

MODEL: BMC-2000

(Breath CO Monitor)

Operation Manual (v.03)



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About CO & COHb

■ What is Carbon Monoxide & Carboxyhemoglobin?

Carbon monoxide (CO) is a colorless, odorless gas produced through incomplete combustion. CO is a poison that binds with hemoglobin, the oxygen-carrying molecule in human blood. Because CO's affinity to bind with hemoglobin is 250 times greater than oxygen, low airborne concentrations and long exposure times can result in substantial carboxyhemoglobin (COHb) concentrations in the blood. COHb is CO bound to hemoglobin. As COHb levels increase, less hemoglobin is available for the transport of oxygen. This lack of oxygen-carrying capability, which is indicated by the increase in COHb, results in the symptoms we associate with CO poisoning.

■ What are the Health Impacts

The acute health effects of CO exposure are well established. Mild exposure symptoms may include headache, dizziness, decreased vigilance, decreased hand-eye coordination, weakness, confusion, disorientation, lethargy, chest pain (in cardiac patients), nausea, and visual disturbances. Greater or prolonged exposure can cause unconsciousness and death. The severity of symptoms depends on the concentration of CO, length of exposure, and degree of physical activity, as well as the state of health of the exposed individuals. People who are exposed to high CO concentrations for long periods of time during strenuous activity will reach the highest COHb levels.

■ Who are Sensitive Populations?

Age and general health may affect susceptibility to CO. Even low levels of CO can present a health risk to susceptible individuals, such as persons with heart disease, sickle cell disease, and anemia. Also, exposure to low levels of CO may harm the developing fetus.

Angina pectoris is chest pain associated with impaired oxygen flow to the heart and may occur at COHb levels between 2.5 and 4.9 percent in cardiac patients. In healthy individuals decreased vigilance, confusion and disorientation, behavioral, and central nervous system effects occur at COHb levels between 4 and 6 percent. Remember that as symptoms of CO poisoning increase, you may become confused and less capable of making decisions that could save your life.

■ Smoking

Tobacco smoke, including second hand smoke, is a large source of CO in homes with smokers. Smokers have higher COHb values than nonsmokers and exposure to secondary tobacco smoke results in an increase in COHb values. Smokers generally have COHb values of five to six percent. Nonsmokers have COHb levels of 0.5 percent, whereas nonsmokers exposed to secondary tobacco smoke have been shown to have COHb levels in the two to three percent range.

Introduction

Senko Co., Ltd. with brand name 'SENKO' was established to provide electrochemical (galvanic and amperometric) gas sensor, breath CO Monitor, portable/fixed gas detector, gas monitoring system, and services that promote worker's safety, prevent gas accidents, and enhance client's health

BMC-2000 can be used in smoking cessation programs by healthcare professionals. And it also can be used as a non-invasive method to get %COHb in the patient's blood and to screen CO poisoned patients by medical man.

The small size and light weight make the BMC-2000 ideal for hand held use. It is mainly used in smoking cessation clinics; it is used for instructional purposes to check on the client's progress and compliance.

BMC-2000 is based on an electrochemical gas sensor, which works through the reaction of CO with an electrolyte at the electrode. This reaction generates an electrical current proportional to CO concentration. Output from the sensor is monitored by a microprocessor and converted to % carboxyhaemoglobin (%COHb). Levels of %COHb in the blood are commonly caused by accidental smoke inhalation/CO poisoning or cigarette smoking.

BMC-2000 has a countdown timer as an aid of timing the breath holding period prior to exhalation

Package Contents

BMC-2000 is supplied with a carrying case containing the following items:

1. BMC-2000
2. 22mm mouthpiece adapter
3. 22mm connector for calibration
4. AA size alkaline battery 2ea
5. 5 Disposable mouthpieces

Specification & Description

■ Specification

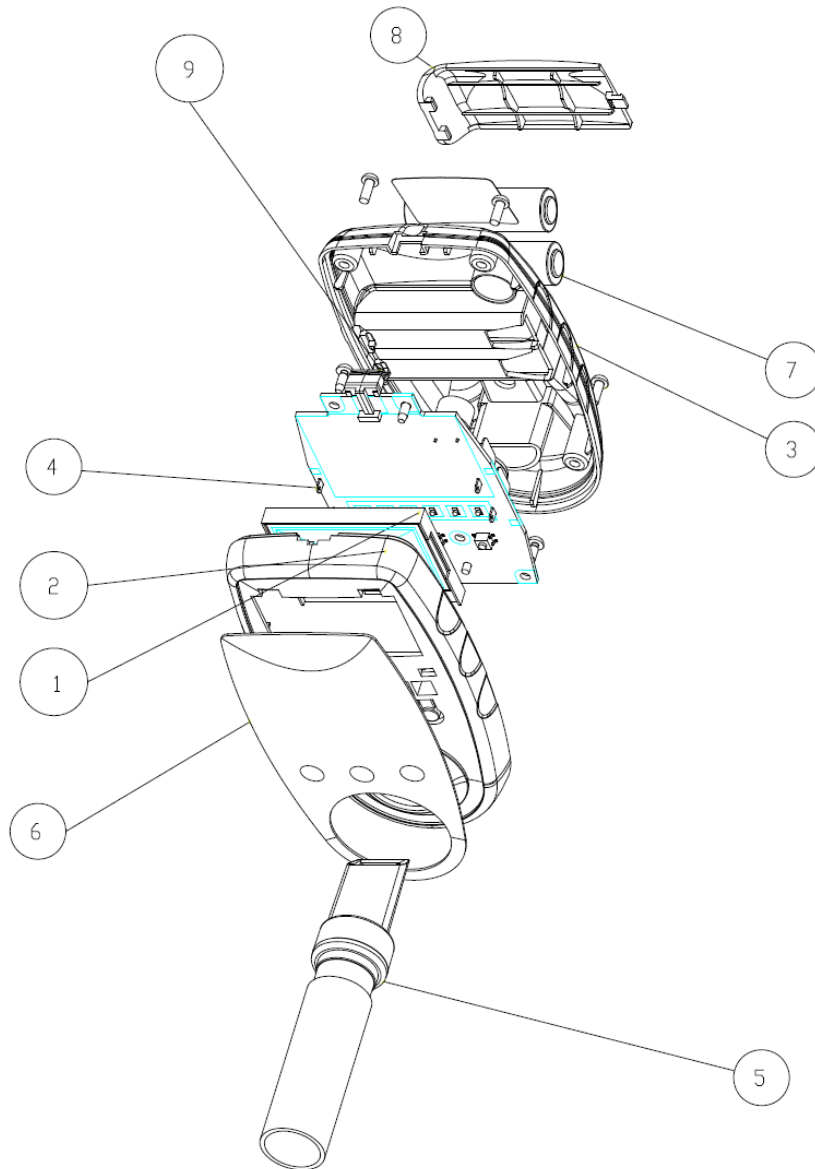
Sensor type	Electrochemical Cell	
Range	0-100 ppm	
Resolution	1 ppm	
Accuracy	+/- 5% of full scale or 1ppm ???	
Sensitivity drift	0.5% / °C	
Sensor life time	2 ~ 5 years	
Hydrogen cross sensitivity	< 15 %	
Operating temperature	15 ~ 25 °C	
Operating pressure	Atmospheric +/- 10%	
Operating Humidity	15 ~ 90 % RH (non-condensing)	
Battery life	1~3 months / Alkaline 1.5 volt AA size * 2	
Weight	200 g	
Dimension	75mm X 140mm X 43mm	
Storage	Temperature	-20 °C ~ 60 °C

	Humidity	30% ~ 90%
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- **LED Indicator**

LED color	Description	Adult (ppm)	Adolescent (ppm)
Green	Non-smoker	0-6	0-4
Yellow	Danger zone	7-10	5-6
1Red	Smoker	11-15	7-10
2Reds	Frequent Smoker	16-25	11-15
3Reds	Addicted Smoker	26-35	16-25
4Reds	Heavily Addicted Smoker	36-50	26-35
4Reds flashing	Dangerous Addicted Smoker	51+	36+

■ Description



1	LCD Display Panel
2	Upper Case
3	Lower Case
4	PCB Board
5	Mouthpiece Adapter
6	Case Cover (Film)
7	AA Alkaline Battery
8	Battery Cover
9	PC connector (USB Port)

Operation and Calibraion

The operation of BMC-2000 is according to the below sequence.

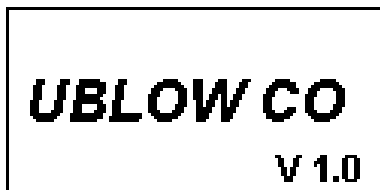
✓ Start – up

To install the 2 AA batteries, first open the battery cover by sliding it, clipping the battery in place and closing the battery cover. Insert the mouthpiece adapter into the BMC-2000 and then connect a disposable mouthpiece to the mouthpiece adapter.

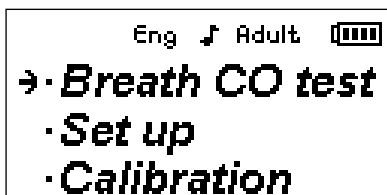
Press and hold the button until buzzer & LED become active.



LCD become active and displays it for 1 second



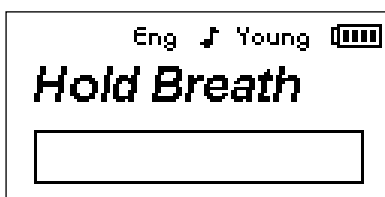
Display for 3 seconds



Main Mode

Arrow move: The arrow is moved up or down by pushing "UP" or "DOWN" button. The arrow flickers per second.

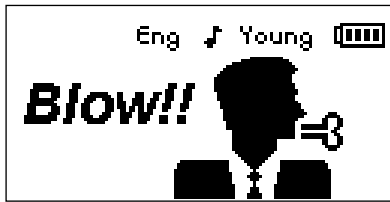
✓ Breath CO test



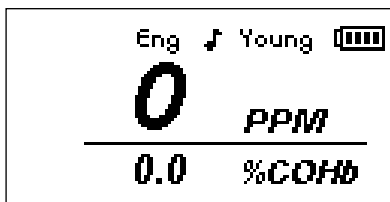
Enter Breath CO test mode then start Breath CO test

While a bar fills up black for 15 seconds, hold breath

The unit will beep out 3 times for the last 3 seconds



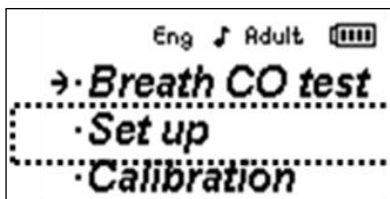
Blow into CO Breath Monitor (Display duration: 2sec)



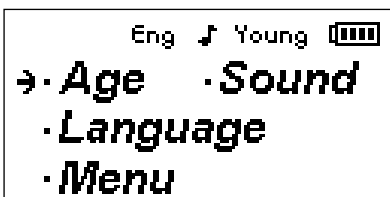
Continue to blow (Display duration: 13sec)

After blowing out, CO Breath Monitor displays both concentrations of CO & %COHb

✓ Set up



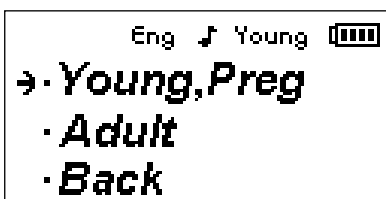
Move the arrow down to 'Set up' and press enter



Move the arrow to 'Age', 'Sound', or 'Language' and press enter button

'Menu' returns to Main mode.

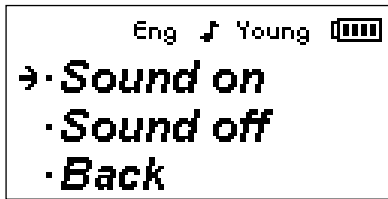
✓ Set up I(Age)



If you are young or Pregnant then choose 'Young, Preg' otherwise choose 'Adult'

'Back' returns to Set up mode.

✓ Set up II(Sound)



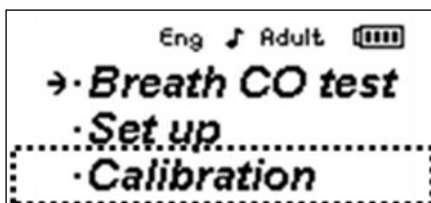
Set up II (Sound: on & off)



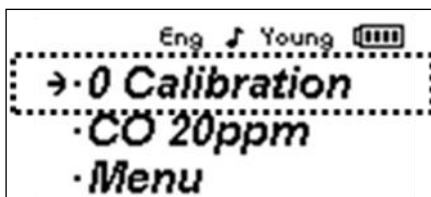
Set up II (Language)

✓ Calibration

Calibration will remain stable to within 1% over one month and typically to within 5% over 6 months. Senko Co., Ltd. Supplies calibration gas (20ppm CO in air). Senko's Breath CO monitor is recommended to recalibrate every 6 month.

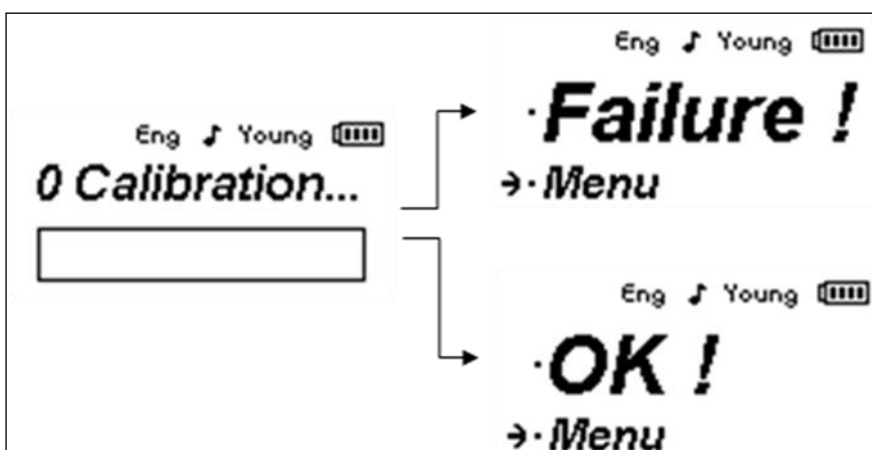


Arrow move to down and press enter button



Zero calibration mode

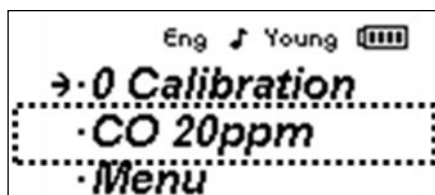
Ensure that the breath CO monitor is surrounded by fresh air (0 ppm CO gas in fresh air).



Zero calibration (bar fills up black for 15 seconds)

The unit will beep out 3 times

If zero calibration is successful, "OK!" will be displayed. Otherwise, "Failure" will be displayed. (If "Failure" happens see the troubleshooting section)



20ppm calibration mode

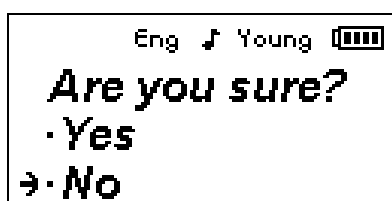
BMC-2000 is calibrated before shipping in a warehouse.

20ppm CO gas diluted in a fresh air is required for this calibration.

Screw the control valve and connect the flow indicator to the gas can as shown below.

Open control valve and allow the gas to flow at 0.5 liter/min. (flow indicator remains at the line)

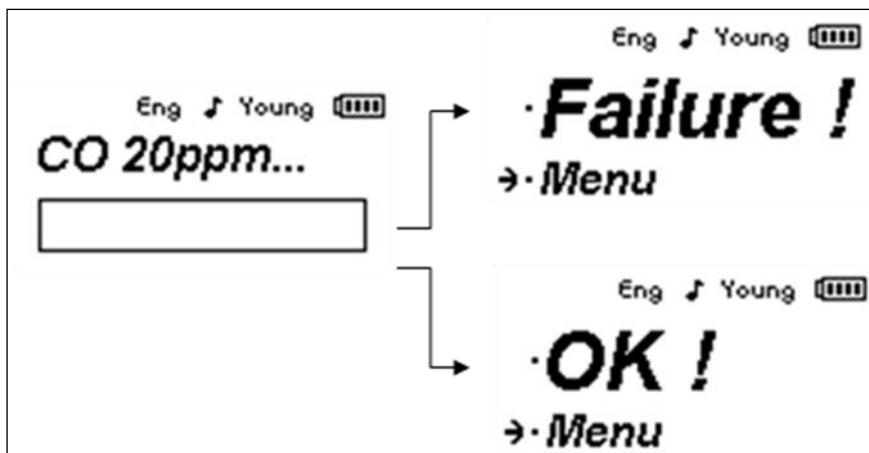
Press "enter" button. And press "yes" in below.



Allow the gas to flow through the CO monitor for about 1 minute to ensure accurate calibration.

20ppm calibration (bar fill up black for 15 seconds)

The unit will beep out 3 times, store the new 20ppm calibration value.



If the 20ppm calibration is successful, "OK!" will be displayed. Otherwise, "Failure" will be displayed. (If failure happens see the troubleshooting section)

Troubleshooting

If the unit fails to turn on properly, replace the 2 x AA batteries. (Battery lifetime is about 150 hours when the unit is working continuously)

After zero calibration, if the unit displays "Failure", make a second attempt to the unit in the fresh air. If the unit still displays "Failure", the unit has to be returned to SENKO or its distributor.

After 20ppm calibration, if the unit displays "Failure", may be caused for the use of incorrect calibration gas, first ensure that the concentration of calibration gas. Only 20ppm CO gas should be used in this calibration. Second check the connections to the gas cylinder, and the period of circulation of can gas. If there are no problems, try 20ppm calibration again. If the unit still displays "Failure", the unit has to be returned to SENKO or its distributor.

Note

Ensure that the unit and can gas have stabilized at room temperature before calibration.
Use only the calibration gas produced from the certified company.

Spare & Warranty

Spare

Part Number:	Description
BMC-2000 101s	22mm disposable cardboard mouthpieces (200 per box)
BMC-2000 201	22mm mouthpiece adaptor (pack of 10)
BMC-2000 301	Calibration can gas (CO 20ppm)
BMC-2000 401	Calibration kit (valve, hose, indicator and connector)
SS1128	Electrochemical CO cell

To place an order for consumables or service inquiries please contact SENKO Co., Ltd or its distributor.

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Warranty

SENKO Co., Ltd. warrants the Model BMC-2000 sold by us to be free from defects in materials, workmanship, and performance for a period of 24 months from the date of shipment from SENKO Co., Ltd. This includes the instrument and the original sensors. Replacement parts are warranted for 1 year from the date of their shipment from SENKO Co., Ltd. Any part found defective within their warranty period will be repaired or replaced, at our option, free of charge.

This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in

accordance with the operation manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

In no event shall SENKO Co., Ltd be liable for indirect, incidental, or consequential loss or damage of any kind connected with the use of its products or failure of its products to function or operate properly.

This warranty covers instruments and parts sold to users only by authorized distributors, dealers, and representatives as appointed by SENKO Co., Ltd.

We do not assume indemnification for any accident or damage caused by the operation of this gas monitor and our warranty is limited to replacement of parts or our complete goods.