



Novec™ 1230 Fire Protection Fluid

Manufacturing

- Q. When will 3M™ Novec™ 1230 Fire Protection Fluid become available for purchase?**
- A. Novec 1230 fluid is available for sale to OEMs for use in developing fire suppression systems and fire extinguishers where a clean halon replacement is required.
- Q. Does 3M have production capacity to supply Novec 1230 Fluid to meet continuous global demand?**
- A. Yes. Novec 1230 fluid is manufactured at our U.S. production facilities. We have sufficient capacity to supply projected demand. We have other manufacturing facilities in the world that are also capable of producing Novec 1230 fluid.

Sustainable Technology

- Q. What do you mean when you say that Novec 1230 fluid is a “sustainable technology”?**
- A. *Sustainable* is a term for a technology expected to be available far into the future. In the case of Novec 1230 fluid, it refers to a product that performs in a fire protection system, is low in toxicity, has low environmental impact and is commercially viable.
- Q. What do you mean when you say that Novec 1230 fluid is “viable”?**
- A. *Viable* means that Novec 1230 fluid can be produced and can be used in many applications at an acceptable cost, considering its value as a fire protection fluid.

Chemistry

- Q. What is Novec 1230 fluid and why was it chosen for use in fire suppression?**
- A. Novec 1230 fluid is a fluorinated ketone with a chemical structure of $\text{CF}_3\text{CF}_2\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$. The six carbon molecule of Novec 1230 fluid was chosen, after carefully considering many others, because it provided an ideal balance of performance, toxicological and environmental properties.
- Q. Are there concerns about product stability of a material like Novec 1230 fluid that is tropodegradable?**
- A. Novec 1230 fluid is photolytically sensitive to sunlight. It must be stored away from direct sunlight. This is not expected to be a problem since it is stored in steel or UV resistant plastic containers. When stored in pressurized cylinders, it is obviously kept away from any direct sunlight.
- Q. Is the product number, 1230, of any significance to its chemistry?**
- A. No. The number 1230 is a 3M-selected numeric that identifies the product only.
- Q. What is the meaning of the brand name Novec?**
- A. The Novec brand stands for products designed to help ensure worker safety, environmental acceptability and optimum performance. Although their chemistries may vary, all Novec branded products offer low toxicity, zero ozone depletion potential, low global warming potential and short atmospheric lifetimes.

Performance

Q. Why is 3M referring to 3M™ Novec™ 1230 Fire Protection Fluid as a fluid?

- A. Novec 1230 fluid will have utility in both streaming as well as certain flooding applications. Therefore, it performs both as a gas and a liquid—both of which are, by definition, fluids.

Q. For global performance standards, does 3M plan to obtain approvals with Novec 1230 fluid?

- A. We will work closely with OEMs who design flooding systems and fire extinguishers to meet standards when required, with consideration for market demand.

Q. Is Novec 1230 fluid better suited for streaming or for flooding applications?

- A. It is designed for use in both types of fire suppression systems. Ultimately, performance is dependent upon the complete system design.

Q. If Novec 1230 fluid performs as well as you say, explain why it is not a “drop-in” for halons?

- A. Novec 1230 fluid and halons are different and their physical properties require different delivery system design. Also, a high-boiling liquid like Novec 1230 fire protection fluid will behave differently than low-boiling gases like the halons. While both Novec 1230 fluid and the halons perform effectively at their respective design concentrations, their extinguishing mechanisms differ. Novec 1230 fluid is a physically-acting agent cooling the fuel to extinguishment, whereas the halons inhibit the combustion chain reaction to extinguish a fire.

Q. Can Novec 1230 fluid be considered a drop-in for other alternatives to halon for streaming or flooding?

- A. Yes, depending upon system hardware and overall system design. Some modifications may be necessary.

Environmental

Q. Is Novec 1230 fluid approved under the U.S. EPA Significant New Alternatives Program (SNAP)? If so, when will it be published by the EPA?

- A. Novec 1230 fluid is registered with the U.S. EPA under TSCA and European ELINCS; others are in progress. Novec 1230 fluid has met the requirements of registration under SNAP for streaming and flooding, and final ruling by the U.S. EPA is pending.

Q: How does Novec 1230 fluid degrade in the atmosphere?

- A: A study conducted by MIT¹ examined the atmospheric loss mechanisms for Novec 1230 fluid. The authors of this study determined that this compound does not react with hydroxyl radical (OH) but that substantial decay occurs when exposed to UV radiation. The authors measured the UV cross-section for Novec 1230 fluid finding a maximum wavelength of absorbance at 306 nm. Since this compound shows significant absorbance at wavelengths above 300 nm, photolysis in the lower atmosphere will be a significant sink for this compound. The authors concluded; “In fact, the absorption spectrum is similar to that of acetaldehyde² a species whose lifetime against solar photolysis is about 5 days.³ The absorption cross sections [of Novec 1230 fluid] are somewhat larger; hence, we expect the atmospheric lifetime [of Novec 1230 fluid] against solar radiation to be of the order of 3 to 5 days.” Recent laboratory measurements of the photodissociation rate of Novec 1230 fluid found it to be equivalent to that for acetaldehyde, within experimental error.⁴ Hence, an atmospheric lifetime of 5 days is appropriate for Novec 1230 fluid.

¹ Guschin, A.G., Molina, L.T., and Molina, M.J.; *Atmospheric Chemistry of L-15381, l-15566 and L-14703 and Integrated Band Strengths of L-14374, L-14375, L-14752, L-13453 and L-14703*; Report prepared for 3M Company, July, 1999.

² Finlayson-Pitts, B.J. and Pitts Jr., J.N.; *Atmospheric Chemistry: Fundamentals and Experimental Techniques*; John Wiley & Sons, New York, 196, 1986.

³ Seinfeld, J.H. and Prandis, S.N.; *Atmospheric Chemistry and Physics*; John Wiley & Sons, New York, 288, 1998.

⁴ Plummer, G.; *Laboratory Measurements and Calculations Related to the Photo-dissociation of L-15566 in the Earth's Lower Atmosphere*; 3M Environmental Laboratory Report Number E01-0549, 2001.

Q: When 3M™ Novec™ 1230 Fire Protection Fluid degrades in the troposphere, what materials are generated?

A: Novec 1230 fluid is expected to rapidly degrade to fluorinated alkyl radicals similar to those produced by other fluorochemicals. Studies of the atmospheric chemistry of these radical species and their degradation products have concluded that they have no impact on stratospheric ozone.⁵ This, combined with its very short atmospheric lifetime, leads to the conclusion that Novec 1230 fluid has an ozone depletion potential of zero.

Q: I thought fully-fluorinated compounds have a long atmospheric lifetime and have extremely high global warming potential. Why is a fluorinated ketone like Novec 1230 fluid different?

A: Novec 1230 fluid is completely different from long-lived HFCs and PFCs in terms of its environmental characteristics because it is a fluorinated ketone. The potential for Novec 1230 fluid to impact the radiative balance in the atmosphere (i.e., climate change) is limited by its very short atmospheric lifetime and low global warming potential (GWP). Using a measured IR cross-section and the method of Pinnock et al⁶ the instantaneous radiative forcing for Novec 1230 fluid is calculated to be 0.50 Wm⁻²ppbv⁻¹. This radiative forcing and a 5 day atmospheric lifetime results in a GWP value of 1 using the WMO 1999 method and a 100 year integration time horizon. Compounds with such short atmospheric lifetimes do not pose any appreciable risk with respect to climate change.

Toxicity

Q. What acute toxicity data is currently available on Novec 1230 fluid?

A. Both the inhalation LC₅₀ and cardiac sensitization NOAEL are greater than 10% v/v. These results indicate Novec 1230 fluid is ideal for use in flooding as well as streaming applications.

Distribution

Q. I am an end user of fire suppression systems and extinguishers. Whom can I contact to buy a system or extinguisher using Novec 1230 fluid?

A. We are initially working with a limited number of OEMs, both for streaming and flooding. Announcement of commercial systems will be a coordinated effort by 3M and these OEMs.

Q. Is Novec 1230 fluid approved for sale in other countries?

A. Each country has its own requirement for registering new chemicals. Some countries have no requirement. We are in the process of registering Novec 1230 fluid in all major countries.

Cost

Q. What is the price of Novec 1230 fluid?

A. The price of Novec 1230 has been established for purchase by approved OEMs. However, we anticipate that the overall cost to the end user for a Novec 1230 fluid extinguisher or system will be within the range of other in-kind alternatives that are already on the market when the overall value associated with its features and benefits are considered. This includes consideration of its sustainability as a viable fire protection technology that can be expected to be available long into the future.

⁵ Wallington, T.J., Schneider, W.F., Worsnop, D.R., Nielsen, O.J., Sehested, J., Debruyne, W.J., Shorter, J.A.; *Environ. Sci. Technol.*; 28, 320, 1994.

⁶ Pinnock, S., Hurley, M.D., Shine, K.P., Wallington, T.J., Smyth, T.J., *J. Geophys. Res.*, 100, 23227, 1995.

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