

# DuPont™ FE-36™

fire extinguishing agent

## Description

DuPont™ FE-36™ (HFC-236fa) is a new fire extinguishing agent that is replacing Halon 1211 in portable extinguishers and other streaming applications. FE-36™ is noncorrosive, electrically nonconductive, free of residue, and has zero ozone-depletion potential (ODP). Its boiling point and vapor pressure (see **Figure 1**) are nearly the same as Halon 1211. DuPont's tests, and those sponsored by the U.S. Navy and the Environmental Protection Agency (EPA), indicate a very low level of toxicity.

## Applications and Performance

FE-36™ is ideally suited for use in portable fire extinguishers for high-value applications, such as in computer areas, telecommunication facilities, process control rooms, and commercial/military aviation. Extinguishers containing FE-36™ have been rated as 5-B, 1-A:10-BC, and 2-A:10-BC in tests performed to Underwriters Laboratories Standard 711 using agent quantities comparable to that of Halon 1211. In Europe, FE-36™ extinguishers have been tested to Standard BS EN3 and achieved 5A 55B C and 8A 70B C ratings.

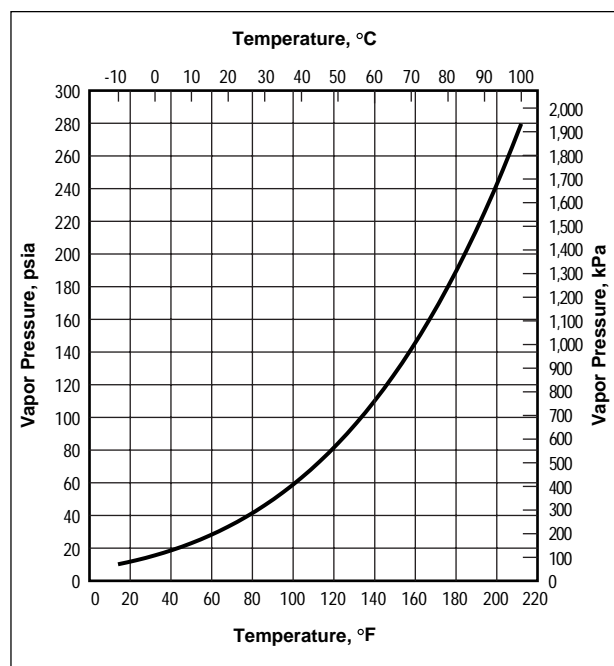
Apart from portables, FE-36™ may be used as a streaming agent in fixed systems where the discharge is aimed at the likely source of the fire. Automotive engine compartments are an example of this use.

At room temperatures FE-36™ functions well as a total flooding agent. Its low toxicity and high efficiency make it particularly attractive for use in normally occupied spaces.

## Toxicity

Toxicity tests show no remarkable clinical signs in 90-day inhalation studies. All genotoxicity tests were negative. Developmental toxicity studies are favorable. Tests for cardiac sensitization show a 10% No Adverse Effect Level (NOAEL) and a 15% Lowest Adverse Effect Level (LOAEL). Comparable values for Halon 1211 are 0.5% NOAEL and 1.0% LOAEL.

Figure 1. Saturated Vapor Pressure of DuPont™ FE-36™



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## Recognition

As a streaming agent, FE-36™ is listed as acceptable for non-residential use under the EPA's Significant New Alternatives Policy (SNAP) program. Also, it is acceptable, without use limits, as a replacement for Halon 1301 in explosion suppression and explosion inerting applications. For total flooding applications FE-36™ may be used where other agents are not technically feasible due to their physical, chemical, or safety properties.

The EPA specifically accepts the FE-36™ system for use inside textile process machinery.

Underwriters Laboratories lists FE-36™ as a recognized component in portable fire extinguishers. Acceptance by Factory Mutual is pending.

The U.S. Coast Guard has granted FE-36™ approval for marine applications.

FE-36™ is included in National Fire Protection Association (NFPA) Standard 2001 and in draft versions of Standard 14520, Gaseous Fire Extinguishing Systems, being developed by the International Organization for Standardization (ISO).

FE-36™ is listed under the Toxic Substance Control Act (TSCA) and the European List of New Chemical Substances (EC-nr.425-320-1).

**Table 1**  
**Properties of DuPont™ FE-36™**  
**Fire Extinguishing Agent**

| Formula   | 1,1,1,3,3,3-hexafluoropropane |
|---|-------------------------------|
| Molecular Weight                                | 152                           |
| Boiling Point, °C                               | -1.4                          |
| °F  | 29.5                          |
| Ozone Depletion Potential (ODP)                 | 0                             |
| Global Warming Potential (GWP)*                 | 6,300                         |
| Atmospheric Lifetime (yrs)                      | 209                           |
| Liquid Density at 25°C (kg/m <sup>3</sup> )     | 1,360                         |
| 77°F (lb/ft <sup>3</sup> )                      | 84.89                         |
| Vapor Pressure at 25°C (kPa)                    | 272.4                         |
| 77°F (psia)                                     | 39.5                          |
| Heat of Vaporization at B.P. (cal/g)            | 38.21                         |
| (Btu/lb)  | 68.77                         |
| Approximate Lethal Concentration (ALC)**, ppm   | >189,000                      |
| Cup Burner (n heptane), %                       | 6.3                           |
| Cardiac Sensitization                           |                               |
| No Observed Adverse Effect Level (NOAEL), %     | 10                            |
| Lowest Observed Adverse Effect Level (LOAEL), % | 15                            |
| Allowable Exposure Limit (AEL)***, ppm          | 1,000                         |

\*100-year time horizon.

\*\*Rats, 4 hr.

\*\*\*Continuous exposure, 8- to 12-hr day.

## Compatibility

DuPont experience with FE-36™ indicates no compatibility problems with common metals during storage as long as moisture is excluded.

In tests performed by the National Institute of Standards and Technology (NIST), certain types of steel, stainless steel, and aluminum in contact with FE-36™ for 28 days at 149°C (300°F) showed no change in appearance.

DuPont two-week tests at room temperature indicate that most common elastomers have negligible swelling, weight gain, and hardness change when exposed to FE-36™, as shown in **Table 2**.

## Availability

FE-36™ is available worldwide in 145-lb and 1,200-lb net weight packages as well as tank trucks or ISO-tank containers.

**Table 2**  
**Common Elastomers Exposed to**  
**DuPont™ FE-36™**

|                             | Linear Swell, % | Weight Gain, % | Hardness Change, Units |
|-----------------------------|-----------------|----------------|------------------------|
| Butyl Rubber                | 0               | 1              | 0                      |
| Norde <sup>®</sup> EPDM     | 1               | 2              | -2                     |
| Neoprene                    | -1              | 1              | 3                      |
| NBR (Buna-N)                | 1               | 3              | -4                     |
| Hypalon <sup>®</sup>        | -1              | 1              | -1                     |
| Viton <sup>®</sup> A        | 15              | 51             | -13                    |
| Epichlorohydrin Homopolymer | -1              | 1              | 0                      |
| Polysulfide                 | -1              | 1              | -1                     |
| Hytrel <sup>®</sup> TPE     | 2               | 7              | 1                      |
| Teflon <sup>®</sup>         | —               | 2              | —                      |

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**CAUTION:** Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.

