

# **MACURCO GAS DETECTORS**

## **CM-4**

### **INSTALLATION AND OPERATING INSTRUCTIONS**

#### **GENERAL INFORMATION**

The CM-4 is an all-electronic, low voltage, Carbon Monoxide to *Voltage* or *Current* Transducer. The unit has a linearized voltage and current output that is temperature compensated and has the ability to be field calibrated. See the CM-4 data sheet for further information and typical circuit diagrams. If multiple transducers are used in a system without a Macurco control panel, each transducer will require a separate power connection from the panel.

#### **LOCATION**

The unit, on average, can cover about 5000 sq. ft. (465 sq. meters). The coverage depends on air movement in the room or facility. Extra detectors may be needed near any areas where people work, or the air is stagnant. Normally, the unit mounts 5 feet (1.5 meters) above the floor, in a central area where air movement is consistent.

#### **INSTALLATION**

Remove the screw from the front of the unit, and remove the front cover. There is a black switch mounted on the printed circuit board labeled "SW". Printed on the circuit board next to the switch is "mA" at one end and "Volts" at the other (factory sets all units to volts). Set the switch in the proper direction for the desired operation, "mA" for 4 to 20 mA current loop output, or "Volts" for 1.00 to 2.88 VDC output. If you are using a Macurco SS103-3A or SS103-10A control panel, set the switch to "Volts". If you are using the DVP-120 control panel, Building Automation Systems or any controller that accepts analog input, set the switch to "mA".

The CM-4 mounts on a type 4S electrical box supplied by the installer. The wire gauge used to install the transducer is determined by the length of the wire run, and should be determined by the installer. The CM-4 can be operated from either 12 to 24 VDC or 12 to 24 VAC. The unit consumes maximum 2.2 W when powered from 24 VDC, maximum 1.6 W when powered from 12 VDC, maximum 4.7 W when powered from 24 VAC or maximum 2.88 W when powered from 12 VAC.

The CM-4 has four 20 gauge pig tails for wiring. Connect power to the two **Red** wires (no polarity). If you are using a Macurco control panel, the **Red** wires connect to the (C) and (D) terminals. Use the **White** and **Black** wires to connect the analog output; **White** is positive. If you are using a Macurco SS103-3A or SS103-10A control panel, the **White** wire connects to the (A) terminal, and the **Black** wire connects to the (B) terminal of the corresponding zone.

Sample wiring diagrams on the back of the Carbon Monoxide Transducers data sheet show the connections for power and output of the transducer. If a two-conductor shielded cable is used to connect the **White** and **Black** wires (output), the shield must be connected to the ground of the measuring equipment only. See the Carbon Monoxide Transducers data sheet for further details.

#### **OPERATION**

When power is first applied to the transducer, it goes through a 2-1/2 minute self-test cycle. The **GREEN** status LED (light) will flash on and off, while the output cycles from 4 to 16 mA or 1.0 to 2.1 VDC. At the end of this cycle, the **GREEN** status LED will turn on continuously to show that the unit is operational. The transducer updates its output every 2-1/2 minutes.

If the transducer is connected to a third party's panel or system refer to the front page of the Carbon Monoxide Transducers data sheet, and set the system according to the CM-4 "Dual Outputs" chart.

#### **ONBOARD DIAGNOSTICS**

The CM-4 firmware monitors all critical functions of the transducer through software diagnostics that continuously test and verify transducer operations. Various parameters are measured, and any problems are indicated by the **GREEN** status LED flashing 3 times per second, and the analog output is switched to maximum, to provide a fail safe operation. The approximate output levels are 24 mA or 2.88 VDC, respectively.

#### **STABILIZATION TIME**

Although the transducer will be fully operational within a few minutes of being turned on, the gas sensor in the unit requires up to 3 days (72 hours) to reach its final operating point. The transducer should be connected to a source of continuous power for proper sensor stabilization.

#### **SENSOR POISONS**

The gas sensor in the transducer is designed with extreme sensitivity to the environment. Consequently, the active surface of the sensor may deteriorate if it is exposed to certain substances. These substances include a direct spray from aerosols such as paints or

silicone vapors, or to a high concentration of corrosive gases such as hydrogen sulfide or sulfur dioxide for an extended period of time.

### **SERVICING**

The CM-4 does not require regular maintenance. The unit uses a self-purging semiconductor sensor that has a 7 to 10 year life expectancy. All maintenance and repair of products manufactured by Macurco are to be performed at the Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities.

For technical assistance, call Macurco Tech Support at (303) 781-4062.

### **LIMITED WARRANTY**

The CM-4 gas detector is warranted to be free from defective material and workmanship for a period of two (2) years from the date of installation. 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 agents 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. (The Uniform Commercial Code applicable in the State of Colorado shall govern.)

### **RETURN INSTRUCTIONS**

Call (303) 781-4062 for a Return Authorization number. Carefully pack the gas detector with a written description of the nature of the return. Send the unit to the following address:

**Macurco**  
**6555 South Kenton Street, Suite 304**  
**Centennial, CO 80111**  
**[www.macurco.com](http://www.macurco.com)**

## TESTING THE CM-4 AFTER INSTALLATION

### SUGGESTED FUNCTIONAL TEST

Normally this will be the only test required for the CM-4 transducer, and is the recommended way to test the unit or units after installation. All CM-4 transducers are factory calibrated and 100% tested for proper operation. The transducer tests itself automatically during every 2-1/2 minute cycle. If the transducer detects an improper voltage or inoperable component, including the CO sensor, it will enter Error mode. Refer to "ONBOARD DIAGNOSTICS," above.

This test may require 2 people: One person at the CM-4, and one person at the control panel or other monitoring system. Verify that the CM-4 **GREEN** status LED is illuminated, and is on continuously (normal operation). If the **GREEN** status LED is not on, do not proceed with the tests. If the unit fails to indicate a normal reading contact your local representative or Macurco technical support for help to resolve the problem.

### TEST PROCEDURE

1. Remove the screw located in the middle of the CM-4 front cover.
2. Remove the front cover of the transducer.
3. Note the switch labeled "TEST" located on the right side of the circuit board.
4. Press the "TEST" switch once.
5. The CM-4 will step through a 2-1/2 minute test cycle:
  - (a) The **GREEN** status LED will begin to blink on and off.
  - (b) If the current output is selected, it will progressively ramp up from 4.0 to 16.0 mA. If the voltage output is selected, it will ramp up from 1.0 to 2.1 volts.
  - (c) Any devices connected to the output will be tested over the analog output range listed in 5(b), above.

**NOTE:** The control panel or monitoring system's alarm setting should be set below the maximum test output to check the response of the panel or monitoring system.

6. At the end of the test cycle, the **GREEN** status LED will turn on continuously, and the transducer output will indicate the ambient CO level.
7. When testing is completed, replace the front cover and cover mounting screw; ensure the **GREEN** status LED is visible through the front cover.

### CARBON MONOXIDE GAS TEST (Optional)

The CM-4-FCK is needed to complete a CO gas test. The kit includes a cylinder of 50 ppm of CO mixed in air. A cylinder of 200ppm of CO mixed in air is also required. These items are available through your local representative, or from Macurco.

Verify that the CM-4 **GREEN** status LED is illuminated continuously. If the **GREEN** status LED is not on, do not proceed with the test. If the unit fails to indicate a normal reading contact your local representative, or Macurco technical support.

This test may require two people: One person at the CM-4, and one person at the control panel or other monitoring system. Proceed as follows, depending on the type of control panel:

### SYSTEM USING MACURCO SS103 CONTROL PANEL

Within the SS103-3A and SS103-10A control panel there are four terminals (labeled A, B, C, and D) that correspond to each CM-4, A and B for the output, and C and D for the power. To monitor the output voltage from the sensor, connect a digital voltmeter across terminals A and B for the sensor to be tested. This voltage will be proportional to the carbon monoxide level as shown by the "Dual Outputs" chart on the Carbon Monoxide Transducers data sheet.

If you are using the DVP-120 panel, use one of the 12 zones labeled C1-C12 for each detector. Connect power source from the panel terminals labeled +24 V and 24 Vref(-) to the detector power terminals labeled "Power", then connect panel terminals labeled I+ and I- to the detector output terminals labeled "Output" or "mA Output".

### SYSTEM USING CONTROL PANEL OR MONITORING SYSTEM NOT FROM MACURCO

Evaluate the system. There will be a way to monitor each zone, either by placing a digital multimeter across the input terminals, or by use of the main computer display terminal or control panel status indicators.

**NOTE:** 1. All units to be tested must be powered continuously for a minimum of **72 hours**.

2. For optimum accuracy of the test results, it is suggested that the transducer to be tested is located in an area of clean air with low ambient airflow.

#### TESTING

1. Remove the screw located in the middle of the CM-4 front cover.
2. Remove the front cover of the unit.
3. Open the CM-4-FCK. Connect the gas cylinder with the 50 ppm CO mixture to the regulator.
4. Check the pressure gauge on the regulator. If the gauge indicates 25 psi or less, the gas canister should be replaced.
5. Place the white cap from the regulator over the round gray device labeled FIGARO TGS 203 (CO sensor).
6. Wait 5 minutes with the gas applied continuously. The CM-4 takes samples every 2-1/2 minutes.
7. After the five (5) minutes the analog output should represent 50 ppm  $\pm 10\%$ : 1.38 VDC or 8 mA,  $\pm 10\%$ , the accuracy of the gas (normally  $\pm 2\%$ .) and the accuracy of the measuring equipment.
8. Once the reading has been taken, remove the gas from the sensor.

**NOTE:** If the output did not read within the given parameters, there are three possibilities:

- (a) The gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if the pressure gauge indicates 25 psi or less.
  - (b) The unit needs to be re-calibrated: perform a field calibration, and retest the transducer.
  - (c) The transducer is in need of servicing: return the transducer to the factory for repair and recalibration.
9. Wait 7-1/2 minutes for the CM-4 to stabilize, with no gas applied to the sensor. Another transducer may be tested at 50 ppm while waiting. If no other transducers are to be tested with the 50 ppm gas, disconnect the canister from the regulator before proceeding.
  10. After 7-1/2 minutes, connect the cylinder with the 200 ppm CO mixture to the regulator.
  11. Check the pressure gauge on the regulator. If the gauge indicates 25 psi or less, the gas canister should be replaced.
  12. Place the white cap from the regulator over the gray device labeled FIGARO TGS 203 (CO sensor).
  13. Wait 5 minutes with the gas applied continuously. The CM-4 takes samples every 2-1/2 minutes.
  14. After the five (5) minutes the analog output should represent 200 ppm  $\pm 20\%$ : (2.5 VDC or 20 mA,  $\pm 20\%$ ), the accuracy of the gas (normally  $\pm 2\%$ .) and the accuracy of the measuring equipment. See "three possibilities" in the note, above, if the reading is incorrect.
  15. When the testing is completed, replace the front cover and cover-mounting screw. Ensure the **GREEN** status LED is visible through the front cover.
  16. If there are more units to test, repeat the above steps from step one.
  17. When testing is complete, disassemble the regulator and cylinder.

**Note:** The specification for repeatability ( $\pm 10\%$ ) is after calibration, with 50 ppm CO mixture applied to the sensor. The gas accuracy (normally  $\pm 2\%$ ) must be considered, along with the accuracy of the measuring equipment.