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Continuous monitoring of carbon monoxide and nitrogen dioxide in welding shops

Welding joins material together by melting metal and adding a filler to form a strong joint. There are over 70 different types of welding processes, all which produce a variety of hazardous gases. The gas or gases generated and their concentrations depend on the process used and the gas formation mechanisms. Common gases produced are carbon monoxide, nitrogen dioxide, ozone, hydrogen chloride, carbon dioxide, nitric oxide and other gaseous fluorides. The health hazards from welding gases are asphyxiation (lack of oxygen), fire, explosion and toxicity.

A well designed and maintained ventilation system is required to remove the air contaminants from the welder's breathing zone. The installation of a fixed gas detection system to continuously monitor the levels hazardous gases help to protect welders and workers from exposure and risks to their health, providing a safer working environment.

For a common indoor welding environment, Critical Environment Technologies' DCC Dual Channel Controller with one internal electrochemical CO sensor and one internal electrochemical NO$_2$ sensor offers the features and functionality to ensure a safe breathing environment.

Welding activities occur in many industries and the work environments vary in size, layout and setup. When planning installation and mounting locations for each DCC Dual Channel Controller, you must consider the air flow patterns in the room; entrances to the room, type of ventilation system, number of welding stations and any other sources of active air currents will affect the ability of the sensors to accurately read the gas levels.

The DCC, with two internal sensors, one Carbon Monoxide (CO) and one Nitrogen Dioxide (NO_2), should be mounted close to the welding work stations, in the "breathing zone" which is 1.2 to 1.8 meters (4 to 6 feet) from the floor. This is the height at which most humans breathe and the height at which these gases pool. In poorly ventilated areas, gases can accumulate and displace the oxygen causing an oxygen-deficient environment.

The DCC has two gas alarm setpoints, LOW and HIGH and two dry contact relays rated 5A @ 240 VAC. If the ventilation system is inadequate or malfunctions and there is a buildup of hazardous gas, the DCC will detect the increase in the gas level and according to the gas alarm levels, activate its internal buzzer and one or both of its internal relays. Relay one could be configured to actuate exhaust fans to bring the gas level down to an acceptable level and relay two could be used to activate a remote strobe/horn in a secondary location to alert workers.

Depending on the type of welding being done, additional hazardous gas monitoring may be required. For example, for Oxy-Acetylene welding, consideration should be given to monitoring combustible gas and Oxygen levels in the room where the cylinders of gas are stored. If there were to be a leak, Acetylene is flammable and explosive and high levels of Oxygen could cause an O_2 enriched atmosphere. A DCC Dual Channel Controller with an internal Oxygen sensor and a remote ESH-A combustible sensor would provide accurate and continuous monitoring to ensure a safe working environment. The DCC with the Oxygen sensor should be installed inside the room at breathing level 1.2 to 1.8 m (4 to 6 feet) off the ground and the ESH-A Acetylene sensor should be mounted near the ceiling as Acetylene gas is lighter than air and will concentrate in high places). An RSH-24-R Remote Strobe/Horn should be mounted outside the entrance to the storage room to sound and flash in alarm should gas levels rise above the configured alarm setpoints.

If a display is not required, an SCC Self Contained Controller can be used instead of the DCC. In the event the area is classified as a hazardous location, the use of a CXT Explosion Proof transmitter, one with an infrared Acetylene sensor and the other with an Oxygen sensor, is recommended.