

ACTIVE FIRE PROTECTION GUIDE

Novec™ 1230

This document has been produced by RISCAuthority Active Suppression & Detection working group to provide information and outline guidance on the application of Novec™ 1230.

Important note

Since the release of version 1.0 of this document in September 2022, Novec™ 1230 is now being voluntarily withdrawn from the market by its manufacturer, 3M due to its classification as a 'forever chemical'. Whilst other manufacturers can supply FK-5-1-12 (the general name for Novec™ 1230), both EU and US environmental policy changes means its days are numbered for use in fire extinguishing systems. Please refer to AFGP-16 Migration of Novec™ 1230 and HFC gaseous extinguishing agents to environmentally acceptable alternatives.

Summary

Refer to AFGP-01 Overarching Active Fire Protection Guide – All Technologies.

Novec™ 1230:

- is a 'compartment' and 'local application' protection fire protection system
- it must be designed to ensure extinguishment
- performance greatly depends on ventilation and sealing of the compartment it is protecting
- has good environmental credentials
- it will produce hydrogen fluoride in a fire which can be harmful to personnel and damage equipment.

What is Novec™ 1230?

Novec™ 1230 fluid (FK-5-1-12) was developed as a halon replacement and hydrofluorocarbon (HFC) alternative. It belongs to a family of chemicals called halocarbons, a group which includes HFCs and fluoroketones. Novec™ 1230 is a C-6 Fluoroketone (full name: dodecafluoro-2-methylpentan-3-one) with a boiling point of 49.2°C.

Novec™ 1230 systems can be used for compartment protection and local application on specific hazards.

How it works

In a typical total flooding system, the fluid is stored as a liquid in cylinders pressurized with nitrogen. Novec™ 1230 has a discharge duration of around 10 seconds at a pressure of circa 1000Kpa (10 bar).

Novec™ 1230 is stored as a liquid but discharges as a gas. Due to the storage of the liquid, this requires the storage cylinders to be located in close proximity to the protected compartment/area. Novec™ works by distributing the gas uniformly throughout the enclosure, absorbing the heat output from the flames quicker than the fire can produce.

Systems may be automatically or manually activated. The system will be designed to shut down any air conditioning system, close openings and doors, and control all sources of oxygen and fuel (energy) prior to discharge.

Challenges and considerations

Novec™ 1230 can be an effective fire protection system which



extinguishes fire and prevents re-ignition. The raw agent, at typical fire protection use concentrations, presents no risk to people or damage to equipment when engineered and installed by a competent qualified fire suppression systems installation company. The No Observable Adverse Effects Level (NOAEL) and Lowest Observable Adverse Effects Level (LOAEL) of the raw agent are 10% and >10% respectively. Please see AFG-01 for explanation. Under the action of fire, hydrogen fluoride, a highly toxic and corrosive acidic gas, is a by-product of its extinguishing action. The amount of hydrogen fluoride is unctioonn of the fire size and generated concentrations can be significant when considering human exposure and this must be appreciated in the fire safety management plan. Hydrogen fluoride forms a very aggressive corrosive acid when dissolved in water and is capable of damaging any exposed metals and/or glass. Similarly, the release of any gaseous agent within a fire compartment will cause mixing of agent and fire products at all levels within the enclosure, which might impair escape through loss of visibility, acid gas irritation, and inhalation of toxic products such as CO and CO₂.

The high agent boiling point means there is a need to consider its appropriateness in cold environments where vaporisation rates may be impaired.

Like any gaseous system, it is imperative that the enclosure it is protecting is designed to vent safely during discharge and hold on to the agent for the prerequisite time period thereafter to secure all fire risks. This is normally achieved by conducting an enclosure integrity test, the data from which will be used to design a specific vent device. During discharge, Novec™ 1230 can result in both under and over pressures. Best practice dictates that the pressure relief device should direct gas and fire products from the protected enclosure to the outside via a route that will not lead to exposure of people to the emitted gases.

Novec™ 1230 is a very heavy gas (11 times heavier than air), and as such uncontrolled leakage paths at low level can be very detrimental to maintaining agent concentration after discharge.

In keeping with all chemical agents of the type capable of hydrogen fluoride production, after deployment in a real fire scenario, all equipment should be examined for fire damage and

contamination by soot/other fire products and acid corrosion – especially high voltage switchgear that might incur resistive heating at corroded contactors.

Applicable standards

BS EN 15004-1:2019. *Fixed firefighting systems. Gas extinguishing systems. Design, installation, and maintenance.*

16/30339864 DC. BS EN 15004-1. *Fixed firefighting systems. Gas extinguishing systems. Part 1. Design, installation, and maintenance.*

14/30274909 DC. BS EN 15004-1. *Fixed firefighting systems. Gas extinguishing systems. Part 1. Design, installation, and maintenance.*

LPS 1204 – 3.1 *Requirements for firms engaged in the design installation, commissioning, and servicing of gas extinguishing systems.*

LPS 1230 – 1.2 *Requirements for fire testing of fixed gaseous fire extinguishing systems.*

BS ISO 14520-1 *Gaseous fire-extinguishing systems – Physical properties and system design – Part 1: General requirements.*

NFPA 2001:2018 *Standard on clean agent fire extinguishing systems.*

F.M. Global D-S 4.9 *Halocarbon and Inert gas (clean agent) Fire extinguishment systems 2019.*

BS 5839-1:2017 *Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning, and maintenance of systems in non-domestic premises.*

BS7273:2006 *Electrical actuation of gaseous total flooding extinguishing systems.*

UL 2166:2019 *Standard for Halocarbon Clean Agent Extinguishing System Units.*

Effective for use with:

- laboratories/telecommunication rooms
- computer and server environments
- control rooms/archive storage
- halon replacement
- conventional detection systems
- Class A, Class B, and Class C Fires
- electrical equipment (non-conductive)
- ship building and oil platforms.

Has limitations in relation to:

- Class D Fires
- combustible metals (Sodium, Potassium, Magnesium, etc.)
- chemicals containing their own oxygen supply, such as cellulose nitrate.
- requires the enclosure to be gas tight
- requires the air conditioning and openings to be closed/shut down on detection

- where equipment is sensitive to acid gases (hydrogen fluoride)
- pressure relief required during discharge.

Approvals

Underwriters Laboratory, Underwriters Laboratory Canada, F.M. Global, Loss Prevention Certification Board, VDS Schadenverhütung, Centre National de Prevention et de Protection, Scientific Services Laboratories, and Korea Fire Institute.

Best practice

Following 3M's decision to withdraw Novec™, alternatives should be sought (see AFGP-16).

Discharge of the gas within the enclosure is by means of a suitable fire detection system, normally a conventional two stage detection system, in which the first detection would raise the alarm, and the second detection would discharge the gas. Fully addressable systems and VESDA/air pipe sampling detection can also be used.

Operation of the system should be interlocked with isolation of all sources of heat, energy, fuel, and conveyancing, and also invoke the main building's fire alarm system.

Mistakes at design stage can be costly in terms of performance and lead to fires not being extinguished. Specialist computer calculation software is essential to ensure that the design of the enclosure/s (floor void, room void, and ceiling void) discharge the correct amount of extinguishing agent into each separate volume using the correct selection of nozzles, pipe sizes, and orifice plates within the nozzles. Spacing of nozzles is also critical to ensure that an even flow of gas is distributed throughout the enclosures to reduce oxygen levels within the specified discharge time required.

Best uses of Novec™ 1230

'Asset protection' – Novec™ 1230 is generally designed as an extinguishing system for use in business critical areas to protect specific assets from fire damage (e.g. servers).

'Life Safety' – Not installed for life safety, however, as a full system inclusive of fire detection system, it can aid in early detection and evacuation.

'Property protection' – Will only be considered as an extinguishment system. Failure of extinguishment and the fire will rekindle and continue unopposed potentially producing prolific quantities of hydrogen fluoride.

Environmental credentials

Novec™ 1230 has a global warming potential of 1 and ozone depletion potential of 0. It has a 5-day atmospheric lifetime and a 30-year shelf life, satisfying current environmental and safety standards. Novec™ 1230 does not fall under the European F-Gas regulation. At the end of the lifetime of the system, the fluid can be readily recovered and recycled.