MACURCO
GAS DETECTION

Macurco™ Single-Gas XLS Series Monitor, CM-1XLS Carbon Monoxide (CO) User Instructions

Important: Keep these User Instructions for reference

TABLE OF CONTENTS

GENERAL SAFETY INFORMATION

Intended Use

The Macurco™ Single-Gas XLS Series Monitor is designed to continuously monitor the ambient environment and notify the user if Carbon Monoxide (CO) levels reach the alarm set point for the monitor.

List of Warnings and Cautions within these User Instructions

⚠ **WARNING**

- Using a certified gas with a concentration other than the one listed for this instrument and sensor when conducting a calibration or calibration verification test (Bump test) will produce inaccurate readings. This means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death.** For proper use, see supervisor or User Instructions, or call Macurco Technical Service at 1-877-367-7891.

- Each person using this equipment must read and understand the information in these User Instructions before use. Use of this equipment by untrained or unqualified persons, or use that is not in accordance with these User Instructions, may adversely affect product performance and **result in sickness or death.**

- This instrument helps monitor for the presence and concentration level of carbon monoxide gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death.** For proper use, see supervisor or User Instructions, or call Macurco Technical Service at 1-877-367-7891.

- Use only for monitoring the gas which the sensor and instrument are designed to monitor. Failure to do so may result in exposures to gases not detectable and cause sickness or death. For proper use, see supervisor or User Instructions, or call Macurco Technical Service at 1-877-367-7891.

- Each time the unit is turned on, it performs a self-test, which activates the audible, vibratory and visual alarms. If the self-test fails, or all the alarms do not activate, do not use. Failure to do so may adversely affect product performance and result in sickness or death. Immediately exit any environment that causes an alarm condition on the monitor. **Failure to do so may result in sickness or death.**

- Do not cover or obstruct display, audible alarm opening or visual alarm cover. Doing so may adversely affect product performance and result in sickness or death.

- Vibrator and LCD may not function effectively below –4 °F (–20 °C). Using the instrument below this temperature may adversely affect product performance and **result in sickness or death.**

- The following steps must be performed when performing a calibration or calibration verification test (Bump test) to ensure proper performance of the detector. Failure to do so may adversely affect product performance and **result in sickness or death.**

    – Calibrate prior to initial use.

    – When performing a calibration or calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not use expired calibration gas.

    – A calibration verification test (bump test) should be performed before initial and each use.

    – If the instrument cannot be calibrated or calibration verification test is not within ± 15% of the calibration gas concentration, do not use until the reason can be determined and corrected.

    – Do not cover or obstruct display, audible alarm opening or visual alarm cover.

    – Ensure sensor inlet is unobstructed and is free of debris.

- – Insure calibration hood is removed prior to use.
- Do not attempt to clean the instrument by rubbing with a dry cloth. Cleaning with a dry cloth may generate a static charge and result in an explosion if located in a hazardous environment.
- Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair intrinsic safety which may adversely affect product performance and **result in sickness or death.**

CAUTION

This instrument contains a lithium battery. Dispose of in accordance with local regulations.

Avoid the use of harsh cleaning materials, abrasives and other organic solvents. Such materials may permanently scratch the surfaces and damage the display window, labels, or instrument housing.

USE INSTRUCTIONS AND LIMITATIONS

⚠ **WARNING**

Each person using this equipment must read and understand the information in these User Instructions before use. Use of this equipment by untrained or unqualified persons, or use that is not in accordance with these User Instructions, may adversely affect product performance and result in sickness or death.

Use For

Monitoring for Carbon Monoxide (CO).

Do Not Use For

Monitoring for gases other than those which the instrument was designed to monitor, or in atmospheres where oxygen concentrations are below 12%. Prolonged exposure to high levels of target gas may prematurely degrade sensor performance.

General Description

These User Instructions apply to the Macurco Single-Gas XLS Series Monitor, Carbon Monoxide (CO). It is designed to provide continuous monitoring of the ambient environment for either Carbon Monoxide (CO). The gas detected by the sensor installed in the instrument is identified on the label located on the front of the unit. Accuracy of the instrument's gas sensor readings can vary up to ±25% depending on the accuracy of the calibration gas, how often the instrument is calibrated, environmental conditions (temperature, atmospheric pressure, humidity, air velocity), cross interference gases, or time of exposure to the target gas (see SPECIFICATIONS section). Calibrating with the appropriate certified calibration gas prior to use, within the same environmental conditions in which the instrument will be used, will increase the accuracy of the instrument's gas concentration reading (see Calibration Verification Test and Calibration section). An internal microprocessor controls the indication and alarm functions in response to the signals received from an electrochemical sensor permanently mounted inside the unit. When turned on, it continuously monitors the ambient air that enters the sensor through the sensor inlet opening by the process of passive diffusion. If the level of the target gas detected by the sensor reaches a factory preset alarm point, the unit will alarm (see SPECIFICATIONS section).

The Macurco Single-Gas XLS Series Monitor is a battery powered unit utilizing a permanently mounted, non-rechargeable 3.6-volt Lithium battery. It is designed to be intrinsically safe. The Macurco Single-Gas XLS Series Monitor is UL Classified intrinsically safe for Class I, Div. I, Groups A, B, C, & D Hazardous Locations.

The components of the Macurco Single-Gas XLS Series Monitor are assembled in an ABS/PC plastic housing 3.2 x 2 x 1.2 in. (8.1 x 5.1 x 3.1 cm). Located on the front face of the unit is an OFF/ON/MENU button, the display (LCD), sensor inlet, audio alarm opening, visual alarm LED. On the back of the instrument is an alligator pocket/belt clip and a label containing the intrinsic safety information and serial number.
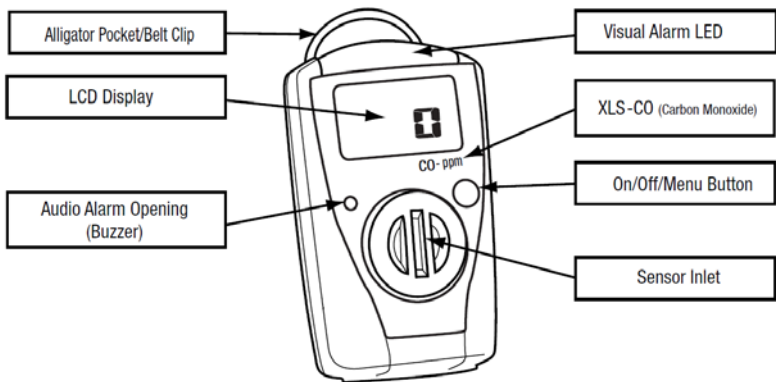
Fig.1

Sensor Symbol	Gas Read by Sensor	Display Range	Reading Resolution	Required Calibration Gas Concentration	User Selectable Alarm Settings*	Factory Set TWA Alarm	Factory Set STEL Alarm	Operating Temperature Range
CO	Carbon Monoxide	0 - 995 ppm	1 ppm	35 ppm	25, 35, 50, 100 ppm	35 ppm	200 ppm	-4 to 122 °F (-20 to 50 °C)

*Factory default setting is 25 ppm.

Specifications

- Size: 3.2 x 2.0 x 1.2 in. (8.1 x 5.1 x 3.1 cm)
- Weight: 4.1 oz. (11 5 g)
- Ingress Protection Rating: IP54
- Sensor: Electrochemical (factory replaceable)
- Operating Humidity: 15 – 90% (non-condensing)
- Readout: Direct read LCD
- Range: 0-995 ppm (CO)
- Alarm Indicators Visual: Flashing LCD display and Red LED, Audio: 85 dBA @ 1 foot (30.5 cm) buzzer, Tactile: Internal vibrator
- Alarm Readings: Low, High, Low Battery, Over Range, TWA, and STEL alarms
- Alarm Settings: 4 user selectable alarm settings (see alarm settings in the table below)
- Reading Resolution: 1 ppm (readings start at 5 ppm)
- Test Function: Self-test on circuitry, battery and alarms. Automated sensor test reminder.
- Sensor Replacement: Factory replaceable
- Intrinsic Safety: UL Classified - Class I, Div. I, Group A, B, C & D, T4
- Power: Permanently mounted, non-rechargeable 3.6-volt Lithium battery (factory replaceable)
- Radio Frequency Protection: <10% deviation of alarm level when subjected to 450MHz, 5 Watt Radio @ 2ft (61cm)
- Keypad: One button operation
- Operating Temperature Range: -4 to 122°F (-20°C to 50°C)

- Sensor Accuracy: (After calibration) Carbon Monoxide (CO) - Less than ±25% of the displayed reading or 5 ppm, whichever is greater.
- Non-contaminated environment: An environment containing less than 0.1 ppm of hydrocarbons, 0.5 ppm of CO, 0.2 ppm of H_2S, 0.2 ppm of Ammonia, 0.5 ppm of Hydrogen and 0.2 ppm of other gasses not normally found in the air.
- Certified calibration gas: Refers to a calibration gas sold by Macurco* or produced by an ISO 9001:2000 certified calibration gas manufacturer. The certified accuracy of the calibration gas components must be listed on the calibration gas container and traceable to National Institute of Standards and Technology (NIST) or a national measurement instiute standard reference material.
- Warranty: 2 years for sensor and electronics (see WARRANTY section)

  * A gas analysis certificate of the calibration gas is available if requested.

Display Menu Sequence

Press On/Off/Menu Button (number of times)	Result
1	Unit performs a self-test
2	Display peak value
3	Enable/Disable calibration reminder function
4	Display/Select alarm set points
5	Clear TWA values
6	Clear STEL values
Hold button down for 3 seconds	Turn unit on or off

OPERATING INSTRUCTIONS

The following instructions are intended to serve as a guideline for the use of the Macurco Single-Gas XLS Series Monitor Carbon Monoxide (CO). It is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for each facility.

⚠ WARNING

Each person using this equipment must read and understand the information in these User Instructions before use. Use of this equipment by untrained or unqualified persons, or use that is not in accordance with these User Instructions, may adversely affect product performance and **result in sickness or death.**

This instrument helps monitor for the presence and concentration level of carbon monoxide gas. Misuse may produce an inaccurate reading, which means that higher levels of the gas being monitored may be present and could result in overexposure and **cause sickness or death.** For proper use, see supervisor or User Instructions, or call Macurco Technical Service at 1-877-367-7891.

Use only for monitoring the gas which the sensor and instrument are designed to monitor. Failure to do so may result in exposures to gases not detectable and **cause sickness or death.** For proper use, see supervisor or User Instructions, or call Macurco Technical Service at 1-877-367-7891.

If you have any doubts about the applicability of the equipment to your job situation, consult an industrial hygienist or call Macurco Technical Service at 1-877-367-7891.

Turning Unit On and Off

Press and hold the On/Off/Menu button for 3 seconds to switch on/off.

During power up, the instrument will display the software version number and sensor type installed in the unit and then perform a self-test. During the test sequence, the unit will display a 60 second countdown.
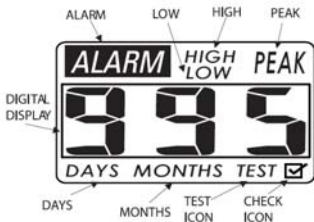
Display Readings

Fig. 2

Normal Operating Mode

The LCD will display 0 ppm for gas levels below 5 ppm. Gas levels of 5 ppm and higher will be displayed in increments of 1 ppm.

Performing Self-test

<div style="border:1px solid black; background:black; color:white">⚠ WARNING</div>

Each time a self-test is performed, it activates the audible, vibratory and visual alarms. If the self-test fails, or all the alarms do not activate, do not use. Failure to do so may adversely affect product performance and **result in sickness or death**.

A self-test can be performed at any time by pressing the On/Off/Menu button once from the normal operating mode. This will test the battery, electronic circuitry and alarm functions to insure they are working properly. The self-test does not test the performance of the sensor. This must be done through a calibration or calibration verification test. See Calibration Verification Test and Calibration section of these User Instructions.

The self-test will be indicated by "test" icon being displayed on the LCD for about 5 seconds (Fig. 3). The buzzer, LED and vibrator will activate and then "CAL" will be

12

displayed for 5 seconds (Fig. 4). If the button is pressed within 5 seconds of "CAL" being displayed, the unit will enter calibration mode (see Calibration

Verification Test and Calibration section). After successful completion of a self-test, the "check" icon (Fig. 5) will appear on the display for 24 hours, and the unit will be in normal operating mode.

If a self-test fails, the LCD will display "Err" (Fig. 6). Press button to clear. **Do not use the instrument until the reason for the "Err" message has been determined and corrected.**

Fig. 3

Fig. 4

Fig.5

Viewing Peak Levels

From normal mode, press the button twice and the peak reading will be displayed.
To clear the peak reading, wait 5 seconds; "Clr" will be displayed. Press the button once to clear and the value will be set to zero so long as the unit is in a non-contaminated environment (Fig. 7). The instrument will go back to normal operating mode after 5 seconds.

Calibration Reminder Function

The unit has a calibration reminder function that can be enabled and disabled by the user (factory default is enabled). When enabled, the "TEST" icon will flash when the time since last calibration exceeds 30 days (Fig. 3).

In the event a user has a fixed calibration schedule less than every 30 days, the calibration reminder function may be disabled. To disable this function: press the button 3 times, the "Off/On" status will be displayed, wait 5 seconds until the "TEST" icon begins to flash. To re-enable this function: press the button 3 times, the off/on status will be displayed, wait 5 seconds until the "TEST" icon begins to flash.

Press the button to toggle between off/on. After 5 seconds it will return to normal mode.

Fig. 6

Fig. 7

Fig. 8

Alarms

<div align="center">⚠ WARNING</div>

Immediately exit any environment that causes an alarm condition on the monitor. Failure to do so may result in **sickness or death.** Do not cover or obstruct display, audible alarm opening or visual alarm cover. Doing so may adversely affect product performance and **result in sickness or death.** Vibrator and LCD may not function effectively below –4 °F (–20 °C). Using the instrument below this temperature may adversely affect product performance and **result in sickness or death.**

Viewing Alarm Set Points

To display alarm set-points, press the button 4 times from the normal operating mode (Fig. 9). The low alarm will be displayed. Press the button again to display the high alarm, TWA alarm and STEL alarm, respectively.

Setting Alarm Levels

The unit's factory alarm level default set point is 25 ppm. The alarm level can be changed to one of four preset values, depending on user needs and applications. The four user selectable alarm settings are: 25 ppm, 35 ppm, 50ppm, 100ppm.

To change the alarm value, press the button 4 times from the normal operating mode. Wait 5 seconds until the "alarm" display flashes, then press the button repeatedly until the desired alarm point is shown. Wait 5 seconds until the display returns to the normal mode. The new alarm point is now set.

Alarm

An alarm condition is indicated by a slow alarm sequence of buzzer, red LED, "ALARM" display and vibrator actuated every 1.25 seconds (Fig. 9).

Fig.9

TWA and STEL Alarm

When a TWA or STEL alarm point is reached, the alarm is actuated. The "tA" is displayed in the digital display area alternating every second with the gas level when the TWA alarm is actuated. The "StL" is displayed in the digital display area alternating every second with the gas level when the STEL alarm is actuated.

To clear TWA, from the normal operating mode, press the button 6 times (Fig. 12). The display will toggle between "tA" and the TWA alarm level setting. Wait 5 seconds until the display shows "Clr," then press the button once (Fig. 14).

To clear STEL, from the normal operating mode, press the button 7 times (Fig. 13). The display will toggle between "StL" and the STEL alarm level setting. Wait 5 seconds until the display shows "Clr," then press the button once (Fig. 14).

| Fig. 10 | Fig. 11 | Fig. 12 |

Over Range Alarm

An over range alarm is indicated by a flashing display showing the highest value in the range of the sensor: 995 ppm for CO (Fig. 13). The alarm indicators are the same as those for the normal alarm.

Low Battery Alarm

If battery capacity reaches a point where it is no longer sufficient to maintain operation of the unit, the LCD will display "bAt" (Fig. 14). Press button to acknowledge and silence the alarm. Do not use until battery is replaced by a certified Macurco Portable Gas Detection Service Center.

Fig. 15

Fig. 16

Alarm Mode Table

Alarm Mode	Display	Alarm Sequence
Alarm	Gas Concentration and "ALARM"	Repeating Alarm Cycle: Three 1.25 sec. alarm sequences (vibrate, double beep/double flash) followed by five 1.25 sec. alarm sequences (double beep/double flash). Repeats cycle.
TWA	Gas Concentration alternates with "tA"	Repeating Alarm Cycle: Three 1.25 sec. alarm sequences (vibrate, double beep/double flash) followed by five 1.25 sec. alarm sequences (double beep/double flash). Repeats cycle.
STEL	Gas Concentration alternates with "StL"	Repeating Alarm Cycle: Three 1.25 sec. alarm sequences (vibrate, double beep/double flash) followed by five 1.25 sec. alarm sequences (double beep/double flash). Repeats cycle.
Over Range	"HIGH ALARM" and flashing of highest value in the range of sensor (995 ppm CO)	Repeating Alarm Cycle: Three 1.25 sec. alarm sequences (vibrate, double beep/double flash) followed by five 1.25 sec. alarm sequences (double beep/double flash). Repeats cycle.
Error	Err	Double beep/double flash every 40 seconds
Fail	FAil	No audible, visual or vibrating alarm
Low Battery	bAt	Double beep/double flash every 40 seconds

Calibration Verification Test and Calibration

⚠ **WARNING**

The following steps must be performed when conducting a calibration or calibration verification test (Bump test) to ensure proper performance of the monitor. Failure to do so may adversely affect product performance and **result in sickness or death.**

– Calibrate prior to initial use.
– When performing a calibration or calibration verification test (bump test) only use certified calibration gas at the required concentration level. Do not use expired calibration gas.
– A calibration verification test (bump test) should be performed before initial and each use.
– If the instrument cannot be calibrated do not use until the reason can be determined and corrected.
– Do not cover or obstruct display, audible alarm opening or visual alarm cover.
– Ensure sensor inlet is unobstructed and is free of debris.
– Insure calibration hood is removed prior to use.

A calibration verification test (Bump test) should be performed before every use. This is done by checking the monitor's response to a known concentration of certified calibration gas. Calibration of the unit must be performed at least every 30 days or immediately if it does not pass a calibration verification test. Sensors used beyond the warranty period or exposed to very high concentrations of gas may require more frequent testing.

Note: The instrument has been calibrated prior to being shipped from the factory. However, to ensure it is performing correctly, a calibration verification test must be performed prior to initial use.

Performing a Calibration Verification Test (Bump Test)

A calibration verification test (bump test) should be conducted every time you use the monitor. This is the only way to effectively confirm that all characteristics of the monitor and the sensors are working correctly.

Ensure that you are in a non-contaminated environment before performing a calibration verification test. To conduct the test, attach the calibration (cal) hood on top of the sensor inlet. Ensure the calibration gas matches the sensor installed in the instrument. Connect the hose from the gas regulator of the calibration gas bottle to the cal hood (Fig. 15). Turn on the gas.

Compare the displayed values with those of your reference calibration gas source. Apply the calibration gas for a period of at least 2 - 3 minutes to ensure sufficient response time and steady state readings. If the measurement displayed is within ±10% of the calibration gas concentration, turn off the calibration gas and remove the cal hood. The unit is now ready for use. Otherwise a calibration should be performed.

Performing a Calibration

Ensure that you are in a non-contaminated environment before entering calibration mode. From normal mode press the button once; the self-test will be performed and "CAL" will be displayed (Fig. 16). Press the button within 5 seconds and the unit will enter calibration mode indicated by "000" displayed on the LCD (Fig. 17). If the unit passed this zeroing step, the display will change to "SPn" alternating with "YES" (Fig. 18 & 19). Press button to complete calibration with a gas span. Apply gas when the display indicates "GAS" alternating with the expected gas level (Fig. 20). Apply the appropriate gas (35 ppm for CO) within 30 seconds.

Once the gas is sensed the display will read "SPn" alternating with the expected gas level. The calibration will take approximately 2 – 3 minutes. Upon successful completion, the display will show the gas reading. Turn off the gas and remove the cal hood.

If calibration fails, the "FAIL" message will be displayed (Fig. 21). Repeat calibration steps. If the instrument still fails to calibrate, do not use. **Do not use the instrument until the reason for the "FAIL" message has been determined and corrected.**

Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

MAINTENANCE

⚠ WARNING

Do not attempt to clean the instrument by rubbing with a dry cloth. Cleaning with a dry cloth may generate a static charge and result in an explosion if located in a hazardous environment.

Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair intrinsic safety which may adversely affect product performance and result in sickness or death.

CAUTION

This instrument contains a lithium battery. Dispose of in accordance with local regulations.

Avoid the use of harsh cleaning materials, abrasives and other organic solvents. Such materials may permanently scratch the surfaces and damage the display window, labels, or instrument housing.

Cleaning

Cleaning of the external surfaces is best carried out using a damp cloth with a mild detergent or soap.

Disposal

The Macurco Single-Gas XLS Series Monitor is designed to be discarded or sent back to a certified Macurco Portable Gas Detection Service Center to have the battery and sensor replaced 2 years after initial activation. To properly dispose of the instrument, follow local solid waste disposal regulations.

MACURCO GAS DETECTION PRODUCTS LIMITED WARRANTY

Macurco warrants the Macurco™ Single-Gas XLS Series Monitor will be free from defective materials and workmanship for a period of two (2) years from date of manufacture (indicated on the cover of the device), provided it is maintained and used in accordance with Macurco instructions and/or recommendations. If any component becomes defective during the warranty period, it will be replaced or repaired free of charge, if the unit is returned in accordance with the instructions below. This warranty does not apply to units that have been altered or had repair attempted, or that have been subjected to abuse, accidental or otherwise. The above warranty is in lieu of all other express warranties, obligations or liabilities. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED TO A PERIOD OF TWO (2) YEARS FROM THE PURCHASE DATE. Macurco shall not be liable for any incidental or consequential damages for breach of this or any other warranty, express or implied, arising out of or related to the use of said gas detector. Manufacturer or its agent's liability shall be limited to replacement or repair as set forth above. Buyer's sole and exclusive remedies are return of the goods and repayment of the price, or repair and replacement of non-conforming goods or parts.