

Flammability of HFC-134a

HFC-134a is considered non-flammable by ASHRAE Standard 34 and by DOT for transportation, and "practically non-flammable" by UL. Flammability can be measured in several different ways depending on the reasons the information is needed. Some definitions of terms relevant to flammability and fire hazard are given below:

- **Flammable Gas** - gases of which mixtures in air of 13 percent or less, by volume, form a flammable mixture; or the flammable range (explosive range) in air is wider than 12 percent regardless of the lower limit (U.S. Department of Transportation definition).
- **Boiling Point** - the temperature at which the vapor of the liquid is in equilibrium with atmospheric pressure. The lower the boiling point, the greater the fire hazard.
- **Flash Point** - the minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid: the lower the flash point, the greater the fire hazard.
- **Auto-ignition Temperature** - the minimum temperature which will initiate a self-sustained combustion of liquid, gas or solid in the absence of a spark or flame : the lower the auto-ignition temperature, the greater the fire hazard.
- **Flammable or Explosion limits** - the range of concentration of a gas or vapor in air, by volume percent in air, in which a fire or explosion can occur upon ignition in a confined area: the wider the range of the explosion limits and the lower the lower flame limit, the greater the fire hazard.
- **Vapor Density** - the weight of a volume of pure vapor or gas compared to the weight of an equal volume of dry air at the same temperature and pressure: vapor densities greater than one indicate the vapor or gas is heavier than air.
- **Auto-ignition Point** - the minimum temperature at which a substance will undergo spontaneous combustion. Also called ignition point, ignition temperature.
- **Fire Point** - the lowest temperature at which a volatile liquid, after its vapors have been ignited, will give off vapors at a rate sufficient to sustain combustion.

For a fire to occur, three conditions must be met: (1) for gases and vapors the concentration of the flammable gas or vapor must be between the lower and upper flammable limits, (2) an oxidizing agent (e.g. the air in the room or a chemical oxidizer) must be available, and (3) there must be a source of ignition or the material must be at its auto-ignition temperature.

A standard test used to measure flammability is ASTM E681 and is used by ASHRAE Standard 34 and UL Standard 2182 to classify the flammability of refrigerants. Under any of these definitions Klea® 134a is not flammable.

Another test used to measure flammability is the flame extension test commonly used with aerosol propellants. An aerosol product is sprayed at a lighted paraffin candle and the extension of the flame past the candle is measured. If the flame projects less than 18 inches the product is labelled as non-flammable.

Klea® 134a does not contribute to flame extension at all in this test.

If Klea® 134a is mixed with oxygen at atmospheric pressure or with air at elevated pressure, a combustible mixture could result. The MSDS for Klea® 134a states both of these conditions should be avoided.