

EU F-Gas Regulation Guidance

Information Sheet 5: Stationary Air-conditioning and Heat Pumps

Target audience for this Information Sheet

This Information Sheet is aimed at organisations that are operators (usually the owner) of stationary air-conditioning and heat pump equipment used in buildings of all types. It is also useful for those organisations that manufacture, sell, maintain and dispose of stationary air-conditioning and heat pump 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 stationary air-conditioning and heat pump sectors, the F-Gas Regulation affects the use of HFCs as refrigerants. 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 stationary air-conditioning and heat pumps. Further guidance is available – see Information Sheet 30 for a full list and a glossary of terms.

Stationary air-conditioning and heat pumps: Compliance Checklist for EU F-Gas Regulation

Purchase of new equipment

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

Operation of existing equipment

- ✓ Mandatory leak checks and repairs
- ✓ **NEW:** Use new CO₂ equivalent size thresholds for mandatory leak checks
- ✓ **NEW:** Use new size thresholds for automatic leak detection (from 1st Jan 2015)
- ✓ Keep records about air-conditioning and heat pump equipment using HFC refrigerants
- ✓ 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 stationary air-conditioning and heat pump sector is a major user of HFCs. The majority of end user applications are in domestic, commercial and public sector buildings. There are 5 main categories of equipment used in the stationary air-conditioning and heat pump sector:

- a) **Single split systems.** These consist of an indoor cooling unit connected to an outdoor condensing unit (compressor and condenser). HFC 410A is dominant in new systems and refrigerant charge is typically between 1 kg and 5 kg.
- b) **Large split systems and packaged units.** This includes a range of direct expansion air-conditioning systems including multi-splits, VRF systems and rooftop packaged plants. HFC 410A is dominant in new systems and refrigerant charge is typically between 5 and 50 kg.
- c) **Chiller systems.** These are usually used to cool large buildings, using chilled water as a secondary refrigerant. Large chillers often use HFC 134a and have typical refrigerant charges between 50 kg and 500 kg. Smaller chillers might use HFC 410A or HFC 407C and have charges between 5 kg and 50 kg.
- d) **Heating only heat pumps.** This includes air source, ground source and water source heat pumps for building heating. Domestic systems often use HFC 410A and typically have a refrigerant charge between 3 kg and 5 kg. Larger systems using various refrigerants are used in commercial, industrial and public buildings.
- e) **Hermetically sealed movable air-conditioning systems.** Small integral air-conditioning units that can be moved between different rooms in a building. These usually use HFC 134a or HFC 410A and have refrigerant charges of well under 1 kg.

Many stationary air-conditioning systems are “reversible”, meaning that they can operate as cooling systems in hot weather and heat pump heating systems in cold weather.

VRF systems are usually designed to operate simultaneously in cooling and heating modes, for different parts of a building.

3. Purchase of new equipment

NEW: HFC Bans

The rules for purchase of new equipment depend on the type and size of equipment. There are two bans on the use of HFCs in new stationary air-conditioning and heat pump systems:

- Ban 1: Use of HFCs with a GWP¹ above 150 will be banned in all new **hermetically sealed movable air-conditioning equipment** placed on the EU market after January 1st 2020
- Ban 2: The use of HFCs with a GWP above 750 will be banned in **single split systems** containing less than 3 kg of refrigerant placed on the EU market after January 1st 2025

There are no HFC bans that apply to larger air-conditioning systems (including chillers and larger split systems) or to heating only heat pumps.

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

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

When purchasing new air-conditioning and heat pump equipment you should also consider the HFC phase down². 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 down³.

4. Operation of existing equipment

The 2014 F-Gas Regulation includes a number of requirements that affect the use and maintenance of existing stationary air-conditioning and heat pump equipment containing HFC refrigerants. The rules depend on the type and size of equipment being used. The regulations affecting existing equipment relate to (a) leak prevention, (b) record keeping, and (c) 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 stationary air-conditioning and heat pump 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 stationary air-conditioning and heat pump 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 equivalent⁴. These new CO₂ equivalent (CO₂e) size thresholds mean that the kg threshold for each refrigerant is different. Refrigerants with a higher GWP (e.g. HFC 410A) will have a lower size 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 410A and HFC 134a. A comprehensive table of thresholds is given in Information Sheet 24.

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 410A is only 2.4 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.

² HFC phase down: see Information Sheet 28 for further details

³ Low GWP alternatives to HFCs: see Information Sheet 29 for further details

⁴ Understanding CO₂ thresholds: see Information Sheet 25 for further details

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 410A	kg threshold for HFC 134a
Annual	3 kg	5 tonnes CO ₂ e **	2.4 kg	3.5 kg
Every 6 months	30 kg	50 tonnes CO ₂ e	24 kg	35 kg
Every 3 months	300 kg	500 tonnes CO ₂ e	240 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 CO₂e

Mandatory automatic leak detection

NEW: For all stationary air-conditioning and heat pump systems containing over 500 tonnes CO₂e 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 an impact on plants using higher GWP refrigerants. For HFC 410A the threshold for automatic leak detection systems is reduced from 300 kg to 240 kg. This rule applies from 1st January 2015. However, for lower GWP refrigerants it is possible that the new size threshold is higher than the old threshold of 300 kg. For HFC 134a, which is commonly used in large chillers, the new threshold is 350 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 every 12 months to ensure proper functioning.

Record keeping

Operators of stationary air-conditioning and heat pump 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. 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.

Service Ban

For refrigeration equipment using high GWP refrigerants there is a new Service Ban. It is important to note that the Service Ban does not apply to stationary air-conditioning and heat pump systems.

Use of trained technicians

All refrigerant handling operations on stationary air-conditioning and heat pump 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 stationary air-conditioning and heat pump equipment containing HFC refrigerants being disposed of at end-of-life must undergo an HFC recovery process.

The HFC 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.

For hermetically sealed movable air-conditioning systems the refrigerant can be recovered before the plant is sent for disposal. Alternatively the whole unit can be sent to a specialist recovery facility where HFCs can be recovered.

All recovered F-Gases 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.

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This Information Sheet has been prepared by Gluckman Consulting

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