

# Novec 1230 (3M) vs. FirePro Condensed Aerosol

	Novec1230 (3M) Fluorinated ketone	FirePro Advanced Condensed Aerosol
Classification & Standard	Clean extinguishing agent NFPA2001 ISO14520	Condensed Aerosols NFPA 2010 ISO 15779
Space	Occupied & Unoccupied	Occupied (a) & Unoccupied
Safety to humans	<p>Highest Safety Margin</p> <hr/> <p>Remarks:</p> <ul style="list-style-type: none"> <li>-Novec 1230 has LOAEL of &gt;10% but at the same time has a LC50 also at &gt;10% (j)</li> <li>- When Novec 1230 is inhaled and crosses the lung air-water interface, can hydrolyse (react with water) and produce Perfluoropropionic acid (k) (l) (g). Perfluoropropionic acid is known as strong acid, which attacks steel, forming iron salt (Ferric &amp; Ferrous). According to its MSDS, it may cause eye and skin burns, severe &amp; permanent damage to digestive tract. Also it's known as tumor promoter (a carcinogenesis process) and peroxisome proliferator (liver damage). Peroxisome proliferation in liver has been observed at LOAEL = 0.0997% (l)</li> <li>- At high temperatures Novec 1230 decomposes to produce COF2 (carbon monoxide di fluoride or carbonyl fluoride) and HF (hydrogen fluoride). COF2 has a Chemical Abstracts Service (CAS) Reg NO. 353-50-4, which is highly toxic to humans and causes serious Lung Damage with a delayed effect (see attached internet info). HF is a very strong acid with possible hazardous effects for humans and equipment (n)(o)</li> <li>- High pressure cylinders (25, 42 bar) pose a hazard to operating or maintenance personnel</li> </ul>	<p>Non toxic (b) (c) (d)</p> <p>FirePro Condensed Aerosol consists of <math>K_2CO_3</math> in suspension in <math>N_2</math>, <math>CO_2</math> and <math>H_2O</math>. <math>K_2CO_3</math> (Potassium Carbonate) is the active extinguishing Agent.</p> <p>Does not react with water. It is soluble in water and the resulted pH is slightly alkaline.</p> <p>No effects on human health are expected when humans are in contact with low concentrations or amounts of the substance.</p> <p>The substance is neutralised in the environment and therefore it is not persistent. Furthermore it does not accumulate in organisms. (q)</p>
Residues	<p>No (gas)</p> <p>Remarks:</p> <p>No solid residues but, due to thermal decomposition, liquid residues of a HF solution</p>	Residues are minute (1-5 microns), easy to remove and non-corrosive to electronics (e)
Heat Generation	<p>No heat generation</p> <hr/> <p>Remarks:</p> <p>Sudden temperature drop caused by discharge may cause thermal shock to sensitive equipment</p>	FirePro Condensed aerosol utilizes natural ceramic coolant. Stream temperatures are determined (f)
10min hold time (NFPA)	<p>Guaranteed with every system</p> <hr/> <p>Remarks:</p> <p>Design very dependent on enclosure integrity significant leakage will cause system to fail. Also, pressure vents must be provided as negative peak pressure of -800 Pa may be created within the enclosure at discharge</p>	FirePro is a non-pressurised agent. 10 min. hold time is ensured in non.-tight enclosures. No door-fan test required (d)
Visibility	May form fog for short time if room temperature below dew point	Reduced visibility

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Critical Applications	<p>Yes</p> <p>Clean. Leaves no particles.</p> <p>Approved for critical applications.</p> <p>Typical applications:</p> <p>Computer rooms, Data storage, Switchgear, Servers, Telecommunication, Electronics.</p> <p>Specified by major power utilities.</p> <hr/> <p>Remarks:</p> <p>Possible decomposition of Novec 1230 to produce HF which is can be corrosive.</p>	<p>Yes</p> <p>Particles in the size of 1-5 <math>\mu\text{m}</math>, non-corrosive, no damage to electronics (e), no restrictions (NFPA 2010), typical applications: control rooms, data storage, switchgear, servers, telecommunication, electronics, specified by major power utilities (h)</p>
Risk of Conductivity	No	No
Risk of Corrosion	<p>No(8)</p> <hr/> <p>Remarks: Hydrogen Fluoride (HF) which can be potentially produced as a result of decomposition of Novec 1230 is highly corrosive- acid (p).</p>	<p>No (e)</p> <p>Tested on electronics by accredited Institutes.</p>
Chemical Reactivity	High (reacts with water, alcohols, amines) (g)	Low Chemical reactivity. FirePro Condensed Aerosol consists of $\text{K}_2\text{CO}_3$ in suspension in $\text{N}_2$ , $\text{CO}_2$ and $\text{H}_2\text{O}$ . $\text{K}_2\text{CO}_3$ is stable, non-reactive and slightly alkaline
Storage	Contact with water or solvents, either polar or hydrocarbon, could render Novec 1230 fluid ineffective (m)	FirePro generators are not pressurised and they can be stored under normal conditions without deterioration of their performance.
Chemical Decomposition	- At high temperatures Novec 1230 decomposes to produce COF <sub>2</sub> (carbon monoxide di fluoride or carbonyl fluoride) and HF (hydrogen fluoride). COF <sub>2</sub> has a Chemical Abstracts Service (CAS) Reg NO. 353-50-4, which is highly toxic to humans and causes serious Lung Damage with a delayed effect (see attached internet info). HF is a very strong acid with possible hazardous effects for humans and equipment (n)(o)	FirePro patented FPC compound produces upon activation atmosphere gases ( $\text{N}_2$ , $\text{CO}_2$ and $\text{H}_2\text{O}$ ) and $\text{K}_2\text{CO}_3$ . The products of the extinguishing action are the same.

## References

- (1) <http://www.epa.gov/ozone/snap/fire/lists/flood.html>
- (2) SNAP Update and Risk Assessment on Aerosol Fire Extinguishing Technologies  
Halon Options Technical Working Conference, Erin Birgfeld, U.S. EPA
- (3) Eurofeu Fire Extinguishing Installation Section:  
Position Paper on Particulate Condensed Aerosols. May 2004  
(Section 3.2 - Direct Impact)
- (4) Enclosure Integrity Test  
Retrotec Energy Innovations,  
1639 2<sup>nd</sup> Ave. W Unit 330, Vancouver, British Columbia, Canada
- (5) BS 6266:2011, ASHRAE TC 9.9
- (6) NFPA 75 & 76
- (7) Reliability Qualification Test for Circuit Boards Exposed to Airborne Hygroscopic Dust  
Franpise S. Sandroff and William H. Burnett  
Bellcore 331 Newman Springs Rd Red Bank, NJ 07701
- (8) Minor in case of HF formation due to fire – minimized with early detection.

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- a. Aerosol in occupied areas\_FirePro
- b. Health and Environmental Aspects of the FirePro Fire Extinguisher\_ KEMA
- c. Certificate of the National Institute of Public Health\_PZH
- d. FirePro Hold Time 2014
- e. Corrosion Test Report\_NLR
- f. FirePro Aerosol Temperatures\_FirePro
- g. Clean Agent Fireprotection with HydroFluoroCarbons\_Mark L. Robin
- h. FirePro Reference List 181113NI\_FirePro
- i. Test Report Electrical Conductivity\_FirePro
- j. Toxicity Information for Halocarbon Clean Agents\_NFPA2001
- k. Novec 1230 - Safety Assessment\_3M
- l. 3M NovecTM Fire Protection Fluid 1230\_NICNAS Std.1019, August 2002
- m. Novec - Storage and handling Information\_3M
- n. Novec 1230 Fire Protection Fluid Thermal Decomposition Considerations with 3M Novec 1230Fire Protection Fluid\_3M
- o. Comparative Examination of Thermal Decomposition Product Formation from HFC227ea and Novec1230\_Hughes
- p. Corrosion of Electronic Components by HF\_Andrew Kim and George Crampton
- q. Potassium Carbonate Chemistry\_EuroChlor