Analox CO_2 Buddy®

Carbon Dioxide Analyser User Manual for your Personal Protection

WARNING

IT IS IMPORTANT THAT THESE INSTRUCTIONS ARE READ BEFORE USING THE ANALOX CO_2 Buddy

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We are delighted to welcome you as a user of the Analox CO2 Buddy

The following guide should assist you in using your CO2 Buddy

However …….

IF YOU EVER NEED US

PLEASE CONTACT

+44 (0) 1642 711400

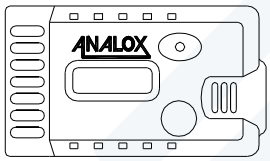
www.analox.net

CONTENTS

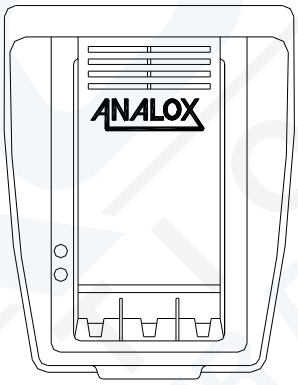
1.0 Packaging and Contents Check

On opening your Analox CO_2 Buddy, please check you have the following items.

a) CO_2 Buddy
b) Mains powered Buddy Cradle Charger and/or optional Vehicle Charger
c) User manual
d) Test Certificate
e) Any accessories ordered for your CO_2 Buddy, from:
    - Datalogging kit
    - Sample draw kit
    - Calibration kit



CO_2 Buddy



CO_2 Buddy Charger

2.0 About the CO_2 Buddy

The Analox CO_2 Buddy has been designed to detect and warn users of unsafe levels of Carbon Dioxide (CO_2). This makes the CO_2 Buddy ideal for people working in potentially hazardous environments where CO_2 is used, stored or produced. The analyser has been designed for continuous wear during the working day. It is supplied with a belt loop / pocket clip to enable you to choose a style which suits your working environment.

The CO_2 Buddy detects CO_2 using infra red absorption, offering the advantages of low cost of ownership throughout the instruments working life. A rechargeable NiMH battery ensures up to 12 hours operation between charges. Factory set, three stage audible and visual alarms will immediately alert you to unsafe levels of CO_2. In the event of a sensor or electronic malfunction an audible and visual 'FAULT' alarm will activate.

2.1 Datalogging

The CO_2 Buddy is fitted with a datalogging facility as standard. This logs the measured level of CO_2 and the corresponding date and time. The CO_2 Buddy has sufficient capacity to log 5 x 12-hour shifts before overwriting. This information can be transferred through a data link using the optional software, into a spreadsheet.
Datalogging kit Part No. SA2 K03 50

3.0 Operation

During normal operation the CO_2 Buddy measures CO_2 in contact with the sensor (the green vent on the side of the analyser), by diffusion. For other methods of operation please see Section 3.6.

3.1 How to Switch the CO_2 Buddy On and Off

To turn the CO_2 Buddy on, press the 'CO_2' button. Each of the indicator lights will flash, together with an audible beep. The CO_2 Buddy will enter into a warm up phase for 40 seconds. During warm up the yellow 'FAULT' light will be permanently on and the green 'OK'[1] light will flash every 2 seconds. After the warm up period, the green 'OK' light will flash every 2 seconds, and the yellow light will go off to inform you that the instrument is working correctly.

To turn the standard CO_2 Buddy off[2], press and hold the 'CO_2' button for 2 seconds. The CO_2 Buddy will emit a continuous tone and the yellow 'FAULT' light will turn on. If fitted the display will turn off. The button can then be released.

The Buddy will also be turned off automatically as it is placed in the Charger (refer Section 3.3.1).

3.2 Test Button

The 'CO_2' Button doubles as a test button. In the absence of any alarms press once to check the alarm indicators and audible sounder are operating correctly. Each of the indicator lights will flash, together with an audible beep.

1 On some customer specific versions the green light may be labeled 'GOOD' instead of 'OK'

2 On some customer specific versions the Buddy may only be turned off when it is placed in the charger

3.3 Charging the battery

The CO_2 Buddy operates using a rechargeable Nickel Metal Hydride battery which will provide approximately 10-12 hours of use between recharging.

Two push buttons on the front face of the Buddy allow additional control of the charging process. Under normal usage as described below , the push buttons are not required. The RAPID and DISCHARGE buttons are shown on Page 10.

The mains charger may be left plugged in at all times if desired. If there is no Buddy in the charger, both indicators will be off.

3.3.1 Normal Charge Mode

To charge the battery, place the CO_2 Buddy into the charger, and ensure that the charger is plugged into the appropriate power source (mains supply or vehicle cigar lighter depending on type of charger).

Note that the green indicator light on the charger illuminates to confirm that charging is taking place.

You must switch off the Buddy as detailed in Section 3.1 whilst it is charging. Failure to do so may result in a partially charged battery. Standard Buddies will switch off automatically when placed in the charger.

Used in this mode, the charger will optimally charge the battery in approximately 10 hours. Whilst the battery is charging, the green indicator on the charger will flash. When the battery is fully charged, the green indicator will be permanently on. The Buddy may then be removed from the charger and used normally. If the Buddy is removed from the charger whilst the green indicator is still flashing, it will only have been partially charged.

3.3.2 Rapid Charge Mode

For greater convenience, you may select the 'Rapid Charge' mode by pressing the 'Rapid' button. Typically, a flat battery will be recharged in just over 1 hour. During the Rapid charge, the red indicator will be lit. When completed, the charger will revert to the normal charging mode. If for any reason you want to terminate the rapid charge, either press the Rapid switch again to turn it off, or simply remove the Buddy from the charger.
Note that the Rapid Charge mode is disabled in cold conditions (below approximately 0°C) to protect the battery.

3.3.3 Battery Maintenance – Discharging

Over an extended period of time, rechargeable batteries lose some of their performance. If you realise that the battery life is poorer than expected, it is possible to partially re-vitalise the battery. With the Buddy in the charger, press the Discharge button. This will then discharge the battery fully for a period of approximately 12 hours, and then automatically recharge the battery ready for re-use within a further 3 hours. During the Discharge period, both indicators flash, and then during the charging period, the normal charging indicators will appear. The Discharge process may be terminated by pressing either of the switches, and the Charger will proceed to charge the Buddy in Rapid mode.

As this procedure lasts for 15 hours, do not select it if you plan to use the Buddy within 15 hours. In an emergency, terminate the process and select a Rapid charge to make the Buddy available for use as quickly as possible.

This feature should not be used more than once per month on a particular Buddy, or the life of the battery may be affected. It is recommended to perform this task every two months of regular use.

3.3.4 Additional Vehicle Charger Considerations

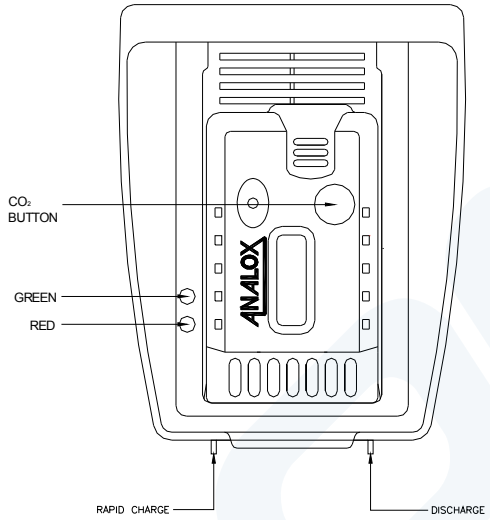
Vehicle chargers should be disconnected from the cigar lighter when not in use to prevent unnecessary draining of the vehicle battery. Note that the wiring of cigar lighter sockets varies between different makes of vehicles. Some are permanently powered, whilst others are only powered while the vehicle ignition is on. In the latter case, the special operating modes of the charger (eg discharging) must be reselected when the vehicle ignition is turned back on. Vehicle chargers will automatically select the Rapid Charge Mode as opposed to the Normal Charge Mode when a Buddy is inserted. The Buddy will automatically switch off when first placed in the charger. It is expected that the Buddy will only be placed in the charger when it needs to be charged, rather than always placing it in the charger, even for the shortest journeys.

3.3.5 Charger Fault Conditions

Under a Fault condition of the charger, the red and green indicators will flash alternately. In this case make sure that the Buddy has been seated correctly in the charger. If the problem still persists, report the fault to the supplier.

Under no circumstances should you attempt to recharge the Buddy from an alternative power source.

3.3.6 Summary of Charger Status Indicators



GREEN INDICATOR	RED INDICATOR	MEANING
		The Charger is switched off, or there is no Buddy in the Charger
☼		The Buddy is charging at it's normal overnight rate
●		Charging of the Buddy has been completed
	●	The Buddy is presently in Rapid Charge mode
☼	☼	The indicators are flashing together means the Buddy is discharging
☼	☼ (ALTERNATE)	The indicators are flashing alternately means the Buddy Charger has detected a Fault. Ensure that the Buddy is seated correctly in the charger. If the fault persists, switch the charger off and then back on. If still faulty contact the supplier for assistance

(● Indicator On ☼ Indicator flashing)

3.4 Alarms

During normal operation the CO_2 Buddy will flash the GREEN 'OK' light every 2 seconds, and the liquid crystal display, when fitted, will show the current measured value of CO_2 concentration.

The CO_2 Buddy has been factory set with 3 alarm points.

'WARN' 0.5% CO_2 (long term exposure limit for CO_2)

'DANGER' 1.5% CO_2 (short term exposure limit for CO_2)


'FATAL' 4% CO_2 (narcotic effects begin to occur)

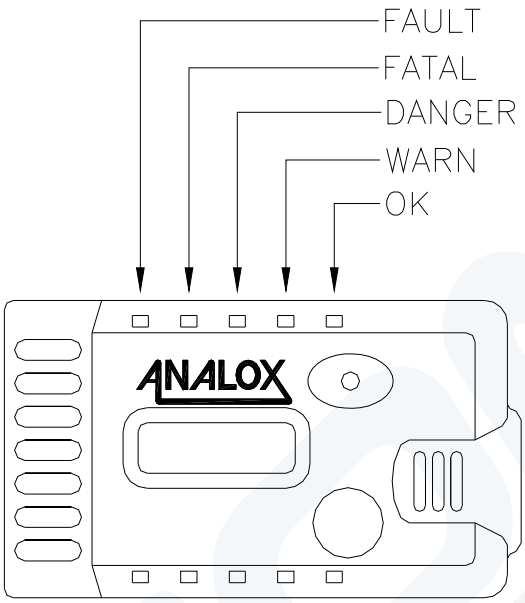
'FAULT'

Alarms must be taken seriously; you could be in a potentially hazardous environment and must follow established procedures. The safest action is to leave the hazardous area, returning only when further testing has shown the area to be safe.

If the CO_2 level rises above the 0.50%, the RED 'WARN' light will flash, and the buzzer will sound, every 2 seconds.

If the CO_2 level continues to increase up to 1.5%, both the RED 'WARN' and RED 'DANGER' lights will flash, together with a faster buzzer sound, every $^1/_2$ second.

If the CO_2 level continues to increase up to 4.0%, the RED 'FATAL' light will flash, in addition to the 'DANGER', and 'WARN' lights, together with a faster buzzer sound, every $^1/_4$ second.



The sequence of alarm lights is shown in the diagram above. The alarm lights are mirrored on the opposite side of the CO_2 Buddy.

When the level of CO_2 begins to fall, the alarms will turn off in reverse sequence, from 'FATAL' to 'DANGER' to 'WARN', until only the 'OK' light is flashing, indicating that the CO_2 level is below 0.5%.

If you would like information regarding the effects of CO_2 please see our website www.analox.net.

If the analyser detects that the internal electronics, or the sensor has failed, the buzzer will sound at a fast rate and flash the yellow 'FAULT' light. For further information on faults see Section 3.5.

3.5 Faults

3.5.1 Indication at Switch On

CO_2 readings are inhibited during a brief Warm Up period when the CO_2 Buddy is first switched on. During warm up the 'FAULT' light will be permanently on, and the buzzer will be silent.

If the 'FAULT' light flashes during the Warm Up period, and the buzzer sounds, the analyser is indicating an internal calibration error. The CO_2 Buddy should be returned to your supplier for servicing.

3.5.2 Low Battery Warning

As the battery power is drained, the analyser will issue a warning beep approximately once every 30 seconds. The CO_2 Buddy is designed to operate for approximately 20 minutes, on a low battery, before shutting down.

If the analyser determines that the batteries are in too discharged a state for the analyser to operate correctly, the buzzer will sound at the very fast rate for 5 seconds. If a display is fitted, the display will read 'BATT'. The CO_2 Buddy will then shutdown and must be recharged before being used again.

3.5.3 Fault Conditions

The Buddy can detect a number of internal fault conditions. These indications are listed in Section 4.0. In the event of an instrument fault you must be aware that harmful levels of CO_2 may be present, and should follow recommended procedures.

The CO_2 Buddy should be returned to your supplier for servicing.

** Note for special CO_2 Buddies of the type that will only switch off when placed in a charger. In the event of an instrument fault the audible alarm can be silenced. To silence the alarm press and hold the CO_2 button for 2 seconds, until the CO_2 Buddy stops beeping. The visual fault alarm will remain flashing.*

IMPORTANT

If at any time the GREEN 'OK' light is **not** flashing and
the YELLOW 'FAULT' light **is** flashing
the analyser must not be used.
You should contact your supplier.

If there are no indicator lights flashing
ensure that the battery is charged
and the unit is switched on.

3.6 Accessories

The CO_2 Buddy can be supplied with the following accessories.

3.6.1 Sample draw kit

The Sample Draw Kit (*Part No: 7000-0100)* allows you to sample a confined space atmosphere before entering. Confined spaces could include:

Dispense gas storage area	CO2 gas storage area
Fermentation vat	Sewer
Manure Pit	

The Sample Draw Kit consists of:

- 1 x Flow through adapter
- 1 x Hose
- 1 x Aspirator bulb

The sample draw kit is supplied assembled; simply push the flow adaptor into the green CO_2 sensor on the side of the CO_2 Buddy. Pump the aspiration bulb; the CO_2 Buddy is now measuring the CO_2 concentration of the gas drawn in at the probe.

3.6.2 Datalogging kit

The Datalogging kit (*Part No: SA2 K03 50)* comprises software and a download lead, enabling you to gain an understanding of your working environment.

For further information see Section 2.1.

3.7 On-line measurement

To measure or monitor the level of CO_2 in gas from a pressurised source remove the aspirator bulb and probe from the Sample Draw Kit, and connect the hose to the gas outlet. The flow rate must be a minimum of 150ml/min and a maximum of 2000ml/min. Under no circumstances should the sensor be pressurised, as this will result in incorrect readings of CO_2.

4.0 Quick Check

Indicator Lights (☼ Indicator flashing ● Indicator On)					Buzzer	Condition	Action
Green 'OK'	Red ⚠1	Red ⚠2	Red ☠	Yellow 'FAULT' ⚠!			
					Silent	Turned off	
☼				●	Silent	Warm up	None
☼					Silent	Safe CO_2 <0.5%	None
	☼				2 sec beep	CO_2 > 0.5%	CO_2 leak detected
	☼	☼			½ sec beep	CO_2 > 1.5%	CO_2 leak detected
	☼	☼	☼		¼ sec beep	CO_2 > 4%	CO_2 leak detected
☼					1 beep every 30 secs	Low battery warning	Recharge battery
☼					Rapid beep for 5 secs	Low battery CO_2 Buddy will shutdown	Recharge battery
	☼	☼	☼	☼	Rapid beep	Detector fault or IR Source failure	Contact service agent
☼				☼	Rapid Beep	Internal calibration error	Contact service agent
	Slow ☼	Rapid ☼		Rapid ☼	Rapid beep	Self Check Error	Contact service agent

5.0 After Sales Service

5.1 Battery Replacement

Battery replacement will depend on usage of the CO_2 Buddy; the battery is expected to last between 2 and 4 years. Replacement batteries and battery fitting is available from your supplier or Analox directly.
NOTE: Only batteries supplied by Analox should be used and fitting replacement batteries **MUST** be done by a trained technician and **NOT** the Buddy operator.

5.2 Testing the Alarms

To test the alarms, attach a flow adaptor to the sensor, and pass a known concentration of CO_2 over the sensor at a flow rate of 150-2000ml/ min. Ensure the CO_2 concentration of the gas is higher than the alarm point. For example, use 0.75% CO_2 or 1.0% CO_2 to check the 0.5% alarm.

The table below can be completed when checking alarms. Calibration is required on an annual basis.

Date	Gas	Alarm 1	Alarm 2	Alarm 3

5.3 Calibration

To maintain optimum performance the CO_2 Buddy must be calibrated every year. Recalibration will also be required if the CO_2 Buddy is not alarming at its designated set points of 0.5%, 1.5% and 4% CO_2.

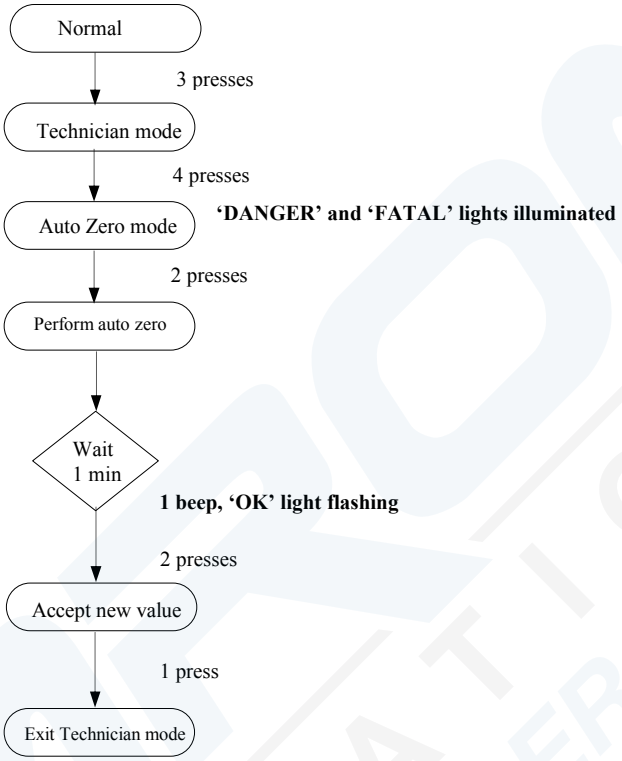
To recalibrate the instrument you will need a calibration software kit. The kit will contain,

- Calibration software & manual
- Download lead
- Flow adaptor

Calibration software kit Part No. 7000-0200

5.3.1 Setting the Zero value

Setting the Zero value is a quick method of calibrating the CO_2 Buddy. In order to set the zero value follow the steps below and the procedure shown in the diagram.



PROCEDURE TO SET THE ZERO VALUE	
STEP	DETAIL
1	Connect tubing from the flow adaptor to the free gas inlet port on the flow meter
2	Connect tubing from the flow meter to the regulator on the bottle of Nitrogen
3	Push the flow adaptor into the green sensor cap on the CO_2 Buddy
4	Turn the Nitrogen on and set the flow rate to between 150-2000ml/min
5	Allow the gas to flow over the sensor for 5 minutes. If fitted the display should read 0.00. Any small deviations will be corrected by this calibration procedure
6	Press the CO_2 button three times in succession to enter Technician mode, each press must be within 1 second of each other. The instrument will beep with each press. If you have entered Technician mode successfully the timing of the flash of the green 'OK' light will reverse, meaning the light will be turned on more than it is turned off
7	Press the CO_2 button four times in succession to enter the auto zero function. The 'DANGER' and 'FATAL' alarm lights 2 and 3 will illuminate to show you are in auto zero mode
8	Press the CO_2 button two times in succession, and wait 1 minute. The CO_2 Buddy is performing an auto zero, when it has finished the CO_2 Buddy will emit one beep, the 'DANGER' and 'FATAL' lights will turn off, leaving only the green 'OK' light flashing. If fitted the display will read 0.00
9	Press the CO_2 button two times in succession to accept the new zero value
10	Press the CO_2 button once to exit Technician mode. The CO_2 Buddy will restart, flashing each indicator and beeping as at normal start up

5.4 Warranty

The Analox CO_2 Buddy is supplied with a 2-year warranty. Analox terms and conditions of sales apply.

5.5 General Care

- Keep the sensor face free from dust, if possible.
- Keep the CO_2 Buddy and Charger out of direct sunlight.
- The CO_2 Buddy has been designed to be splash proof; it must not be immersed in water.
- Do not place metallic or conductive objects in the Charger, as this could short out the electrical connections.
- Ensure the Charger is kept clean, excess dust could cause failure of the Infra Red communications ports.
- The Analox Buddy should be protected from salt water spray at all times.

6.0 WARRANTY INFORMATION

We provide the following Warranties for the Analox CO2 Buddy:

A 5 year sensor warranty.
A 2 year electronics warranty.

In both cases the Warranty period runs from the date of our Invoice.

We warrant that the equipment will be free from defects in workmanship and materials.

The Warranty does not extend to and we will not be liable for defects caused by the effects of normal wear and tear, erosion, corrosion, fire, explosion, misuse, use in any context or application for which the equipment is not designed or recommended, or unauthorised modification.

Following a valid Warranty claim in accordance with the above, the equipment, upon return to us, would be repaired or replaced without cost or charge but in our discretion we may elect instead to provide to you which ever is the lesser of the cost of replacement or a refund of net purchase price paid as per our Invoice on initial purchase from us. We shall have no liability for losses, damages, costs or delays whatsoever. We shall have no liability for any incidental or consequential losses or damages. All express or implied warranties as to satisfactory or merchantable quality, fitness for a particular or general purpose or otherwise are excluded and no such Warranties are made or provided, save as set out in this Clause 7.

In order to effectively notify a Warranty claim, the claim with all relevant information and documentation should be sent in writing to:

Analox Sensor Technology Limited
15 Ellerbeck Court
Stokesley Business Park
Stokesley
North Yorkshire
TS9 5PT

Or by e-mail to : info@analox.net
Or by Fax to : +44 1642 713900

We reserve the right to require from you proof of dispatch to us of the notification of Warranty claim by any of the above alternative means.

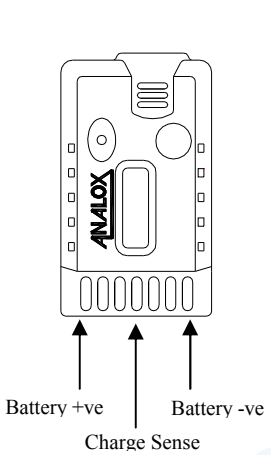
The equipment should not be sent to us without our prior written authority. All shipping and Insurance costs of returned equipment are to be born by you and at your risk. All returned items must be properly and sufficiently packed.

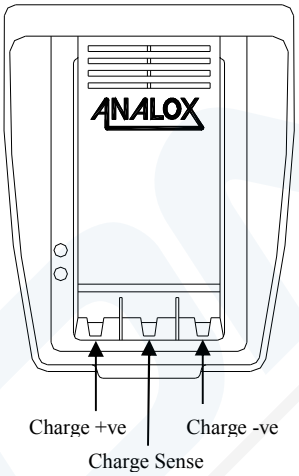
"CO_2 Buddy" is an Analox registered trade mark.

7.0 Specification

BUDDY RATING	Nickel Metal Hydride, 1.2V 1600mAh
CHARGER RATING	Mains voltage:- 230V AC (Not Adjustable - Instrument will be factory set) 110V AC (Not Adjustable - Instrument will be factory set) Mains power:- Less than 5VA – 110V AC and 230V AC Versions
RANGE	0.01 to 5% CO_2
ACCURACY	$^{+}$/- 2% of Full Scale over 0.01 to 2.5% CO_2 $^{+}$/- 3% of Full Scale over 2.5 to 5.0% CO_2
RESPONSE TIME	45 seconds to T90
OPERATING TEMPERATURE	0 to 40°C
TEMPERATURE EFFECT	<0.1%FS/°C
WARM UP TIME	40 seconds
BATTERY	NiMH rechargeable, up to 12 hours use between charges
ORIENTATION	Not sensitive
WEIGHT	150 g
DIMENSIONS	116 x 63 x 23mm
SENSOR TYPE	ANALOX LP Infra Red Microprocessor based compensation for a) Temperature effects b) IR source ageing
ALARMS	Audio Visual 3 Stage plus 'FAULT' & 'OK'

8.0 Electrical Input/Output Connections





9.0 Disposal

According to WEEE regulation this electronic product can not be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.