Macurco
GAS DETECTION
a DwyerOmega brand



ENERGY STORAGE GUIDE

This application guide helps engineers, installers and integrators provide suitable gas detection systems for energy storage systems.

This publication is intended to serve as a guideline for the use of 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 Sales at 1-877-367-7891

Made in the USA

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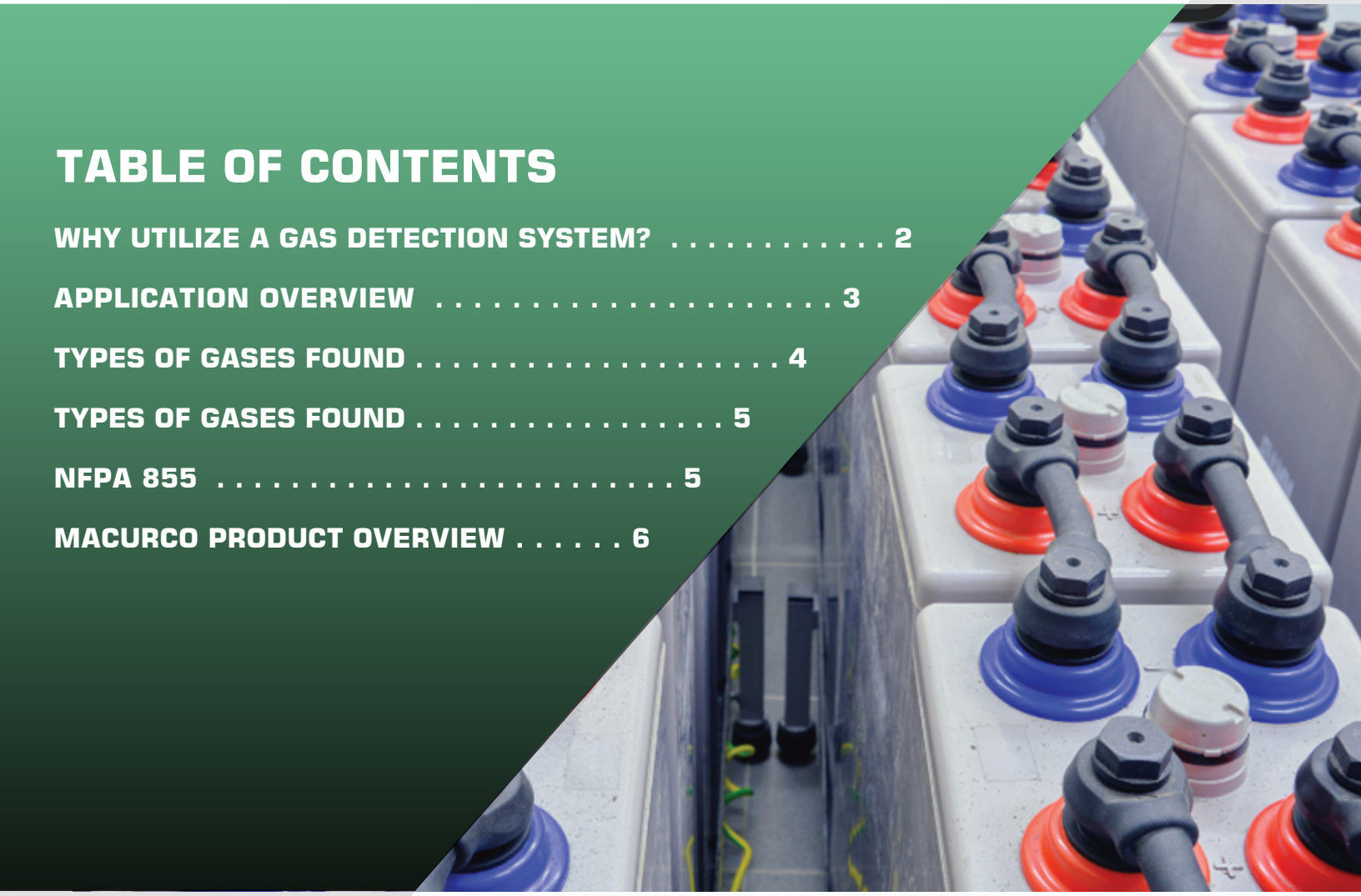


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WHY UTILIZE A GAS DETECTION SYSTEM?

SAFETY

Safety at Battery Energy Storage Systems is imperative for the personnel operating these facilities. **In lithium-ion battery containers, gas detection is vital for safety due to the risk of thermal runaway, which can lead to fires and explosions.** During thermal runaway, overheating causes chemical reactions within the battery, often releasing flammable gases such as hydrogen, carbon monoxide, and electrolyte vapors. These gases can ignite or explode if they accumulate and reach critical levels.

RISK MITIGATION

Gas detection in lithium battery applications aims to reduce the risk of thermal runaway, a serious safety concern. **Sensors monitor the battery environment in real-time, detecting gas emissions early to signal potential issues.** This early warning allows operators to take preventive actions, such as cooling the system, shutting down charging, increasing ventilation, or isolating the battery.

COMPLIANCE

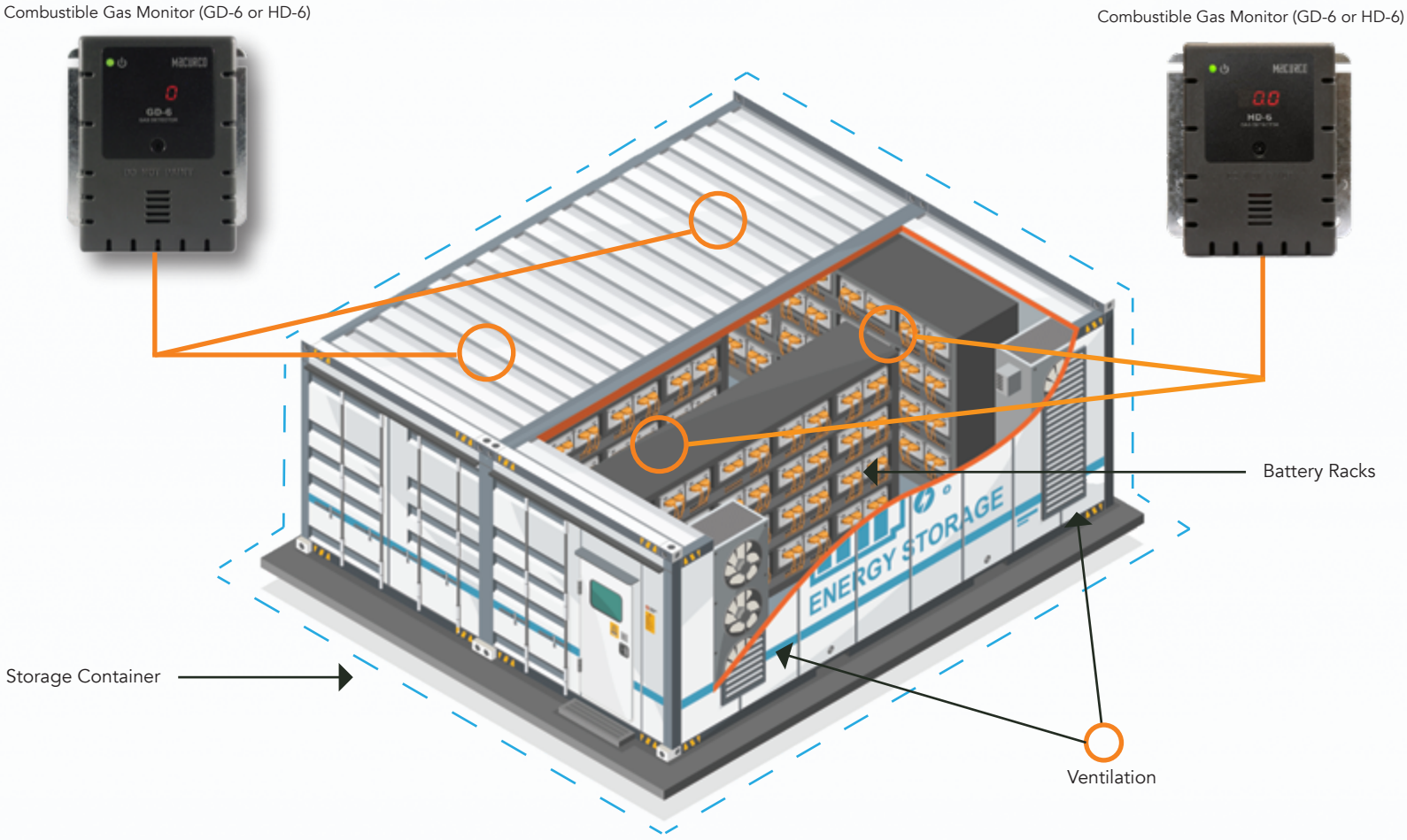
Not only do you need to keep your personnel and buildings / equipment safe, but gas detection is regulated by code. Fixed gas detection systems provide continuous monitoring ensuring compliance with Federal and Local regulations. **The Macurco HD-6 and GD-6 is listed to UL 2075, the industry standard that provides a uniform set of performance, construction, and testing guidelines.**

IMPORTANCE OF A FIXED GAS DETECTION SYSTEM

- **Protection of people and property 24 / 7 / 365**
- **Advance notification**
- **Explosion prevention**
- **Low-cost investment to help prevent accidents**

APPLICATION OVERVIEW

ENERGY STORAGE SYSTEMS (ESS) – Energy storage systems (ESS) play a crucial role in the modern energy landscape by addressing the intermittent nature of renewable energy sources and enhancing grid stability. These systems store excess energy when it is abundant and release it when demand is high or renewable sources are not generating power. Here's an overview of energy storage systems and the direction the industry is heading:



Disclaimer: Each containers mounting height will vary based on size, orientation, and design. Mount the Macurco GD-6 centrally on the ceiling.

LEAD ACID – Lead-acid batteries emit flammable hydrogen gas during charging, posing an explosion risk if the concentration reaches explosive limits. Proper ventilation during charging or storage dissipates the hydrogen and reduces this risk.

LI-ION – Lithium-ion batteries are vital for electronics and transportation due to their high energy density and long lifespan but pose safety risks like thermal runaway during charging, leading to fires or explosions. Implementing gas detection systems in charging containers is crucial for preventing accidents and ensuring safe charging.

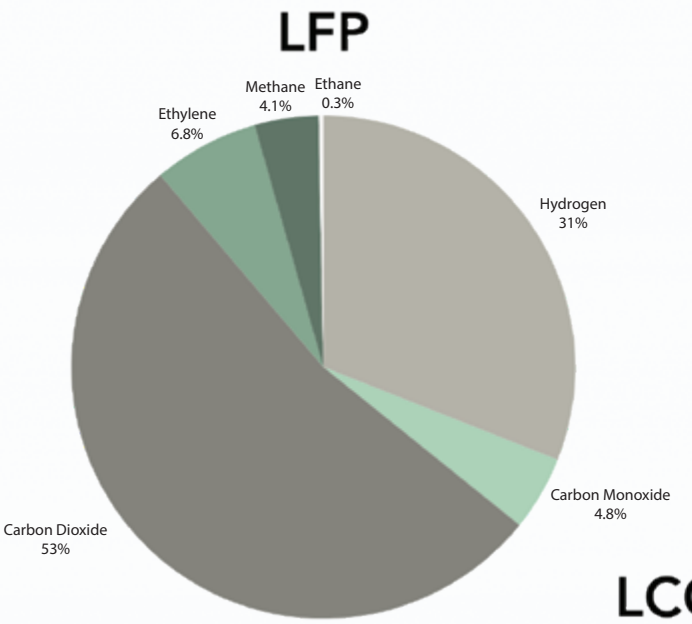
THERMAL RUNAWAY – Dangers of Thermal Runaway is a phenomenon that occurs when a lithium-ion battery generates heat faster than it can dissipate it, leading to an increase in temperature and pressure inside the battery. This can cause the battery to rupture, leak, or even explode, releasing toxic gases and starting a fire. Thermal runaway can be triggered by several factors, including overcharging, external heat, or mechanical damage.

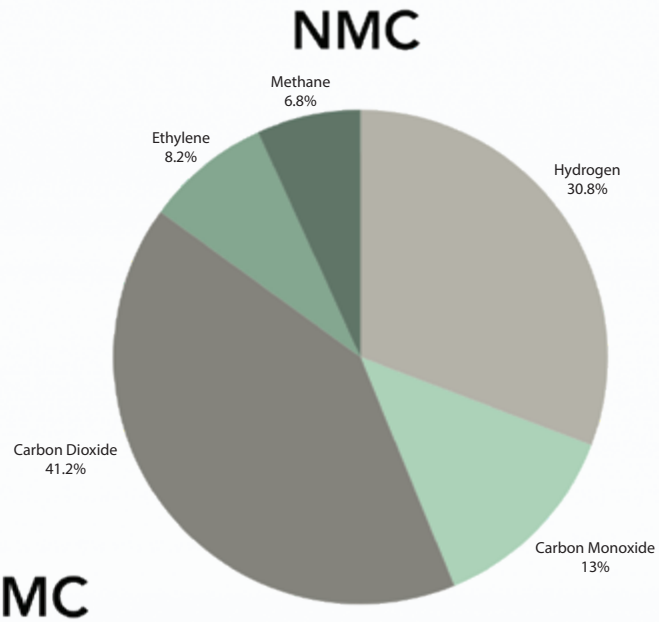
TYPES OF GASES FOUND

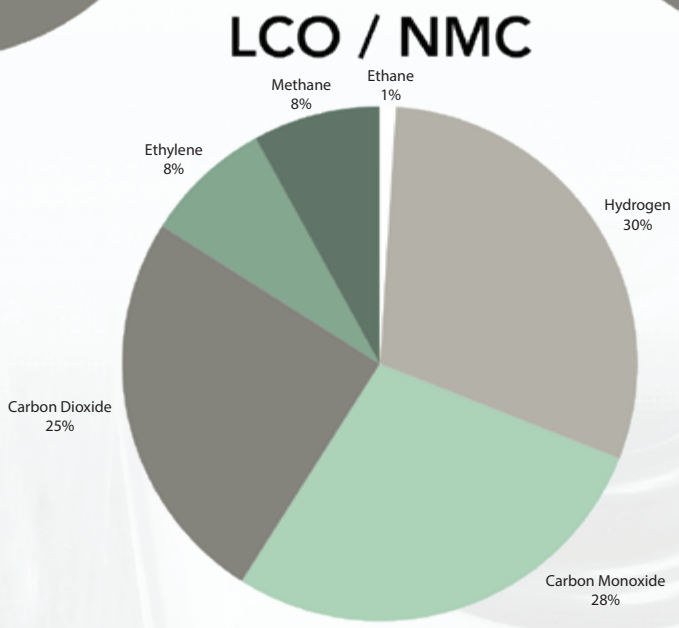
Lithium Cobalt Oxide (LiCoO2) - LCO - Lithium Cobalt Oxide (LiCoO2), or LCO, is a popular cathode material in lithium-ion batteries known for high energy density and stable performance. It is commonly used in consumer electronics, power tools, and some electric vehicles. Despite its benefits, LCO has limited thermal stability and relies on cobalt, prompting research into alternatives.

Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO2) – NMC - Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO2), or NMC, is a critical cathode material in lithium-ion batteries, valued for its high energy density and stability. It is widely used in electric vehicles, portable electronics, and grid energy storage due to its long cycle life and improved thermal stability. Research is ongoing to optimize NMC for better performance and sustainability.

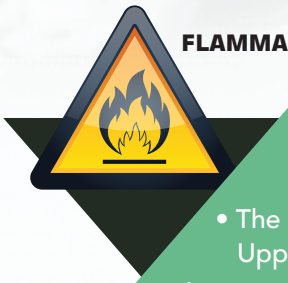
Lithium Iron Phosphate (LiFePO4) – LFP - Lithium Iron Phosphate (LiFePO4), or LFP, is a widely used cathode material in lithium-ion batteries, noted for exceptional safety, longevity, and stability. Its robust thermal and chemical stability makes it ideal for stationary energy storage, renewable energy storage, and applications requiring high reliability. While it has lower energy density, research aims to improve this while maintaining safety and durability, potentially extending its use to electric vehicles and portable electronics.







TYPES OF GASES FOUND



- 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)

MACURCO GD-6/12 HYDROGEN DEFAULT SETPOINTS

Relay 1 Adjustable Setpoints: OFF, 3, 4, 5, 6, 7, 8, 9, 10 (default), 11, 12, 13, 14, 15, 16, 17, 18, 19, 20% LEL

Relay 2 Adjustable Setpoints: OFF, 5, 10, 15, 20 (default), 25% LEL



COMBUSTIBLE GASES



NFPA 855

NFPA 855, titled "Standard for the Installation of Stationary Energy Storage Systems," is a comprehensive safety standard developed by the National Fire Protection Association (NFPA). It provides guidelines and requirements for the safe installation and use of stationary energy storage systems (ESS), which include batteries and other technologies used to store energy for later use.

NFPA 855 is a crucial document for anyone involved in the design, installation, operation, or regulation of stationary energy storage systems, providing a framework to ensure safety and mitigate risks associated with these technologies. NFPA 855 aims to enhance the safety of energy storage systems in various settings, such as commercial, industrial, and utility-scale applications, while supporting the growth of renewable energy and grid resilience. The standard is regularly updated to reflect advancements in technology and evolving safety practices.

MACURCO PRODUCT OVERVIEW

GD-6 (24V)



Hydrogen, Propane, or Natural Gas (Methane) (Catalytic Bead Sensor)

See data sheet for more information on each monitor

- Coverage Area up to 1,257 sq. ft (Centrally mounted, the radius is 15-20ft)
- Centrally mounted where air movement is generally good
- Listed to UL 2075
- CE Listed

HD-6 (24V)



Hydrogen (Electrochemical Sensor)

TRACXP PRODUCT OVERVIEW



Flame Monitoring (Radiant Energy Sensing)

- High immunity to false alarm
- Ultra-fast detection within 40 ms for explosions
- Three relay contacts (two alarm and a fault)
- 4-20mA and Modbus RS-485 RTU outputs
- Detects hydrogen, methane & syngas flames using three infrared wavelengths

MACURCO

GAS DETECTION

a **DwyerOmega** brand

Celebrating over 50 years of gas detection, the Macurco, a DwyerOmega brand, 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, a DwyerOmega brand, 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.

Visit **www.macurco.com** for additional product information and training.

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