smokerlyzer®

bedfont

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smokerlyzer®

Mini 2 Smokerlyzer®

Breath Carbon Monoxide (CO) Monitor

Operating Manual

bedfont

www.smokerlyzer.com

Contents

Intended Use

The Mini 2 Smokerlyzer® is a Breath Carbon Monoxide (CO) Monitor for use in group quit smoking programmes. It shows the dangers of smoking and tracks progress of people who are trying to stop.

Carbon Monoxide is a toxic, odourless, colourless, tasteless gas. It is formed from incomplete combustion of organic material at high temperatures with an insufficient Oxygen supply. When inhaled, CO competes successfully with Oxygen in the bloodstream to form carboxyhaemoglobin (COHb). This starves the body tissues of the Oxygen vital to repair, regeneration and general living. CO can remain in the bloodstream for up to 24 hours, depending on a range of factors including physical activity, gender and inhalation intensity. The half-life is about 5 hours.

CO (ppm)/Carboxyhaemoglobin (%COHb) Correlation

Breath Carbon Monoxide is measured in parts per million (ppm) and blood Carboxyhaemoglobin in percentages (%COHb).

In fact the two are compatible and convertible, CO relating to lung/breath and COHb to blood gas. The monitor displays both CO ppm and %COHb.

Clinical research has demonstrated that a useful relationship between Carbon Monoxide and Carboxyhaemoglobin is obtained after a short period of breath holding by the person. CO readings demonstrate the levels inhaled of poisonous CO, while the COHb reading shows the percentage of vital Oxygen that has been replaced in the bloodstream.

Many government bodies stipulate a maximum CO exposure in industrial environments as 35ppm CO for no more than eight hours time-weighted average.

Spares

Part Number	*Description*
EC50-PICO-T/P-V	Disposable T-piece, pack of 10
EC50-MP/200-V	Disposable cardboard mouthpieces, pack of 200
ONE-WAYMP/100-V	Single use mouthpieces with one-way valve, pack of 100
PI-BATTS-V	Replacement batteries, pack of 3AA
020-08-04010K-V	Calibration kit with 20 litre cylinder
020-08-04010-V	Replacement 20 litre cylinder for calibration kit

The above spares are available from Bedfont Scientific Ltd, UK. For spares availability in all other countries contact your local distributor.

Warranty

Bedfont Scientific Limited warrants the Mini 2 Smokerlyzer® (batteries excepted) to be free of defects in materials and workmanship for a period of one year from the date of shipment. Bedfont's sole obligation under this warranty is limited to repairing or replacing, at its choice, any item covered under this warranty when such an item is returned intact, prepaid, to Bedfont Scientific Limited or the local representative.

Note: Sensors are guaranteed for a period of six months from the date of shipment from Bedfont

These warranties are automatically invalidated if the products are repaired, altered or otherwise tampered with by unauthorised personnel, or have been subject to misuse, neglect or accident.

At the end of the product's life, do not dispose of any electronic instrument in the domestic waste, but contact Bedfont or its distributor for disposal instructions.

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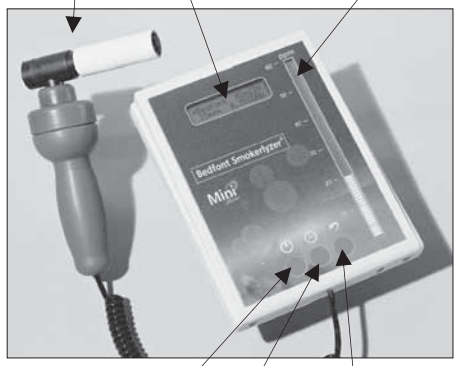
The readings from the Mini2 Smokerlyzer® can be downloaded into the optional DataCO Software package. The software provides a digital display of the instrument readings and a report of the user's results for their records or a printout for them to take away. The Mini2 Smokerlyzer® can also be operated from the computer.

Connecting to the PC

Place one end of the connection lead into the Mini2 Smokerlyzer® serial jack socket. Connect the other end to a spare communications port on the PC. When the software is installed, set the communication port to the one the instrument is connected to.

Before starting the software, ensure the Mini2 Smokerlyzer® is connected to the PC and switched on. Once the sensor has stabilised, double click the DataCO icon to start the programme.



1. Switch on the instrument by pressing and holding the ON button. The 60ppm LED will illuminate and the LCD will display: "Bedfont Mini 2 Smokerlyzer".
2. When the unit bleeps release the ON button and the LCD sequences through a number of displays. When the unit has finished its zeroing sequence the 1ppm LED flashes and the LCD displays: "Ready Bedfont Mini2".
3. Ask the user to hold their breath and initiate the 15 second countdown period, holding their breath throughtout the countdown.
4. To initiate the countdown sequence press & hold the GO button for more than 2 seconds. The LCD displays: "Breath Hold Xxsecs". Where XX is a number which decreases from 15 to 0 at a one second rate. A short bleep is emitted for each of the last 3 seconds, with a longer bleep at the end of the sequence to indicate that the user should start to exhale fully. The LCD then shows: "Exhale Fully".
5. When the countdown is complete the user should exhale slowly but gently into the mouthpiece, aiming to empty their lungs as far as possible.
6. The displays will show a rising reading. If the reading exceeds 10ppm then a series of short bleeps are emitted which increase in rate as the reading increases. The highest level will hold and the final reading will be indicated on the LCD and as a single LED on the bar graph display.
7. After 1 minute the short bleeps will cease and the LCD will display: "Ready".
8. To take another reading press GO to initiate the 15 second countdown.
9. To view the previous reading, press the RECALL button, the reading will display on the LEDs and the LCD.
10. A new mouthpiece should be used for each person.
11. The T-Piece/mouthpiece assembly should be removed between tests and the air around the sample vent stirred to ensure none of the previous sample remains in the sensor.
12. To turn the unit off, press and hold the ON button for 5 seconds until it bleeps.

Key

1. Mini 2 Smokerlyzer® with remote sensor and handle
2. Collapsible flat-packed display stand (shown assembled)
3. T-Piece sampling system - two section assembly
4. Calibration adaptor
5. Batteries - 3 x AA (Alkaline)
6. Carry case
7. Mouthpieces
8. Operating manual

Self-Test Function

If the event a problem occurs in the operation of the Mini2 Smokerlyzer® initiate the self-test function to confirm the basic instrument and displays are operating correctly.

To start the self-test hold down the GO and ON buttons while the unit is powered off.

The LCD will show the following message and the LEDs will illuminate through a specific test sequence.

```
SELF-TEST Vx.X
```

When the test is complete the instrument powers off. If the ON button is held on during the test the instrument will continue into normal operating mode when the self- test is complete.

Note: X.X is the firmware (internal software) version of the unit's microcontroller program. You may be asked what this is if you ever report the unit as being faulty.

Battery Test

The unit continuously monitors the battery status. If the batteries are low then the unit bleeps and the LCD will show:

```
!Battery Low!
```

The unit powers off after a few seconds preventing normal operation until the batteries are replaced.

11 Specification

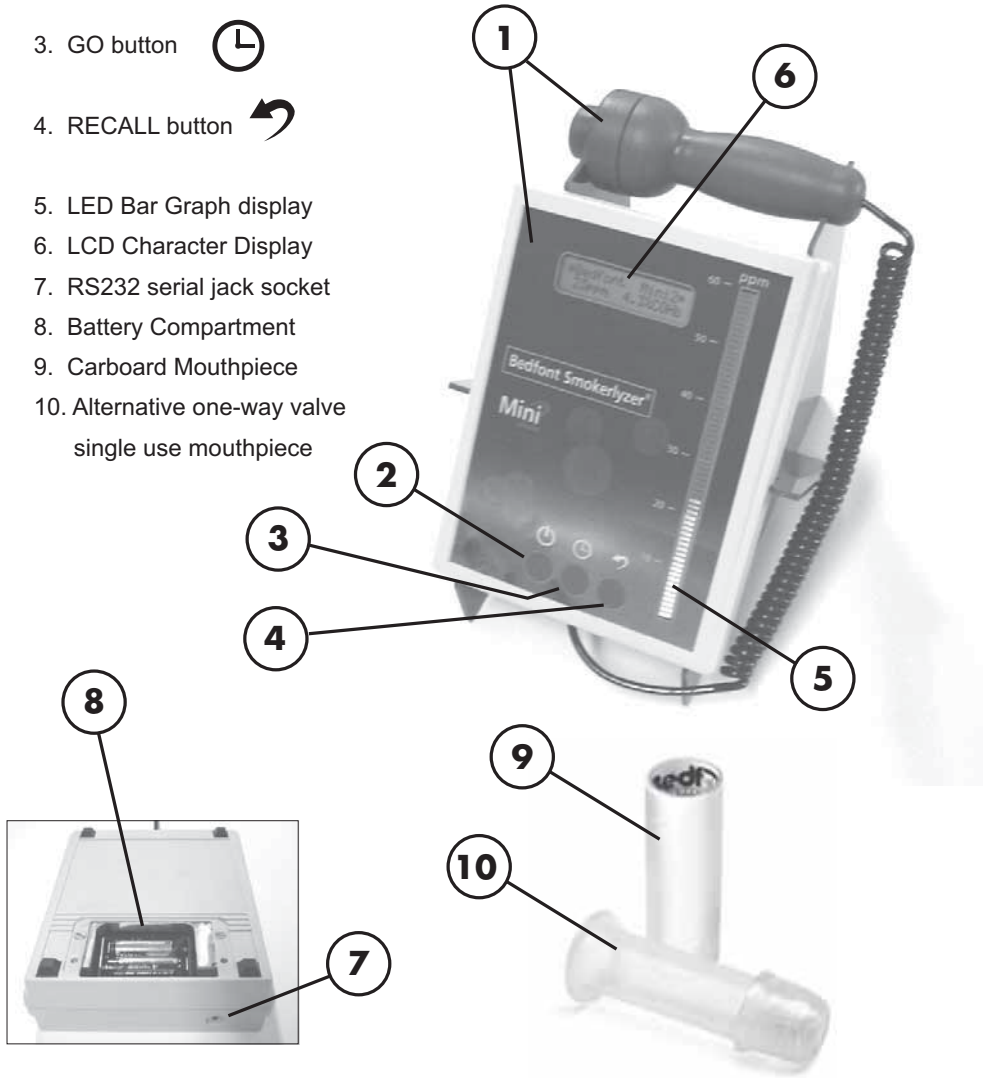
Concentration Range:	0-200ppm
Display:	LCD - Displays ppmCO & COHb(%) LED - 60 segment bar,1ppm increments
Detection Principle:	Sealed electrochemical sensor
Accuracy:	+/- 2%
H2 Cross Interference:	<7%
Power:	3x AA (LR6 or equivalent) alkaline batteries
Response Time:	Typically <45 seconds to 90% FSD
Operating Temperature:	0-40°C (Storage 0-50°C)
Operating Humidity:	10-90% (Storage 0-95%)- non-condensing
Sensor Operating Life:	2-3 years, 6 month warranty
Sensor Sensitivity:	1ppm
Dimensions:	Approx. 200 x 150 x 50 mm
Weight:	Approx. 0.5Kg including batteries
Construction:	Case - ABS with polyester overlay T-piece - Polypropylene

CE Meets the essential requirements of the Medical Device Directive 93/42/EEC Annex V. Certificate No. CE:01469.

Instrument Layout 4

Key

1. The instrument with remote sensor handle (shown mounted on display stand)
2. ON button
3. GO button
4. RECALL button
5. LED Bar Graph display
6. LCD Character Display
7. RS232 serial jack socket
8. Battery Compartment
9. Carboard Mouthpiece
10. Alternative one-way valve single use mouthpiece



Warnings
People with lung disease or chest ailments may not be able to achieve the15 second breath-hold. In such cases, the user should inhale and hold their breath when the GO button is pressed, and exhale, if necessary, before the countdown has completed.

The calibration limits of this unit are 25-80ppm. The gas used must be 50ppm (+/-5%) CO/Air to retain accuracy.

Routine Maintenance
It is recommended that the following routine maintenance be carried out every six months:

- Calibration using Bedfont calibration gas - see page 9 for procedure
- Replace battery
- Replace T-Piece

Cleaning and Sterilisation
The case of the instrument may be cleaned by wiping with a cloth moistened with water. NEVER use alcohol or cleaning agents containing alcohol or other organic solvents.

Under no circumstances should the instrument be immersed in liquid.

The T-Piece can be cleaned using a soap and water solution; to clean under the valve seats lift the white flaps using a cotton bud. Care should be taken not to crease or damage the white flap valves as this may prevent correct operation.

Once the T-Piece has been cleaned it can be sterilized a maximum of 2 times by autoclaving at 121°C for 15 minutes. Ensure that the white flap valves are in place and free from distortion after the procedure.

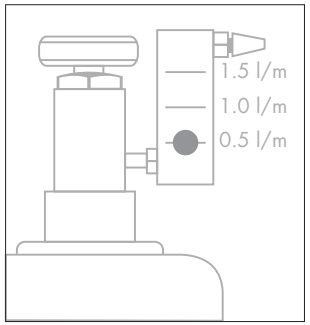
Ensure the T-Piece is completely dry before refitting to the instrument.

Alternatively the T-Piece can be cost effectively replaced. Bedfont recommend the use of one-way valve, single use, mouthpieces when there is particular concern about possible cross contamination.

For replacement calibration gas, T-pieces and single use mouthpieces refer to the Spares & Warranty section on page 14.

Batteries
Batteries should be removed if the instrument is not likely to be used for some time.

Additional technical information can be made available on request; please contact Bedfont or its distributor.



- Open the fine control valve and allow the gas to flow at 0.5litres per minute. To maintain this, adjust the flow so the ball in the Flow Indicator remains at the lower line.
- Allow the gas to flow through the instrument for about 1.5 minutes to ensure accurate calibration, again monitoring the rate of flow.
- If no gas has been detection after 20 seconds the unit will bleep and the LCD will show:

```
CALIBRATION  FAIL
   (NO GAS)
```

Pressing the GO button will clear this condition and return to the ready state. No calibration value will be stored.

- If an incorrect calibration gas is applied (high or low) then one of the following messages will be displayed on the LCD:

```
CALIBRATION  FAIL
   (LOW GAS)
```

```
CALIBRATION  FAIL
   (HIGH GAS)
```

The condition can be cleared as above and no calibration value is stored.

- As the calibration gas is applied, a single flashing LED will climb the LED bar graph display.
- After approx. 1.5 minutes, or until no further increase in the reading is obtained, the measured value will be shown as a solid LED and a static reading on the LCD. The unit will bleep and the LCD will show:

```
CALIBRATION  PASS
```

- Pressing the GO button again will store the calibration value and return the unit to the ready state.
- Turn off the gas flow, remove the T piece sampling system and disconnect the Calibration Adapter from the T piece sampling system.
- Remove the Fine Control Valve from the gas cylinder to ensure no gas escapes and store safely.

Calibration

Equipment required

The unit should be calibrated every 6 months to ensure continued accuracy. The following equipment is required.

- Bedfont Calibration kit (see Spare Parts section for part number - this kit is not supplied as standard with the instrument) - which includes: 50 ppm carbon monoxide in air gas cylinder, Fine Control Valve with Flow Indicator and rubber tubing.
- Calibration adaptor - supplied with instrument.

Calibration procedure

- Ensure the calibration gas valve is in the off position.
- Screw the Fine Control Valve and Flow Indicator assembly to the gas cylinder. This is best done by screwing the gas cylinder into the valve.
- With the tubing, connect the Calibration Adapter and the Flow Indicator together.
- Insert the Calibration Adapter into the T-piece, where the mouthpiece would normally be inserted - see diagram above.
- Switch on the instrument using the ON button. Allow the unit to zero and enter the ready state.
- Enter the calibration mode by pressing the RECALL and ON buttons together for 5 seconds. The unit bleeps, the 50ppm LED illuminates and the LCD show:

```
APPLY CAL GAS
 (50ppm CO)
```

Operation

Preparing the instrument for use

- Ensure 3 AA batteries are correctly fitted.
- Attach T-piece sampling system, with a cardboard mouthpiece attached, to the remote sensor handle. Check all connections are pushed firmly together.
- Switch on the instrument by pressing and holding the ON button. The 60ppm LED will illuminate and the LCD will display:

```
Bedfont  Mini2
Smokerlyzer
```

- When the unit bleeps release the on button and the LCD sequences through:

```
!!ZEROING!!          SENSOR OK
Please Wait....  →   Please Wait....

                 !!ZEROING!!
                 Please Wait....
```

- When the unit has zeroed the1ppm led flashes and the LCD changes to:

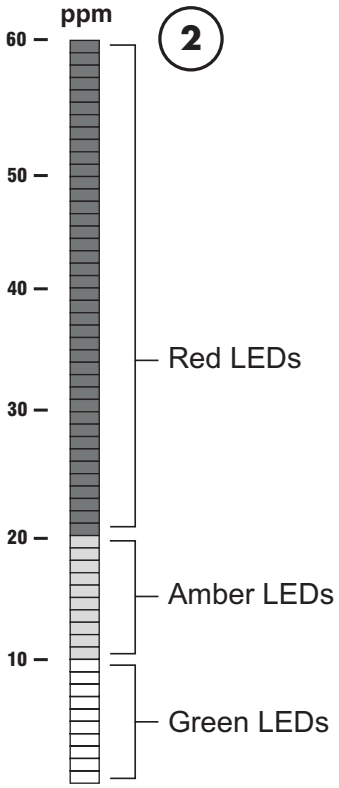
```
-----READY------
*Bedfont  Mini2*
```

- The unit is now switched on, correctly zeroed and ready for use.
- To turn the unit off hold the ON button depressed for 5 seconds, the unit will bleep then turn off. If no user activity (i.e button presses) occurs for 15 minutes the unit automatically switches off.
- If the unit fails to zero when first switched on, leave it alone. It will sense its correct zero level, store it and switch off within a few minutes. When subsequently switched on again, the unit will zero to its new reference level. If it still will not zero, you may have a fault, contact your local distributor for assistance.

Understanding the displays

The instrument has two displays

1. A 2 line LCD character display that shows text user messages on the top line and the reading as parts per million Carbon Monoxide (ppmCO) and blood carboxyhaemoglobin (COHb) concurrently. This provides an accurate and reliable analysis of lung/breath gas.
2. A coloured LED bar graph representing ppmCO. Each colour band is indicative of the smoking habit, thus:
   - Green (0-10 ppmCO): Non-smoker
   - Amber (11-20 ppmCO): Light smoker
   - Red (21-60ppmCO): Heavy smoker



1

```
EXHALE FULLY
23PPM  4.3 %COHb
```

Using the instrument

- Press and hold the GO button for more than 2 seconds to initiate a 15 second breath hold countdown sequence. The LCD shows:

```
BREATH HOLD
XXsecs
```

  Where XX is a number which decreases from 15 to 0 at a one second rate. A short bleep is emitted for each of the last 3 seconds, with a longer bleep at the end of the sequence to indicate that the user should start to exhale fully. The LCD then shows:

```
EXHALE FULLY
XXXppm YY.Y %COHb
```

  Where XXX and YY.Y are the readings. If no gas is sensed by the unit after a few seconds, it will bleep and then return to the 'ready' state.

- Ask the user to hold their breath throughout the countdown period. When the countdown is complete exhale slowly but gently into the mouthpiece, aiming to empty the lungs as far as possible.
- The displays will show a rising reading. If the reading exceeds 10ppm then a series of short bleeps are emitted which increase in rate as the reading increases. The highest level will hold and the final reading will be indicated on the LCD and as a single LED on the bar graph display.
- After 1 minute the short bleeps will cease and the LCD will show:

```
-----READY------
XXXppm YY.Y %COHb
```

- (For instruments with firmware version greater than V2.0 only - see Self-Test Function, page 10). Pressing the RECALL button during the test routine will display ‘sound on’ or ‘sound off’ and enable/disable the ‘test bleep’ respectively. The state of the enable/disable function is stored when the instrument is switched off. The ‘test bleep’ can thus be switched on or off at will. The other sound functions of the instrument remain unaffected by this feature.
- The increasing audible bleep feature can be disabled for each test by pressing the GO button for an additional two seconds when initiating the 15 second breath hold countdown sequence.
- A new mouthpiece should be used for each person.
- To take another reading press GO to initiate the 15 second countdown.
- To view the previous reading, press the RECALL button, the reading will display on the LEDs and the LCD will show:

```
STORED VALUE
XXXppm YY.Y %COHb
```

- To view the previous reading when the unit is switched off press and hold the RECALL button. The unit bleeps and the stored value is display as before. When the RECALL button is released the unit powers off.