

Macurco 6-Series Training

Gas Detection. It's What We Do.

Macurco 6-Series Detector, Controller and Transducer



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Macurco 6-Series Detector, Controller and Transducer

- The Macurco 6-Series is a family of low voltage commercial gas detectors. The 6-Series detectors can be used as a stand alone detector and controller with their on-board relays or integrated with the Macurco DVP-120 control panel using the 4-20mA analog output
- Features:
 - Easy programmability with a 2-Button user interface
 - Digital display option (diS) – user selects on or off
 - User selectable buzzer (buZ)– on or off
 - Quick connectors – for power, relays & 4-20mA
 - Relay actuation: selectable at various levels
 - User selectable fan delay, fan minimum runtime
 - Factory calibrated, field calibration kit available



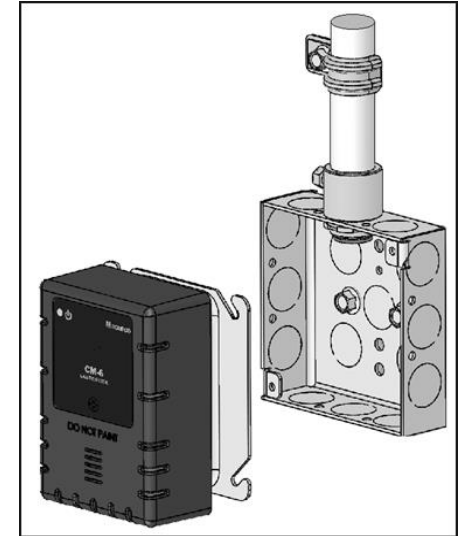
Macurco 6-Series Detector, Controller and Transducer

- The Macurco 6-Series is a Detector, Controller and Transducer. In other words... The 6-Series units can:
 - Detect a target gas level and communicate it to an alarm panel using the 0.5A alarm relay contacts
 - Control appliances, valves, fans, louvers using the on-board 5.0A relay
 - Transduce or convert gas concentrations into a 4-20mA electrical signal which can be read by indicators, alarm systems and Building Automation Systems and the Macurco DVP-120 Detection and Ventilation Panel



Macurco 6-Series - Installation

- The Macurco 6-Series detectors mount on a 4" square (or 4x4) electrical box supplied by the installer
 - The 6-Series detectors are to be connected to a Class 2 power supply or the Macurco DVP-120 Detection and Ventilation Panel
 - Interference's from other devices on the same power supply can occur, so it is suggested to use a separate transformer for powering the detectors
 - Connections to the 6-Series detectors from the control cables are made with terminal plugs
 - There are two terminals for Power: 12 to 24 VAC or 12 to 32 VDC, with no polarity preference



Macurco 6-Series – Alarm Relay

- There are two terminals for the dry alarm relay contacts - no polarity preference
- The alarm relay can switch up to 0.5 A 120 V, or 60 VA
- The Alarm Relay Configuration (Arc) can be set to normally open (default) (N.O.) or normally closed (N.C.) and will activate if the gas concentration exceeds alarm set point
- The alarm relay will deactivate once the gas concentration drops below the Alarm Relay Setting (ArS). Note that the “disable” setting will cause the alarm relay not to engage at all



Macurco 6-Series – Control Relay

- The dry contact, SPDT fan relay has three terminals. The common (COM.), normally open (N.O.) and the normally closed (N.C.) contact
- The fan relay can switch up to 5.0 A up to 240 VAC
- The Fan Relay can be configured for latching or non-latching (default) when activated (when the gas concentration exceeds fan relay set point)
- Once latched in, power will need to be interrupted or the “TEST” button pressed to un-latch the relay condition
- This Fan Relay Latching (FrL) latching feature comes in handy when controlling appliances or 24V gas valves



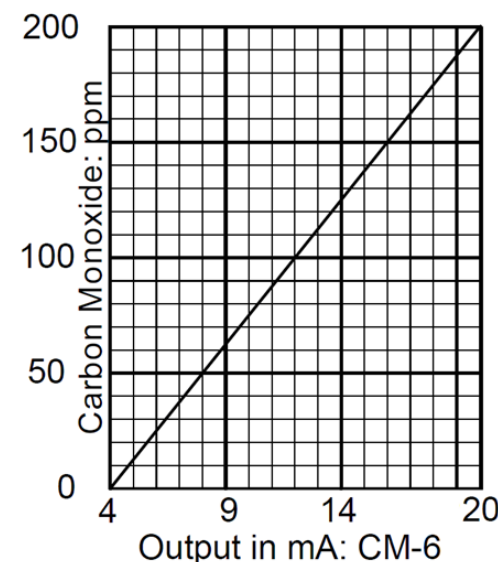
Macurco 6-Series – Control Relay

- The Fan Relay will engage if the fan setting target gas concentration is exceeded for longer than the Fan Relay Delay time
- Fan Relay Delay (Frd) Settings of 0, 1, 3 (default), 5 and 10 minutes
- Unless it is configured for latching, the fan relay will disengage once both of these conditions have been met:
 - Target gas concentration has dropped below fan setting
 - Fan Relay Run time has been exceeded
- Fan Relay Runtime (Frr) settings are OFF (default), 3, 5, 10 or 15 minutes
- Note that the “disable” Fan Relay Setting (FrS) will cause the fan relay to not engage
- The fan relay will engage in trouble fault condition and will disengage once trouble fault condition is cleared



Macurco 6-Series – Analog Output

- In addition to the fan and alarm relays the 6-Series detectors also have a 4-20mA analog output option (420). This current loop is 4 mA in clean air and 4-20 mA for the specific range of the detector; 0-200 ppm for carbon monoxide for example
- The Macurco MRS-485 adapter is an accessory used to convert the 4-20mA analog output from 6-Series detectors to a digital signal for use with multipoint addressable systems using Modbus RTU over serial line
- This device simply plugs into the back of the detector and a single screw fastens it in place
- The MRS-485 accepts the 4-20mA output and is powered from the same connection as the detector



Macurco 6-Series – User Interface

- The easy-to-use, 2-Button user interface allows the end user to program the 6-Series selectable options. Example:
 - To select the Default Configuration (dEF), in normal mode, push the Next button to get to “Con” or the Configuration menu
 - Then push the Enter button to enter the Con menu. The first selection is the “dEF” or Default setting. Push Enter.
 - If it is already in Default configuration, there will be no action. If it is not already in Default configuration, “nO” will be displayed
 - Push Next to change it to “YES” (flashing) then push Enter to confirm the change (solid) and push Enter again to return to “dEF” in the con menu
 - Push Next until “End” is displayed then push Enter to go back to normal



Macurco 6-Series – User Interface

Default Configuration – Factory Settings (for the CM-6)

- Power Up Test (PUt) setting is On
- Display (dSP) setting is Off
- Buzzer (bUZ) setting is Off
- Alarm Relay Setting (ArS)
activation at 200 ppm
- Alarm Relay Configuration (Arc)
setting is Normally Open
- Fan Relay Setting (FrS) activation
at 35ppm
- Fan Relay Delay (Frd) setting is
3 minutes
- Fan Relay Runtime (Frr)
setting is 0 minutes
- Fan Relay Latching (FrL)
condition is OFF
- Trouble Fan Setting (tFS)
setting is Off
- 4-20mA Output (420) setting
is On

Macurco 6-Series – Onboard Diagnostics

- The 6-Series 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 error mode or trouble condition
 - In this error mode, the Fan and Alarm relays will be activated, the 4-20 mA current loop will go to 24 mA, the unit will display the error code and the buzzer will chirp intermittently. This is a safety precaution
 - To clear this mode, simply turn off power to the unit for a few seconds, or push the ENTER/TEST switch (inside the unit). This will cause the unit to restart the 1 minute self-test cycle

Macurco 6-Series – End-of-life Signal

- The end-of-life signal (EOL) provides the user an opportunity to test, calibrate or replace the sensor assuring that it is still performing within acceptable parameters nearing the end of its expected life:
 - The CM-6 has a long life, non-replaceable electrochemical sensor. Seven (7) years after the CM-6 is installed the sensor end-of-life signal will be activated indicating that the CM-6 has reached the end of its typical usable life
 - The GD-6 has a long life, non-replaceable catalytic bead sensor. Five (5) years after the GD-6 is installed the sensor EOL will be activated
 - The TX-6 sensors have a 2-3 year life expectancy that can be tested, calibrated and replaced in the field
 - The RD-6 sensors have a 7 year life expectancy that can be tested, in the field
 - The OX-6 sensors have a 2-3 year life expectancy that can be tested, calibrated and replaced in the field
 - The CD-6 sensors have a 10 year life expectancy that can be tested are self calibrated in the field

Macurco 6-Series – Calibration

- All 6-Series units are factory calibrated and 100% tested for proper operation. Field Calibration Kits are also available to complete calibrations or gas testing
 - Contents of the FCK - gas cylinders, as regulator with about two feet of plastic tubing, humidifier, calibration hoods
 - Several detectors can be calibrated with one FCK. The only limitation is the amount of gas in the cylinder. The 17 liter cylinder has approximately 85 minutes of continuous calibration run time at 0.2 LPM
 - Replacement cylinders are available
 - 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



CM-6 Carbon Monoxide Detector, Controller and Transducer



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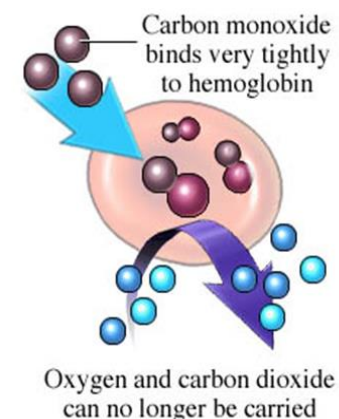
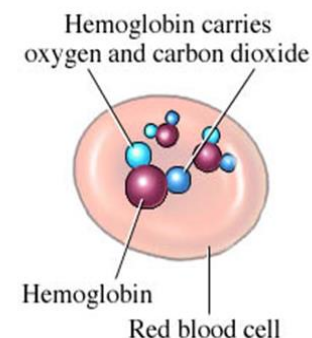
CM-6 Carbon Monoxide Detector, Controller and Transducer

- The Macurco™ CM-6 is a fully programmable, low voltage, dual relay Carbon Monoxide (CO) detector, controller and transducer for HVAC and Fire & Security applications
- The CM-6 has selectable relay, 4-20mA output, buzzer and digital display options
- The CM-6 an electronic detection system used to measure the concentration of CO and provide feedback and automatic exhaust fan control
- Low level meter and alarm from 0-200 ppm of CO For applications that require CO response meeting OSHA requirements
- Can be field tested and calibrated
- 5,000 square feet coverage



CM-6 Carbon Monoxide and Hydrocarbon Fuels

- Carbon monoxide is colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. Carbon monoxide interferes with blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects
- Carbon monoxide is an odorless, colorless and toxic gas. Because it is impossible to see, taste or smell the toxic fumes, CO can kill you before you are aware it is present
- At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue



CM-6 Carbon Monoxide and Hydrocarbon Fuels

CO Level in Air	Health Effects
0 ppm	Fresh Air
100 ppm	Slight headache after 1-2 hours.
200 ppm	Dizziness, headache, nausea after 2-3 hours.
400 ppm	Dizziness, headache, nausea after 1-2 hours / life threatening after 3 hours.
800 ppm	Dizziness, headache, nausea after 45 minutes, unconscious after 1 hour, death within 3 hours.
1,600 ppm	Dizziness, headache, nausea after 20 minutes, death within 2 hours.
3,200 ppm	Dizziness, headache, nausea after 10 minutes, death within 60 minutes.
6,400 ppm	Dizziness, headache, nausea after 1-2 minutes, death within 30 minutes.
12,800 ppm	Instantaneous effects, death within 3 minutes.

CM-6 Carbon Monoxide and Parking Garages

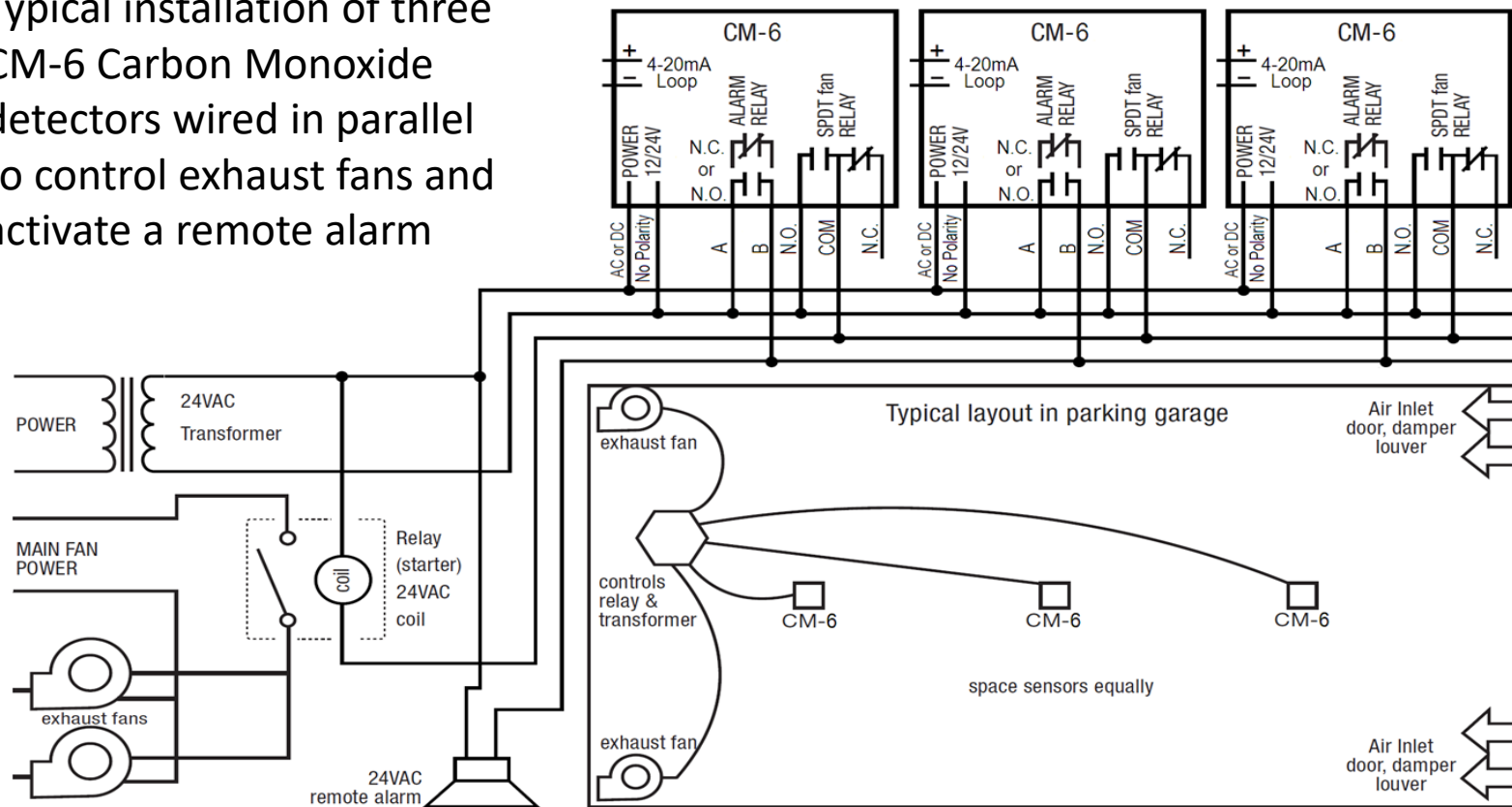
- Sources of Carbon Monoxide include automobile exhaust in parking garages, truck or forklift exhaust in loading docks, vehicle repair facilities or warehouses and combustion of heating type gases; a worn or poorly adjusted boiler or furnace can be a significant source
- The CM-6 meets the requirements of the Uniform Building Code for enclosed garages and meets OSHA standards for CO exposure
- The CM-6 provides CO detection and automatic exhaust fan control for automotive maintenance facilities, enclosed parking garages, utility rooms, warehouses and other commercial applications

CM-6 Carbon Monoxide and Parking Garages

Level of CO in Air	Standard	Recommended Action
9 ppm	EPA – Environmental Protection Agency. Ambient air standard over 8 hours	None – level is too low to be a set point.
25 ppm	IMC – International Mechanical Code, ACGIH – American Conference of Government Hygienists. Maximum allowable level for worker exposure over 8 hours.	Low level fan activation / alarm set point if municipality complies with IMC standard. Required level for California and Canada.
35 ppm	NIOSH – National Institute of Occupational Safety and Health. Maximum allowable level for worker exposure over 8 hours. EPA – Ambient air standard over 1 hour.	Recommended low level fan activation / alarm set point.
50 ppm	OSHA – Occupational Safety and Health Administration. UMC – Uniform Mechanical Code. Maximum allowable level for worker exposure over 8 hours.	Maximum recommended low level fan activation / alarm set point.
100 ppm		Recommended high level alarm set point.
200 ppm	NIOSH and UMC – Maximum allowable concentration level.	Maximum high level alarm set point.

CM-6 Carbon Monoxide and Parking Garages

Typical installation of three CM-6 Carbon Monoxide detectors wired in parallel to control exhaust fans and activate a remote alarm



GD-6 Combustible Gas Detector, Controller and Transducer



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GD-6 Combustible Gas Detector, Controller and Transducer

- The Macurco™ GD-6 is a fully programmable, low voltage, dual relay Combustible Gas detector, controller and transducer for HVAC and Fire & Security applications
 - The GD-6 an electronic detection system used to measure the concentration of Combustible Gas and provide utility, exhaust fan or valve control
 - The GD-6 has selectable relay, 4-20mA output, buzzer, digital display and target gas options: Methane, Propane or Hydrogen, though it is sensitive to other hydrocarbons
 - Low level meter and alarm from 0-50% LEL
 - Can be field tested and calibrated
 - 900 square feet coverage



GD-6 Combustible Gases: Propane, Methane and Hydrogen

- Propane also known as Liquefied Petroleum (LP) gas is fuel for many homes, businesses, private and municipal vehicle fleets, school buses, taxis, forklifts and other indoor industrial vehicles
 - Propane is stored as a liquid and converted into a gas inside a tank or a cylinder. In its natural form Propane (C₃H₈) is colorless and odorless with flammability limits in air of 2.2 to 9.5%
 - The “rotten egg” smell of Propane gas is an odorant called “Mercaptan” added to aid in leak detection
 - Gas boilers, furnaces, water heaters, clothes dryers, fireplaces and stoves are sources of gas leaks
 - Propane gas is heavier than air and may accumulate in basements, crawl spaces, ditches or along floors

GD-6 Combustible Gases: Propane, Methane and Hydrogen

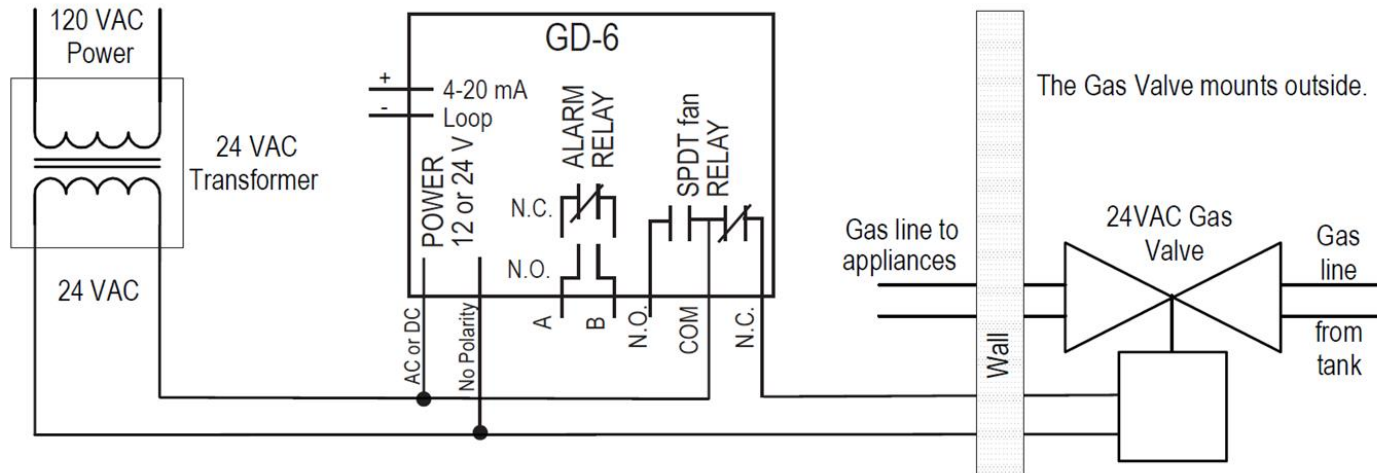
- Sources of Methane gas include Landfills; from the decomposition of wastes, livestock and manure management, Natural Gas utilities or Natural Gas powered vehicles and maintenance facilities
 - Methane (CH_4) is a colorless, odorless gas with flammability limits in air of 5.3% to 15%
 - Utility Natural Gas is almost pure Methane mixed with ethane, propane, butane and pentane
 - The smell of natural gas is Mercaptan odorant
 - Gas boilers, furnaces, water heaters, clothes dryers, fireplaces and stoves are common sources of gas leaks
 - Natural Gas and Methane are lighter than air and may accumulate high in a room or building

GD-6 Combustible Gases: Propane, Methane and Hydrogen

- Sources of Hydrogen include battery charging stations for golf carts, forklifts or automobiles, battery back-up in IT rooms or telecommunication towers and fuel cell or hydrogen powered vehicles and maintenance facilities
 - Lead-Acid batteries generate Hydrogen (H₂) gas during recharging
 - At ordinary temperature and pressure Hydrogen it is an odorless, colorless gas
 - Hydrogen burns readily in air over a wide range of concentrations: from 4 to 75% by volume
 - Hydrogen gas is lighter than air and may accumulate high in a room or building

GD-6 Combustible Gases: Valve Control

- The GD-6 can be used as a latching gas valve controller that sounds an audible alarm and turns off one or more gas valves when gas is detected. The gas valve is not supplied by Macurco must be purchased separately. The gas valve must be of the normally closed type, that is then opened by the GD-6 to allow gas to flow to the gas fueled appliance



TX-6-ND Nitrogen Dioxide Detector, Controller and Transducer



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TX-6-ND Nitrogen Dioxide Detector, Controller and Transducer

- The Macurco™ TX-6-ND is a fully programmable, low voltage, dual relay Nitrogen Dioxide (NO₂) detector, controller and transducer for HVAC and Fire & Security applications
 - The TX-6-ND has selectable relay, 4-20mA output, buzzer and digital display options.
 - The TX-6-ND an electronic detection system used to measure the concentration of NO₂ and provide feedback and automatic exhaust fan control to help ensure a safe environment
 - The TX-6-ND is a Low level meter and alarm and displays 0-20ppm of NO₂
 - 5,000 square feet coverage



TX-6-ND Nitrogen Dioxide and Diesel Emissions

- Nitrogen Dioxide is one of the most prominent air pollutants and is toxic by inhalation. Symptoms of Nitrogen Dioxide poisoning tend to appear several hours after one has inhaled a low, but potentially fatal dose
 - At ordinary temperatures and atmospheric pressure, it is a reddish-brown gas with a characteristic sharp, biting odor
 - High concentrations of the oxides of nitrogen can cause headache, dizziness and loss of consciousness as well as pulmonary edema
 - Health concerns about diesel exhaust relate not only to as respiratory and heart diseases, but also to other health problems such as cancer. Lung cancer is the major cancer thought to be linked to diesel exhaust

American Cancer Society, Inc.

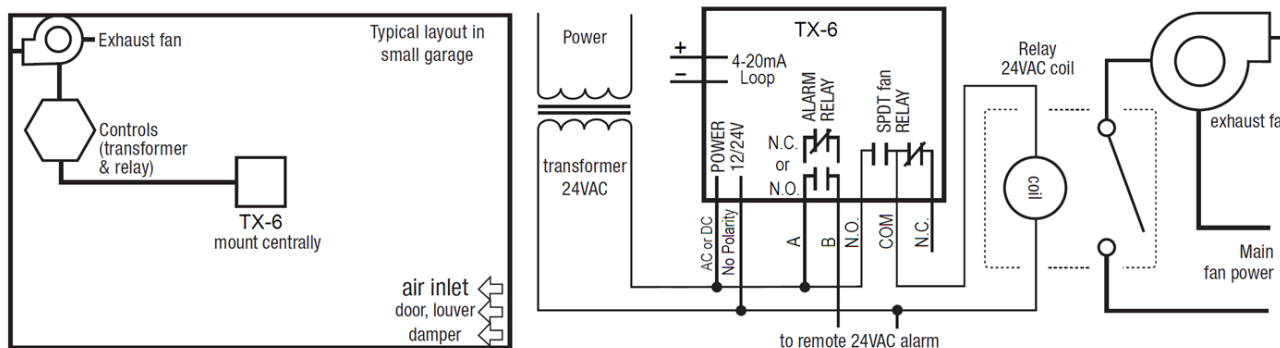
TX-6-ND Nitrogen Dioxide and Diesel Emissions

- There is a large market for NO₂ or Diesel Exhaust detection: parking garages, loading docks, truck and bus depots, firehouses, ambulance bays, warehouses, maintenance facilities, railroads and farms
 - The higher average temperature of combustion of diesel engines generates more nitrogen oxides (NO_x) than gasoline engines
 - NIOSH estimates that approximately 1.35 million workers are occupationally exposed to the combustion products of diesel fuel
 - Diesel is the most widely used fuel for public buses and school buses in the US
 - 94% of goods are shipped using diesel powered vehicles

OSHA Safety Hazard Information Bulletin on Potential Carcinogenicity of Diesel Exhaust

TX-6-ND Nitrogen Dioxide and Diesel Emissions

- Workers who are likely to be exposed to diesel emissions include firemen, bridge and tunnel workers, railroad workers, loading dock workers, truck drivers, fork-lift drivers, truck and bus maintenance garage workers
 - Typical installation of the TX-6-ND used as a stand alone detector and controller in a small truck bay or loading dock to ventilate nitrogen dioxide (NO₂) from diesel exhaust



TX-6-AM Ammonia Detector, Controller and Transducer



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TX-6-AM Ammonia Detector, Controller and Transducer

- The Macurco™ TX-6-AM is a fully programmable, low voltage, dual relay Ammonia (NH₃) detector, controller and transducer for HVAC and Fire & Security applications
 - The TX-6-AM has selectable relay, 4-20mA output, buzzer and digital display options.
 - The TX-6-AM an electronic detection system used to measure the concentration of NH₃ and provide feedback and automatic exhaust fan control to help ensure a safe environment
 - The TX-6-AM is a Low level meter and alarm and displays 0-100ppm of NH₃
 - The TX-6-AM has a replaceable sensor and can be field tested and calibrated
 - 900 square feet coverage



TX-6-AM Ammonia and Refrigeration

- The TX-6-AM provides Ammonia detection and automatic exhaust fan control for industrial refrigeration, warehouses, hockey rinks or other commercial refrigeration applications
 - Refrigerant grade anhydrous ammonia is a clear, colorless liquid or gas, free from visible impurities. It is at least 99.95 percent pure ammonia
 - Ammonia or NH_3 , is a colorless gas with a pungent, suffocating odor. It is shipped as a liquefied compressed gas
 - Causes irritation of the eyes, nose, throat; dyspnea (breathing difficulty), wheezing, chest pain; pulmonary edema; pink frothy sputum; skin burns liquid: frostbite
 - The TX-6-AM is designed to meet the NIOSH and OSHA standards for Ammonia exposure limits

TX-6-HS Hydrogen Sulfide Detector, Controller and Transducer



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TX-6-HS Hydrogen Sulfide Detector, Controller and Transducer

- The Macurco™ TX-6-HS is a fully programmable, low voltage, dual relay Hydrogen Sulfide (H₂S) detector, controller and transducer for HVAC and Fire & Security applications
 - The TX-6-HS has selectable relay, 4-20mA output, buzzer and digital display options
 - The TX-6-HS an electronic detection system used to measure the concentration of H₂S and provide feedback and automatic exhaust fan control to help ensure a safe environment
 - The TX-6-HS is a Low level meter and alarm displaying 0-50ppm of H₂S
 - The TX-6-HS has a replaceable sensor and can be field tested and calibrated
 - 900 square feet coverage



TX-6-HS Hydrogen Sulfide and Swamp Gas

- The TX-6-HS provides Hydrogen Sulfide detection and automatic exhaust fan control for industrial activities that can produce the gas including petroleum/natural gas drilling and refining, wastewater treatment, coke ovens, tanneries and paper mills
 - Common names for H₂S include sewer gas, stink damp, swamp gas and manure gas
 - It occurs naturally in crude petroleum, natural gas, and hot springs and is produced by bacterial breakdown of organic materials in sewage
 - Hydrogen sulfide is a colorless, flammable, extremely hazardous gas with a “rotten egg” smell
 - High levels of H₂S can cause death. Lower, longer-term exposure can cause eye irritation, headache, and fatigue

CD-6 Carbon Dioxide Detector, Controller and Transducer



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CD-6 Carbon Dioxide Detector, Controller and Transducer

- The Macurco CD-6 is a low voltage, dual relay Carbon Dioxide (CO₂) detector, controller and transducer. The CD-6 has selectable 4-20 mA output, buzzer and digital display options
 - It is an electronic detection system used to measure the concentration of Carbon Dioxide and provide feedback and automatic ventilation control to help reduce CO₂ concentrations in conference rooms, classrooms, meeting halls or similar applications
 - The CD-6 is a low level meter capable of displaying from 0-2000 ppm (parts per million) of Carbon dioxide
 - The CD-6 is factory calibrated and 100% tested for proper operation
 - The CD-6 uses an automated background calibration program to set the clean air level on a regular basis

CD-6 Carbon Dioxide Detector, Controller and Transducer

- Outdoor "fresh" air ventilation is important as it can dilute CO₂ the indoor environment. The amount of fresh air that should be supplied to a room depends on the type of facility and room
 - Ventilation should keep carbon dioxide concentrations below 1000 ppm and create indoor air quality conditions that are acceptable to most individuals
 - The CD-6 uses an automated background calibration program to set the clean air level on a regular basis
 - The CD-6 will maintain accuracy it is exposed to the "clean air reference value" (this reference value is the lowest concentration to which the sensor is exposed) at least three times in the span of 14 days
 - Note: This applies when used in typical indoor ambient air



CD-6 Carbon Dioxide Detector, Controller and Transducer

- The CD-6 provides CO₂ detection and automatic ventilation control for conference rooms, classrooms, meeting halls or similar applications
 - Carbon dioxide is a colorless, odorless gas that is produced both by people exhaling CO₂ as well the burning of gasoline, coal, oil and wood
 - The outdoor concentration of carbon dioxide can vary from 350-400 parts per million (ppm) or higher in areas with vehicle high traffic or industrial activity
 - The indoor CO₂ level depends upon the number of people present, how long an area has been occupied, the amount of outdoor fresh air entering the area and other factors
 - Carbon dioxide concentrations indoors can vary from several hundred parts per million to over 1000 ppm in areas with many people present for an extended period and where fresh air ventilation is limited

RD-6 Refrigerant Gas Detector, Controller and Transducer



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Refrigerant Categories

- There is a wide variety of refrigerants used in air conditioning equipment depending on the application. In general the most common refrigerants used in the industry belong to the following three categories
 - Chlorofluorocarbons (CFCs)
 - Hydrochlorofluorocarbons (HCFCs)
 - HFCs - such as R-134a are the new refrigerants and are being used in the newer machines to replace the CFC and HCFC
 - Blends - There are many common blends that include either R-12, R-22, R-125 or R-134a

Hydrofluorocarbon (HFCs)

- The Macurco new RD-6 and RD-12 Refrigerant Detectors will be calibrated with R-134A and will detect:
 - R-22 Hydrochlorofluorocarbon (HCFC)
 - R-134a Hydrofluorocarbon (HFC)
 - R-404a Hydrofluorocarbon (HFC) Blend
 - R-407c Hydrofluorocarbon (HFC) Blend
 - R-410a Hydrofluorocarbon (HFC) Blend



Refrigerant Safety Classifications

- Refrigerant safety group classifications consist of two alphanumeric characters (e.g. A2); the capital letter corresponds to toxicity and the digit to flammability
- Toxicity classification - Refrigerants are divided into two groups according to toxicity:
 - Class A signifies refrigerants for which toxicity has not been identified at concentrations less than or equal to 400 ppm
 - Class B signifies refrigerants for which there is evidence of toxicity at concentrations below 400 ppm

Refrigerant Safety Classifications

- Flammability classification - Refrigerants are divided into three groups according to flammability:
 - Class 1 indicates refrigerants that do not show flame propagation when tested in air at 21°C and 101 kPa
 - Class 2 indicates refrigerants having a lower flammability limit of more than 0.10 kg/m³ at 21°C and 101 kPa and a heat of combustion of less than 19 kJ/kg
 - Class 3 indicates refrigerants that are highly flammable as defined by a lower flammability limit of less than or equal to 0.10 kg/m³ at 21°C and 101 kPa or a heat of combustion greater than or equal to 19 kJ/kg

<http://www.epa.gov/ozone/snap/refrigerants/safety.html>

Refrigerant Safety Classifications

Hydrochlorofluorocarbons (HCFC)			
R22	chlorodifluoromethane	CHClF_2	A1
R141b	1,1-dichloro-1-fluoroethane	$\text{CH}_3\text{CCl}_2\text{F}$	A2
R142b	1-chloro-1,1-difluoroethane	CH_3CClF_2	A2
Hydrofluorocarbons (HFCs)			
R32	difluoromethane	CH_2F_2	A2
R125	pentafluoroethane	CHF_2CF_3	A1
R134a	1,1,1,2-tetrafluoroethane	CH_2FCF_3	A1
R143a	1,1,1-trifluoroethane	CH_3CF_3	A2
R152a	1,1-difluoroethane	CH_3CHF_2	A2
Azeotropic mixtures			
R502		R22/R115 (48.8/51.2)	A1
R507		R125/R143a (50/50)	A1
Zeotropic mixtures			
R404A		R125/R143a/R134a (44/52/4)	A1
R407C		R32/R125/R134a (23/25/52)	A1
R410A		R32/R125 (50/50)	A1

http://www.iifir.org/userfiles/file/webfiles/summaries/Refrigerant_classification_EN.pdf

OX-6 Oxygen Detector, Controller and Transducer



Gas Detection. It's What We Do.

Oxygen Detection

- The new Macurco OX-6 and OX-12 Oxygen Detectors will be field calibrated with ambient air and bump tested with 17% oxygen v/v gas
 - Fan relay actuation: selectable at “dis” (disabled), 18, 18.1... , 20.2 (default), 20.3, 20.4 & 20.5% v/v
 - Alarm relay settings: “dis” (disabled), 18.5, 19, 19.5 (default), 20, 20.5% v/v
 - If oxygen levels rise to 23.5% v/v the Fan Relay and Alarm Relay will be activated. This is a preset function and is not selectable



Oxygen Properties and Occurrence

- Oxygen is a colorless, odorless, tasteless gas essential to living organisms, being taken up by animals, which convert it to carbon dioxide; plants, in turn, utilize carbon dioxide as a source of carbon and return the oxygen to the atmosphere
 - The proportion of oxygen by volume in the atmosphere is 20.9 percent
 - Seawater is 89 percent oxygen by weight. Dissolved oxygen is essential for the respiration of fish and other marine life
 - During respiration, animals and some bacteria take oxygen from the atmosphere and return to it carbon dioxide, whereas by photosynthesis, green plants assimilate carbon dioxide in the presence of sunlight and evolve free oxygen
 - Almost all the free oxygen in the atmosphere is due to photosynthesis

Oxygen Enrichment

- Potential Symptoms: Cough; dizziness; sore throat; visual disturbances at very high concentrations
 - At 100% oxygen for more than 24 hours: symptoms above plus weakness, fatigue, pain in joints and muscles, numbness and tingling in arms and legs, palpitations, headache, nasal congestion, ear disturbances, nausea, vomiting, loss of appetite, fever and swelling of mucous membranes
 - OSHA does not have a PEL for oxygen. Minimum acceptable breathing air contains 19.5% oxygen.
 - Supplying oxygen to animals has been known to produce tissue damage, with toxicity increasing with the increase of oxygen concentrations and exposure pressures

Oxygen Enrichment

- Oxygen therapy is administered to decrease tissue hypoxia and to relieve arterial hypoxemia. High concentrations of oxygen are often used in patients with adult respiratory distress syndrome
 - End-organ damage from hyperoxia depends on both the concentration of oxygen administered and the oxygen pressure during exposure
 - Prolonged exposure to hyperbaric oxygen causes central nervous system and pulmonary toxicity which results in atelectasis, pulmonary edema, and seizures
 - Lung damage may occur as a result of normobaric hyperoxia
 - A severe retinopathy (retrolental fibroplasia) occurs in neonates during oxygen exposures

Oxygen Depletion

- If the oxygen concentration in air decreases or, if the concentration of any other gases increase, a situation is rapidly reached where the risks of asphyxiation are significant. For this reason any depletion of oxygen below 20.9 % must be treated with concern

O ₂ (Vol %)	Effects and Symptoms
18-21	No discernible symptoms can be detected by the individual. A risk assessment must be undertaken to understand the causes and determine whether it is safe to continue working.
11-18	Reduction of physical and intellectual performance without the sufferer being aware .
8-11	Possibility of fainting within a few minutes without prior warning. Risk of death below 11%.
6-8	Fainting occurs after a short time. Resuscitation possible if carried out immediately.
0-6	Fainting almost immediate. Brain damage , even if rescued.

Macurco 6-Series Detector Accessories

Duct Mount Kit DMK-1

- Duct Mount Kit for monitoring gas concentrations in ventilation ducts

Weatherproof Housing Kit

- Enables 6-Series units to be protected from indirect spray

White Housing

- Available for customers that require a move interior type housing

Plug-in Power Supply PS-12

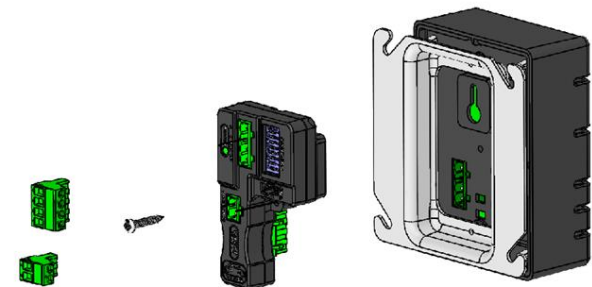
- 120VAC to 12VDC transformer



Macurco 6-Series Detector Accessories

MRS-485 Adapter

- Converts the 4-20mA analog signal to a digital signal for use with multipoint addressable systems.
- Mounts behind the detector inside of a standard 4" x 4" electrical box
- 8 bit dip switch address selector
- RS-485 termination uses 4 pin connector with jumper to select termination
- Communications connections include signal (A and B), common and shield terminals



Macurco 6-Series Detector Accessories

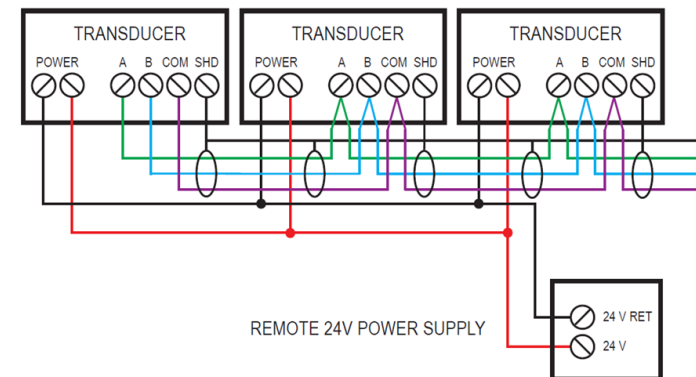
MRS-485 Adapter

- Operates in the RTU Modbus Transmission Mode with a Selectable Baud Rate: 4800, 9600, 19200 (default), 38400, 57600, 115200 bps
- Converts the 6-Series 4-20mA analog output to a digital output for use with addressable network systems for building automation, HVAC and industrial control applications.
- The Macurco MRS-485 output is connected via a four terminal screw type connector. The MRS-485 adapter is wired in the standard 2W-Modbus circuits definition with selectable built-in terminating resistors at the ends of the RS-485 bus.

Macurco 6-Series Detector Accessories

- MRS-485 Adapter
- It is recommended to always use twisted wires, especially for non-shielded cable, to reduce noise and allow for reliable data communication over greater distances.
- Use at least 3-conductor wire with one twisted pair providing a pair for signal (A & B) and common (COM) connections.
- For best performance use shielded 3-conductor wire with one twisted pair providing a pair for signal (A & B), common (COM) and shield ground (SHD) connections.

TYPICAL CONNECTION OF MRS-485






Note: Running the Modbus cable adjacent to or in the same conduit with high voltage wires is not recommended as there may be interference from the high voltages.

Macurco 6-Series Detector Accessories

GD-6 Field Calibration and Test Kits




- 10 & 20% LEL Methane, Propane, Hydrogen
- Gas Cylinders
- Regulator
- Plastic tubing
- Humidifier
- Calibration hoods

Product	GDH-FCK	GDM-FCK	GDP-FCK
Image			
Data Sheet			
Type	<i>Calibration Kit</i>	<i>Calibration Kit</i>	<i>Calibration Kit</i>
Description	GD-6 Hydrogen Gas Field Calibration Kit GDH-FCK, 34L, 10% LEL, 34L, 20% LEL, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs	GD-6 Methane Gas Field Calibration Kit GDM-FCK, 34L, 10% LEL, 34L, 20% LEL, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs	GD-6 Propane Gas Field Calibration Kit GDP-FCK, 34L, 10% LEL, 34L, 20% LEL, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs
Size	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)
Shipping Weight	8 pounds (3.6kg)	8 pounds (3.6kg)	8 pounds (3.6kg)

Macurco 6-Series Detector Accessories

CM-6 Field Calibration and Test Kits




- 50ppm and 200ppm CO
- Gas Cylinders
- Regulator
- Plastic tubing
- Humidifier
- Calibration hoods

Product	CME-FCK	CMS-FCK	CME1-FTK
Image			
Data Sheet			
Type	Calibration Kit	Calibration Kit	Field Test Kit
Description	Carbon Monoxide Gas Field Calibration Kit, 17L, 50PPM, 17L, 200PPM, Carry Case, Regulator, Tubing, Calibration Hoods, 1/cs. Used to calibrate the CM-3, CM-6 and CS102A (CM-6 calibration hood sold separately)	Carbon Monoxide Gas Field Calibration Kit, 17L, 50PPM, Carry Case, Regulator, Tubing, Calibration Hoods, 1/cs. Used to calibrate CM-4, CM-2B, CM-21A, CM-1B and SS102HC	Carbon Monoxide Gas Field Test Kit, 17L, 200PPM, Carry Case, Regulator, Tubing, CM-E1 Test Hood, 1/cs. Use for the CM-E1 CO sensitivity test. Can also be used to calibrate the CM-6 (CM-6 calibration hood sold separately)
Size	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)
Shipping Weight	8 pounds (3.6kg)	6 pounds (2.7kg)	6 pounds (2.7kg)

Macurco 6-Series Detector Accessories

TX-6 Field Calibration and Test Kits

- 5.0ppm NO₂, 10ppm H₂S or 25ppm NH₃
- Gas Cylinder
- Regulator
- Plastic tubing
- Humidifier
- Calibration hoods

Product	ND-1-FCK	HS-FCK	AM-FCK
Image			
Data Sheet			
Type	Calibration Kit	Calibration Kit	Calibration Kit
Description	Nitrogen Dioxide Gas Field Calibration Kit, 34L, 5PPM, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs	Hydrogen Sulfide Gas Field Calibration Kit, 34L, 10PPM, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs	Ammonia Gas Field Calibration Kit, 34L, 25PPM, Carry Case, Regulator, Tubing, Calibration Hood, 1/cs
Size	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)	18 X 13.5 X 6 in. (45.7 x 34.3 x 15.2 cm)
Shipping Weight	6 pounds (2.7kg)	6 pounds (2.7kg)	6 pounds (2.7kg)

Macurco 6-Series Detector Accessories

Aerosol Carbon Monoxide Field Test Gas

- The CM-6 can be quickly tested with the Macurco CME1-FTG
- The CME1-FTG is an 11L 500 ppm Aerosol Carbon Monoxide Field Test Gas
- This field test gas allows installers to do a quick functionality test of the CO sensor
- The flow rate of the CME1-FTG is 10 LPM providing enough gas to quick test 20-30 CM-6 Carbon Monoxide sensors





Gas Detection. It's What We Do.