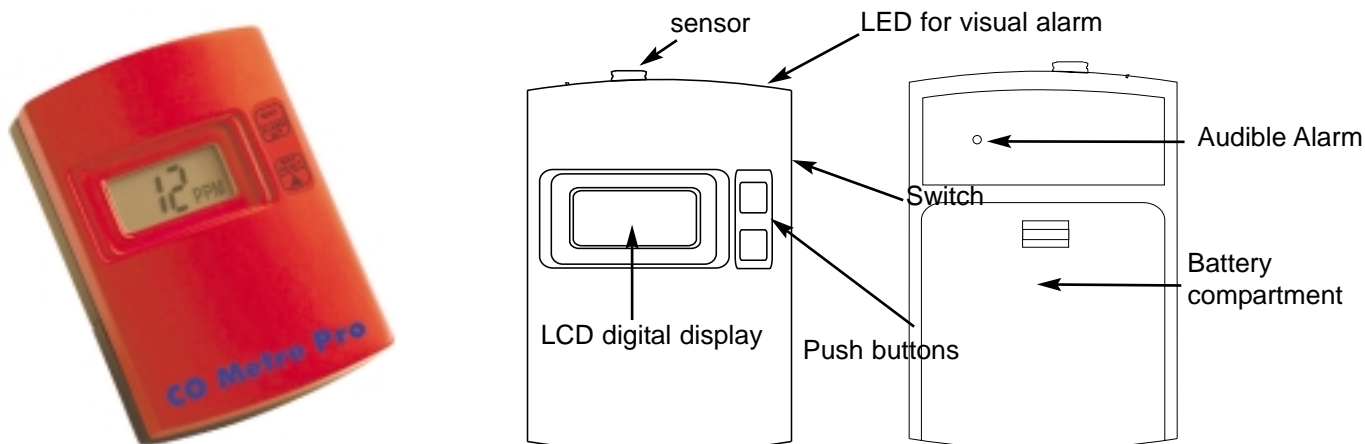


INSTRUCTION MANUAL

Designation	Portable CO controller CO Metre® Pro
Reference	CO9917

THE INFORMATION PROVIDED BY THE CO Metre® PRO

Carbon Monoxide (CO) is the most prevalent polluting gas in the world (in volume) ahead of all the other polluting gases put together. Moreover it is particularly insidious, it is a gas without smell and without colour, so undetectable. We know the fatal effects in confined spaces, apartments or houses. Formed during the combustion of carbon substances (hydrocarbon, coal, wood), it is very toxic from the point when its concentration reaches a certain level (See WHO recommendations).

CO penetrates the blood system from the lungs and combines with the human body's haemoglobin (red blood cells) 200 times more easily than oxygen. Progressively, the more CO that accumulates in the blood, the more the body is deprived of oxygen. Prolonged exposure to a weak concentration can cause permanent damage to the heart and to the brain. Headaches can be an early symptom of CO poisoning.

The CO Metre® Pro enables you to monitor the pollution that you are exposed to: it is a processor-driven CO detector, displaying a highly precise measurement of the CO concentration in the air.

When there are traces, that is to say small concentrations, of a gas in the atmosphere, the result of the analysis is given in ppm, or **parts per million**.

For example, when the CO Metre® Pro displays a reading of 6 ppm, that means there is a proportion of 6 parts of CO per million parts of air, or 6 cubic centimetres of CO per cubic metre of air (6 cm³/m³).

The CO Metre® Pro benefits from the latest technology in sensors and guarantees precise readings from 0 to 999 ppm. You can use it for years without any adjustment.

THE USE OF CO Metre® PRO

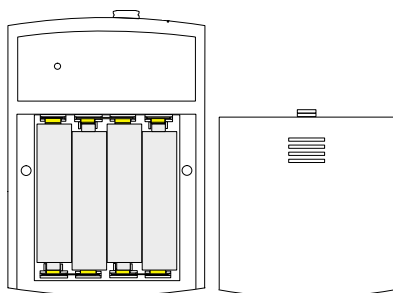
The CO Metre® Pro let you :

- Work in safe condition
- Identify a boiler or a heater with insufficient combustion.
- Put in evidence a return in a chimney's exhaust
- Localize the leak of a chimney's exhaust.
- Identify the bad evacuation of the exhaust gases of a generator.
- Identify a bad ventilation in a garage, etc.

The use of the CO Metre® Pro can bring other informations: the tobacco is an important CO Generator. In certain area like offices or badly aerated premises, it is sometimes possible to measure CO concentration up to 30 ppm and beyond. Also in the traffic (notably in tunnels or underground parking) it is usual to get important CO concentrations.

INSTRUCTION MANUAL

INSTALLING THE BATTERY



The battery compartment is situated in the back of the CO2 Metre® Pro.

Push on the battery door's grid and slide the battery cover down . Position 6 AAA battery (type LR03) into the battery compartment, following the polarity markings. Replace the cover door.

Your CO2 Metre® Pro is now ready for use.

STARTING YOUR CO2 Metre® Pro

Take the CO2 Metre® Pro and slide the switch situated on the right side upwards.

When you switch on your CO2 Metre® Pro to the ON position, the following appears on the screen during the first two seconds:



This shows that your device has carried out an auto-test and is working normally. A beeps will be emitted after this initialisation.



Right side of the CO2 Metre® Pro

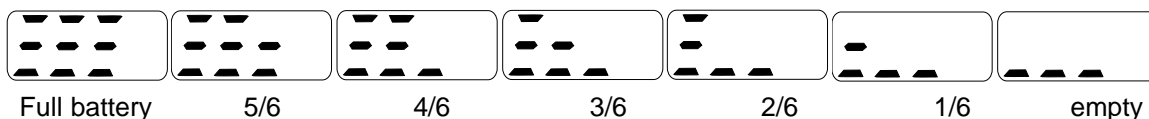
HOW THE CO2 Metre® PRO WORKS

Once the auto-test is finished, CO2 Metre® Pro checks the battery autonomy:

First the "CAP" message announces that the capacity of the battery will be displayed.

Then, one of the following figures is displayed indicating the state of the battery.

According to the type of battery (depends on the technology) you can estimate the remaining autonomy.



After autonomy It begins by measuring the ambient temperature.

- First in Celsius :

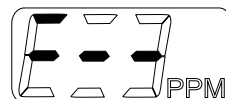


- Then in Fahrenheit :



Note: The temperature displayed by the CO2 Metre® Pro indicates the temperature inside the device. This internal temperature is useful for the sensor's operation, and is only displayed for convenience. If you move suddenly from a hot area to a cold area or vice-versa, or if you are carrying or have recently carried the sensor/display unit in your pocket, the displayed temperature will not be an accurate measure of the ambient air temperature.

The CO2 Metre® Pro then goes through a sensor cleaning cycle. This cycle lasts about 30 seconds. During this delay, ppm blinks on your screen and the display indicates the progress of this process. Then, it takes a sample from the air of the surrounding atmosphere and displays the level of CO2 measured.



INSTRUCTION MANUAL

Every two seconds, the microprocessor measures the concentration of CO again, then displays it on the LCD display: identical if the concentration is unchanged, with a new reading if it has changed.



The time taken for cleaning corresponds to normal contamination of the sensor. If your CO Metre® Pro displays a few ppm in a clean-air environment at the end of the cleaning phase, it is because it could have been contaminated before. After a little while it will correctly indicate the measure of pollution in the ambient air.

INTERPRETING THE READINGS GIVEN BY THE CO Metre® Pro

The CO Metre® Pro gives you precise readings of the CO concentration in your immediate environment. You now need to understand how to interpret those readings.

The **World Health Organisation (WHO)** recommends not to exceed the following CO exposure levels.

<u>Level of exposure</u>	<u>WHO maximum recommended exposure time</u>
10mg/m3 (8,7ppm)	8 hours
30mg/m3 (26ppm)	1 hours
60mg/m3 (52ppm)	30minutes
100mg/m3 (87ppm)	15 minutes

In addition, for CO exposure levels above 26 ppm, WHO recommends avoiding any similarly high CO exposure level for the following eight hours.

US Standards : MSHA "Threshold Limit Values (TLVs) booklet" (Cincinnati, Ohio, ACGIH,1971) and OSHA limits the exposure to 50 ppm for a workstation (TWA). This is the preset alarm threshold for your device.

The density of CO is 0.968, which is very close from the air's one (1.00) and explains why it behaves as the air.

EXPOSITION TIME

For CO exposure above WHO limits, special precautions should be taken especially for those with fragile physical health, including infants, children, the elderly and people suffering from anaemia, cardiac or respiratory problems, asthma, emphysema or chronic bronchitis.

As the mass of a gas can be different from that of air, the formula that converts mg/m3 into ppm (at 25°C) takes into account this mass, known as the "molar mass"; this is the formula

$$\text{mg/m}^3 \times 24.45 / \text{molar mass} = \text{ppm}$$

The molar mass of carbon monoxide is 28.01

To convert ppm in mg/m3, apply the following formula : **mg/m3 = p.p.m. x 1,15**

Maximum-value mode :

Press the upper button briefly to enter maximum-value mode. The MAX symbol will appear with the maximum measurement since the maximum-value was last reset. When in maximum-value mode, a push on the lower button will reset the stored maximum-value. Pressing the upper button again exits the maximum-value mode.

Alarm-set mode :

The alarm-set mode allows you to activate or deactivate the alarm and to set the alarm threshold.

When activated, three different alarms can occur depending on the sensor's current measurement:

From 50% to 100% of the threshold value: a beep every 2 seconds

From 100 to 150% of the threshold value: a double beep every second

Greater than 150% of the threshold value: a beep every half-second.

Press and hold the upper button for more than 3 seconds to enter the alarm-set mode. The first display (with "ALr" displayed) lets you activate or deactivate the alarm function. The presence of a bell indicates the alarm is activated, and it can be deactivated or reactivated with the lower button.

Press the upper button to set the alarm threshold. First, the hundreds digit will blink and you can scroll through the digits using the lower button. Then press the upper button again to set the tens and the ones digits in a similar fashion. Then press the left button again to exit the alarm-set mode.

A visual alarm (red LED) is associated to the sound alarm (for noisy environment).

For safety reasons, the bell symbol is displayed to remind and guaranteed you that alarm is activated.

A push on one of the buttons switches the alarm off until the alarm threshold is passed again.

When measure goes back below the alarm threshold, the alarm switches off automatically.





Each button pressed generates a beep. The alarm settings and max. value are memorised even when the device is turned off.

INSTRUCTION MANUAL

MAKING THE MOST OF YOUR CO Metre® Pro

Gases move fairly slowly in the air. The fact that the CO has to come into contact with the sensor to be measured should be taken into account. The sensor itself has a certain inertia that must be taken into account. The time taken for the reading to rise from the one of clean air to a reading of 60 ppm of CO takes about 35 seconds. In reverse, the corresponding time taken for the reading to go down, for the same values, is 50 seconds. Such a change in measurement depends on the air speed and consequently the measurement reacts faster when it is windy.

Apart from the normal display indications upon start-up or during the normal operation of the device, certain specific messages can occasionally appear :

bAt

If the "bAt" symbol appears on your screen, it indicates that the power of the battery of your device is insufficient to give a precise reading. Turn off the device, replace all the batteries together or recharge your device if you are equipped with rechargeable batteries (see accessories).

The battery level is monitored every 2 seconds, and a low battery is indicated by a beep. The "bAt" message will be displayed after 3 consecutive beeps.

tF

If the "tF" message appears it means that the ambient temperature is outside the range that permits normal functioning of your device (see "Technical Specifications")

SAt

The "Sat" message means that the measurement of the device is at saturation point (beyond 999 ppm). You should move your CO Metre® Pro immediately away from the source of pollution that caused the saturation. The measurement will decrease progressively until it can make a normal, stabilised reading.

SF

If the "SF" message appears it means that the sensor is out of order (Sensor Failure).

HOW TO CHECK YOUR CO Metre® Pro

Testing the electronics:

An auto-test function when you turn on the device verifies the electronics. The error messages of the auto-test function are indicated previously in the previous chapter.

Testing the sensor:

This test is not essential but it enables you to familiarise yourself with the functioning of the device. Hold the CO Metre® Pro 20cm above a burning cigarette, making sure that the smoke goes up into the opening of the sensor.

To control the sensor's accuracy, use a can of CO containing a well-known concentration (30 and 100 ppm are standard). Inject in an empty plastic pocket containing some drops of water to moisten the gas, Wait for the warming of the gas at ambient temperature and empty slowly the contents of the pocket on the sensor. Attention, a too important stream can disrupt measurement. In case of abnormal result, see the paragraph about sensor contamination at feet of this page.

RECOMMENDATIONS

The CO Metre® Pro guarantees you precise readings for years, it just needs the following care and attention...

- **Do not store your device near vapors of alcohol, essence, fuel oil, lubricants, painting, chlorine or chemicals. The sensor would be contaminated**
- **Do not spray aerosol products, including hair sprays, deodorants, perfumes, lubricants and paints, near the sensor.**
- **avoid any contact or nearness with materials made or containing silicone (polymerized or not).**
- **Do not use detergents or solvents to clean the CO Metre® Pro, , the chemical products can contaminate the sensor, causing temporary or permanent malfunction.**
- **Do not store your device near a major source of air pollution, the time necessary for the sensor to clean itself will be prolonged.**
- **Do not immerse or spray a liquid of whatever nature in the opening, this could permanently damage your CO Metre® Pro.**

To restore the sensor after contamination, warm the device to between 40° and 60°C for several days. Test it again after cooling down.

INSTRUCTION MANUAL

GARANTEE

The CO Metre® Pro has been manufactured according to the high standards. However, it is possible that a fault or a problem might exist in spite of the numerous tests carried out. This device is guaranteed against all manufacturing defects in the conditions listed below.

GARANTEE CONDITIONS

The guarantee is strictly limited to the exchange or the repair at the factory of parts recognised as faulty, having been examined and tested, excluding any other liability.

- The length of the guarantee, given by the manufacturer, is one year and begins on the date of purchase.
- It is only applicable if the device has been used according to the conditions of use and according to normal regulations for an electric device.
- The following conditions are not covered by the guarantee
 - Deterioration coming from abnormal usage or as a result of the using of a battery that has been wrongly positioned or one that has been leaking.
 - Damages caused by dropping.
 - Deterioration or accidents as a result of negligence or stemming from an alteration or attempt to alter the device in any way..
 - Deterioration as a result of opening or attempting to open the device.
- The guarantee is only valid for devices who are sent back to the address given on the attached card.
- The replacement or repair under this guarantee does not extend the duration of the guarantee.
- The conditions of this guarantee does not prevent the application of the legal guarantee, for the benefit of the buyer, in the case of hidden defects or manufacture faults; the guarantee is then valid in every case.

TECHNICAL CHARACTERISTICS

- SnO₂ semi-conductor technology sensor (non-ageing)
- Microprocesor driven, reliability with unlimited life duration.
- 10 bits Analogic / Digital Converter.
- Individually factory-calibrated.
- Auto-test upon start-up and autonomy display.
- Automatic sensor cleaning upon start-up (30 seconds duration)
- Full scale: from 0 to 999 ppm
- Resolution : one part per million
- Calculations accuracy within 2%
- Sensor accuracy within 10% (over 30 ppm)
- Nominal conditions: 25°C and 60% relative humidity (RH)
- Temperature / relative humidity compensation from -10°C to + 60°C and 30% to 90% associated relative humidity.
- Temperature range: 10°C to 45°C
- Functions under air pressure variations from -100m to + 2,000m above sea-level
- Measuring cycle: every 2 seconds.
- Three different sounds and visual alarm (75%, 100% and 150% of the alarm threshold)).
 - Visual by red LED
 - Sound with different bip modulations. Sound level : 110 dB at 30 cm (80 dB at 1 m)
- Ambient temperature displayed at start-up (in °C and °F) accurate to within +/- 1.5°C
- Lightweight and compact, less than 80 grams (excluding battery)
- Compact 6 x 8,5 x 2,9 cm
- Operated by 6 AAA batteries.
- Possibility of functioning with Ni-Mh batteries, autonomy : 32/35 hours (for C > a 600mA/h)
- Embedded connector for charger.

ACCESSORIES

- Pouch with belt clip (ref. 9937)
- Charger Kit (ref. 9927)
 - Including:
 - 6 Ni-Mh rechargeable batteries, autonomy 32/35 hours.
 - A 230 V AC/DC charger : a charging socket (desktop type).
 - A cigarette lighter charger : 12 V DC