

**MACURCO GAS DETECTORS**  
**CM-21A**  
**INSTALLATION & OPERATING INSTRUCTIONS**  
WWW.MACURCO.COM

**GENERAL INFORMATION**

The CM-21A is a low voltage, dual relay Carbon Monoxide (CO) detector and controller. It uses an all electronic system to measure the concentration of CO and calculates when the relays should be actuated. The unit also has the ability to be calibrated in the field. See the CM-21A data sheet for relay actuation levels, relay ratings, and more technical information.

**LOCATION**

The unit on average can cover about 5000 sq. ft. 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 above the floor, in a central area where air movement is generally good. See the CM-21A data sheet for more information on location.

**INSTALLATION**

The CM-21A mounts on a type 4S electrical box supplied by the contractor. Do *not* mount the CM-21A inside another box, *unless* it has good air flow through it. It is suggested to use a separate transformer for powering the unit or units because of possible interference's from other devices on the same power supply that may cause the CM-21A microcontroller to become erratic. When making connections, make sure the power is off. Connect the CM-21A wires to the control cable with wire nuts. The two **Red** wires are the power: 12 to 24 VAC or VDC (26.5 max.), with no polarity preference. The dry contact, SPDT Fan relay has three wires. The **Blue** wire is common (Com.). The **Brown** wire is the Normally Open (N.O.) contact. The **Orange** wire is the Normally Closed (N.C.) contact. The Fan relay can switch up to 5.0 Amps up to 240 VAC. The Fan relay switches if there is 35 ppm or more of CO for two or more sampling cycles (5 minutes average). The two **Yellow** wires are the dry, normally open Alarm relay contacts, again with no polarity preference. The Alarm relay is activated if CO vs. time is exceeded. See the front of the CM-21A data sheet for activation times and levels. The Alarm relay can switch up to 0.5 Amp, 200 V, or 10 VA.

**OPERATION**

The CM-21A steps through a special self test cycle for the first 2 1/2 minutes that it is powered. During the self test cycle, the Fan relay will be activated for the entire cycle (therefore the fan should run, if the system is wired to exhaust carbon monoxide). The Alarm relay will turn on for the first 10 seconds of the self test cycle, and be open for the remainder of the cycle. The unit will execute the test cycle any time power is dropped and reapplied (ex. power failure). The light can display three different colors: green, amber and red. During the self test cycle, the light on the CM-21A will turn alternately between red and green. At the end of the 2 1/2 minute cycle, the unit will take its first carbon monoxide sample and the light will turn solid green.

Once the unit has finished the self test cycle and the light is on continuously, the color of the light then indicates the relay condition. If the light is **green** neither of the relays should be activated. If the light is **amber** the Fan relay should be activated. If the light is **red** the Fan relay & Alarm relay should be activated. The CM-21A samples the air and updates its outputs every 2 1/2 minutes. *Nothing you do will cause a change until the next 2 1/2 minute cycle.*

**ONBOARD DIAGNOSTICS**

The CM-21A monitors all critical functions of the unit through software diagnostics that continuously test and verify unit operations. If a problem is found, the unit will switch to a fail-safe mode/error mode. In this error mode, the Fan and Alarm relays will be activated and the light will be off. This is a safety precaution. To clear this mode, simply turn off power to the unit for a few seconds, or push the TEST switch (inside the unit). This will cause the unit to restart the 2 1/2 minute self-test cycle. If the error mode repeats frequently, check for continuous power and proper voltage. If power is not the problem, and a unit has repeating error conditions, it may need to be returned to Macurco for service, per instructions below.

**BROWN-OUTS**

Occasionally, a lower than normal line voltage can cause the CM-21A to become erratic and inoperable. To clear this condition, reset power to the unit, by turning it off for a few seconds, then back on.

**SENSOR POISONS**

The gas sensing tip in the detector is designed with extreme sensitivity to the environment. As a result, the sensing function of the tip may be deteriorated if it is exposed to a direct spray from aerosols such as paints, silicone vapors, etc., or to a high density of corrosive gases (such as hydrogen sulfide, sulfur dioxide) for an extended period of time.

**SERVICING OF UNIT**

The CM-21A does not require regular maintenance. The unit uses a self purging semi-conductor sensor that has a 7-10 year life expectancy. All maintenance and repair of products manufactured by Macurco, Inc. are to be performed at the Macurco manufacturing facility. Macurco does not sanction any third-party repair facilities.

**LIMITED WARRANTY**

The CM-21A gas detectors are warranted to be free from defective material and workmanship for a period of one (1) year 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 ONE (1) YEAR 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. Then carefully pack the gas detector with a written description of the nature of the return. Send the unit to the following address:

**Macurco Inc.**  
**3946 South Mariposa Street**  
**Englewood, Colorado 80110**  
[WWW.MACURCO.COM](http://WWW.MACURCO.COM)

MACURCO CM-21A (CONT.)

**TESTING THE CM-21A AFTER INSTALLATION**

**SUGGESTED FUNCTIONAL TEST**

#### GENERAL:

Normally this will be the only test required for the CM-21A and is the recommended way to test the unit or units after installation. All CM-21A units are factory calibrated and 100 % tested for proper operation. The unit also has the ability to test itself automatically and does so every 2 1/2 minute cycle. If the unit detects an improper voltage or inoperable component it will default into Error mode. In Error mode, the light is off and both the Fan & Alarm relay will be actuated.

Check that the CM-21A OPERATING LED type light is illuminated, continuously. If not, do not proceed with the tests. If the unit is in error mode contact your local representative or Macurco service technician for information on resolving the problem.

#### TESTING:

1. Remove the single screw in the middle of the front cover of the CM-21A.
2. Remove the front cover.
3. Locate the switch labeled TEST on the right side of the printed circuit board.
4. Observe the color of the light on the front of the CM-21A.
5. If the light is green proceed to step 10.
6. If the light is any color except green press the Test switch now.
7. The unit will now clear itself and go through the 2 1/2 minute self test.
8. Wait for the test to end as indicated by the green light on solid.
9. Both the Fan & Alarm relay should now be in the standby mode.
10. Push the Test switch once.
11. The CM-21A will step through a 2 1/2 minute test cycle:
  - a. The light will alternate between red and green.
  - b. During the first 10 seconds of the Test cycle, the Alarm relay will be closed, so any devices connected to that relay will be tested.
  - c. The Fan relay will be activated for the full 2 1/2 minutes of the test, so if the fan circuits are wired in the normal manner, the fan should run.
12. At the end of the test cycle, the light will turn green and be on steady (Normal Operation) and the Fan & Alarm relay will be in standby mode.
13. When testing is completed reassemble the unit or units.

#### CARBON MONOXIDE GAS TEST (Optional)

#### GENERAL:

The CM21A-FCK is needed to complete a CO gas test. The kit includes a cylinder of 50 ppm of carbon monoxide (CO) in air. A cylinder of 250 ppm of CO in air will also be needed. These are available through your local representative or from Macurco Inc.

- Notes:**
1. All units to be tested must be powered continuously for a minimum of **72 hours**.
  2. For optimum test results it is suggested that the unit be in clean air (green light on) and be in a low ambient air flow.

#### TESTING:

1. Remove the philips screw on the front of the CM-21A. Remove the front cover.
2. Open the CM21A-FCK. Connect the 50 ppm gas cylinder to the regulator.
3. Check the pressure gauge on the regulator. If you have 25 psi or less you will need to replace the gas canister.
4. Place the white cap from the regulator over the round gray device labeled FIGARO TGS 203 (CO sensor). Continue to apply the gas until the test is over.
5. Wait 6 minutes with the gas applied continuously.
6. The light should turn amber within the 6 minute time frame, and the fan relay should activate, along with the connected fan circuits.
7. Remove the gas from the sensor after 6 minutes.

**Note:** If the Fan relay does not close within 6 minutes, there are three possibilities:

- a) the gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25 psi or less.
- b) the unit needs to be re-calibrated (go through recalibration and re-test)
- c) the detector is in need of servicing (return unit to factory for servicing).

8. Wait 5 minutes for the CM-21A to re-stabilize, with no gas applied to the sensor. You might test another unit at 50 ppm while waiting.
9. Disconnect the 50 ppm canister from the regulator and then connect the 250 ppm cylinder of carbon monoxide to the regulator.
10. Check the pressure gauge. If there is 25 psi or less the cylinder should be replaced.
11. Place the white cap from the regulator over the gray device labeled FIGARO TGS 203 (the CO sensor). Continue to apply the gas until the test is over.
12. The Fan relay should activate after about 5 minutes and the light turn amber.
13. After the Fan relay activates the Alarm relay should close between 2 1/2 and 6 minutes later and the light should turn red. Any devices connected to the Alarm relay should actuate. See 3 possibilities in "Note" above if Alarm relay does not close.

**Note:** The CM-21A operates on a two and one half minute cycle. Accurate times are not possible because it is difficult to tell where in the cycle each unit is currently operating. The unit only takes a sample of the air every 2 1/2 minutes. The "6 minutes" above ensures two cycles and "11 minutes" ensures 4 cycles.

14. Replace the cover and the screw on the CM-21A.
15. If there are more units to test repeat the above steps from step one.
16. When testing is complete disassemble the regulator and cylinder.

**Note:** The specification for repeatability ( $\pm 10\%$ ) is after calibration. The gas accuracy (normally  $\pm 2\%$ ) needs to be considered also along with the accuracy of the measuring equipment.