MACURCO
GAS DETECTION

GROW / EXTRACTION GUIDE

This application guide helps engineers, contractors, installers and integrators provide suitable gas detection systems for grow / extraction facilities.

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 or call Macurco Technical Service at 1-877-367-7891

Made in the USA

INDUSTRY OVERVIEW

Driven by deregulation and acceptance, the legalization of cannabis for medical and recreational use is rapidly becoming part of the modern, industrial world. With the increase in demand, new construction and old warehouses are being re-purposed to house controlled environment grow and extraction facilities. With this increased facility development comes the increased concern for worker safety. There has been a similar increase in the number of worker accidents within the industry. To better protect workers, Local Building and Fire Code officials are now starting to require additional permits, including Life Safety requirements.

Some facilities may consist of both a grow facility and an extraction facility. These facilities will be required to meet additional requirements.

TYPES OF GASES FOUND

CARBON DIOXIDE

Current cultivation methods of cannabis and industrial hemp utilize Carbon Dioxide (CO_2) enrichment to increase plant growth and development. CO_2 is classified as an asphyxiant gas, meaning it has the potential to reduce or displace normal Oxygen concentrations in the air.

- **CO_2 can be stored in vacuum-jacketed cryogenic liquid cylinders, or in steel or aluminum cylinders as liquefied compressed gas.**

- **It can also be produced onsite by Carbon Dioxide generators. If CO_2 is generated using fossil fuel combustion, Carbon Monoxide (CO) and Nitrogen Dioxide (NO_2) can be produced. Both CO and NO_2 are toxic gases that can cause significant health effects or even death for exposed individuals.**

The two categories regarding gas detection include explosion/fire fueled by combustible gases and asphyxiation due to Oxygen (O_2) displacement from Carbon Dioxide (CO_2) leaks. The choices involving the source of CO_2 can have an impact on what is needed to design a Life Safety System properly.

ASPHYXIANT OR OXYGEN DEPLETING

- Where Oxygen levels are too low, people within the environment can succumb to asphyxiation.
- The following common gases pose risks for asphyxiation: Carbon Dioxide, Nitrogen, Helium, and Argon.

CO2 LEVELS PPM (% BY VOL.)	HEALTH EFFECTS
350-450PPM (.035-.045%)	Fresh outdoor air.
400-1,000PPM (.04-.1%)	Indoor occupied spaces with good air exchange.
1,000-2,000PPM (.1-.2%)	Complaints of drowsiness and poor air.
2,000-5,000PPM (.2-.5%) Permissable Exposure Limit (PEL): 5,000 Average Over 8 Hours	Headaches and sleepiness; stagnant, stale, and stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
>5,000PPM (.5%) Average Over 8 Hours	This indicates unusual air conditions where high levels of other gases also could be present. Toxicity or oxygen deprivation could occur. This is the permissible exposure limit for daily workplace exposures.
30,000PPM (3%) Short Term Exposure Limit (STEL): 15 Minutes	Moderate respiratory stimulation, increased heart rate and blood pressure.
>40,000PPM (4%) Immediately Dangerous to Life or Health (ILDH)	Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma or death.
50,000PPM (5%)	Strong respiratory stimulation, dizziness, confusion, headache and shortness of breath.
80,000PPM (8%)	Dimmed sight, sweating, tremor, unconsciousness, and possible death.

COMBUSTIBLE GAS

If the release of a hazardous or combustible gas can cause immediate harm to a person or property, a means to mitigate the gas should be provided. Combustible liquids and compressed gases used in extraction or processing in these facilities should be vented in accordance with International Fire and Mechanical Codes. Utilizing a gas detection system can activate an exhaust system and shut down the extraction process to prevent a dangerous event.

CBD concentrate is produced by extracting cannabinoids from the cannabis plant. Solvent-based concentrate is the most common, and the process involves passing a gas through a solvent extraction device filled with cannabis plant matter.

- **Commonly used combustible gas solvents include Butane (C_4H_{10}), Propane (C_3H_8), Hexane (C_6H_{14}), and Ethanol (C_2H_6O).**

- **Hypercritical Carbon Dioxide (CO_2) is another solvent rising in popularity, which adds the risk of asphyxiation to the extraction process.**

Macurco Gas Detection equipment will detect gas, provide visual and audible alarms, and can control appliances to mitigate the gas before reaching hazardous levels. Commonly controlled equipment includes ventilation systems and mechanical interlocks that shut down the flow of gas to the unit when gas is detected. Additional audible and visual alarms can also be controlled to alert occupants of unsafe levels.

Regulation and enforcement of handling hazardous gases may vary by state, so be sure to consult your Fire Marshall or AHJ for local requirements.
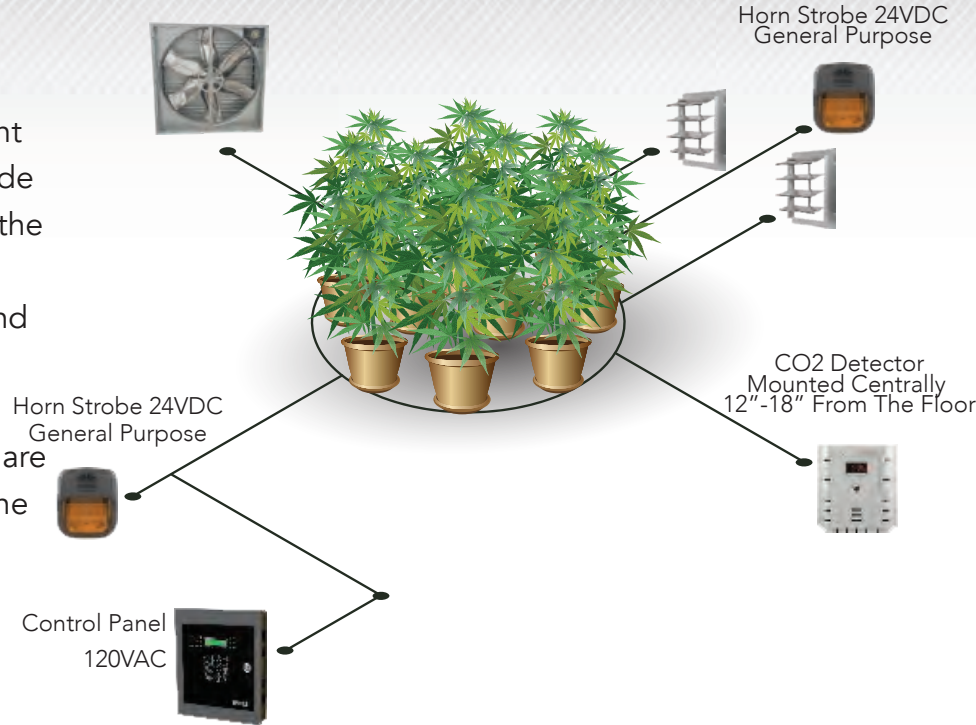
FLAMMABLE

- 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.
- Flammable gases have different densities thus detector mounting height is critical: Ex. Methane, Hydrogen (Lighter than Air); Propane, Butane, Hexane, Ethanol (Heavier than Air)
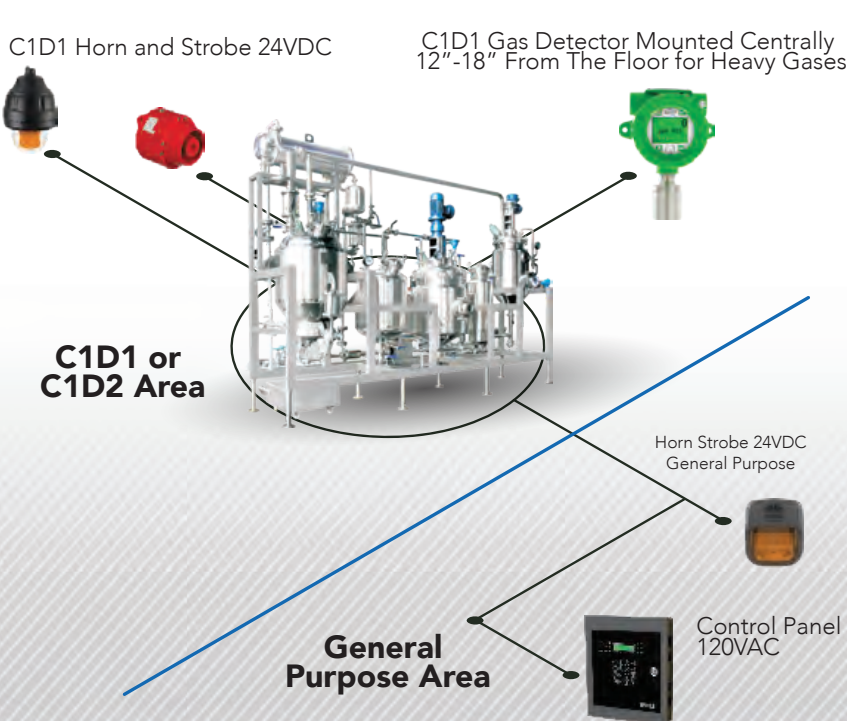
APPLICATIONS

GROW ROOMS

Typically grow rooms are not electrically classified and general-purpose equipment works great for monitoring Carbon Dioxide levels. The graphic to the right displays the control panel outside the room showing gas values and controls the ventilation and alarm notifications both internally and externally. The system is designed to engage the exhaust system if CO_2 levels are slightly elevated followed by engaging the alarms if CO_2 levels are approaching dangerous levels.

Horn Strobe 24VDC
General Purpose

Horn Strobe 24VDC
General Purpose

CO2 Detector
Mounted Centrally
12"-18" From The Floor

Control Panel
120VAC

EXTRACTION ROOMS

Typically extraction rooms are rated either Class 1 Division 1 or Class 1 Division 2 depending on the process and room setup. If your local jurisdiction does not have this requirement it is highly recommended due to the increased risk of combustible gas that is continuously present in the room and used in the process of production. The following graphic depicts a Class 1 Division 1 room with a C1D1 gas detector, horn, and strobe and then general-purpose equipment outside the room.

C1D1 Horn and Strobe 24VDC

C1D1 Gas Detector Mounted Centrally
12"-18" From The Floor for Heavy Gases

C1D1 or
C1D2 Area

General
Purpose Area

Horn Strobe 24VDC
General Purpose

Control Panel
120VAC

The system is designed to engage multiple alarm setpoints if the presence of combustible gas hits predetermined levels of a low, medium, and high %LEL. The highest setup should still be significantly lower than the explosive level for the particular gas of concern (typically the following values are a great reference for multiple set points 10% LEL Low Alarm, 20% LEL Medium Alarm, and 30% LEL for High Alarm).

CONTROL PANEL OVERVIEW

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

DVP-1200 Key Features:

- 90-250 VAC input
- Three RS-485 channels can connect up to 192 detectors (64 per channel)
- Up to 12 relays
  - Standard with four on-board relays
  - Up to four optional on-board expansion relays (+2 or +4)
  - Can be connected to two remote relay boxes (two relays in each box)
- (3) 4-20mA outputs for VFD control
- (4) 24VDC outputs for alarm, trouble, remote notification
- BACnet IP (ethernet connection)
- Lockable NEMA4x type enclosure
- Other panel options available (DVP-120, DVP-120B, DVP-120M)

TRACXP CONTROL PANELS (Wired or Wireless)

TXP-C40 Key Features:

- Certified for Class 1, Div. 2
- NEMA 7 explosion proof enclosure option for Div. 1 applications
- LCD readout displays engineering units, bar graphs and 30 minute trends
- LED's indicate alarm and fault status
- 2 programmable SPDT relays for warning, high alarm, horn and fault conditions
- Optional RS-485 Modbus® master/slave serial port
- "Cal Mode" offers pushbutton zero and span calibration for direct sensor input applications

MACURCO COMMERCIAL PRODUCT OVERVIEW

CD-6G 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
- 0-5% vol (0-50,000PPM)

TRACXP PRODUCT OVERVIEW

Fixed Monitoring
- Certified for Class 1, Div. 1 (Aluminum) or Div. 2 (Poly)
- Vivid QVGA backlit color TFT display
- Brilliant status indicating color display
- Standard communications are 4 - 20 mA and ethernet with web server
- Optional Modbus TCP with 3 programmable relays
- Universal transmitter utilizing smart sensor technology
- Dual sensor capable w/ integral & remote sensor options
- Non-intrusive One-man calibration

AIMSAFETY PRODUCT OVERVIEW

Portable Monitoring PM150-CO2
- Range:0-5% Vol. (0-50,000PPM)
- Easy-to-read LCD display
- Event logging
- Data Logging
- IP66/67 protection rating
- Rechargeable with up to 7 day run time
- Low maintenance

COMMON ACCESSORIES

Horn and Strobes

C1D1 Horn and Strobe

Weatherproof Housing Kit
(Detector Sold Seperately)

Calibration Kits