Davis Controls®
A breed above the rest

MACURCO
GAS DETECTION

APPLICATION GUIDE

This publication is intended to serve as a guideline for the use of the Macurco products. It is not to be considered all-inclusive, nor is it intended to replace the policy and procedures for any facility. If there are any doubts about the applicability of the equipment to your situation, consult an industrial hygienist.

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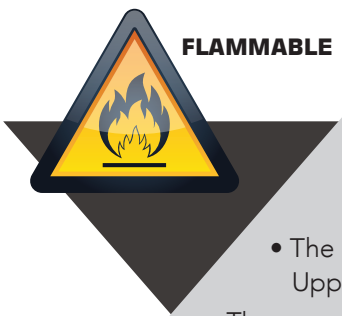
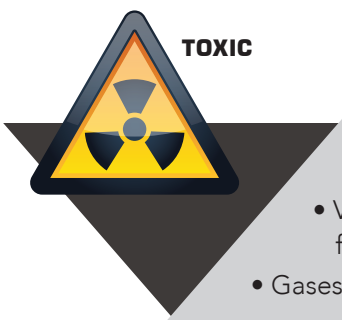
GAS DETECTION 101

THREE TYPICAL GAS HAZARDS TO BE AWARE OF



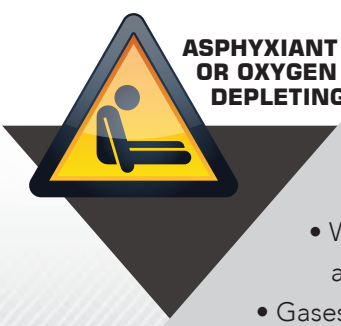
FLAMMABLE

- Having the right combination of an ignition source, oxygen, and fuel in a gas or vapor form provides for the necessary means to create a fire or explosion
- The minimum concentration of combustible gas or vapor necessary to support its combustion in air is defined as the Lower Explosive Limit (LEL). Below this level, the gas mixture is too "lean" to burn
- The maximum concentration of a gas or vapor that will burn in the air is defined as the Upper Explosive Limit (UEL). Above this level, the mixture is too "rich" to burn
- The range between the LEL and UEL is known as the flammable range for that gas or vapor
- Gases such as Methane, Hydrogen, Propane



TOXIC

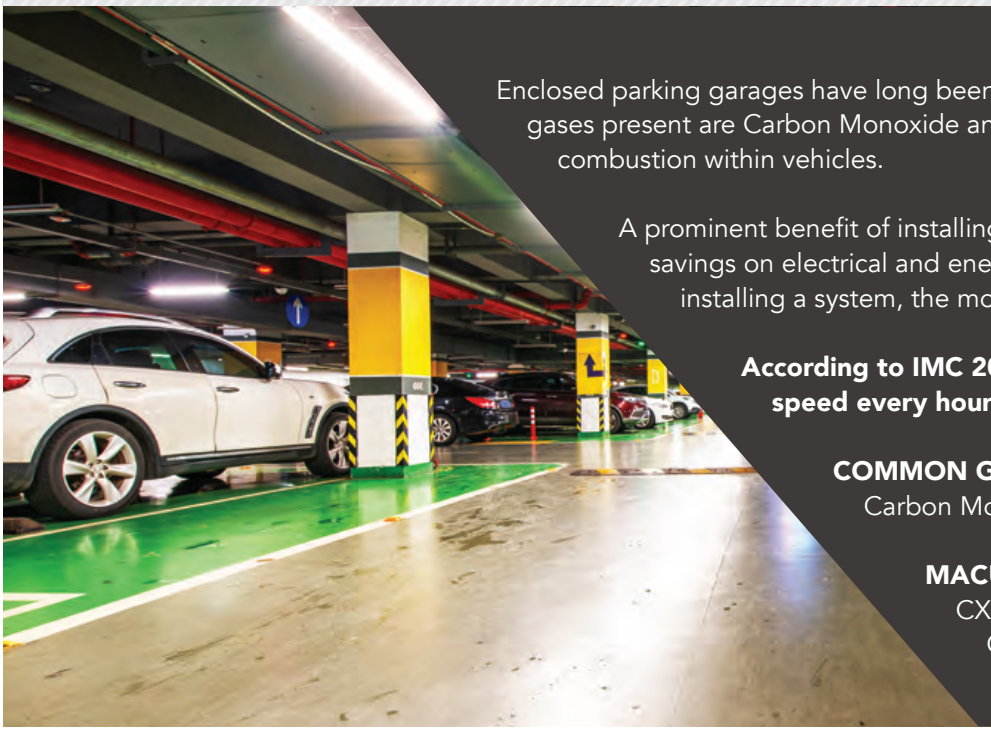
- Some gases are poisonous and are dangerous to life at very low levels. Some toxic gases have distinct odors (H_2S, NH_3) and others have no odors at all (CO)
- Very low levels inhaled, ingested, or absorbed through the skin pose adverse effects from exposure
- Gases such as Carbon Monoxide, Nitrogen Dioxide, Ammonia, Hydrogen Sulfide



ASPHYXIANT OR OXYGEN DEPLETING

- Where Oxygen levels are too rich, environments have the potential to become an explosive environment
- Where Oxygen levels are too low, people within the environment can succumb to asphyxiation
- Gases such as Oxygen, Carbon Dioxide, Nitrogen, Helium, Argon

PARKING GARAGES



Enclosed parking garages have long been using detection for vehicle exhaust. The primary gases present are Carbon Monoxide and Nitrogen Dioxide resulting from incomplete combustion within vehicles.

A prominent benefit of installing a gas detection system in a garage is the cost savings on electrical and energy consumption. On average within one year of installing a system, the money spent on a gas detection system is recouped.

According to IMC 2018 – the only alternative to running fans at full speed every hour of every day is to install a CO/NO_2 system.

COMMON GASES:
Carbon Monoxide, Nitrogen Dioxide, Combustibles

MACURCO PRODUCTS:
CX-6 (CO & NO_2), CM-6 (CO), TX-6-ND (NO_2), GD-6 (Combustibles)

CAR DEALERSHIPS / MAINTENANCE BAYS

Car dealerships and maintenance bays are considered occupied spaces. Ventilation equipment is heavily relied upon to mitigate vehicle exhaust that results in potential fumes from Carbon Monoxide and Nitrogen Dioxide.

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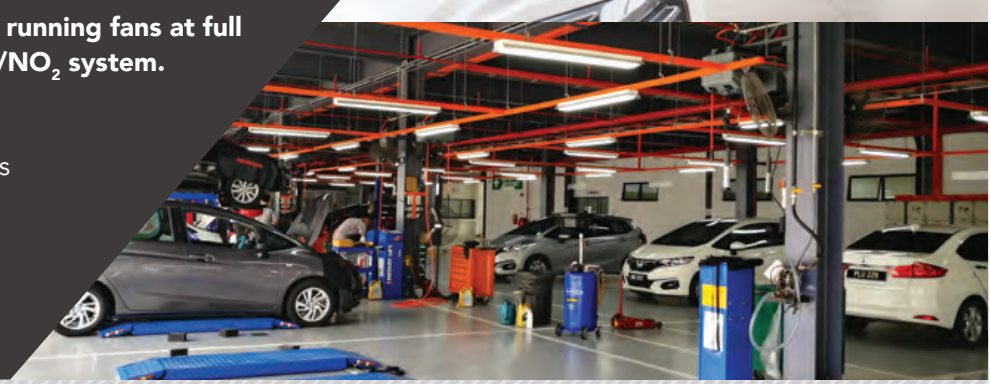

AMBULANCE / FIRETRUCK BAYS

Ambulance and firetruck bays are typically connected to another occupied building where people reside. It is extremely critical to monitor toxic gases and exhaust appropriately to ensure the safety of the residents and crews.

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CX-6 (CO & NO_2), CM-6 (CO), TX-6-ND (NO_2), GD-6 (Combustibles)

LOADING DOCKS

With large vehicles coming and going regularly, vehicle exhaust is a major hazard within loading docks. If not properly ventilated, employees could be exposed to toxic fumes regularly.

Much like a parking garage, a gas detection system can cut costs on ventilation equipment operations and noise pollution.

According to IMC 2018 – the only alternative to running fans at full speed every hour of every day is to install a CO/NO_2 system.

COMMON GASES:
Carbon Monoxide, Nitrogen Dioxide, Combustibles

MACURCO PRODUCTS:
CX-6 (CO & NO_2), CM-6 (CO), TX-6-ND (NO_2), GD-6 (Combustibles)

BEVERAGE DISPENSING

New legislation dictates any storage of a Carbon Dioxide 100lb tank or more for beverage dispensing must result in a Carbon Dioxide monitor present. This is a state by state code which is indicated on what year of IFC the State has adopted.

Restaurants & Bars / Gas Stations / Cafeterias etc. are all common applications where the Carbon Dioxide code is prevalent.

Per IFC 2015 (5307.5.2) and IFC 2018 (5307.3.2), there are different alarm values required.

- 2015 – Activate alarm at 5,000ppm of CO_2 (CD-6MC)
- 2018 - Activate low alarm at 5,000ppm of CO_2 (CD-6B)
- 2018 - Activate high alarm at 30,000ppm of CO_2 (CD-6B)

COMMON GASES:
Carbon Dioxide

MACURCO PRODUCTS:
CD-6G (CO_2), CD-6B (CO_2)

BREWERIES / WINERIES

High levels of Carbon Dioxide are found in pits, storage tanks, bottling rooms and the fermentation process within wineries. Carbon Dioxide is heavier than air and will fall to the floor if leaking from a tank displacing the Oxygen.

Carbon Monoxide has the potential to be present in these applications due to the incomplete combustion of combustible gases during their manufacturing process and heating of the venue.

OSHA and NIOSH have regulations on exposure to these gases (CO, CO_2, Combustible) over some time.

COMMON GASES:
Carbon Dioxide, Carbon Monoxide, Oxygen Deficiency, Combustibles

MACURCO PRODUCTS:
CD-6MC (CO_2), CD-6B (CO_2), CM-6 (CO), OX-6 (O_2), GD-6 (Combustibles)

RESTAURANTS / COMMERCIAL KITCHENS

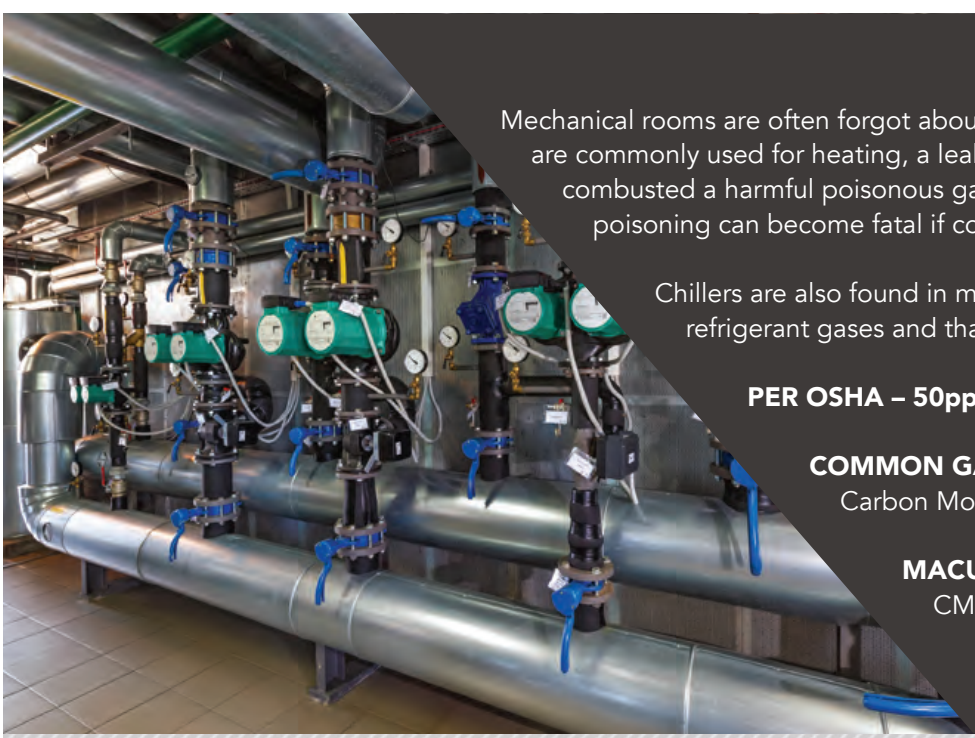
Appliances in kitchens such as grills, stoves, and fryers are often using natural gas and/or propane for their heating source. Carbon Monoxide is a by-product of these gases and if methane (natural gas) or propane leak it may cause an explosion.

Legislation for commercial kitchens may change depending on the state but following NFPA 54 regarding the National fuel gas code is a good place to start.

COMMON GASES:
Carbon Monoxide, Combustibles

MACURCO PRODUCTS:
CM-6 (CO), GD-6 (Combustibles)

BOILER / MECHANICAL ROOMS



Mechanical rooms are often forgot about as unsafe spaces. Since Methane and/or Propane are commonly used for heating, a leak can become catastrophic. If the gases are not fully combusted a harmful poisonous gas can result in Carbon Monoxide. Carbon Monoxide poisoning can become fatal if concentrations become high enough.

Chillers are also found in mechanical rooms and have the potential to leak refrigerant gases and that can become costly and extremely hazardous.

PER OSHA – 50ppm of CO Permissible Exposure Level over 8 hours.

COMMON GASES:
Carbon Monoxide, Combustibles

MACURCO PRODUCTS:
CM-6 (CO), GD-6 (Combustibles)

GENERAL WAREHOUSE / FORKLIFTS

Warehouses are a busy place with personnel and forklifts. Whether gas powered or battery powered, gases are present. Carbon Monoxide and Nitrogen Dioxide are present due to vehicle exhaust and Hydrogen gas can be present due to the charging of the forklift batteries.

Fixed gas detection is present in these applications for the safety of employees and the prevention of loss of goods due to explosions from Hydrogen.

COMMON GASES:
Carbon Monoxide, Nitrogen Dioxide, Hydrogen, Combustibles

MACURCO PRODUCTS:
CX-6 (CO & NO_2), CM-6 (CO), TX-6-ND (NO_2), GD-6 (Combustibles)

BATTERY CHARGING / DATA CENTERS

Hydrogen is a common gas present in any atmosphere where battery charging exists.

Golf cart charging/storage facilities with forklifts have become a popular application due to the volatile nature of Hydrogen gas.

Data centers are also using Hydrogen as a footprint to replace greenhouses gases that in the past were produced at much higher levels.

The Uniform Fire Code, International Fire Code allows Hydrogen levels at 1% by volume or 25% of the lower explosion limit (LEL).

COMMON GASES:
Hydrogen

MACURCO PRODUCTS:
GD-6 (Combustibles)

GROW / EXTRACTION FACILITIES

The grow industry has evolved and become one of the hotbeds in America. Whether growing tomatoes, lettuce or cannabis, gas detection is prevalent throughout this application.

Carbon Dioxide is injected into these rooms at a constant PPM value of 1000-2000ppm. Other gases found within these grow houses are Carbon Monoxide and Oxygen.

Everyday consumer products like lettuce, tomatoes, and others are being cultivated indoors. These operations also are injecting Carbon Dioxide into the growth areas for the optimum product.

COMMON GASES:
Carbon Dioxide, Carbon Monoxide, Oxygen (enrichment or depletion), Combustibles

MACURCO PRODUCTS:
CD-6G (CO_2), CD-6B (CO_2), CD-6MC (CO_2), CM-6 (CO), OX-6 (O_2), GD-6 (Combustibles)

ICE RINKS

Several gases can be found in ice rinks but Ammonia is the most common gas as it is a chilling agent to keep the ice from melting. Exposure to high concentrations of Ammonia can cause extreme health issues and needs to be constantly monitored.

Other gases that can be found include Carbon Monoxide and Combustible gases due to the vehicles on ice.

COMMON GASES:
Ammonia, Carbon Monoxide, Combustibles

MACURCO PRODUCTS:
TX-6-AM (NH_3), CM-6 (CO), GD-6 (Combustibles)

CRYOSAUNA / LABS

Many labs use inert gases such as Nitrogen, Helium, and Argon during their processes. These inert gases can readily deplete Oxygen level and cause asphyxiation.

Cryosaunas are popping up everywhere as a new way to rehabilitate the body. This cold chamber uses liquid Nitrogen to get temperatures below -100 degrees Fahrenheit. Oxygen depletion has become a concern should a tank ever leak.

Storage of Combustible gas tanks in labs also have the potential to leak combustible gases.

COMMON GASES:
Oxygen (depletion & enrichment), Combustibles

MACURCO PRODUCTS:
OX-6 (O_2), GD-6 (Combustibles)

LANDFILLS

Due to growing cities, old landfills are being converted into commercial or residential developments. Due to the dangers of methane seeping up through the ground the need to monitor methane levels is being required.

The decomposition of garbage results in both Methane and Hydrogen Sulfide being by-products in these environments. These landfills can have dangerous gases rising to the surface or accumulating in the area, Methane and/or Hydrogen Sulfide. High levels of Methane can displace Oxygen in the air resulting in an array of health issues and at high concentrations can be explosive. Hydrogen Sulfide is a toxic gas that has a pungent rotten egg smell and very high levels can be deadly.

Common Gases:
Methane, Hydrogen Sulfide

Macurco Products:
GD-6 (Combustibles), TX-6-HS (H_2S)

MACURCO CONTROL PANEL OVERVIEW

DVP FAMILY DVP-120 (Analog), DVP-120M (Digital), DVP-120B/120C (Digital w/ BACnet Output), DVP-1200 (Digital, BACnet IP, 4-20 mA Outputs)

Key Features:

- 12 analog (4-20mA) sensor connections
- DVP-120M: 87 digital sensor connections (RS-485) + 12 analog (4-20mA) sensor connections
- Three 10A SPDT fan/alarm relays
- Two 24VDC drivers for horn/strobe
- Compatible with Macurco 6-Series
- Auto recognizes Macurco detectors
- Settings are customizable, default is per OSHA
- DVP-120B: BACnet MSTP output
- DVP-120C: Title 24 compliant (CO & NO_2 only)
- DVP-1200: BACnet IP, 4-20 mA outputs

DVP-120 CONTROL PANEL OUTPUT OPTIONS

	DVP-120	DVP-120M	DVP-120B	DVP-120C	DVP-1200
Analog Connections	12	12	0	0	0
Digital Connections	0	87	99	99	192
10 AMP Relays	3	3	3	3	8*
24VDC Output	2	2	2	2	4
BacNET	N/A	N/A	✓	✓	✓
Title 24	N/A	N/A	N/A	✓	✓

MACURCO COMMERCIAL PRODUCT OVERVIEW

Grey Housing (Standard)

White Housing (Optional)

Key Features:

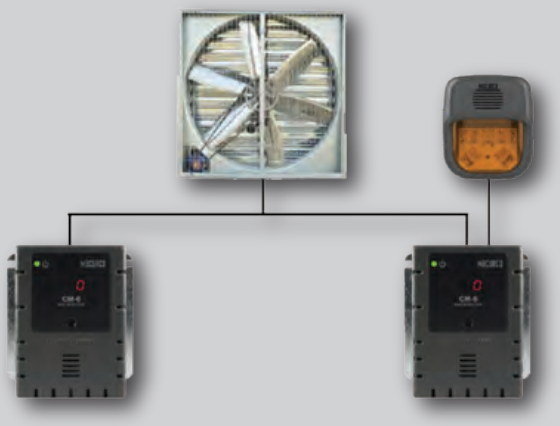
- Easy installation to 4x4 electrical boxes via mud plate
- User-selectable settings (Default to industry standards) via two-button interface
- 5 A SPDT fan relay, 0.5A alarm relay to control fans, valves, louvers, horn, and strobes
- 4-20mA output to control VFD's and send to BMS
- LED display to easily show gas concentrations
- Field calibration kits available

6-SERIES DETECTOR OUTPUT OPTIONS

	CX-6 ($CO\&NO_2$)	CM-6 (CO)	GD-6 (LEL)	TX-6-ND (NO_2)	TX-6-HS (H_2S)	TX-6-AM (NH_3)	OX-6 (O_2)	CD-6MC (CO_2)	CD-6G (CO_2)
Display	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)	LED (On/OFF)
Range	0-200 PPM CO_2 0-50 PPM NO_2	0-200 PPM	0-50% LEL	0-20 PPM	0-50 PPM	0-100 PPM	0-25%V/V	0-5,000 PPM	0-5% V/V 0-50,000 PPM
Low Level	5 AMP	5 AMP	5 AMP	5 AMP	5 AMP	5 AMP	5 AMP	5 AMP	5 AMP
High Level	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP	1/2 AMP
Buzzer	✓	✓	✓	✓	✓	✓	✓	✓	✓
Expected Sensor Life	2-3 Years	10 Years	5 Years	2 Years	2 Years	2 Years	2 Years	15 Years	15 Years
Coverage	Up to 7,500 sq. ft.	Up to 7,500 sq. ft.	Up to 1,257 sq. ft.	Up to 7,500 sq. ft.	Up to 1,257 sq. ft.	Up to 1,257 sq. ft.	Up to 1,257 sq. ft.	Up to 5,000 sq. ft.	Up to 5,000 sq. ft.
4-20mA	Scaling / Peak	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off

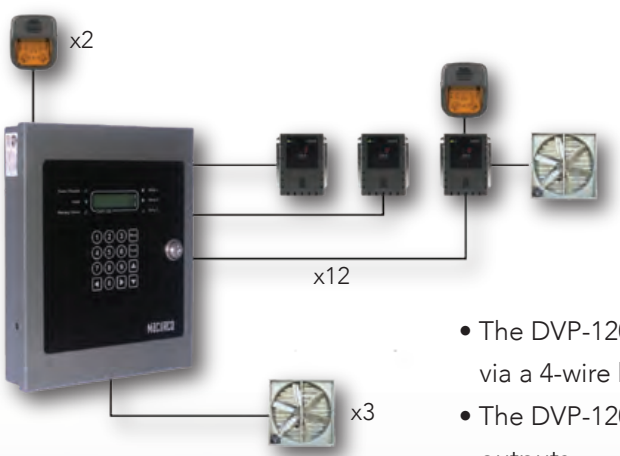
TYPES OF SYSTEMS

STAND-ALONE DETECTORS



Dry contact relays or 4-20mA outputs to control fans, louvers, valves, horn and strobes, etc.

- The 6 and 12 series gas detectors can be used as a stand-alone setup
- This family of detectors is offered in low voltage or line voltage and can tie directly into many different pieces of equipment using one of the two dry contact relays or the 4-20mA output
- Customizable settings are done from each detector



4 conductor homerun
2 for power, 2 for signal

DETECTION AND VENTILATION CONTROL PANEL (DVP-120)

- The DVP-120 has the capacity to handle up to 12 of the 6 series detectors via a 4-wire homerun from each detector
- The DVP-120 has three 10 amp form relays along with two 24VDC outputs
- Any combination of gases within the 6-series will work with the DVP-120

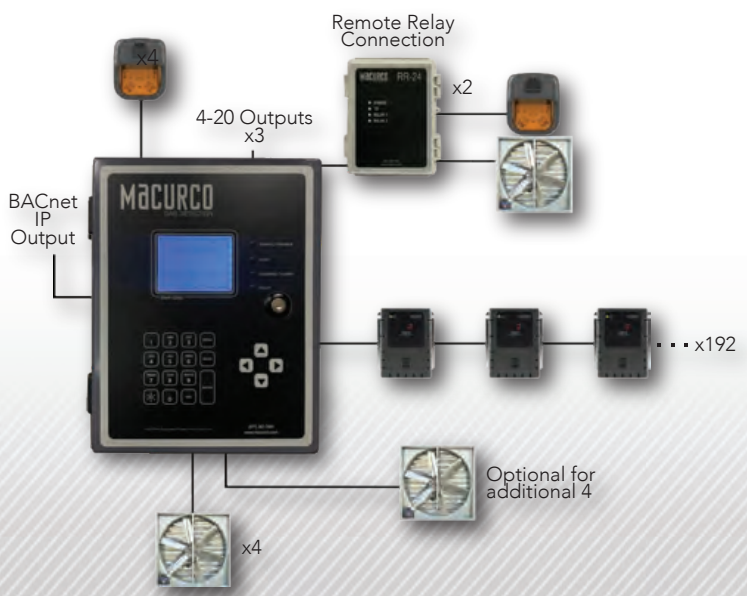
TYPES OF SYSTEMS

ADDRESSABLE GAS DETECTION AND CONTROL (DVP-120M / DVP-120B)

Use sheilded 3-conductor wire with one twisted pair providing a pair for signal (A&B), common (COM) and shield ground (SHD) connections.

- DVP-120M connects to 87 addressable 6 series detectors using the MRS-485 on each of the detectors in the field converting the analog signal to a digital signal
- Cost of installation decreases due to a daisy chain loop, equaling less wire and conduit costs
- The DVP-120M has three 10-amp form C relays along with two 24VDC outputs
- The DVP-120B adds an additional BACnet MSTP output being the major difference from the DVP-120M

ADDRESSABLE WITH ANALOG OUTPUT (DVP-1200)



- DVP-1200 connects up to 192 addressable 6 series detectors using the MRS-485 on each of the detectors in the field converting the analog signal to a digital signal
- Four 10-amp form C relays with the ability to add an additional 4 relay board if needed. Also includes four 24 VDC outputs
- Includes three 4-20mA outputs for VFD control
- Includes 2 Remote Relay outputs for the optional RR-24 (Remote Relay)
- Event Logging found within DVP-1200 including Trouble/Warning/Alarms
- BACnet IP output as well as a USB port for firmware upgrades

COMMON ACCESSORIES

Horn and Strobes

Addressable Adapter

Power Supplies

Calibration Kits

Weatherproof Housing Kit
(Detector Sold Seperately)

- Horn/strobe combo with temporal 4 option
- MRS-485 modbus adapter for addressable systems
- Calibration/test kits
- Weatherproof/duct mounting housings
- Power supplies

MAINTENANCE

DEMONSTRATION AND TRAINING

Inspect the components, equipment installation and electrical connections for optimum functionality of the product. Test the alarm setpoints of the gas detection system with calibration and test gases and verify the sequence of operation. Perform demonstrations and train maintenance personnel to adjust, operate, troubleshoot, calibrate and maintain the gas detection and ventilation control systems. Calibration and test kits should be provided with the gas detection system. Calibration and test intervals must comply with the manufacturer's recommendations. If required, prepare a written report to record test procedures, test results, and corrective actions. The report should also cover the requirements for accessories like the acceptability of alarm types, signs and protective equipment. Any repair or replacement of malfunctioning units should be performed by Macurco.

MACURCO
GAS DETECTION

Celebrating over 50 years of gas detection, the Macurco product line offers equipment for residential, commercial and industrial applications. Since 1972 Macurco has been providing detection options for a number of different gases including carbon monoxide (CO), nitrogen dioxide (NO_2), hydrogen (H_2), propane (LP), methane (natural gas), hydrogen sulfide (H_2S), ammonia (NH_3), oxygen (O_2), carbon dioxide (CO_2) and refrigerants. Headquartered in Sioux Falls, South Dakota, Macurco strives to provide the highest quality detection, safety and security solutions to customers worldwide. Whether you are looking for gas detection for a security system, building automation or HVAC system, for personal safety or for monitoring specific gases in potentially hazardous environments, Macurco has a gas detector to meet your needs.

GAS DETECTION IS ALL WE DO, AND WE DO IT BEST.

Davis Controls®
A breed above the rest

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