMER OF ANY IMPLIED WARRANTY IS NOT PERMITTED BY LAW, THE DURATION OF ANY SUCH IMPLIED WARRANTIES IS LIMITED TO THE DURATIONS SET FORTH IN THIS LIMITED WARRANTY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY MAY LAST, SO SUCH LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.

9.5 Obtaining Warranty Service

If you wish to make a claim under this warranty with respect to the Product, you can do that either by using our website or by sending an e-mail to customer.service@divenav.com with the following information:

- 1) Attach photocopy of original purchase receipt.
- 2) Provide purchase date, product UPC code, and serial number.
- 3) Write brief description of the problem.
- 4) Provide a telephone number and e-mail address at which you can be reached during normal business hours.

All of the above information is required before a warranty claim will be accepted. Once Company validates your claim, we will issue you an RMA (Return Material Authorization) number and shipping information.

10 FCC

10.1 FCC Compliance Statement

FCC ID: RSY2015COOTWO

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- * Reorient or relocate the receiving antenna.
- * Increase the separation between the equipment and receiver.
- * Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

* Consult the dealer or an experienced radio/TV technician for help.

10.1 FCC Caution

The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

11 COPYRIGHT NOTICE

This manual is copyrighted and it may not be copied, reproduced, translated or transformed into any electronic format without prior written consent of DiveNav, Inc.