CARBON DIOXIDE FIRE SUPPRESSION SYSTEMS EXTINGUISHING AGENT

DATA/SPECIFICATIONS

APPLICATION

Carbon dioxide extinguishing agent used in Ansul engineered systems is particularly useful for hazards where an electrical, nonconductive medium is essential or desirable; where clean-up of other agents presents a problem; or where the hazard obstructions require the use of a gaseous agent.

The following are typical hazards protected by carbon dioxide systems:

Printing presses
Vaults
Open pits
Dip tanks
Spray booths
Ovens
Engine rooms
Coating machines
Process equipment
Hoods and ducts
Flammable gas or liquid storage areas

DESCRIPTION

Carbon dioxide is a plentiful, non-corrosive gas that does not support combustion nor react with most substances. It has a low toxicity classification by Underwriters Laboratories (Group 5a). It is commonly compressed to the liquid state for storage and transportation in DOT cylinders. Upon release, it discharges under its own pressure giving the appearance of steam as its low temperature crystalizes water in the air. For fire suppression purposes the discharge is designed to raise the carbon dioxide concentration in the hazard. This removes the free oxygen which supports combustion*, and results in fire extinguishment. The resultant lack of free oxygen dictates that total flooding hazards be evacuated immediately, and carbon dioxide from local application be avoided by personnel.

PERFORMANCE

Carbon dioxide is an effective fire extinguishing agent that can be used on many types of fires. It is effective for surface fires, such as flammable liquids and most solid combustible materials. It expands at a ratio of 450 to 1 by volume. Other desirable attributes are its high degree of effectiveness, its excellent thermal stability, and freedom from deterioration. In addition, carbon dioxide has so many additional commercial uses that refills are available in practically every large city or seaport throughout the world. Criteria for quantity and concentration of carbon dioxide is developed in NFPA-12 for both local and total flooding applications.

*Certain materials do exist which contain their own oxygen supply (such as cellulose nitrate). The exclusion of oxygen by carbon dioxide is not effective in the extinguishment of fires involving these materials.

PROPERTIES OF CARBON DIOXIDE

The following are the properties of the agent:

Chemical formula	CO_2
Molecular weight	44.011
Normal sublimation temperature at atmospheric pressure, (°F)	–109.21
Triple point temperature (at 75.35 psia) (°F)	–69.88
Critical temperature, (°F)	87.87
Critical pressure, (psia)	1069.96
Critical density, (lb. per cu. ft.)	29.21
Density of liquid at 86 °F, (lb. per cu. ft.)	37.3
Specific volume of saturated vapor at 5 °F (cu. ft. per lb.)	0.266
Specific heat of liquid at 86°F, (btu per lb. °F)	2.5
Specific heat ratio (c_p/c_v) of vapor at 86 °F and one atmosphere pressure	1.3
Thermal conductivity, (btu ft. per sq. ft. hr. °F):	
Saturated liquid, at 5 °F	0.067
Saturated liquid, at 86 °F	0.041
Vapor, at saturation pressure at 5 °F	0.0139
Vapor, at one atmosphere pressure at 86 °F	0.0169
Viscosity, (Centipoises):	
Saturated liquid at 5 °F	0.13
Saturated liquid at 86 °F	0.065
Vapor at saturation pressure at 5 °F	0.013
Vapor at one atmosphere pressure at 86 °F	0.015
Relative dielectric strength of vapor at ambient temperature and one atmosphere pressure (Nitrogen = 1)	0.88
Color	Clear and water white
Flammability	Non-flammable
Toxicity, Underwriters Laboratories classification	Group 5a

Quality criteria for initial and recharge are as follows:

The vapor phase shall not be less than 99.5% carbon dioxide with no detectable odor.

The water content of the liquid phase shall not be more than 0.01% by weight (–30 °F dew point).

Oil content shall not be more than ten parts per million by weight.

ORDERING INFORMATION

Carbon dioxide cylinders for use in engineered systems may be ordered in 50, 75, and 100 pound sizes.

APPROVAL

Ansul carbon dioxide system components comply with NFPA Standard 12 and are included in Underwriters Laboratories listed File Numbers EX-2968, EX-2969 and EX-2970 for Ansul carbon dioxide fire suppression systems. Containers meet the applicable Department of Transportation and U. S. Bureau of Explosives specifications.