



MicroCO Meter

Operating Manual

Federal (USA) law restricts this device to sale by or on the order of a physician or licensed practitioner.

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Table of Contents

Overview	1
Introduction	1
Smoke Inhalation/CO Poisoning.....	2
Cigarette Consumption.....	3
Package Contents	5
Contraindications.....	7
Warnings and Cautions	7
Intended Use	8
Operation	9
PC Connection	12
Calibration	12
Battery Life	16
Battery Replacement.....	16
Internal Battery Expiry	17
Sensor Expiry	17
Product Lifetime	18
Cleaning	18
Servicing	19
Trouble Shooting Information	19
Safety Designation per IEC 60601-1	21
Electromagnetic Compatibility (EMC) to	22
EN60601-1-2:2007	22
Symbols	26
Consumables / Accessories	27
Specifications	28
Customer Contact Information	29

Overview

The MicroCO is a hand-held battery-operated device used to measure the concentration of carbon monoxide, CO, on the breath and calculates the percentage of carboxyhemoglobin, %COHb, in the blood.

It is accurate, easy to use, and has many features designed to simplify its operation.

These include:

- Auto zero function
- Smoking level color light indicators
- Poison level alarm
- Simple calibration
- Serial interface to PC

Please note: It is recommended that this unit be calibrated upon receipt.

This device should only be used by trained and qualified personnel.

Introduction

The MicroCO is based on an electrochemical fuel cell sensor, which works through the reaction of carbon monoxide (CO) with an electrolyte at one electrode, and oxygen (from ambient air) at the other. This reaction generates an electrical current proportional to CO concentration. Output from the sensor is monitored by a microprocessor, which detects peak expired concentrations of alveolar gas. This is then converted to % carboxyhemoglobin (%COHb) using the mathematical relationships described by Jarvis et al¹, for concentrations below 90 ppm, and by Stewart et al² for higher levels.

Raised levels of carboxyhemoglobin are most commonly caused by accidental smoke inhalation/CO poisoning or cigarette smoking. The MicroCO includes a countdown timer as an aid to timing the breath holding period prior to exhalation.

The results are displayed on a clear LCD display. Warning lights are provided to give an instant indication of the smoking level.

The countdown timer, warning light levels, and the alarm level are user adjustable when the unit is connected to a PC running COBRA software.

Note: the countdown timer, warning light levels, and the alarm level used throughout this manual are the factory settings and may have been changed.

References

1. Jarvis MJ, Belcher M, Vesey C, Hutchison DCS
Low cost carbon monoxide monitors in smoking assessment
Thorax 1986; 41: 886-887
2. Stewart RD, Stewart RS, Stamm W, Seleen RP
Rapid estimation of carboxyhemoglobin levels in fire fighters
JAMA 1976; 235, 390-392

Smoke Inhalation/CO Poisoning

CO poisoning usually occurs as a result of smoke inhalation from fires or exposure to CO from car exhausts or faulty heating systems. CO binds with hemoglobin to form carboxyhemoglobin (COHb) which reduces the capacity of the blood to carry oxygen. Acute poisoning may cause symptoms ranging from headache and breathlessness (at COHb levels of 10% to 30%) through confusion to coma and

death (COHb usually greater than 60%). A particularly insidious feature of CO poisoning is the development of neurological problems such as movement disorders (often resembling Parkinson's disease), memory loss and altered personality. Such problems may develop weeks after apparent recovery from acute poisoning.

Chronic exposure to relatively low levels of CO may result in a variety of symptoms including headache, fatigue, poor concentration, dizziness, palpitations, chest pain, visual disturbance, nausea, diarrhea and abdominal pain.

Chronic CO poisoning as a cause of such symptoms is often missed.

The MicroCO allows immediate assessment of patients at risk of CO poisoning who can then be rapidly referred for expert assessment. Prompt treatment with oxygen (in a hyperbaric chamber, if severe) is often life saving. Screening for CO exposure may also reveal the cause of non-specific symptoms relating to low level CO exposure (usually as the result of faulty gas appliances).

References

Meredith T, Vale A, **Carbon monoxide poisoning**
British Medical Journal, 1988; 296, 77-78

Cigarette Consumption

The MicroCO provides a simple screening test for cigarette consumption for use in all smoking cessation programs.

Measurement of carboxyhemoglobin has been well validated as an indirect measure of cigarette consumption and is widely used in smoking cessation programs.

Typical values for carboxyhemoglobin and expired CO in smokers and poisoning victims, together with the alarm light status, are given below:

CO (ppm)	%COHb	Cigarette consumption	Indicator
0 – 6	0 – 1	Nonsmoker	Green
7 –10	1.1 – 1.6	Light smoker	Amber
11 – 72	1.8 – 12	Heavy smoker	Red
>72	>12	Suspected poisoning	Red + alarm

Please note that some urban areas may have high environmental levels of CO. This can cause a rise in exhaled CO of a few ppm above that which is normally present on the breath. In these cases it is possible for a non-smoker to appear at the bottom of the ‘light smoker’ range (7 – 10 ppm).

References

The relationship between alveolar and blood carbon monoxide concentrations during breath holding

Jones RH, Ellicott MF, Cadigan JB, Gaensler EA
 Journal of Laboratory and Clinical Medicine 1958; 51, 553 – 564

Carbon monoxide in breath in relation to smoking and carboxyhemoglobin levels

Wald NJ, Idle M, Boreham J, Baily A
 Thorax 1981; 36, 366-369

Definition of a reliable threshold value for detecting current smokers by CO measurement

Marino Luigi; Latini Roberto; Barbano Gina; Bazzlerla Giorgio;
 De Luca Anita, Nardini Stefano Respiratory and TB Unit-General
 Hospital- Via forlanini, 71-I-31029-Vittorio Veneto (TV-ITALY).

Correlation between exhaled CO measurements and carboxyhemoglobin percentage in smokers

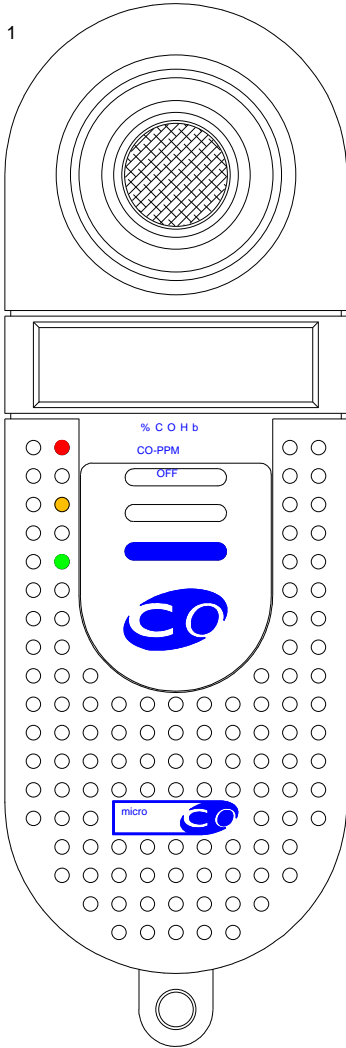
Marino Luigi; Latini Roberto; Barbano Gina; Bazzera; Zanette Antonia; Nardini Stefano Respiratory and TB Unit- General Hospital- Via Forlanini, 71- I-31029-Vittorio Veneto (TV- ITALY).

Package Contents

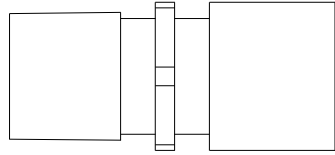
The MicroCO is supplied with a carrying case containing the following items:

1. MicroCO meter (Cat No. MC02)
2. 22 mm mouthpiece adapter (Cat No. PSA1800)
3. 22 mm reducing connector for calibration (Cat No. MEC1007)
4. 9-Volt Battery
5. 4 Disposable mouthpieces (Bag 100 Cat No. 3301)
6. Calibration tool (Cat No. MEC1184)

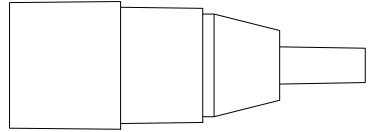
1



2



3



4



5



6



Contraindications

There are no known contraindications for using the MicroCO.

Warnings and Cautions


The following terms are used as follows in this manual

Caution: Possibility of injury or serious damage

Warning: Conditions or practices that could result in personal injury

Please Note: Important information for avoiding damage to the instrument or facilitating operation of the instrument.

Note: The device should be used by trained and qualified personnel.

	CAUTION: Read the manual before use.
CAUTION: Do not attempt to charge the batteries, connect improperly or dispose of in a fire as there is a possibility of leakage or explosion. Follow manufacturer's recommendations for proper disposal.	
WARNING: The instrument is not suitable for use in the presence of explosive or flammable gases, flammable anesthetic mixtures or in oxygen rich environments.	

CAUTION: Mouthpieces are single patient use. If used on more than one patient, there is a risk of cross-infection. Repeat use may increase air resistance and lead to an incorrect measurement.



PLEASE NOTE: The product and battery you have purchased should not be disposed of as unsorted waste. Please utilize your local recycling facility for the disposal of this product.

PLEASE NOTE: Degree of protection against Ingress of Water is IPX0.

CAUTION: When you connect the MicroCO to other equipment, always make sure the whole combination complies with the international safety standard IEC 60601-1 for medical electrical systems. During measurements, connect the MicroCO only to computers that comply with IEC 60601-1 / ANSI/AAMI ES60601-1:2005 / CAN/CSA-C22.2 No. 60601-1:14

Intended Use

The MicroCO is intended to measure the amount of Carbon Monoxide (CO) that can be expired from the breath. The expired CO is measured in parts per million (ppm) and is used to calculate the percentage of carboxyhemoglobin (%COHb) in the blood.

The MicroCO is used in smoking cessation clinics, physician offices, emergency departments and by the fire-fighting services. In smoking cessation clinics, it is used for instructional purposes to check on the client's progress and compliance. General practitioners, emergency room personnel and the fire-fighting services can use the

instrument to quickly assess the level of suspected CO poisoning.

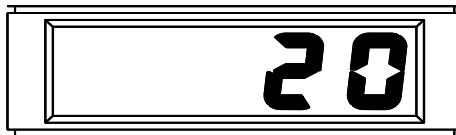
The MicroCO is designed for use by clinicians and health care professionals.

Operation

For accurate results, the CO meter should be used at room temperature. If the instrument has been stored in cool or hot conditions, allow time to reach room temperature prior to use.

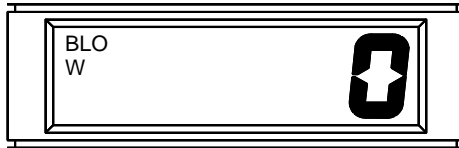
Install the 9-volt battery by sliding open the battery cover, clipping the battery in place and replacing the cover. Insert a SafeBreath mouthpiece (order #FM200); or if not using a SafeBreath mouthpiece, insert the plastic mouthpiece adapter followed by a cardboard mouthpiece. Turn the unit on by selecting the upper or middle position on the central slide switch and the display will show software version number (ex. 3.03).

The version number will appear momentarily while correction for ambient levels is executed. During this time the unit must not be exposed to concentrations of CO. The display will change to:



Upon seeing the number 20, instruct the subject to inspire fully and hold their breath for 20 seconds. The display will

count down from 20 to 0 as an aid to timing the breath holding period. The green indicator will illuminate and the display will change to:



At this time, the subject should seal their lips around the mouthpiece and exhale slowly and fully. The 20 second breath holding period is recommended to allow time for equilibration of alveolar gas.

If, however, the subject is unable to hold their breath for this period, the unit may still be used before 20 seconds have elapsed.

The unit must not be used, however, for one (1) second after the unit is first switched on i.e. before the countdown commences. Expired alveolar gas is then entrapped between sensor and mouthpiece valve. The display reading will rise to a plateau over the course of a several seconds. The final value will be held until the unit is turned off and represents parts per million CO or %COHb depending on the slide switch position.

The lights will come on according to the table on page 4 and the red light will flash and an alarm will sound if the measurement rises above 72 ppm (12%COHb).

If this occurs, then the possibility of CO poisoning should be investigated as this level of CO is unlikely to be produced by cigarette smoking.

Important note: Before repeating a measurement, the unit must be turned off, and the mouthpiece and adapter removed for at least one (1) minute. This is to allow re-equilibration with ambient air and to dry the surface of the sensor. Visually inspect that all moisture has evaporated from the surface of the sensor before reuse.

If the unit is switched on again too quickly after use, there may be a response to residual expired carbon monoxide from the previous test.

In this case the display will show:



If this is displayed, turn the unit off, remove the mouthpiece adapter, and expose to ambient air for two (2) minutes before repeating the test.

Note: If this warning appears again after following the above procedure, turn off and leave the sensor exposed to ambient air for a further three (3) minutes. If the same message appears again then this indicates possible contamination of the sensor with a solvent.

In this case remove all sources of solvent from the vicinity of the sensor and expose to ambient air for 24 hours before switching on again.

PC Connection

The MicroCO may be connected to the serial port of a PC running COBRA (CO BReath Analysis) software.

This software allows the measurements to be read by a PC and automatically entered onto a pre-defined report for subsequent printing and filing. It also allows the CO level indicators and the breath holding countdown timer to be configured to individual requirements.

Note: The MicroCO should only be connected to a computer that is manufactured in accordance with EN 60601-1.

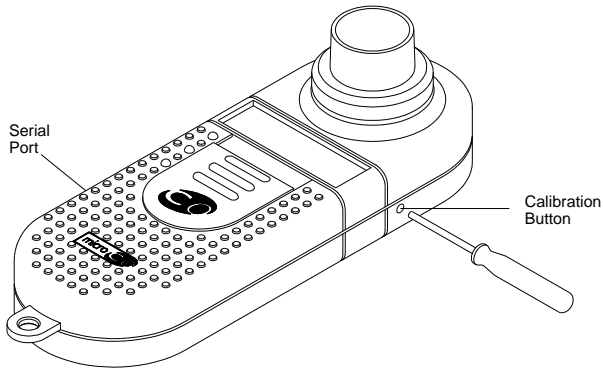
Note: Keep the PC out of reach of the patient at all times.

Calibration

Calibration will remain stable to within 2% over one (1) month and typically to within 10% over six (6) months. Micro Direct supplies calibration gas (20ppm CO in air) and recommends that the unit is recalibrated every six (6) months. See page 27 for calibration accessories.

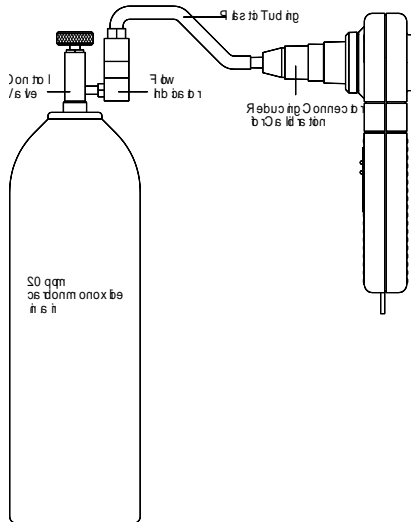
The gas is supplied in convenient, disposable cans containing 17 liters of gas (Cat No. MC10).

To carry out the calibration, locate the calibration button on the right-hand side of the instrument as shown on the next page.



Screw the control valve firmly onto the cylinder and connect the gas supply as shown below:

Push the slide switch to the CO - PPM position and wait for the unit to display zero.



The plastic tubing supplied with the gas should be pushed firmly over the reducing connector.

Turn the control knob fully counterclockwise until knob will not turn any further. Apply gas for 25 seconds. If the meter does not read 20 ppm, use the calibration tool to push the calibration button.

The unit will beep three (3) times, store new calibration value and the display will show:



The gas supply should then be turned off.

If the signal from the CO sensor is too low a new calibration value will not be stored and the display will show:



The most likely cause for this is an expired cell but may also be caused by depressing the calibration switch with no gas applied. Ensure that the concentration of calibration gas is correct (20ppm) that the connections to the gas cylinder are secure, that the gas cylinder is not empty, and then repeat the calibration procedure.

If the above message is repeated, the CO meter must be returned to Micro Direct, Inc. for sensor replacement.

Sensor life is greater than 2 years and depends upon both the amount of exposure to CO and other gases, particularly solvents such as alcohol and cleaning fluids.

If the signal from the CO sensor is too high, a new calibration value will not be stored and the following will be displayed when calibration is attempted:



The most likely cause for this is using an incorrect concentration of calibration gas. Ensure that the concentration of calibration gas is correct (20 ppm) that the connections to the gas cylinder are secure and then repeat the calibration procedure.

In order to stop any gas leak from the can after calibration, ensure that the control knob is tightened firmly.

Important Notes:

- Only certified calibration gas from a reputable source should be used.
- Ensure no CO is present on the sensor for three (3) minutes before starting the calibration procedure.
- Ensure the instrument and gas cylinder has stabilized at room temperature before calibrating.
- In order to stop any gas leaks from the can after calibration, ensure the control knob is tightened firmly.

Battery Life

Battery life is approximately 30 hours of continuous use. When the battery has approximately one (1) hour of useful life left, the alarm will sound momentarily after the unit is first switched on and the following message will be displayed:



When the battery has completely expired the above will be displayed continuously and the battery must be replaced.

Battery Replacement

Locate the sliding cover situated on the rear of the unit, toward the bottom of the device.

Place your thumb over the round thumb indent, press gently and slide the cover to the right to remove it from the unit.

Lift the old battery out and holding the battery terminal by the plastic body, pull it off the old battery.

Plug the new battery into the battery terminal taking care that the correct polarity is observed.

Push the battery back into the battery holder and replace the battery cover onto the guides. Slide the battery cover to the left until it is fully home.

Note: Please remove the battery if the meter is likely to be unused for some time.

CAUTION: Do not open the battery cover when the device is turn on.

CAUTION: The operator should not touch the contacts of the battery and the patient at the same time.

Please Note: Dispose of the waste battery in accordance with your waste management regulations.

Internal Battery Expiry

The MicroCO has an internal battery with a life of approximately ten years. This battery supplies the sensor signal conditioning circuit continuously to ensure instant start up.

When the battery has expired, the following warning message will be displayed:



and the alarm will sound when the unit is first turned on.

When this occurs, the battery must be replaced with a 3.6V 1/2 AA lithium battery.

Sensor Expiry

Sensor life is greater than 2 years and depends upon both the amount of exposure to CO and other gases and solvents such as alcohol and cleaning fluids.

When the sensor has expired, it will become impossible to obtain a correct calibration. When this occurs, the MicroCO must be returned to Micro Direct for sensor replacement.

Product Lifetime

The MicroCO meter is designed for a product lifetime of seven (7) years.

Cleaning

Disinfection of contaminated parts is only effective after having them carefully pre-cleaned. Micro Direct recommends using any cold germicidal disinfectant that does **NOT** contain chlorine or alcohol. Please follow the given manufacturer's instructions.

CAUTION: Switch off the device and always unplug your MicroCO meter from the computer before cleaning.

If using the cardboard mouthpieces with the mouthpiece adapter instead of the SafeBreath filtered mouthpiece (#FM200), it is recommended that the plastic Mouthpiece Adapter (#PSA1800) under the prerequisite that the patient was instructed only to exhale, the mouthpiece adapter and the CO meter surface have to be cleaned.

The mouthpiece adapter may be cleaned and disinfected by immersion in any cold disinfecting solution that does NOT contain chlorine or alcohol. We recommend wiping exposed surfaces of the meter with the Protex disinfectant wipe (order #48-70). It is recommended that this procedure is performed after each use and all used cardboard mouthpieces be discarded.

CAUTION: The sensor surface must not be wiped with any aqueous solutions and **must not** be exposed to solvents (i.e. chlorine or alcohol) or permanent damage may result.

CAUTION: Do not attempt to wash or immerse the MicroCO meter in water or cleaning fluid, as there are electronic components inside that will be permanently damaged.

Important Note: Cardboard mouthpieces must be disposed of immediately after use. If there are changes on the material surfaces of either the unit or mouthpiece adapter (cracks, brittleness) the respective parts must be disposed of.

Servicing

If your unit requires service or repair, please see page 29 for contact details. A full-service manual including circuit diagram and parts list is available upon request.

Trouble Shooting Information

Should you encounter problems operating your MicroCO, please consult the table on the next page.

Problem	Possible Cause	Solution
MicroCO cannot be switched on or "bat" is displayed	Batteries are flat	Change the battery
Battery life is shorter than expected	Unit not being switched off	Turn the unit off after use
"CEL" is displayed	Fuel cell is depleted	Return unit for cell replacement
"Err" is displayed	Gas cylinder empty	Check valve on cylinder for contents and replace cylinder if necessary Check the calibration value on the cylinder is 20 ppm.
"bt2" is displayed	Internal battery has expired	Replace internal battery
"gAS" is displayed	Fuel cell is depleted	Return unit for cell replacement
	Fuel cell is contaminated by residual gas or solvents	Allow unit to be exposed to clean air. Turn unit ON and await message to disappear, if not return unit for cell replacement

Safety Designation per IEC 60601-1

Type of protection against electrical shock	Internally powered Equipment
Degree of protection against electrical shock	Type B applied part
Power Equipment	Battery type: 9 volt battery, Alkaline Manganese Dioxide 9.0V, 550mAh
Battery Life	2000 tests
Degree of Electrical connection between equipment and patient	Equipment designed as non-electrical connection to the patient
Degree of mobility	Transportable
Mode of operation	Continuous
Classifications according to IEC 60601-1	
MicroCO	Applied part, type B

WARNING: No modification of this equipment is allowed.

WARNING: Do not connect devices that are not specified as part of the system.

NOTE: When you connect other equipment to the unit, always make sure the whole combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems. When connecting to a PC with the supplied serial cable, the PC must be IEC 60601-1 / ANSI/AAMI ES60601-1:2005 / CAN/CSA-C22.2 No. 60601-1:14 compliant.

WARNING: The user must not touch any voltage carrying parts and the patient at the same time.

Electromagnetic Compatibility (EMC) to EN60601-1-2

WARNING: use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

The MicroCO has been test to EN 60601-1-2:2014, regarding the ability to operate in an environment containing other electrical/electronic equipment (including other medical devices).

The purpose of this testing is to ensure that the MicroCO is not likely to adversely affect the normal operation of other such equipment and that other such equipment is not likely to adversely affect the normal operation of the MicroCO.

Despite the testing of the MicroCO that has been undertaken, normal operation of the MicroCO can be affected by other electrical/electronic equipment and portable and mobile RF communications equipment. Keep a distance of about 2 meters from possible error sources when using the device.

As the MicroCO is medical equipment, special precautions are needed regarding EMC (electromagnetic compatibility).

It is important that the MicroCO is configured and installed /put into service, in accordance with the instructions/guidance provided herein and is used only in the configuration as supplied.

Changes or modifications to the MicroCO may result in increased emissions or decreased immunity of the MicroCO in relation to EMC performance.

The MicroCO should be used only with the PC serial cable provided by Micro Direct, Inc. (Cat No. ASS3803, Description: Interface cable for COBRA software). This cable should not be extended by the user. This cable should not be used with devices other than the MicroCO. If the cable is extended by the user, this may result in an increased level of emissions or decreased level of immunity, in relation to the MicroCO's EMC. Use of the cable with devices other than the MicroCO, may result in an increased level of emissions or decreased level of immunity, in relation to the other devices' EMC.

The MicroCO has an essential performance – the product should continue to operate as intended to an accuracy of +/- 5% of reading or 1 ppm (whichever is greater).

WARNING: The MicroCO should not be used adjacent to or stacked with other equipment. If adjacent or stacked use with other equipment is necessary, the MicroCO and the other equipment should be observed / monitored, to verify normal operation in the configuration in which it will be used.

Guidance and Manufacturer's Declaration – Electromagnetic Emissions		
The MicroCO is intended for use in the electromagnetic environment specified below. The customer or user of the MicroCO should assure that it is used in such an environment.		
Emission Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	Group 1	The MicroCO uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment
RF emissions CISPR 11	Group B	The MicroCO is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes
Harmonic emissions IEC61000-3-2	Not Applicable (battery powered)	
Voltage fluctuations / flicker emissions IEC61000-3-3	Not Applicable (battery powered)	

Guidance and Manufacturer's Declaration – Electromagnetic Immunity			
The MicroCO is intended for use in the electromagnetic environment specified below. The customer or user of the MicroCO should assure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC61000-4-2	Contact: +/- 8 kV Air: +/- 2 kV, +/- 4 kV, +/- 8 kV, +/- 15 kV	Contact: +/- 8 kV Air: +/- 2 kV, +/- 4 kV, +/- 8 kV, +/- 15 kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%
Electrical fast transient / burst IEC61000-4-4	+/- 2 kV 100 kHz repetition frequency for power supply lines.	Not Applicable (battery powered)	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC61000-4-5	+/- 0.5 kV, +/- 1 kV, +/- 2 kV	Not Applicable (Battery powered)	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% U _T ; 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% U _T ; 1 cycle and 70% U _T ; 25/30 cycles Single phase: at 0° and 0%U _T ; 250/300 cycle	Not Applicable (Battery powered)	Mains power quality should be that of a typical commercial or hospital environment. If the user of the MicroCO requires continued operation during power mains interruptions, it is recommended that the MicroCO be powered from an uninterruptible power supply or a battery
Power frequency (50/60 Hz) Magnetic field IEC61000-4-8	30 A/m 50 & 60 Hz	30 A/m 50 & 60 Hz	If incorrect operation occurs, it may be necessary to position the MicroCO further from sources of power frequency magnetic fields or to install magnetic shielding. The power frequency magnetic field should be measured in the intended installation location to assure that it is sufficiently low.
NOTE U _T is the a.c. mains voltage prior to application of the test level.			

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The MicroCO is intended for use in the electromagnetic environment specified below. The customer or user of the MicroCO should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level
Conducted RF IEC61000-4-6	3 V 0,15 MHz – 80 MHz 6 V in ISM bands Between 0,15 MHz and 80 MHz 80% MHz at 1 kHz	3 V 0,15 MHz – 80 MHz 6 V in ISM bands Between 0,15 MHz and 80 MHz 80% MHz at 1 kHz
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m 80 MHz to 2.7 GHz
IMMUNITY to proximity fields from RF wireless communications equipment IEC 61000-4-3	28 V/m 450 MHz, 50% PM at 18 Hz 810 MHz, 50% PM at 18 Hz 870 MHz, 50% PM at 18 Hz 930 MHz, 50% PM at 18 Hz 1720 MHz, 50% PM at 217 Hz 1845 MHz, 50% PM at 217 Hz 1970 MHz, 50% PM at 217 Hz 2450 MHz, 50% PM at 217 Hz 27 V/m 385 MHz, 50% PM at 18 Hz 9 V/M 710 MHz, 50% PM at 217 Hz 745 MHz, 50% PM at 217 Hz 780 MHz, 50% PM at 217 Hz 5240 MHz, 50% PM at 217 Hz 5500 MHz, 50% PM at 217 Hz 5785 MHz, 50% PM at 217 Hz	28 V/m 450 MHz, 50% PM at 18 Hz 810 MHz, 50% PM at 18 Hz 870 MHz, 50% PM at 18 Hz 930 MHz, 50% PM at 18 Hz 1720 MHz, 50% PM at 217 Hz 1845 MHz, 50% PM at 217 Hz 1970 MHz, 50% PM at 217 Hz 2450 MHz, 50% PM at 217 Hz 27 V/m 385 MHz, 50% PM at 18 Hz 9 V/M 710 MHz, 50% PM at 217 Hz 745 MHz, 50% PM at 217 Hz 780 MHz, 50% PM at 217 Hz 5240 MHz, 50% PM at 217 Hz 5500 MHz, 50% PM at 217 Hz 5785 MHz, 50% PM at 217 Hz

Symbols



Type B device



0086

In accordance with Directive 93/42/EEC



Disposal in compliance with your local waste management facility



Consult the instructions for use



Manufacturer



Date of Manufacture



Serial Number

Rx only

Federal U.S. law restricts this device to sale by or on the order of a physician.



Batch Code



Reference Number



Single Patient Use

Consumables / Accessories

Cat. No.	Description
FM200	SafeBreath Mouthpieces (Bag of 200)
3301	Mouthpieces (Bag of 100)
PSA1800	CO Connector with Valve
MC10	CO Calibration Gas (17 Liters)
MC15	CO Calibration Kit
MC22	Regulator for Calibrating Gas
MEC1184	Calibration Tool
MEC1007	Reducing Connector for Calibration
ASS3803	Interface cable for COBRA Software
48-70	Protex Disinfectant Wipes

For further information or to place an order for disposables or supporting products, please contact Micro Direct, your local distributor or view our website www.mdspiro.com

For Customer Care: Toll Free 1-800-588-3381, phone 207-786-7808

Please Note: Information in this manual is subject to change without notice and does not represent commitment on the part of Micro Direct, Inc.

Specifications

Sensor type	Electro-chemical fuel cell
Range	0 - 300 ppm
Resolution	1 ppm
Detected levels:	Display:
Green indicator light	0 to 6 ppm (0 to 1 %COHb)
Amber indicator light	7 to 10 ppm (1.1 to 1.6 %COHb)
Red indicator light	11 to 72 ppm (1.8 to 12 %COHb)
Flashing red light +alarm	> 72 ppm (> 12 %COHb)
Accuracy	+/-5% of full scale or 1ppm whichever is the greater
Sensitivity drift	0.5%/°C
Sensor life	>2 years
Response time	< 15 sec (to 90% of reading)
Hydrogen cross sensitivity	<15%
Operating temperature	32 - 104 °F
Operating pressure	Atmospheric +/- 10%
Pressure coefficient	0.02% signal per mBar
Relative humidity (Noncondensing)	15 - 90% continuous (0 - 99% intermittent)
Baseline drift	0 ppm (auto-zero)
Long term drift	< 2% signal loss per month
Power source	Single Alkaline 9-volt battery
Main battery life	30 hours of continuous use
Internal battery	Lithium 1/2AA 3.6 volt
Internal battery life	10 years
Weight	6.3 ounces with battery
Dimensions	6.5" x 2.5" x 1"
Display	Custom LCD
Storage temperature	-4° to +158° F
Storage humidity	30% to 75%

Customer Contact Information

For all sales order processing for products, training and spare parts, service and technical support inquiries, please contact the following:

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240

Customer Service and Sales

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Factory Repair and Technical Support

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