

EU F-Gas Regulation Guidance

Information Sheet 2: Commercial Refrigeration

Target audience for this Information Sheet

This Information Sheet is aimed at organisations that are operators (usually the owner) of commercial refrigeration equipment, including food and drink retailers and food service companies. It is also useful for those organisations that manufacture, sell, maintain and dispose of commercial refrigeration equipment.

1. Background

This guidance is for organisations affected by the 2014 EU F-Gas Regulation (517/2014). The F-Gas Regulation creates controls on the use and emissions of fluorinated greenhouse gases (F-Gases) including HFCs, PFCs and SF₆.

In the commercial refrigeration sector, the F-Gas Regulation affects the use of HFCs as refrigerants and as blowing agents for the insulation foam used for retail displays and storage equipment. The 2014 EU F-Gas Regulation replaces the 2006 Regulation, strengthening all of the 2006 requirements and introducing a number of important new measures.

The F-Gas Regulation is an important piece of legislation that will result in significant reductions in the emissions of F-Gases. These are very powerful greenhouse gases, with global warming impacts that are several thousand times higher than CO₂ (per kg of gas emitted). All EU Member States agree that it is important to reduce emissions of these gases.

This Information Sheet describes the requirements that apply to commercial refrigeration. Further guidance is available – see Information Sheet 30 for a full list and a glossary of terms.

Commercial Refrigeration: Compliance Checklist for EU F-Gas Regulation

Purchase of new equipment

- ✓ **NEW:** Comply with various bans on the use of HFCs in new commercial equipment
- ✓ **NEW:** Take account of service ban when selecting refrigerants
- ✓ **NEW:** Take account of HFC phase down when selecting refrigerants

Operation of existing equipment

- ✓ Mandatory leak checks and repairs
- ✓ **NEW:** Use new CO₂e equivalent (CO₂e) size thresholds for mandatory leak checks
- ✓ **NEW:** Use new CO₂e size thresholds for automatic leak detection (from 1st Jan 2015)
- ✓ Keep records about all refrigeration equipment using HFC refrigerants
- ✓ **NEW:** Service ban, affecting maintenance of existing high GWP systems (e.g. HFC 404A)
- ✓ Use qualified technicians for leak checking and refrigerant handling operations

End-of-life requirements

- ✓ Mandatory recovery of refrigerant by qualified technician

2. Sector description

The commercial refrigeration sector is a major user of HFCs. The majority of commercial end users are in retail (e.g. supermarkets, petrol stations, small shops) and in food service (e.g. pubs, hotels, restaurants). There are 3 main categories of equipment used in the commercial refrigeration sector:

- a) **Small hermetically sealed systems**, e.g. ice cream freezers, bottle coolers, stand-alone retail displays. These systems have similarities with domestic refrigerators and typically contain between 0.1 and 0.5 kg of refrigerant. HFCs 134a and 404A are widely used in these systems.
- b) **Condensing units**, used in small shops, convenience stores and food service. These are medium sized systems with one or two retail displays cooled by a remote “condensing unit” comprising a compressor and a condenser, located at the back of the shop or outdoors. They typically contain between 2 and 10 kg of refrigerant, with HFC 404A being dominant.
- c) **Central pack systems**, used in supermarkets and other large stores. Numerous display cases are connected to a compressor pack at the back of the store (with several compressors) and to an externally located condenser. Central packs are large systems often containing in excess of 100 kg of refrigerant, with HFC 404A being dominant.

3. Purchase of new equipment

NEW: HFC Bans

The rules for purchase of new equipment depend on the type and size of equipment. For **all new commercial refrigeration equipment** there is a ban on very high GWP refrigerants from 2020 – this will mainly affect the use of R404A:

- Ban 1: The use of HFCs with a GWP¹ above 2,500 will be banned in all new commercial refrigeration equipment placed on the EU market **after January 1st 2020**

For **hermetically sealed commercial refrigerators and freezers** there is an additional ban:

- Ban 2: The use of HFCs with a GWP above 150 will be banned in new hermetically sealed commercial refrigeration equipment placed on the EU market **after January 1st 2022**

For **central pack systems** and other large commercial refrigeration systems there is an additional ban:

- Ban 3: The use of HFCs with a GWP above 150 will be banned in new commercial refrigeration systems with a rated capacity of 40 kW or more placed on the EU market **after January 1st 2022**. The primary circuit of a cascade system can use an HFC with a GWP below 1,500²

The size threshold of 40 kW in Ban 3 refers to cooling capacity. Smaller pack systems and condensing units with a cooling capacity below 40 kW are only subject to Ban 1.

For **hermetically sealed commercial refrigerators and freezers** Ban 1 and Ban 2 apply to both the refrigerant and the foam blowing agent. Ban 1 will mainly affect the use of HFC 404A as a refrigerant. Ban 2 will also prevent the future use of HFC 134a as the refrigerant and it will ban HFCs 245fa and 365mfc as the foam blowing agents (as these all have GWPs well above 150).

¹ GWP: Global Warming Potential. See Information Sheet 25 for more details on GWP.

² Primary circuit of a cascade system: See Information Sheet 30 glossary for more details.

Any foam insulation used in retail displays or cold rooms served by **condensing units** or **central pack systems** is subject to 2 further bans that apply to different types of insulating foam:

- Ban 4: The use of HFCs with a GWP above 150 will be banned in **extruded polystyrene foam (XPS)** placed on the EU market **after January 1st 2020**
- Ban 5: The use of HFCs with a GWP above 150 will be banned in other foams, including **polyurethane foam (PU)** placed on the EU market **after January 1st 2023**

NEW: Impact of the Service Ban on purchase of new equipment

Purchasers of new commercial refrigeration equipment must be aware that a “Service Ban” will affect certain **existing** systems using HFCs with a GWP above 2,500 from **2020**. To avoid future problems you should select only refrigerants with a GWP below 2,500, with immediate effect. The service ban is discussed in detail below.

NEW: Impact of the HFC Phase Down on the purchase of new equipment

When purchasing new commercial refrigeration equipment you should also consider the HFC phase down³. This will reduce the quantity of HFCs that can be sold in the EU – by 2030 there will be an 80% cut in HFC supply. Equipment bought now will still be operating when deep cuts in HFC supply are in force. Irrespective of the bans described above, it makes sense to always purchase equipment using refrigerants with the lowest practical GWP to minimise the future impact of the phase down⁴.

4. Operation of existing equipment

The 2014 F-Gas Regulation includes a number of requirements that affect the use and maintenance of existing commercial refrigeration equipment containing HFC refrigerants. The exact rules depend on the type and size of commercial refrigeration equipment being used. The regulations affecting existing equipment relate to (a) leak prevention, (b) record keeping, (c) the Service Ban and (d) the use of trained technicians. These requirements are described below.

Leak prevention and mandatory leak checks

The intentional release of F-Gases into the atmosphere is prohibited and operators of all commercial refrigeration equipment must take all measures that are technically and economically feasible to minimise leakage. Where leaks are detected operators must carry out repairs without undue delay.

NEW: Under the 2006 Regulation, the legal responsibility for preventing F-Gas releases was only given to the operator (usually the owner) of the equipment. In the 2014 Regulation there is a similar legal responsibility given to third party contractors carrying out installation, maintenance, leak checking or refrigerant recovery on behalf of operators.

Mandatory leak checks are required on all commercial refrigeration equipment above certain size thresholds. Under the 2006 F-Gas Regulation, the thresholds were set in terms of the physical quantity of refrigerant in the system – those containing more than 3 kg required a regular leak check.

NEW: Under the 2014 Regulation the requirements are similar, but the size thresholds are defined in terms of tonnes CO₂ equivalent (CO₂e)⁵. These new CO₂e size thresholds mean that the kg threshold for each refrigerant is different. Refrigerants with a high GWP (e.g. HFC 404A) will have a lower size

³ HFC phase down: see Information Sheet 28 for further details

⁴ Low GWP alternatives to HFCs: see Information Sheet 29 for further details

⁵ Understanding CO₂ thresholds: see Information Sheet 25 for further details

threshold than refrigerants with a lower GWP (e.g. HFC 134a). Table 1 shows leak testing requirements under both Regulations. Example thresholds are given for HFC 404A and HFC 134a. A comprehensive table of thresholds for all refrigerants is given in Information Sheet 24.

Table 1: Size Thresholds for Mandatory Leak Checks

Leak Check Frequency*	2006 Regulation	2014 Regulation		
	kg threshold for all HFC refrigerants	tonnes CO ₂ e threshold for all HFC refrigerants	kg threshold for HFC 404A	kg threshold for HFC 134a
Annual	3 kg	5 tonnes CO ₂ e **	1.3 kg	3.5 kg
Every 6 months	30 kg	50 tonnes CO ₂ e	13 kg	35 kg
Every 3 months	300 kg	500 tonnes CO ₂ e	127 kg	350 kg

* Leak check frequency is halved if automatic leak detection system is installed

** The threshold for annual leak checks of hermetically sealed equipment is 10 tonnes CO₂

The new CO₂e thresholds will require some systems below the old 3 kg threshold to be regularly leak tested. As shown in Table 1, the size threshold for HFC 404A is only 1.3 kg. Operators should check which of their systems are affected by the new CO₂e size thresholds. Most of the leak checking rules apply from 1st January 2015, continuing the similar requirement in the 2006 Regulation. However, for systems with less than 3 kg, the 5 tonnes CO₂e threshold only applies from 1st January 2017.

If a leak is found during a mandatory leak check it must be repaired without undue delay and the leak test repeated within one month to ensure the repair was effective.

Mandatory automatic leak detection

NEW: For all commercial refrigeration systems containing 500 tonnes CO₂e or more there is a mandatory requirement for an automatic leak detection system to be fitted. This is a continuation of a similar requirement in the 2006 Regulation, although the size threshold is changed from 300 kg to 500 tonnes CO₂e. This will have a significant impact on plants using high GWP refrigerants.

For HFC 404A refrigeration systems, the new threshold for automatic leak detection is reduced from 300 kg to 127 kg. This rule applies from 1st January 2015. The lower size threshold for HFC 404A will affect many central pack systems as they often contain more than 127 kg.

An automatic leak detection system is defined as a “*calibrated mechanical, electrical or electronic device for detecting leakage of F-Gases which, on detection, alerts the operator or a service company of any leakage*”.

Automatic leak detection systems must be tested at least once every 12 months to ensure their proper functioning.

Record keeping

Operators of commercial refrigeration equipment must keep records for each piece of equipment that is subject to a mandatory leak check (i.e. above the 5 tonnes CO₂e threshold). The records that must be kept are similar to those required under the 2006 Regulation:

- a) quantity and type of F-Gas installed
- b) quantities of F-Gas added during installation, maintenance or when repairing a leak

- c) **NEW:** whether the F-Gases used have been recycled or reclaimed (including the name and address of the recycling or reclamation facility and, where applicable, the certificate number).
- d) quantity of any F-Gases recovered
- e) the identity of the undertaking that installed, serviced or decommissioned the equipment, including, where applicable, their certificate number
- f) dates and results of all mandatory leak checks
- g) **NEW:** if the equipment was decommissioned, the measures taken to recover and dispose of the F-Gases.

NEW: Records must be kept by the plant operator for at least 5 years

NEW: Records collected by a contractor on behalf of an operator must be kept by the contractor for at least 5 years

The records shall be made available on request to the UK Government's competent authority (i.e. the Environment Agency) or to the Commission.

NEW: Service Ban

An important new feature of the 2014 F-Gas Regulation is the Service Ban, affecting existing systems:

- From 1st January 2020 the use of F-Gases with a GWP above 2,500 to maintain commercial refrigeration systems with a charge size of 40 tonnes CO₂e or more shall be prohibited.

In the commercial refrigeration sector this will mostly affect systems that use HFC 404A. The size threshold of 40 tonnes CO₂ is equivalent to 10 kg of HFC 404A. Small systems, including hermetically sealed units and many condensing units will be unaffected if they are below this size threshold.

All existing central pack systems and larger condensing units (with more than 10 kg of HFC 404A) will need to comply with the 2020 Service Ban. It will be legal to continue operating such systems, but you will not be allowed to top up any leaks with virgin HFC 404A. Owners of equipment affected by the Service Ban have 3 main options:

- a) You can replace the plant with new equipment using a refrigerant with a lower GWP. This is a good option for plants close to end-of-life.
- b) You can "retrofill" the plant, replacing the HFC 404A with a lower GWP alternatives such as HFC 407A, HFC 407F, HFC 448A and HFC 449A. This option is a good one for younger equipment. There is good evidence that retrofilling with these refrigerants will improve energy efficiency by between 5% and 10% - this creates a good financial case for retrofill.
- c) You can use reclaimed or recycled HFC 404A for plant maintenance until 1st January 2030.

Use of trained technicians

All refrigerant handling operations on commercial refrigeration equipment containing HFC refrigerants must be carried out by suitably trained technicians holding an F-Gas handling certificate and working for an F-Gas Certificated company. This includes plant installation, leak testing, maintenance and end-of-life decommissioning.

See Information Sheet 21 for details of all training and certification requirements.

5. End-of-life requirements

Any commercial refrigeration equipment containing HFCs in either the refrigeration circuit or the insulation foam that is being disposed of at end-of-life must undergo an HFC recovery process.

For **central pack systems** and **condensing units** refrigerant must be recovered by a certificated technician before the plant is dismantled. Modern refrigerant recovery machines should be able to remove well over 95% of the refrigerant in an old system. Any insulating foam associated with these refrigeration systems (e.g. PU foam in retail displays and small cold rooms) should be sent to a specialist recovery facility, where the foam can be crushed and the HFCs recovered.

For **hermetically sealed commercial refrigerators and freezers** any HFC refrigerant or HFCs in insulating foam must be recovered. The whole unit can be sent to a specialist recovery facility where HFCs from both the refrigeration circuit and the insulating foam can be recovered. Alternatively, the refrigerant can be recovered in situ and then the unit sent to a specialist facility for foam recovery.

All recovered HFC refrigerants can either be:

- a) sent for destruction by incineration at a licenced waste facility
- b) sent to a specialist plant that can re-process the old refrigerant into a gas with properties identical to virgin refrigerant, to create “reclaimed refrigerant”
- c) given a basic cleaning process, to create “recycled refrigerant”.

Given the HFC supply shortage that will be created by the phase down process, it is worth trying to send the old refrigerant for reclamation as it may have a good residual value. If the old refrigerant is too contaminated it cannot be reclaimed and must be sent for destruction. It is important not to mix different gases in the same recovery cylinder – as this would render them unsuitable for reclamation.

Reclaimed refrigerant can be used in any refrigeration equipment. Recycled refrigerant must always be used with care as it may be contaminated or of unknown composition. The use of recycled refrigerant with a GWP above 2,500 is restricted to either (a) the organisation owning the plant from which the gas was recovered or (b) the organisation that carried out the recovery.

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This Information Sheet has been prepared by Gluckman Consulting

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