Department for Environment, Food and Rural Affairs

Guidance for Fire Protection Sectors

Guidance: F Gas and Ozone Regulations

Information Sheet FP 2: Usage

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Contents

This Information Sheet provides background information about the use of fluorinated greenhouse gases for fire protection in Great Britain. We provide a description of the F gas used and discuss sources of emissions and options for reducing emissions through improved containment or use of alternatives.

1 Use of F Gases by Fire Protection Sector

Fire protection systems are users of F gases that are affected by the EU F gas Regulations. The following table lists the most common F gases used in fire protection systems. A more comprehensive list of both F gases and ozone-depleting substances in use and affected by these Regulations is available in Information Sheet GEN 2.

F Gas	Trade Names	Chemical Formula
HFC-23	FE-13	CHF_3
HFC-125	FE-25, ECARO, NAF-125	C_2HF_5
HFC-227ea	FM-200, FE-227, NAF-227	C_3HF_7
HFC-236fa	FE-36	$C_3H_2F_6$

HFC 227ea is the most dominant HFC used in fire protection systems in Great Britain. It is safe for use in applications where people are normally present (normally occupied spaces) for both Class-A and Class-B fire risks. HFC 227ea is intended to prevent or extinguish fires in situations where conventional extinguishing agents such as water, dry chemical, and carbon dioxide are unsuitable. These situations exist primarily where there is electrical or sensitive electronic equipment servicing a critical operation, the loss of which would not only be the value of the equipment, but also the cost of business interruption. Other situations involve delicate or irreplaceable materials such as those found in museums, libraries and historical sites. Applications where HFC 227ea is appropriate for a total flood fire suppression system also include computer rooms, telecommunication switch stations and facilities, semiconductor manufacturing facilities, data processing centres, clean rooms, and industrial process control rooms. Other examples of applications include pleasure craft engines' compartments, petrochemical facilities, chemical storage rooms, paint lockers, and other applications where hydrocarbon-based materials are present.

HFC 125 was originally sold as a 'drop-in' halon replacement, but is now provided for new systems, such as those described for HFC 227ea. HFC 125 is effective for many surface fires and most solid combustible materials.

HFC 23 is a high vapour pressure HFC and a by-product of HFC 22 manufacture. As it has low toxicity, HFC 23 can be used in applications at high concentrations where the occupancy of the protected space is possible. HFC 23 can be used in applications with difficult Class-B fire hazards, such as hard-to-extinguish fuels like methanol, as well as in spaces where the volume will vary with contents, such as cargo holds. The physical properties of HFC 23 allow for its use in applications where large differences between the low and high hazard temperatures are expected. The low boiling point of HFC 23 allows for the storage of the containers to be located in remote areas, far from the protected space, as well as in environments other than room temperature. Some other examples of applications where HFC 23 is used include: electrical control rooms, oil rig platforms, control rooms, pump rooms, flammable liquid processing areas, railroad locomotives, turbine enclosures, computer rooms, mobile communication facilities, and surface mining equipment.

HFC-236fa is a streaming agent best suited to directing a jet at the seat of a fire from a portable appliance.

2 Use of Fire Protection Systems

F gases are used as fire fighting agents in certain specialised applications e.g. for buildings protecting valuable items or critical plant or machinery such as electronic systems serving computer centres and telecoms, data warehouses, clean rooms, industrial process control rooms, petrochemical factories. The use of HFCs in fire fighting is relatively small. Some emissions are inevitable i.e. if there is a fire the HFC agent is all emitted. The key F gas fire protection systems are as follows:

2.1 Fixed systems

These are associated with the total flooding of a 'room' or enclosed space. These systems are designed and installed to ISO 14520[1],[2]. These systems are used in situations as described in Section 1 above. The size of HFC charges in fixed systems ranges from a few kg to 1000s kg.

2.2 Portable extinguishers

The use of HFCs in portable fire extinguishers is very limited as the requirement is for a streaming agent. All of the HFCs mentioned above could be used, but the most likely to be found is HFC 236fa. In relation to fixed systems the use of HFCs in portable extinguishers is very small.

[1] EN15004 is now published and is the European equivalent of ISO 14520.

[2] ISO 14520-1:2000 Gaseous fire-extinguishing systems -- Physical properties and system design. ISO 14520-1:2005 specifies requirements and gives recommendations for the design, installation, testing, maintenance and safety of gaseous fire fighting systems in buildings, plant or other structures, and the characteristics of the various extinguishants and types of fire for which they are a suitable extinguishing medium. It covers total flooding systems primarily related to buildings, plant and other specific applications, utilizing electrically non-conducting gaseous fire extinguishants that do not leave a residue after discharge and for which there are sufficient data currently available to enable validation of performance and safety characteristics by an appropriate independent authority. The standard is comprised of part 1 covering general requirements, and parts 2 through 15 covering agent-specific requirements.

3 Sources of F Gas Emissions

Any fire protection system or extinguisher must be available for discharge at the moment a fire event occurs. Fixed systems (and extinguishers) are therefore designed, produced and maintained in a manner that eliminates loss of agent through leakage, and, in the case of fixed systems, inadvertent or unwanted discharge. Fixed systems are effectively leak free throughout their life, but emissions will occur as a result of the discharge onto a fire. Procedures are in place to prevent discharge through inadvertent fire alarms. Personnel are trained to minimise emissions which could occur during filling or maintenance of systems.

For fire protection systems there are five potential sources of F gas emissions. These are:

- **Gradual leakage from the valve.** If leakage is slow it can go unnoticed. The monitoring of the pressure gauge by the user and the service visits every 6 months would identify these. The leakage testing carried out as part of the approval against EN12094-4 ensures that the valves are inherently leak tight.

- **Unwanted discharge.** This is extremely rare as procedures are in place to ensure that the systems only discharge upon a second confirmation of the fire signal. A maliciously operated system discharge is theoretically possible.

- **Emission during system maintenance.** There is no adding or removal of F gases during maintenance. Recovery and refilling operations are carried out in a specialist factory - never on site.

- **Emissions at end of system life.** It is vital to properly recover F gases from older systems during decommissioning, using recovery equipment and appropriately trained personnel.

- **Discharge onto a fire.** The Regulation accepts that discharge onto a fire is a legitimate use of HFCs. This is a very rare occurrence, but is crucial for saving life and property. The HFC extinguishes by absorbing heat from the fire. Some or all of the HFC is broken down by the heat, dependent on the size of the fire. Therefore the full discharge quantity is never emitted to the atmosphere as an HFC.

4 Options for Reducing F Gas Emissions

Fully complying with the EU F gas Regulations will help reduce emissions. F gas leakage is costly in both financial and environmental terms – it makes sense to address the leakage problem. To achieve the lowest possible loss of F gas a fire protection system operator should take the following steps.

4.1 Ensure regular leak checks are carried out and take action to repair leaks

The EU F gas Regulation sets down minimum requirements on leak testing that are a key obligation. Make sure that leaks are repaired promptly and properly by appropriately certificated personnel. See Information Sheet FP 3 for details on frequency.

4.2 Address the "rogue" systems

Any recurring leaks or discharges must be fully investigated to avoid any re-occurrences.

4.3 Ensure you maintain complete records

Data, such as the loss of HFC and the cause of previous leaks, makes management of leakage problems easier and more effective. For advice on keeping records see Information Sheet FP 6 and GEN 3.

5 Alternative Substances for Use in Fire Protection Systems

The ideal way of reducing F gas emissions is to consider alternative fire protection systems. HFCs should only be used when the need for speed of extinguishment, safety, weight and economic factors have been considered. A skilled fire engineer needs to assess the risk and identify the possible solutions. There is no simple cross reference because every alternative system has positive and negative aspects which must be taken into consideration.

The information in this document is intended as guidance and must not be taken as formal legal advice or as a definitive statement of the law. Ultimately only the courts can decide on legal questions and matters of legal interpretation. If you have continuing concerns you should seek legal advice from your own lawyers.